SIEMENS

SIMATIC

Process Control System PCS 7 PCS 7 Advanced Process Library V8.0

Function Manual

12/2011
A5E03709256-01

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

indicates that an unintended result or situation can occur if the relevant information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens AG
Industry Sector
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E03709256-01
℗ 10/2011

Table of contents

Basics of APL

1

1.1 Functions of the blocks

1.1.1 Display of delay times

Display of delay times

As soon as the immediate command output is delayed due to an active delay time at the "Large" blocks of the "Drives" family, this fact is signaled by a bit in the status word and a display in the faceplate.

These times include:

- Pre-warning time
- On/Off delays
- Restart inhibit

1.1.2 General information

1.1.2.1 Forcing operating modes

Forcing operating modes

The "forcing of operating modes" function lets you set the function block into a different operating mode using interconnectable input parameters, regardless of the currently active control. This can, for example, be:

- Forces tracking for closed-loop controllers and control values
- Enabling and disabling at motors
- Opening and closing of valves

It is only possible to force operating modes with "Large" blocks in the following operating modes:

- Manual mode
- Automatic mode

Forcing operating modes has the highest priority over both operating modes.

Note

It is not possible to force operating modes in local mode.

Forcing operating modes at closed-loop controllers

In control engineering, this procedure is also known as forced tracking of values. Refer to the Tracking and limiting a manipulated variable (Page 153) section for more on this.

Forcing operating modes at motors and valves

The input parameter `xxxxForce = 1` (for example `OpenForce` and `CloseForce` at a valve) is used for forced controlling of the function block and thus an intervention in the function of the block, irrespective of currently active controls, interlock conditions and monitoring errors. If the input parameters are inconsistent (for example `OpenForce = 1` and `CloseForce = 1` at valves), an error number (Page 104) is output at the parameter `ErrorNum` and the control remains unchanged.

Note

If you have set the parameters for the advance warning time `WarnTiMan` and the idle time `IdleTime` to values higher than 0, the control will only take effect once the set times have elapsed.

Note

With block VlvAnl, the warning time is ignored in tracking `MV_TrkOn` = 1 and in forced tracking `MV_ForOn`.

The Enabling direct changeover between forward and reverse (Page 121) feature bit has no effect when forcing the operating modes of the MotRevL and MotSpdCL blocks. Direct switchover between forward and reverse is always possible.

Display in the faceplate and in the block icon

If an operating mode is forced, this is displayed in the block icon and in the standard view of the faceplate:

Block icon: In the block icon, the display for motors, valves and dosers involves the use of a red F and a crossed-out padlock.

There is no display for closed-loop controllers.

Faceplate: An information text on the forced operating mode is displayed in the standard view of the faceplate, for example, "Forced stop" for motors. This is also indicated by a crossed-out padlock:

Messaging

No messages are assigned to the forcing of operating modes. However, if you want to have corresponding messages, you can use the freely interconnectable input parameters to generate the messages. Refer also to the Generating instance-specific messages (Page 162) section for more on this.

1.1.2.2 Resetting the block in case of interlocks or errors

Resetting the block

The block must be reset when an interlock has been set via the `Protect` ("Protection") or `Trip` ("Motor protection") input, or an error ("Runtime" or "Control").

Note

"Small" blocks do not feature protection (`Protect`).

The `RdyToReset` output signals when a reset can be carried out via the `RstLi` input parameter or the automatic commands.

There are different ways to reset the block:

- Reset by interconnection (input `RstLi`).
- Reset by the operator using a button in the faceplate (input `RstOp`).
- Reset with a 0-1 edge transition in the corresponding automatic or local signal (except with motor protection). Refer to the following sections for more information.

The operator must have the appropriate authorization to use the reset function in the faceplate (`OS_Perm`). After a reset, the output parameter `P_Rst` is set for a cycle.

Resetting monitoring errors and interlocks in manual and automatic mode

You can influence the reaction using the following `Feature` bits:

- `Feature` bit 9: Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
- `Feature` bit 30: Resetting depending on the operating mode (Page 137)
- `Feature` bit 31: Activating reset of interlocks in manual mode (Page 138)

Note

The following applies for valves:

With `MonSafePos = 0`, no reset is required; the valve can be moved in spite of the response fault.

Resetting monitoring errors and interlocks in local mode

The monitoring error can occur in local mode if you have set 1, 3 or 5 for the input parameter `LocalSetting` (see Local mode (Page 66)). When `LocalSetting` is set to 2 or 4, a monitoring error can only occur when a rapid stop is triggered.

The monitoring error cannot be reset when the control and feedback signals do not match.

When the control and feedback signals match, the monitoring error is reset by stopping (`StopLocal = 1`) the drive.

- With Vlv2WayL in the `MonSafePos = 1` setting, a monitoring error is reset by `Pos0Local = 1`.
- When VlvL is set to `MonSafePos = 1`, a monitoring error is reset with the local command, which moves the valve to the neutral position.
- With Vlv2WayL and VlvL in the `MonSafePos = 0` setting, a monitoring error is reset by a positive 0-1 edge transition of any local command.
- With DoseL, you must acknowledge the protection (`Protect`) and flow alarms with a positive edge at the "`CancelLocal`" or "`PauseLocal`" output parameter.

Resetting motor protection (`Trip`) in local mode

In local mode, the "Motor protection" display is reset in the faceplate and not using the Reset button available there. The display disappears as soon as `Trip = 1`, the activation signals and feedback match and a command for stopping the drive has been issued.

Note

A motor protection signal (Trip parameter) with signal status 16#00 or 16#28 is used to activate motor protection. This is indicated by "Motor protection" in the standard view of the faceplates.

Resetting monitoring errors and interlocks using the "Forcing operating modes" function

With "Forcing operating modes", monitoring errors, interlocks or the motor protection function is reset under the following conditions and a reset pulse is sent to the `P_Rst` output:

- The block is in an operating mode in which a reset is necessary and
- a monitoring error, an interlock lock "protection" or the motor protection function is ready to reset. This can be seen in the faceplate with the reset button or with the Request 0/1 indicator in the faceplate. When `Feature` bit 19 = 1, the block is ready to reset as soon as the protection `(Protect = 0)` or motor protection `(Trip = 0)` interlock is set, whereby enabled motor protection prevents the motor from starting.

See also the following section: Forcing operating modes (Page 31).

Tabular overview for resetting for interlocks and errors

	Permit	**Interlock**	**Protect**
Meaning	Activation enable ("Permission")	Interlock without reset ("Interlock")	Interlock with reset ("Protection")
Description	The activation enable (input `Permit` = 1) makes it possible to leave the neutral position of the block in response to operator input or a command from the program (CFC/SFC). The activation enable has no effect if the block is not in the neutral position.	A pending interlock condition brings the block to the neutral position (input `Intlock` = 0).	A pending interlock condition brings the block to the neutral position (input `Protect` = 0).
Mode: **Automatic**	Takes effect if block is in the neutral position. After the interlock condition has gone, the currently pending control function becomes active again.	After the interlock condition has gone, the currently pending control function becomes active again.	**Feature Bit 9 and 30 = 0:** Reset via faceplate or `RstLi` = 1 **Feature Bit 9 = 1 and 30 = 0:** Reset via faceplate or `RstLi` = 1 or a 0-1 edge transition in the control **Feature Bit 9 = 0 and 30 = 1:** Reset via `RstLi` = 1 **Feature Bit 9 and 30 = 1:** Reset via `RstLi = 1` or 0-1 edge transition in the control = 1 or 0-1 edge transition in the control

	Permit	Interlock	Protect
Mode: **Local**	Takes effect if block is in the neutral position. After the interlock condition has gone, the currently pending control function becomes active again.	After the interlock condition has gone, the currently pending control function becomes active again.	The following applies with LocalSetting = 1 or 3: **Generally:** When the control and feedback signals match, resetting via StopLocal = 1. **Vlv2WayL, VlvMotL und VlvL:** Reset via local command, which moves the valve into the neutral position. **DoseL:** Reset via a positive edge at "CancelLocal" or "PauseLocal". The following applies with LocalSetting = 2,4 or 5: No reset required
Mode: **Manual**	Takes effect if block is in the neutral position. It is possible to leave the neutral position with an operation in the faceplate.	The faceplate can be operated again after the interlock condition has gone.	**Feature Bit 30 and 31 = 0:** Resetting not necessary **Feature Bit 30 = 1 and 31 = 0:** Resetting not necessary **Feature Bit 30 = 0 and 31 = 1:** Reset via faceplate or RstLi = 1 **Feature Bit 30 and 31 = 1:** Reset via faceplate

	Trip	Error	Rapid stop
Meaning	Motor protection	Monitoring error	Rapid stop
Description	The motor protection function is used to switch off the motor when there is a heat overload (input Trip = 0).	• Monitoring the start-up and stop characteristics for motors or the runtime of valves • Monitoring the operation of motors or the maintenance of the position of valves	A rapid stop stops the drive immediately.
Mode: **Automatic**	**Feature Bit 9 and 30 = 0:** Reset via faceplate or RstLi = 1 **Feature Bit 9 = 1 and 30 = 0:** Reset via faceplate or RstLi = 1 or a 0-1 edge transition in the control **Feature Bit 9 = 0 and 30 = 1:** Reset via RstLi = 1 **Feature Bit 9 and 30 = 1:** Reset via RstLi = 1 or 0-1 edge transition in the control = 1 or 0-1 edge transition in the control		**Feature Bit 9 = 0:** Reset via faceplate or RstLi = 1 **Feature Bit 9 = 1:** Reset via faceplate or RstLi = 1 or 0-1 edge transition in the control

	Trip	Error	Rapid stop
Mode: **Local**	The following applies with `LocalSetting` = 1 or 3: When the control and feedback signals of the drive match, resetting via `StopLocal` = 1. The following applies with `LocalSetting` = 2, 4 or 5: No reset required.	The following applies with `LocalSetting` = 1 or 3: • When the control and feedback signals of the drive match, resetting via `StopLocal = 1`. • With Vlv2WayL, VlvMotL and VlvL with `MonSafePos` = 1: Reset via the local command, which moves the valve into the neutral position. • With Vlv2WayL, VlvMotL and VlvL with `MonSafePos = 0`: No resetting required; the currently pending control function is active. • With DoseL, resetting via a positive edge at "`CancelLocal`" or "`PauseLocal`". The following applies with `LocalSetting` = 2, 4 or 5: No reset required.	The rapid stop function is unlocked in the faceplate via the "Reset" button (`RstOp = 1`). In CFC, unlocking is carried out using the input parameter `RstLi` = 1
Mode: **Manual**	**Feature Bit 30 and 31 = 0:** Resetting not necessary **Feature Bit 30 = 1 and 31 = 0:** Resetting not necessary **Feature Bit 30 = 0 and 31 = 1** Reset via faceplate or `RstLi = 1` **Feature Bit 30 and 31 = 1:** Reset via faceplate		The rapid stop function is unlocked in the faceplate using the "Reset" button (`RstOp = 1`). In CFC, the unlocking is carried out using the input parameter `RstLi` = 1

1.1.2.3 Neutral position for motors, valves and controllers

Neutral position for motors, valves and controllers

The neutral position always represents the deenergized state.

Neutral position for motors

The neutral position for motors is always the stopped motor.

Neutral position for valves

There are different forms of the deenergized state for valves:

- Valve is closed in a de-energized state
- Valve is open in a de-energized state
- Valve is stopped in a de-energized state (e.g. motor valve)

The input parameter `SafePos` is used to set these properties of the valve:

- `SafePos = 0`: Valve is closed in a de-energized state
- `SafePos = 1`: Valve is open in a de-energized state
- `SafePos = 2`: Valve is stopped in a de-energized state (e.g. motor valve)

The neutral position is adopted when:

- The runtime monitoring function was addressed (see Setting the startup characteristics (Page 116))
- One of the interlock conditions is active (see Interlocks (Page 85))

The neutral position is adopted if at least one of the interlock conditions is present ("Protection" `[Protect]` or "Interlock" `[Intlock]`; see Interlocks (Page 85)).

Neutral position for the VlvAnL block (actuator)

The possible neutral positions are set by the `SafePos` parameter:

- `SafePos = 0`: Neutral position of the control valve is "Closed" (`MV.Value = MV_OpScale.Low`)
- `SafePos = 1`: Neutral position of the control valve is "Open" (`MV.Value = MV_OpScale.High`)
- `SafePos = 2`: Neutral position of the control valve is "Stop" (`MV.Value` remains unchanged)

The control valve is brought to the neutral position when the `FbkAuxVCloseOut = 1` control valve is closed.

Neutral position for continuous controllers (does not apply to controller modules)

Only the limits for the manual value are taken into consideration for the neutral position with continuous controllers. The input parameter `SafePos` is used to specify the neutral position:

- `SafePos = 0` corresponds to the low limit (`ManLoLim`)
- `SafePos = 1` corresponds to the high limit (`ManHiLim`)

The neutral position is adopted:

- during start-up if the `Feature` bit Setting the startup characteristics (Page 116) and the `Feature` bit Neutral position manipulated variable takes effect at startup (Page 139) are set.
- in the "Out of service" mode if the `Feature` bit Neutral position manipulated variable takes effect with "out of service" operating mode (Page 139) is set.

Neutral position for step controllers (does not apply to controller modules)

You can use the input parameter `SafePos` to determine if the step controller should close, open or stop the valve when it enters the neutral position:

`SafePos = 0`: close valve

`SafePos = 1`: open valve

`SafePos = 2`: stop valve

When the neutral position (fully opened or fully closed) is reached and a limit stop signal (`FbkOpened` or `FbkClosed`) is set, the valve is stopped (Stop = 1).

The neutral position is adopted:

- during start-up if the `Feature` bit Setting the startup characteristics (Page 116) and the `Feature` bit Neutral position manipulated variable takes effect at startup (Page 139) are set.
- in the "Out of service" mode if the `Feature` bit Neutral position manipulated variable takes effect with "out of service" operating mode (Page 139) is set.

Safety control for controllers of the FM 355 or FM 355-2 modules

The controller modules have their own mechanism for feedforwarding a safety value (see Temperature Controller FM 355-2 manual or Controller Module FM 355 manual)

1.1.2.4 Specifying warning times for control functions at motors and valves

Specifying warning times for control functions at motors and valves

This function is only supported by "Large" blocks.

You can generate warning signals when, for example, motors are started or valves are opened. Warning signals can be generated in the following modes:

- Manual mode (input parameter `WarnTiMan`)
- Automatic mode (input parameter `WarnTiAut`)

You specify the warning times in seconds using the input parameters `WarnTiMan` and `WarnTiAut`. If, for example, a motor is started then, this is displayed at the output parameter with `WarnAct = 1`. The motor then starts after the configured warning time has expired and `WarnAct` is reset (`WarnAct = 0`).

A corresponding warning is not output if the warning times (`WarnTiMan` or `WarnTiAut`) are specified with a smaller value than the `SampleTime` parameter.

Note

In this case, the warning time is only active if the block is controlled from the de-energized state.

Disabling warnings

Configure each parameter with 0 seconds to generate no warnings.

1.1.2.5 Output signal as a static signal or pulse signal

Output signal as a static signal or pulse signal

You can output the control signals for motors, valves and dosers as:

- Static signal or as a
- Pulse signal with configurable pulse length.

You can find the signals in the I/O table of the individual blocks.

Note

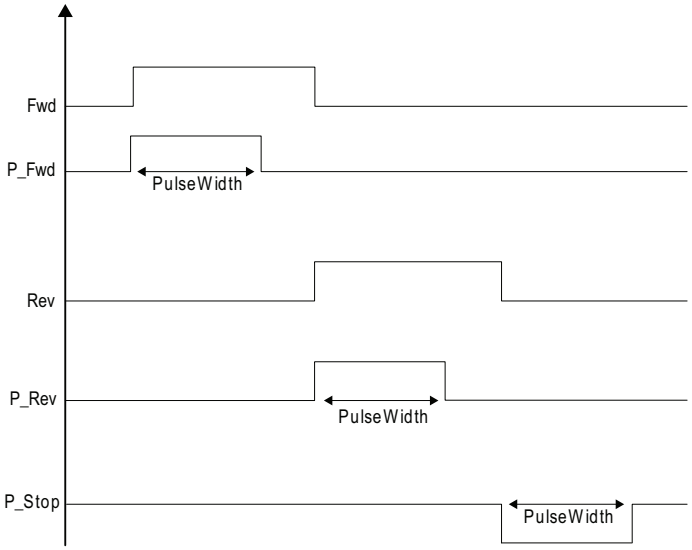
The pulse signal is available only for the "large" blocks.

Output signal as a static signal

The control settings are made available as a static signal in the blocks in the form of interconnectable output parameters. The MotRevL block, for example, provides these as static signals via the alternative output parameters `Fwd`, `Rev` and `Run`.

Output signal as a pulse signal

The control is made available as pulse signals at the blocks using interconnectable output parameters. You specify the pulse length of the output signals in seconds using the input parameter `PulseWidth`. The MotRevL block, for example, provides these as pulse signals via the output parameters `P_Fwd`, `P_Rev` and `P_Stop`.



Note

Almost all output parameters for pulse control, for example `P_Fwd`, `P_Rev`, `P_Ctrl`, have a positive effective direction, i.e. a 0→1→0 pulse triggers activation.

The only exception is the `P_Stop` output parameter with a negative effective direction, i.e. a 1→0→1 pulse triggers activation.

1.1.2.6 Recording the first signal for interlock blocks

Recording the first signal

You activate the function described below using the `Feature` bit " Activating recording of the first signal (Page 125)".

The number of the input that caused the last output signal change from 1 to 0 (good state to locked) is displayed for you in bit coding at the `FirstIn` output. The cause may be:

- A signal change at the input or a change in inversion

  Example: With an OR logic operation, the single 1 changes to 0. The output then changes from 1 to 0.

- A change to the I/O

  Example: Excluding the single 1 then results in an output of 0 with an OR logic operation.

- A change to the signal status

  If the signal status of the input, which forms the output value alone and has the value 1, changes from 16#80 to 16#00, the output value changes from 1 to 0.

- `FirstIn` is not changed if the following events occur, despite a change to the output:
  - Change in output value from or to `DefaultOut`

If several signals are at the same time responsible for the change, all responsible inputs are indicated in the faceplate and output in bit coding in the `FirstIn` output. If the input signals change without this causing the signal at the output to change, `FirstIn` does not change.

Inputs which are not interconnected or which are excluded are not taken into account.

You can reset `FirstIn` to 0 if you set the `RstLi` input from 0 to 1 (positive edge) or you can operate the `RstOp` input using the faceplate ("Reset" button).

If at least one bit in `FirstIn` is set, other signal changes are not taken into account.

1.1.2.7 Outputting a signal for start readiness

Outputting a signal for start readiness

The `RdyToStart = 1` output parameter is used to indicate start readiness in automatic mode.

Start readiness is output when the following conditions are met:

- No group errors are present
- No interlock is active
- No forced operating mode or manipulated variable is active
- No rapid stop is active (only applies to motors or VlvMotL)
- The block is in automatic mode (not with controller blocks)
- The idle time for the restart must have expired (only applies to motors or VlvMotL)

The start readiness is shown at the following block groups via the `RdyToStart` output parameter:

- Motors
- Valves
- Dosers
- Software controller
- Hardware controller

Start readiness for motors

The start readiness for motor blocks is formed as follows:

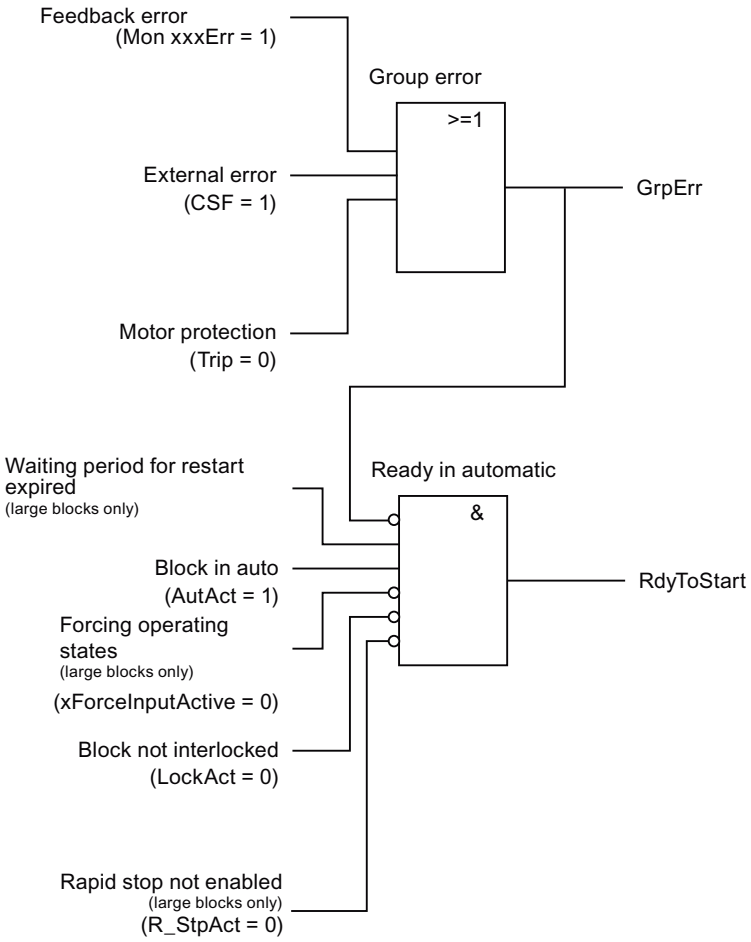


Figure 1-1 Output signal for start readiness for motors

Start readiness for valves

The start readiness for valve blocks is formed as follows:

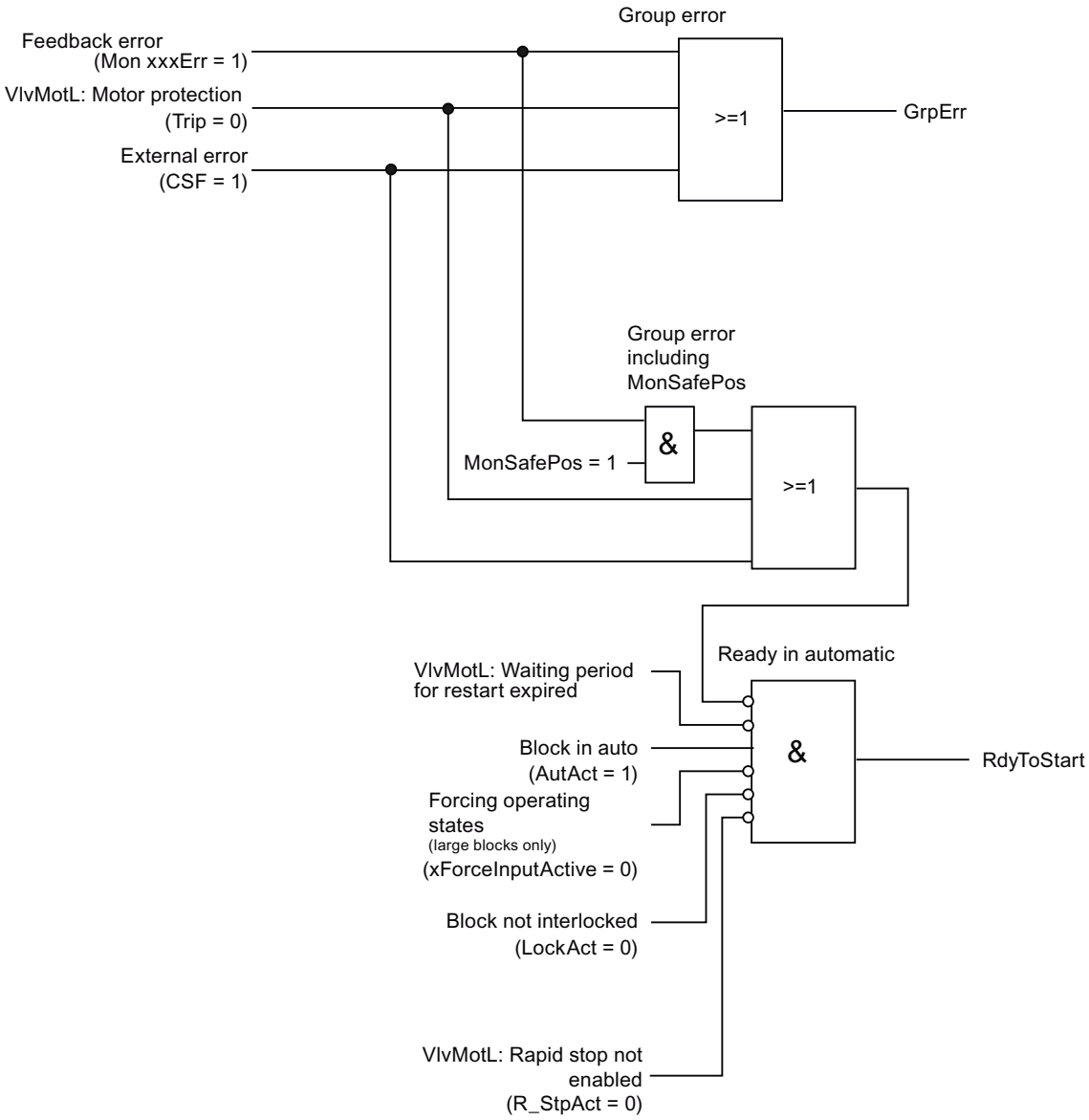


Figure 1-2 Output signal for start readiness for valves

Start readiness for dosers

The start readiness for dosers is formed as follows:

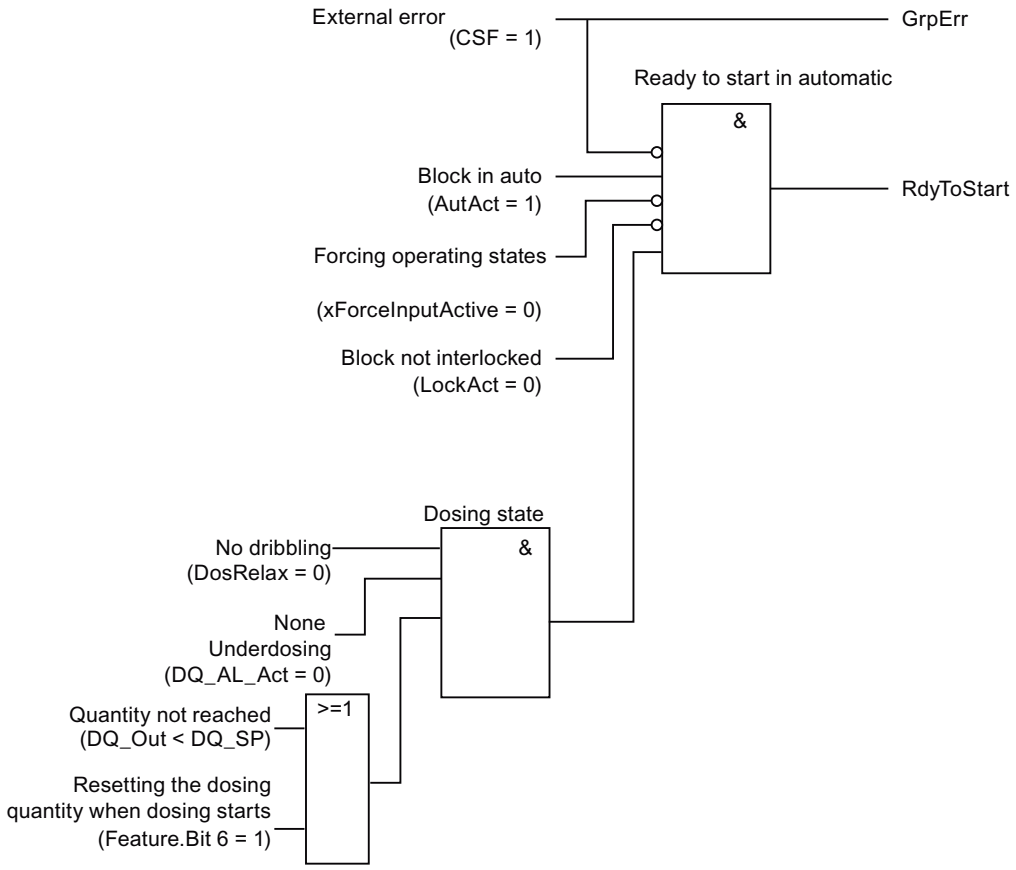


Figure 1-3 Output signal for start readiness for dosers

Start readiness for software controllers

The start readiness for software controllers is formed as follows:

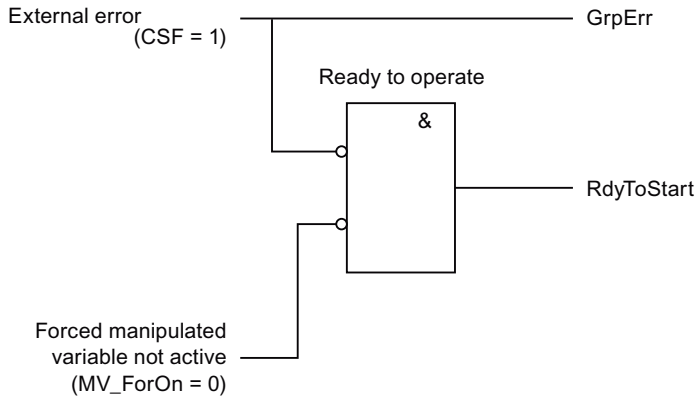


Figure 1-4 Output signal for start readiness for software controllers

Start readiness for hardware controllers

The start readiness for hardware controllers is formed as follows:

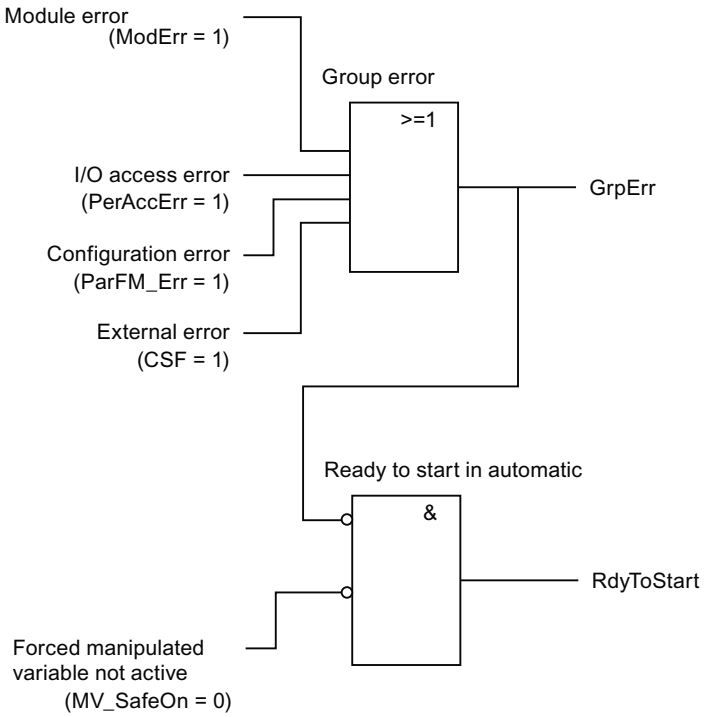


Figure 1-5 Output signal for start readiness for hardware controllers

1.1.2.8 Simulating signals

Simulating signals

Simulation means the manipulation of a signal regardless of the actual source of the signal or logic that generates this signal.

Simulation is carried out either at the field device (externally from the control system) itself or at a block (internally in the control system).

In either case. the status of the signal is set to the simulation value (see also Forming and outputting signal status for blocks (Page 92)).

During the simulation, every block is considered in isolation. There are two different forms of simulation here, namely:

- Block-external simulation and
- Block-internal simulation.

Block-external simulation

Block-external simulation is characterized by the fact that:

- The simulation function is not executed in the block itself and
- A signal whose status has the simulation state, for example, a simulation of the signal at another block or directly in the I/O device, is applied at an input parameter.

The block-external simulation has the following effects on the functionality of the block:

- The technological functions are not influenced
- All the process-relevant output signals do not receive the simulation status. In the case of technologic blocks, process-related output signals are parameters that actively affect the process, e.g. "`Start`" for block MotL.
- In the case of blocks with operator control or monitoring functions (for example faceplates), these signals are identified in the faceplate with the status for the simulation as follows:

- Blocks with one or more input parameters for signals with "Generate status from individual status" receive a group status in accordance with the priority table. This group status is displayed in the status bar of the block icon and of the operator block with the simulation status as follows:

- The interlocking functions of the block are not influenced.

Note

For the output channel blocks, you need to specify the exact block response with external simulation using the `Feature` bit Outputting a de-energized value for block-external simulation (Page 124).

Block-internal simulation

Block-internal simulation is characterized by the "simulation" function being run in the block itself.

With operator control and monitoring blocks, all process values that cannot be controlled (e.g. `PV`, `AV`, `In`) can be simulated. This is used primarily as an aid for commissioning and servicing of the system. For example, the control settings of a motor can be simulated and the feedback values corrected without the monitoring functions being active.

For blocks that can be operated and monitored, simulation can take place via the faceplate as well as interconnectable inputs:

- `SimLiOp` = 0: The simulation is activated/deactivated via faceplate (parameter view) at the input `SimOn`.

- `SimLiOp` = 1: The simulation is activated/deactivated via the input `SimOnLi`. The interconnectable simulation values (e.g. `SimPVLi`, `SimAVLi`, `SimInLi`) will become effective in the process.

The `Feature` bit Activating the run time of feedback signals (Page 126) can be used to delay tracking of the feedback signals for motors and valves (for example, `Fbkxxx`).

Simulation can also be carried out for blocks (such as channel blocks) that cannot be controlled and monitored by the operator.

The control is simulated in the CFC by setting parameters directly in the block with the input parameters `SimOn = 1` and `Simxxxx =` for the desired simulation value (e.g. `SimPV` , `SimAV` or `SimIn`).

Note

With channel blocks, ensure that the `Mode` parameter is set correctly during simulation. Otherwise this is displayed on the `Bad = 1` output parameter with a higher-level error.

If the block is not in simulation, the simulation value (`SimPV`, `SimAV` or `SimRbk`) process value (`PV`, `AV` or `Rbk`) is tracked.

Simulation is triggered during runtime in the faceplate's parameter view by clicking on the "Simulation" button.

This simulation is characterized by the fact that:

- The simulation can only be enabled / disabled with the operator authorization level for system authorization.
- The technological functions are not influenced.
- All the process-related output signals receive the "simulation" status. In the case of technologic blocks, process-related output signals are parameters that actively affect the process, e.g. "`Start`" for block MotL.
- In the case of blocks with operator control or monitoring functions (for example faceplates), these signals are identified in the faceplate with the status for the simulation as follows:

- The group status of the block is displayed in the status bar of the block icon and of the operator block with the simulation status as follows:

- All the process values displayed in the faceplate that cannot be operated-controlled in normal operation (e.g. `PV`).
- When the block control can be manipulated, the readback and feedback values (for example `Rbk`, `FbkSpd1`) are adjusted according to the manipulation of the control.
- Associated values (for example `UserAna1`) cannot be simulated.
- The interlocking functions of the block are activated in accordance with input parameter `BypProt = 0` or deactivated (`BypProt = 1`). This is shown as follows in the faceplate and block icon:

Activated	
Deactivated	

Block-internal simulation for controllers

How block-internal simulation for controllers works (`SimOn = 1`):

- In manual mode, both the simulated process value `SimPV` and the simulated repeated manipulated variable `SimRbk` can be entered in the faceplate as a simulated value.
- When a switchover to automatic mode is performed, the simulated process value `SimPV` is set so that it is equal to the setpoint `SP` (= tracking). This means the control deviation is no longer present and the pending manipulated variable (from the bumpless manual-automatic switchover, for example) remains constant. `SimRbk` can still be controlled.

Note

If you switch a controller block to block-internal simulation during automatic mode and the controller is connected to the actual process on the actuator side, you will open the control loop as a result.

The actuating signals calculated on the basis of the simulated actual value are switched to the process, but the resulting motion in the process is no longer visible in terms of the controller actual value, as a copy of the setpoint is present at this point instead, where it takes the form of a simulated actual value. The process could move away from the setpoint without the controller doing anything to counteract this and without you seeing this happen in the controller faceplate.

Manipulated variable step changes occur during switchover to automatic mode if an error signal was already present before the switchover.

The following applies to program mode:

- Program mode with setpoint specification should be considered the same as automatic mode from a control engineering point of view. Block-internal simulation reacts in the same way as it does in automatic mode: The process value `PV` is set so that it is equal to the setpoint `SP`, which in this case is derived from the input parameter `AdvCoMV`.
- Program mode with manipulated variable specification should be considered the same as manual mode from a control engineering point of view. Block-internal simulation reacts in the same way as it does in manual mode: The simulated process value `SimPV` can be entered as a simulated value. In this case the manipulated variable `MV` is derived from the input parameter `AdvCoMV`.

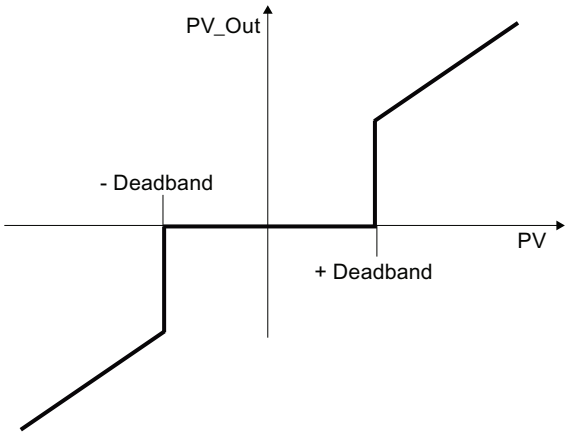
1.1.2.9 Dead band

Dead band

To suppress values fluctuating around zero, you can set a dead band (`Deadband`):

`Deadband = 0`: Dead band is disabled

`Deadband ≠ 0`: Dead band is enabled



1.1.2.10 Release for maintenance

Issuing a release for maintenance

The release for maintenance serves as information about a process tag at which maintenance, service or calibration should be carried out. You can use the signal for release for maintenance to transfer the information about the enabling of a process tag from the OS to a Maintenance Station.

Note

The block must be in either "Manual," "On" or "Out of service" mode to set the release for maintenance.

You set the release for maintenance (operator control permission "System control" required) in the parameter view using the input parameter `MS_RelOp = 1`. A release for maintenance is then made available via the interconnectable output parameter `MS_Release = 1` for further processing. In order to make this information of the Maintenance Station available, you have to interconnect the output parameter `MS_Release` of the technologic block with the input parameter `MS_Release`of the corresponding channel block.

The issuing of a release for maintenance does not have any influence on the function of the block. An operation message is generated.

Use of the state "In progress" on the Maintenance Station

The status "In progress" is implemented on the Maintenance Station for a process tag or a field device using the channel blocks and the interconnectable output parameter `OosAct = 1`. You can interconnect the output parameter `OosAct` of the channel block with the input parameter `OosLi` of a technologic block.

Use the `Feature` bit Reaction to the out of service mode (Page 148) to specify, in case the input parameter is `OosLi = 1`, if:

- there is a switchover to the "out of service" mode and the symbol for the "In progress" (see table) status is displayed. You can change to manual mode at any time.
- Only the "In progress" display (see table) in the block icon and in the faceplate of the assigned technologic block is made.

Display	Meaning
	In progress

Function sequence in the APL

- The OS operator issues the release for maintenance (`MS_RelOp = 1`) in the technologic block's parameter view.
- The technologic block then sets the `MS_Release = 1` output parameter.
- The channel block's `MS_Rel` input is now also 1.
- The channel block signals the release for maintenance to the diagnostic driver via the `DXCHG` parameter.
- The release for maintenance is only signaled to the Maintenance Station once all 0 bits of the parameter `DXCHG_XX` are set on the diagnostic driver.
- The channel block determines the "in progress" state of the Maintenance Station using the `MS` input parameter and makes this information available at the `OosAct` output parameter.
- On the technologic block, the "working" state is displayed at input parameter `OosLi` and forwarded for display to the faceplate.

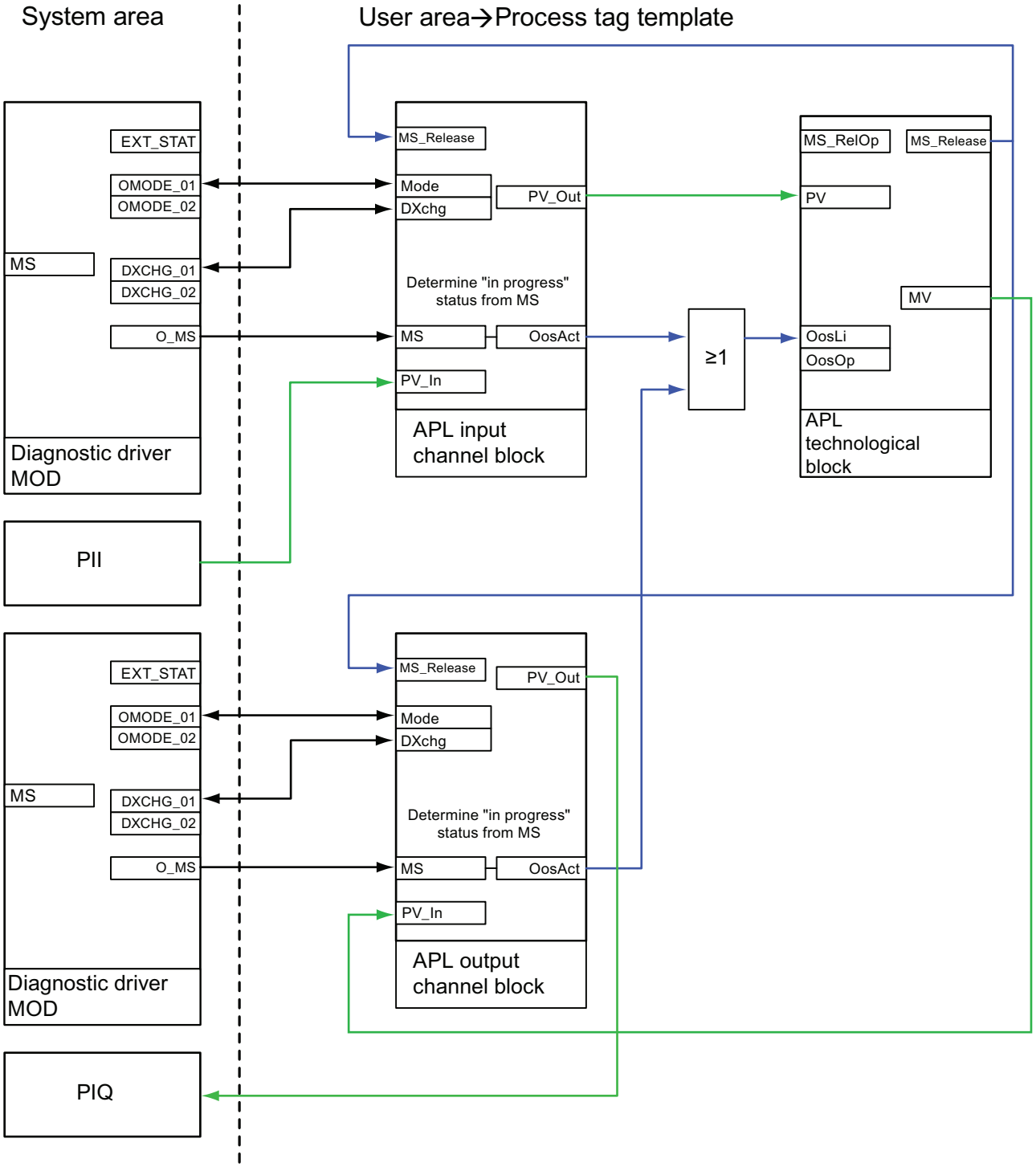


Figure 1-6 Release for maintenance

Key to diagram:

PII	Process image of inputs
PIQ	Process image of outputs
Black lines	Automatic system connections
Green lines	Process value connections made by the planner
Blue lines	Connections for release for maintenance made by the planner

Note

For additional information on the topic of maintenance please refer to PCS 7 OS process management.

1.1.2.11 SIMATIC BATCH functionality

SIMATIC BATCH functionality

Some blocks have an interface to SIMATIC BATCH. You use them when you connect `BatchEn`, `BatchID`, `BatchName`, `StepNo` and `Occupied` I/Os to the corresponding SIMATIC BATCH blocks. Refer to the SIMATIC BATCH documentation.

Please refer to the descriptions of the individual blocks for information about whether a block supports the SIMATIC BATCH functionality.

1.1.2.12 Flutter suppression for channel blocks

Flutter suppression

The time-controlled "Flutter suppression" function is used to delay the outgoing of a message by a configurable period.

Flutter suppression is used for

- OB82 events - diagnostic messages
- OB83 events -

failure.

The flutter time is entered at the channel block at the `FlutTmIn` parameter. The high byte of the `DataXchg` parameter of the channel blocks contains the flutter time.

Flutter suppression comes into effect when `FlutEN` = 1 or `FlutTmIn` > 0 is set at the channel block.

There is only one flutter message per module. The delay times and fault messages are channel-specific. The fault messages are extended by at least the delay time. Flutter occurs when the status of fault messages changes from "Outgoing" back to "Incoming" within the delay time.

The last fluttering channel and its set delay time deactivates the flutter message.

The following channel blocks have this function:

FbAnIn - Analog input channel block for field devices (Page 1582)

FbAnOu - Analog output channel block for field devices (Page 1590)

FbDiIn - Digital input channel block for field devices (Page 1601)

FbDiOu - Digital output channel block for field devices (Page 1611)

Pcs7AnIn - Analog input channel block (Page 1638)

Pcs7AnOu - Analog output channel block (Page 1650)

Pcs7DiIn - Digital input channel block (Page 1659)

Pcs7DiIT - Digital input channel block with time stamp (Page 1667)

Pcs7DiOu - Digital output channel block (Page 1675)

Pcs7Cnt1 Controlling and reading FM 350 modules (Page 1682)

Pcs7Cnt2 Control and read an 8-DI_NAMUR module of the ET 200iSP (Page 1691)

Pcs7Cnt3: Control and read the 1 COUNT 24V/100kHz module for count mode (Page 1700)

1.1.3 Operating modes of the blocks

1.1.3.1 Overview of the modes

Overview of the individual modes

The available operating modes are assigned to the block families:

- Motors, valves and dosers
- Controllers
- Blocks without "Manual" and "Automatic" modes

You can find an overview below. Click on one of the operating modes to go directly to the relevant detailed description.

You can find a state graph for the operating modes (Page 70) at the end of this section.

Operating modes for motors, valves and dosers

The following operating modes are available:

1. Local mode (Page 66)
2. Automatic mode (Page 63)
3. Manual mode (Page 63)
4. Out of service (Page 58)

The mode with the lowest number in the list above has the highest priority. "Manual" and "Automatic" modes have the same priority. General information on the individual modes is available in the following sections. The sections also include block-specific information, for example, non-standard parameter assignment. Refer to the description and function of the relevant blocks.

Operating modes for controllers

The following operating modes are available:

1. Automatic mode (Page 59)
2. Manual mode (Page 59)
3. Program mode for controllers (Page 65)
4. Out of service (Page 58)

The mode with the lowest number has highest priority. "Manual" and "Automatic" modes have the same priority. General information on the individual modes is available in the following sections. The sections also include block-specific information, for example, non-standard parameter assignment. Refer to the description and function of the relevant blocks.

Operating modes for blocks without "Manual" and "Automatic" operation

The following operating modes are available:

1. On (Page 58)
2. Out of service (Page 58)

The mode with the lowest number has highest priority. General information on the individual modes is available in the following sections. The sections also include block-specific information, for example, non-standard parameter assignment. Refer to the description and function of the relevant blocks.

Note

Note that the operating modes are realized differently in the individual block families.

1.1.3.2 On

"On" operating mode

The "On" operating mode tells you that the block algorithm is being processed (output parameter `OnAct = 1`). This operating mode is only available for blocks that have faceplates but not the following operating modes:

- Manual mode or
- Automatic mode or
- Local mode

The "On" mode can only be activated via a control on the faceplate (input parameter `OnOp = 1`). The block must be in the "Out of service" operating mode for this to be possible.

1.1.3.3 Out of service

Using the "out of service" operating mode

The "Out of service" operating mode is available to all blocks that have an operating mode switchover and a direct connection to the process (with a connection to a process tag, for example).

It is intended for purposes of maintenance and servicing (replacing the device, for example). All of the block's functions are disabled. No incoming or outgoing messages are generated. The only function still possible is an operating mode switchover.

All outputs for motors and valves are set to the neutral position in this operating mode.

For controllers, the neutral position manipulated variable (high or low manual limit of the manipulated variable) is only used if the `Feature` bit Neutral position manipulated variable takes effect at startup (Page 139) is active. Otherwise the manipulated variable remains at the latest value like all the other output parameters.

Refer also to the Neutral position for motors, valves and controllers (Page 37) section for more on this.

The last value available is output permanently for all other blocks.

Requirement for the "out of service" mode

Prerequisite for switching to this operating mode is that the block is in "Manual mode" or "On" mode.

Activating the "Out of service" operating mode using the faceplate

The "Out of service" operating mode can only be switched on by using the faceplate when it is in the default block view (`OosOp = 1` parameter) and even then, only if `ModLiOp = 0`.

To switch the operating mode using the faceplate, refer to the descriptions relating to the standard view of the individual blocks.

Switching on the Out of service operating mode by using the interconnection

The "Out of service" operating mode is switched on by using the configurable parameter `OosLi = 1`. This is only possible if the block was previously in manual mode or "on" mode and the `Feature` bit Reaction to the out of service mode (Page 148) was set to 1.

Regardless of operating mode, the parameter view of the faceplate will always display the status of the parameter `OosLi =1` with the symbol for the status "In progress" (see table) next to the Maintenance enable button.

Display	Meaning
	In progress

Refer also to the Release for maintenance (Page 52) section for more on this.

Exiting the "Out of service" operating mode

From this operating mode, a block can only be switched by an operator action at the faceplate into the following operating modes:

- "On"
- "Manual mode"

1.1.3.4 Manual and automatic mode for control blocks

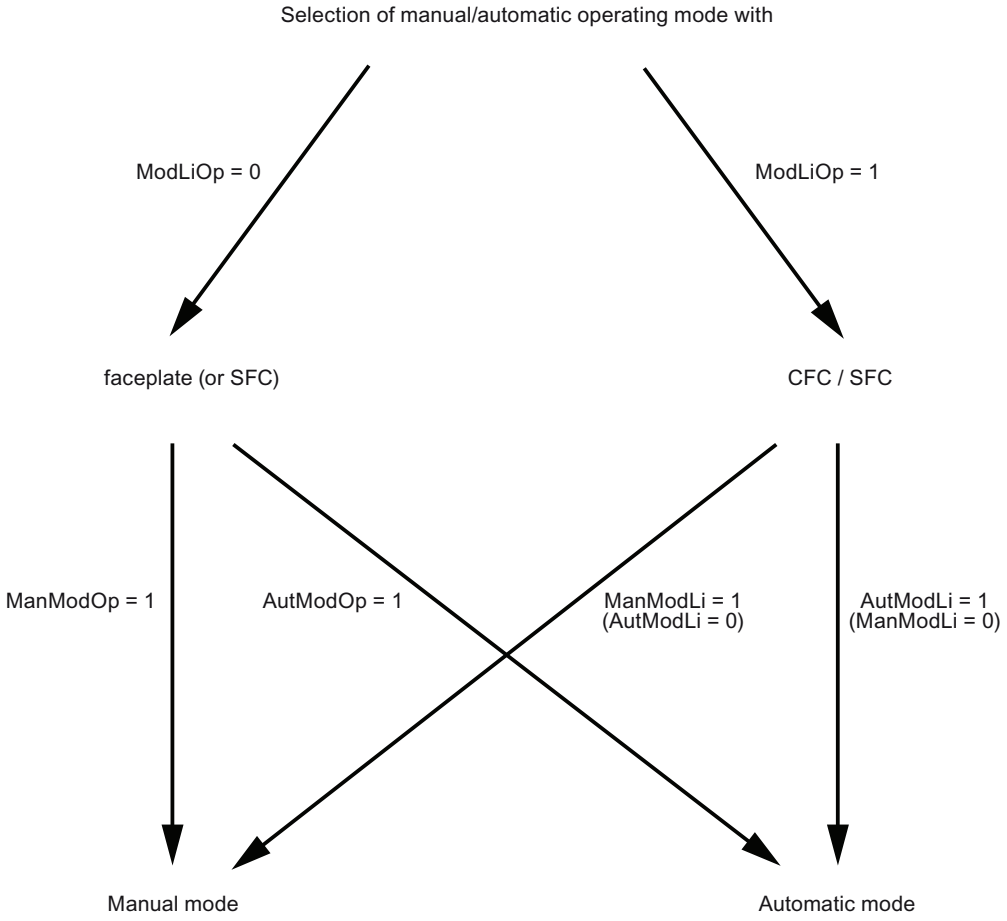
"Manual" and "Automatic" modes for controller blocks

In "manual mode", the control settings for the device are made manually by the operator. The operator decides how to change the block's manipulated variable (output signal). The manipulated variable can be analog or binary.

In "automatic mode", the control settings for the controller are made automatically as calculated by the block algorithm.

Changing between operating modes

The switchover between manual and automatic modes takes place as shown in the following schematic:



Switchover initiated in the faceplate (`ModLiOp` = 0)**:** The switchover between operating modes is carried out in the standard view of the faceplate. In the function block, the parameters `ManModOp` for "manual mode" and `AutModOp` for "automatic mode" are used.

If both signals (`ManModOp =1, AutModOp = 1`) are set, `ManModOp = 1` has priority.

Switchover per interconnection (CFC or SFC instance) (`ModLiOp = 1`)**:** The switchover between the operating modes is carried out with an interconnection on the function block. The parameters `ManModLi` for "manual mode" and `AutModLi` for "automatic mode" are used in pushbutton operation. In switching mode (requirement: `Feature Bit 4 = 1`, see Setting switch or button mode (Page 140)) connection `AutModLi` is used exclusively.

If both signals (`ManModLi =1, AutModLi = 1`) are set, `ManModLi = 1` has priority.

Note

You can access the variable parameters `AutModOp` and `ManModOp` from a normal SFC (in contrast to the instance of an SFC type). The SFC can thus change the operating mode without revoking the access rights of the operator (i.e. without setting `ModLiOp = 1`).

Switchover from automatic mode to manual mode

When changing over from "automatic mode" to "manual mode", the last valid control settings (**M**anipiulated **V**alue `MV`)for the controller set in "automatic mode" remain valid until you change the control settings manually.

Switchover from automatic mode to manual mode

The switchover from manual to automatic mode can take place with or without the internal setpoint tracking the process value. You specify this behavior on the `SP_TrkPV` I/O, which can also be operated from the faceplate in the parameter view (Option "SP = PV"). For the blocks PIDConL and PIDStepL you can also change the behavior for the switchover via the parameter `Feature` bit Disabling bumpless switchover to automatic mode for controllers (Page 145):

- **Switchover with internal setpoint tracking process variable**(`SP_TrkPV = 1`) means that in "Manual" mode the setpoint (`SP`) tracks the process value (`PV`) (bumpless switchover). After switching back to "Automatic" mode, the manipulated variable remains constant until the setpoint value (`SP`) is changed or the process value (`PV`) changes.
- **Switchover without internal setpoint tracking process variable** (`SP_TrkPV = 0`) means that the block immediately recalculates the value of the manipulated variable based on the setpoint and process value (`PV`) when the mode is changed. The `Feature` parameter is used to choose between the two variants:
  - **Switchover without P step** (standard setting, `Feature` bit = 0):

    During switchover, the I action of the controller is set in such a way that the switchover is carried out without a P step (virtually bumpless referring to the manipulated variable). A control deviation is only regulated via the I action.
  - **Switchover with P step** (`Feature` bit = 1):

    During switchover, the I action of the controller is set in such a way that the switchover is carried out with a P step (not bumpless referring to the manipulated variable). A control deviation is regulated via the P and the I action.

Note

Points to note about switchovers with a P step change:

- The P action must be active for the setting "Switchover with P step" (`PropSel = 1`)
- If the P action is in the feedback (`PropFacSP = 0`), the "Switchover with P step" setting has no effect.
- If the switchover function with the internal setpoint tracking the process variable is active (`SP_TrkPV = 1`), the "Switchover with P step" setting has no effect.

Reaction of signals when operating mode is changed

Using the `Feature` bit Resetting the commands for changing the mode (Page 135), you can choose whether the block automatically resets the signal for changing the operating mode.

Switch on program mode

A few controller blocks allow you to operate in program mode. Refer to the relevant sections for the controller blocks to learn whether a control block allows program mode.

Also refer to the section Program mode for controllers (Page 65) for information on program mode.

1.1.3.5 Manual and automatic mode for motors, valves and dosers

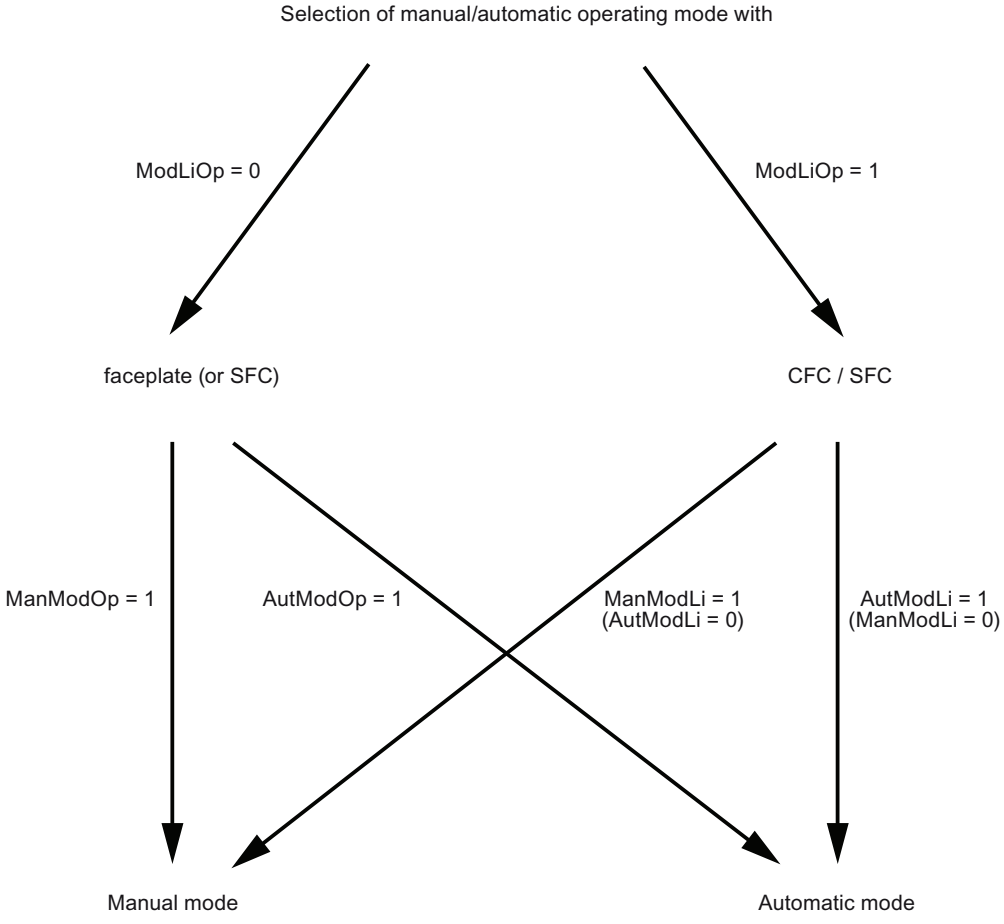
Manual and automatic mode for motors, valves and dosers

In "manual mode", the control settings for the device are made manually by the operator. The operator decides how to change the block's manipulated variable (output signal). The manipulated variable can be analog or binary in accordance with the function block.

In "automatic mode", the control settings for the device are made by the block algorithm via interconnected inputs or inputs controlled by SFC.

Changing between operating modes

The switchover between "manual and automatic mode" takes place as shown in the following schematic:



Note

The two selections (manual and automatic) cannot both be set to "1" in switching mode.

Switchover using faceplates (`ModLiOp = 0`)**:** The switchover between operating modes is carried out in the standard view of the faceplate. In the function block, the parameters `ManModOp` for "manual mode" and `AutModOp` for "automatic mode" are used.

Switchover per interconnection (CFC or SFC instance) (`ModLiOp = 1`)**:** The switchover between the operating modes is carried out with an interconnection on the function block. The parameters `ManModLi` for "manual mode" and `AutModLi` for "automatic mode" are used in pushbutton operation. In switching mode (requirement: `Feature Bit 4 = 1`, see Setting switch or button mode (Page 140)) connection `AutModLi` is used exclusively.

Note

The `Feature` Bit 4 is available only for the "large" blocks.

Note

You can access the variable parameters `AutModOp` and `ManModOp` from a normal SFC (in contrast to the instance of an SFC type). The SFC can thus change the operating mode without revoking the access rights of the operator (i.e. without setting `ModLiOp = 1`).

Switchover from automatic mode to manual mode

When changing over from "automatic mode" to "manual mode", the last valid control settings for the block set in "automatic mode" remain valid until you change the control settings manually.

Switchover from manual to automatic mode

You can set the following options for changing over from "manual mode" to "automatic mode" using the `Feature` bit Bumpless switchover to automatic mode (Page 145). Refer to the I/O descriptions for the relevant block.

- A switchover from manual to automatic mode is possible at any time (standard setting, `Feature` bit = 0). The control settings for the automatic mode become effective immediately.
- Switchover from manual to automatic mode is only possible if the control settings for the manual and automatic modes match (Bumpless switchover), (`Feature` bit = 1). An error message is output if they do not match. In this case, you will need to adapt the control settings in "manual mode" to the control settings in "automatic mode".

  Note

  The "Bumpless switchover to automatic mode" function is supported only by "large" blocks.

Reaction of signals when operating mode is changed

Using the `Feature` bit Resetting the commands for changing the mode (Page 135), you can choose whether the block automatically resets the signal for changing the operating mode.

Resetting the commands for the control settings

With the Feature bit Enabling resetting of commands for the control settings (Page 136), you select how the block handles commands for the control settings (for example motor on) via the interconnected input parameters.

1.1.3.6 Program mode for controllers

Program mode for controllers - interface for higher-level control functions

The interface for primary controller functions (external Advanced Control software package) provides primary controller functions, which run on an external PC as an OPC client, the option of using the control from the controller function block and specifying the setpoint or manipulated variable from a remote location. This procedure is called program mode.

You can use the feature bit Enabling program mode (Page 134) to specify whether or not the controller block is intended for program mode.

Program mode requires an enable signal (input parameter AdvCoEn = 1) from a central control block. If this enable signal goes from 1 to 0, for example, due to errors in the OPC communication, the controller block returns to the operating mode it had before program mode.

You activate program mode in the standard view of the controller faceplate. In addition to switching from manual to automatic mode, you are also given the option of using program mode as the operating mode. You exit program mode by operator input or by switching back into manual or automatic mode.

A 0-1 edge transition of the interconnectable input parameter AdvCoMstrOn activates program mode depending on the conditions described below. You can use this to put an entire group of downstream controller blocks into program mode at the same time from a central control block. Both the input parameter AdvCoOn and the interconnectable input parameter AdvCoMstrOn can be used at the same time, since the parameter AdvCoMstrOn only reacts to edges of the binary signal.

Program mode is deactivated with a 1 - 0 edge transition.

The output parameter AdvCoRdy = 1 indicates if the PID controller is ready to switch to program mode. At a central control block, you can use an AND operation for all AdvCoRdy signals of the downstream controllers to enable central switchover.

The output parameter AdvCoAct = 1 indicates of the block is in program mode.

Selecting the type of program mode

There are two types of program mode:

- Program mode with setpoint (in automatic mode only)
- Program mode with setpoint (in manual mode only, not for step controllers without position feedback)

Program mode with setpoint: If you set the input parameter `AdvCoModSP = 1`, the analog value provided by the OPC client (`AdvCoMV`) is used as an external setpoint for the controller. The controller and faceplate otherwise react as they do with automatic mode and an external setpoint. Refer to section Setpoint specification - internal/external (Page 112) for more about this.

Requirements for program mode with setpoint:

- `AdvCoModSP = 1`,
- `AdvCoEn = 1`,
- The controller is in automatic mode.

Program mode with manipulated value: If you set the input parameter `AdvCoModSP = 0`, the analog value provided by the OPC client (`AdvCoMV`) is used as an external manipulated value for the controller. The algorithm of the PID controller is bypassed. The controller and faceplate otherwise react as they do with tracking (`MV_TrkOn = 1`). Refer to section Tracking and limiting a manipulated variable (Page 153) for more about this.

Requirements for program mode with manipulated value:

- `AdvCoModSP = 0`,
- `AdvCoEn = 1`,
- The controller is in manual mode.

Note

Program mode with setpoint is not available for step controllers without position feedback (available in PIDStepL, FmCont and FmTemp). `ErrorNum = 50` is output on the controller block and the controller cannot switch into program mode `(AdvCoAct=0)`.

1.1.3.7 Local mode

Areas of application for local mode

This operating mode is used for motors, valves and dosing units. The control settings are made directly or via a control station that is located "locally". In addition, you can set different control strategies with the parameter `LocalSetting`.

With `LocalSetting = 0`, you prevent a change to "local mode".

Note

Differences between "Large" and "Small" blocks

The operating mode described here is valid for "Large" blocks. For "Small" blocks, LocalSetting can be parameterized only on a limited basis. For more information, refer to the respective description for the operating modes of the blocks.

Changing to local mode

Changing to local mode is only possible from the manual and automatic operating modes. The change to this mode is initiated by:

- An operation on the faceplate (input parameter `LocalOp = 1`, valid if `LocalSetting = 3` or `LocalSetting = 4` and `ModLiOp = 0`) or
- The interconnected input parameter (`LocalLi = 1`, valid if `LocalSetting = 1` or `LocalSetting = 2`).

Exiting local mode

You leave local mode using:

- An operation on the faceplate (`LocalSetting = 3` or `LocalSetting = 4` and `ModLiOp = 0`) or
- the interconnected input parameter (`LocalSetting = 1` or `LocalSetting = 2`).

  In order to exit local mode via the interconnected input parameter, you can configure various reactions using a `Feature` bit Exiting local mode (Page 149).

Operator input in "local mode" using a faceplate

You are not permitted to functionally operate the block in local mode. You can only use the faceplate to exit local mode if you have also activated "local mode" using the faceplate. The rules you specified for exiting "local mode" apply here.

Input in "local mode" via interconnected inputs

In "local mode", the way the block functions is influenced via interconnected input parameters according to the settings of the `LocalSetting` parameter. You have the following options:

- `LocalSetting = 1` and `LocalSetting = 3`
  - The control settings for the block are adjusted (tracking) via an interconnected input parameter. The interconnected input parameter includes the control signal for the local operator station on the system.
  - The runtime monitoring of the block is effective in accordance with your configuration.
  - The interlocking functions of the block are activated in accordance with input parameter `BypProt = 0` or deactivated (`BypProt = 1`).

    Note

    The block VlvAnL does not support this configuration.

- `LocalSetting = 2` and `LocalSetting = 4`
  - The control settings for the block are made based on internal adjustment of the feedback value.
  - Runtime monitoring of the block is deactivated.

    Note

    Special note for motor valve VlvMotL

    For the motor valve `VlvMotL`, the configured runtime monitoring for motor feedback is still active only for shutting down the motor when the end position is reached. This means that pending motor feedback messages are reported in the end positions. Opening and closing of the motor value continues to be monitored.

    Note: The configured runtime monitoring is deactivated for motor feedback of the `VlvMotL` motor valve. Opening and closing of the motor value continues to be monitored.
  - The interlock functions of the block are deactivated.

Overview of behavior in local mode

LocalSetting =	0	1	2	3	4	5 (VlvS only)
Switch on operating mode	Cannot be set	CFC/SFC	CFC/SFC	Faceplate	Faceplate	Faceplate
Changing the operating mode: Local mode/to manual mode only (`Feature = 0`)	-	CFC/SFC	CFC/SFC	-	-	CFC/SFC

LocalSetting =	0	1	2	3	4	5 (VlvS only)
Changing the operating mode: Local mode/previous mode (`Feature = 1`)	-	CFC/SFC	CFC/SFC	-	-	CFC/SFC
Operating in the faceplate	-	Only rapid stop and resetting of rapid stop	Only rapid stop and resetting of rapid stop (only for "Large" blocks)	Only switching of operating mode, rapid stop, internal/external setpoint switchover and resetting of rapid stop	Only switching of operating mode, rapid stop, and resetting of rapid stop	-
Executing local commands	-	Yes	No	Yes	No	No
Reaction of the block	-	Monitoring the feedbacks	Tracking of feedback, monitoring feedback during rapid stop	Monitoring the feedbacks	Tracking of feedback, monitoring feedback during rapid stop	Monitoring the feedbacks
Interlock activated	-	Yes: (`BypProt = 0`) No: (`BypProt = 1`)	only at output `LockAct` with `Feature` Bit 27 = 1 and `BypProt = 0`	Yes: (`BypProt = 0`) No: (`BypProt = 1`)	only at output `LockAct` with `Feature` Bit 27 = 1and `BypProt = 0`	No

1.1.3.8 State graph of the operating modes

State graph of the operating modes

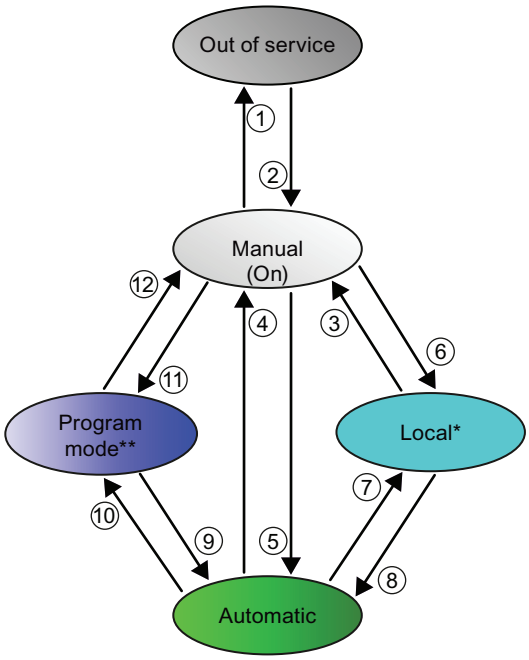


Figure 1-7 State graph of the operating modes

* This operating mode is used for motors, valves, and dosing units.

** This operating mode is used for controllers only.

Number in graphic (top)	Condition for status change
(1)	**Manual (on) → Out of service** • Via faceplate `(OosOp = 1)` if `ModLiOp = 0` or • Via edge transition 0 → 1 of `OosLi` if Feature bit Reaction to the out of service mode (Page 148)= 1
(2)	**Out of service → Manual (on)** • Via faceplate `(ManModOp = 1)`
(3)	**Local mode → Manual** • Via faceplate `(ManModOp = 1)` if `ModLiOp = 0` and `LocalSetting = 3` or `LocalSetting = 4` or • Via `LocalLi = 0` if `LocalSetting = 1`, `LocalSetting = 2` or `LocalSetting = 5`. See section Exiting local mode (Page 149) for more conditions.

Number in graphic (top)	Condition for status change
(4)	**Automatic → Manual** • Via faceplate (`ManModOp = 1`) if `ModLiOp = 0` or • Via `ManModLi = 1` if `ModLiOp = 1` and Feature bit Setting switch or button mode (Page 140)`= 0` or • Via `AutModLi = 0` if `ModLiOp = 1` and Feature bit Setting switch or button mode (Page 140)`= 1`
(5)	**Manual → Automatic** • Via faceplate (`AutModOp = 1`) if `ModLiOp = 0` or • Via `AutModLi = 1` if `ModLiOp = 1`
(6)	**Manual → Local mode** • Via faceplate `(LocalOp = 1)` if `ModLiOp = 0` and `LocalSetting = 3` or `LocalSetting = 4` or • Via `LocalLi = 1` if `LocalSetting = 1`, `LocalSetting = 2` or `LocalSetting = 5`
(7)	**Automatic → Local mode** • Via faceplate `(LocalOp = 1)` if `ModLiOp = 0` and `LocalSetting = 3` or `LocalSetting = 4` or • Via `LocalLi = 1` if `LocalSetting = 1`, `LocalSetting = 2` or `LocalSetting = 5`
(8)	**Local mode → Automatic** • Via faceplate `(AutModOp = 1)` if `ModLiOp = 0` and `LocalSetting = 3` or `LocalSetting = 4` or • Via `LocalLi = 0` if `LocalSetting = 1`, `LocalSetting = 2` or `LocalSetting = 5`. See section Exiting local mode (Page 149) for more conditions.
(9)	**Program mode → Automatic** • Via faceplate (`AutModOp = 1`) if `ModLiOp = 0` or • Via `AutModLi = 1` if `ModLiOp = 1` or • Via edge transition 1 → 0 of `AdvCoMstrOn` if automatic is set before program mode.
(10)	**Automatic → Program mode** Requirement for switchover in program mode: `AdvCoEn = 1` • Via faceplate (`AdvCoOn= 1`) if `ModLiOp = 0` or • Via `AdvCoMstrOn = 1`
(11)	**Manual → Program mode** Requirement for switchover from manual to program mode: `AdvCoEn = 1` and `AdvCoModSP = 0` • Via faceplate (`AdvCoOn= 1`) if `ModLiOp = 0` or • Via `AdvCoMstrOn = 1`
(12)	**Program mode → Manual** • Via faceplate (`ManModOp = 1`) if `ModLiOp = 0` or • Edge transition 1 → 0 of `AdvCoMstrOn` if manual is set before program mode.

1.1.4 Monitoring functions

1.1.4.1 Monitoring functions in the Advanced Process Library

Monitoring functions in the Advanced Process Library

This and the following section encompass the standard monitoring functions in the Advanced Process Library. The monitoring functions include:

- Limit value monitoring
- Feedback monitoring
- Motor protection

Some of the configured time values (e.g. `MonTiStatic`, `MonTiDynamic`) are limited at the low end to the sampling time by the block algorithm and written back to the block input. "Reset Program" (after a "Download Entire Program" for example) writes the parameter values changed in this way to the offline data storage system.

For further and detailed information, refer to the following section. For the block-specific monitoring functions, also refer to the description of the particular block.

1.1.4.2 Limit monitoring

Limit monitoring of the process value

You can monitor the process value to the following high and low alarm, warning and tolerance limits:

- `PV_AH_Lim`: Limit for high alarm
- `PV_AL_Lim`: Limit for low alarm
- `PV_WH_Lim`: Limit for high warning
- `PV_WL_Lim`: Limit for low warning
- `PV_TH_Lim`: Limit for the high tolerance
- `PV_TL_Lim`: Limit for the low tolerance

Note

Special note for "Small" blocks

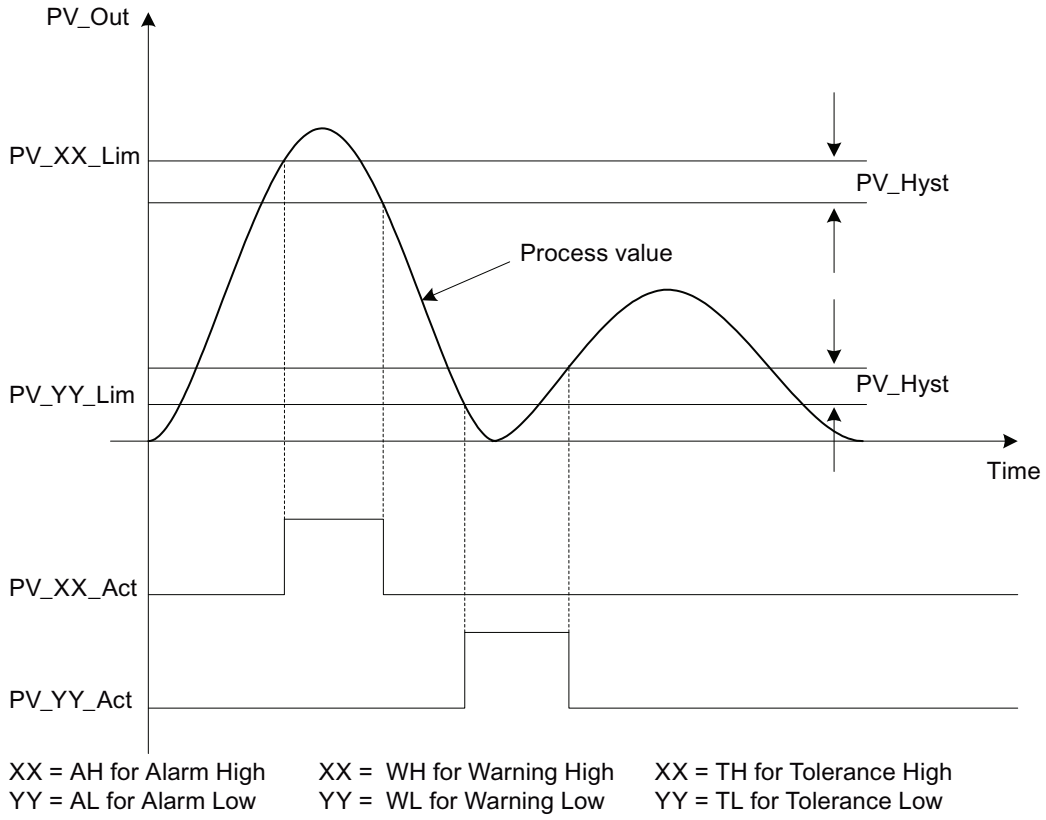
"Small" blocks provide only the monitoring for alarms and warnings.

Result of the limit monitoring

The result of limit monitoring is made available at the interconnectable output parameters:

- `PV_AH_Act = 1`: Limit for high alarm reached or exceeded
- `PV_AL_Act = 1`: Limit for low alarm reached or undershot
- `PV_WH_Act = 1`: Limit for high warning reached or exceeded
- `PV_WL_Act = 1`: Limit for low warning reached or undershot
- `PV_TH_Act = 1`: Limit for high tolerance reached or exceeded
- `PV_TL_Act = 1`: Limit for low tolerance reached or undershot

made available (see figure). The `SumMsgAct = 1` output parameter is also set when at least one limit value is reached or violated. This parameter can also be 1 if the limit for the position feedback value or the limit for the control deviation was reached or exceeded.



You can use `Feature`.Bit 29 Signaling limit violation (Page 142) to determine if the output parameter is to trigger limit monitoring with the value "0" or "1".

You can use `Feature`.Bit 28 Disabling operating points (Page 121) to disable limit monitoring when alarm suppression is enabled (`MsgLock = 1`).

Activating limit monitoring

Monitoring is always enabled using the input parameters:

- `PV_AH_En = 1`: Monitoring of the high alarm limits
- `PV_AL_En = 1`: Monitoring of the low alarm limits
- `PV_WH_En = 1`: Monitoring of the high warning limits
- `PV_WL_En = 1`: Monitoring of the low warning limits
- `PV_TH_En = 1`: Monitoring of the high tolerance limits
- `PV_TL_En = 1`: Monitoring of the low tolerance limits

Predefinition: When the block is installed, monitoring of the tolerance limits is disabled, meaning that the parameters are configured with 0. To activate monitoring, assign 1 to these parameters.

All other monitoring functions are enabled.

Message suppression

	Icon for message suppression

The corresponding message is suppressed using the parameters:

- `PV_AH_MsgEn = 0`: Alarm (high) messages are suppressed
- `PV_AL_MsgEn = 0`: Alarm (low) messages are suppressed
- `PV_WH_MsgEn = 0`: Warning (high) messages are suppressed
- `PV_WL_MsgEn = 0`: Warning (low) messages are suppressed
- `PV_TH_MsgEn = 0`: Tolerance (high) messages are suppressed
- `PV_TL_MsgEn = 0`: Tolerance (low) messages are suppressed

The output of messages is not suppressed when the block is installed (all `xx_MsgEn` parameters are preset to 1). Messages can only be output if limit monitoring of the additional analog value has been enabled.

Hysteresis

You can specify a hysteresis (`PV_Hyst`) for the limits, for example, to suppress signal flutter. Refer to the Limit monitoring with hysteresis (Page 82) section for more on this.

Alarm delays

You can set alarm delays for coming and going alarms, warnings and tolerances. Refer to the Area of application of the alarm delays (Page 156) section for more on this.

Operating in the faceplate

You can also change the limits and the hysteresis using the faceplate. Refer to the Limit operation and display in the faceplate (Page 255) section for more on this.

See also

Two time values per limit pair (Page 158)

Two time values for each individual limit (Page 160)

Limit monitoring of the count value

You can monitor the count value to the following high and low alarm, warning and tolerance limits:

- `OutAH_Lim`: Limit for high alarm
- `OutAL_Lim`: Limit for low alarm
- `OutWH_Lim`: Limit for high warning
- `OutWL_Lim`: Limit for low warning
- `OutTH_Lim`: Limit for the high tolerance
- `OutTL_Lim`: Limit for the low tolerance

Note

Monitoring the limits

The limits monitored depend on the direction of counting:

- In Mode 1 (summing up or integrating), the high limits are monitored:
  - OutAH_Lim
  - OutWH_Lim
  - OutTH_Lim
- In Mode 2 (summing down or integrating), the low limits are monitored:
  - OutAL_Lim
  - OutWL_Lim
  - OutTL_Lim

Example for limit monitoring with a counter

Monitoring of the high limit is performed only if the counter is running in "up" direction.

If you count "up" but with negative values, for example, from 100 down, you need to adjust the high limit accordingly (for example, the high limit could be -15).

This behavior applies to the blocks CountScL, CountOh and TotalL.

Result of the limit monitoring

The result of limit monitoring is made available at the interconnectable output parameters:

- `OutAH_Act = 1`: Limit for high alarm reached or exceeded
- `OutAL_Act = 1`: Limit for low alarm reached or undershot
- `OutWH_Act = 1`: Limit for high warning reached or exceeded
- `OutWL_Act = 1`: Limit for low warning reached or undershot
- `OutTH_Act = 1`: Limit for high tolerance reached or exceeded
- `OutTL_Act = 1`: Limit for low tolerance reached or undershot

made available (see figure). The `SumMsgAct = 1` output parameter is also set when at least one limit value is reached or violated.

You can use `Feature`.Bit 29 Signaling limit violation (Page 142) to determine if the output parameter is to trigger limit monitoring with the value "0" or "1".

You can use `Feature`.Bit 28 Disabling operating points (Page 121) to disable limit monitoring when alarm suppression is enabled (`MsgLock = 1`).

Activating limit monitoring

Monitoring is always enabled using the input parameters:

- `OutAH_En = 1`: Monitoring of the high alarm limits
- `OutAL_En = 1`: Monitoring of the low alarm limits
- `OutWH_En = 1`: Monitoring of the high warning limits
- `OutWL_En = 1`: Monitoring of the low warning limits
- `OutTH_En = 1`: Monitoring of the high tolerance limits
- `OutTL_En = 1`: Monitoring of the low tolerance limits

Predefinition: When the block is installed, monitoring of the tolerance limits is disabled, meaning that the parameters are configured with 0. To activate monitoring, assign 1 to these parameters.

All other monitoring functions are enabled.

Message suppression

The corresponding message is suppressed using the parameters:

- `OutAH_MsgEn = 0`: Alarm (high) messages are suppressed
- `OutAL_MsgEn = 0`: Alarm (low) messages are suppressed
- `OutWH_MsgEn = 0`: Warning (high) messages are suppressed
- `OutWL_MsgEn = 0`: Warning (low) messages are suppressed
- `OutTH_MsgEn = 0`: Tolerance (high) messages are suppressed
- `OutTL_MsgEn = 0`: Tolerance (low) messages are suppressed

The output of messages is not suppressed when the block is installed (all `xx_MsgEn` parameters are preset to 1). Messages can only be output if limit monitoring of the additional analog value has been enabled.

Operating in the faceplate

You can also change the limits using the faceplate. Refer to the Limit operation and display in the faceplate (Page 255) section for more on this.

Limit monitoring of an additional analog value

Limit monitoring of an additional analog value

Limit monitoring is performed for an additional analog value on the basis of the AV block, see Description of AV (Page 330) section.

You can monitor an additional analog value to the following high and low limits for alarms warnings and tolerances at the technologic block:

- `AV_AH_Lim`: Limit for high alarm
- `AV_AL_Lim`: Limit for low alarm
- `AV_WH_Lim`: Limit for high warning
- `AV_WL_Lim`: Limit for low warning
- `AV_TH_Lim`: Limit for the high tolerance
- `AV_TL_Lim`: Limit for the low tolerance

Note

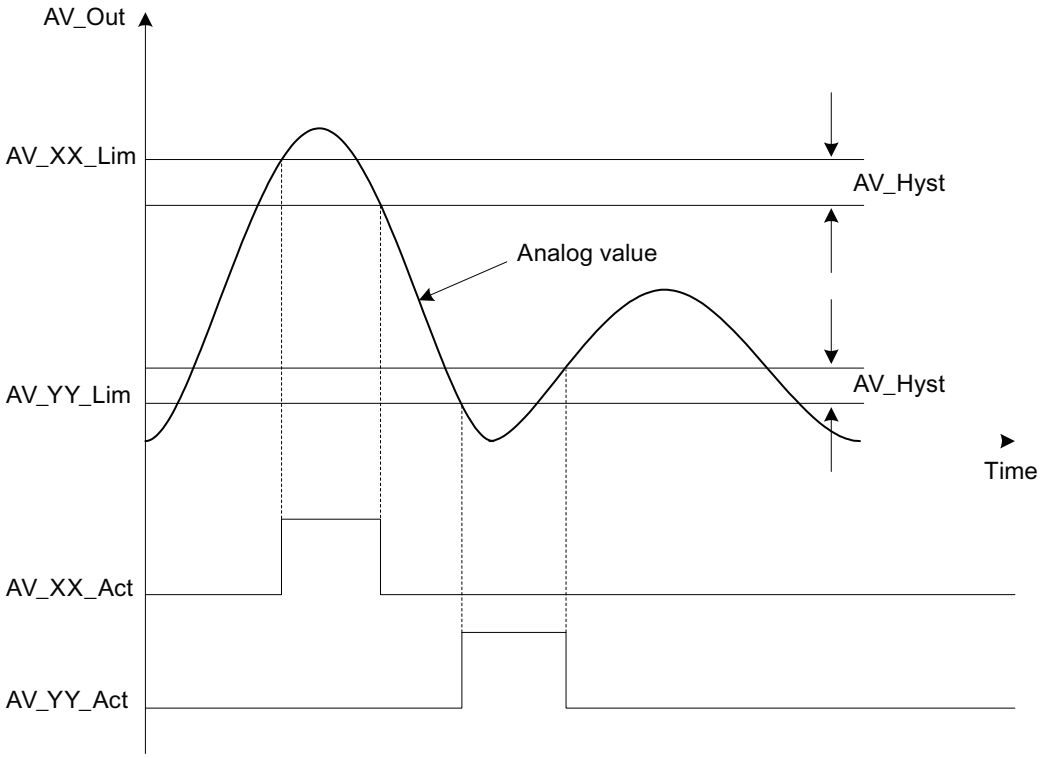
The AV block and the technologic block must be built into the same cyclic interrupt OB.

Result of the limit monitoring

The result of limit monitoring is made available at the interconnectable output parameters of the AV block:

- `AV_AH_Act = 1:`: Limit for high alarm reached or exceeded
- `AV_AL_Act = 1:`: Limit for low alarm reached or undershot
- `AV_WH_Act = 1:`: Limit for high warning reached or exceeded
- `AV_WL_Act = 1:`: Limit for low warning reached or undershot
- `AV_TH_Act = 1:`: Limit for high tolerance reached or exceeded
- `AV_TL_Act = 1:`: Limit for low tolerance reached or undershot

made available (see figure).



XX = AH for Alarm High
YY = AL for Alarm Low

XX = WH for Warning High
YY = WL for Warning Low

XX = TH for Tolerance High
YY = TL for Tolerance Low

You can use `Feature`.Bit 29 Signaling limit violation (Page 142) to determine if the output parameter is to trigger limit monitoring with the value "0" or "1".

You can use `Feature`.Bit 28 Disabling operating points (Page 121) to disable limit monitoring when alarm suppression is enabled (`MsgLock = 1`).

Activating limit monitoring

Monitoring is always enabled using the input parameters of the AV block:

- `AV_AH_En = 1`: Monitoring of the high alarm limits
- `AV_AL_En = 1`: Monitoring of the low alarm limits
- `AV_WH_En = 1`: Monitoring of the high warning limits
- `AV_WL_En = 1`: Monitoring of the low warning limits
- `AV_TH_En = 1`: Monitoring of the high tolerance limits
- `AV_TL_En = 1`: Monitoring of the low tolerance limits

Predefinition: When the block is installed, monitoring of the tolerance limits is disabled, meaning that the parameters are configured with 0. To activate monitoring, assign 1 to these parameters.

All other monitoring functions are enabled.

Message suppression

The corresponding message is suppressed at the block AV using the parameters:

- `AV_AH_MsgEn = 0`: Alarm (high) messages are suppressed
- `AV_AL_MsgEn = 0`: Alarm (low) messages are suppressed
- `AV_WH_MsgEn = 0`: Warning (high) messages are suppressed
- `AV_WL_MsgEn = 0`: Warning (low) messages are suppressed
- `AV_TH_MsgEn = 0`: Tolerance (high) messages are suppressed
- `AV_TL_MsgEn = 0`: Tolerance (low) messages are suppressed

The output of messages is not suppressed when the block is installed (all `xx_MsgEn` parameters are preset to 1). Messages can only be output if limit monitoring of the additional analog value has been enabled.

Hysteresis

You can specify a hysteresis (`AV_Hyst`) at the technologic block for the limits, for example, to suppress signal flutter. Refer to the Limit monitoring with hysteresis (Page 82) section for more on this.

Alarm delays

You can set alarm delays for coming and going alarms, warnings and tolerances. Refer to the Area of application of the alarm delays (Page 156) section for more on this.

Operating in the faceplate

You can also change the limits and the hysteresis using the faceplate. Refer to the Limit operation and display in the faceplate (Page 255) section for more on this.

Limit monitoring of the feedback

Limit monitoring of position feedback

The position feedback of the manipulated variable can be monitored for the following high and low warning limits:

- `RbkWH_Lim`: Limit for high warning
- `RbkWL_Lim`: Limit for low warning

Result of limit monitoring of the position feedback

The result of limit monitoring of the position feedback is made available at the interconnectable output parameters:

- `RbkWH_Act = 1`: High limit reached or exceeded
- `RbkWL_Act = 1`: Low limit reached or undershot

made available. The `SumMsgAct = 1` output parameter is also set when at least one limit value is reached or violated. This parameter can also be 1 if the limit for the process value or the limit value for the control deviation was reached or exceeded.

When the limits are reached or exceeded, messages that can be suppressed are output.

You can use `Feature`.Bit 29 Signaling limit violation (Page 142) to determine if the output parameter is to trigger limit monitoring with the value "0" or "1".

You can use `Feature`.Bit 28 Disabling operating points (Page 121) to disable limit monitoring when alarm suppression is enabled (`MsgLock = 1`).

Activating limit monitoring

Monitoring is always enabled using the input parameters:

- `RbkWH_En = 0`: Monitoring of the high warning limit is disabled
- `RbkWL_En = 0`: Monitoring of the low warning limit is disabled

Predefinition: When the block is installed, monitoring is enabled (default is 1).

Message suppression

The corresponding message is suppressed using the parameters:

- `RbkWH_MsgEn = 0`: Messages from the high limit monitoring are suppressed
- `RbkWL_MsgEn = 0`: Messages from the low limit monitoring are suppressed

The output of messages is not suppressed when the block is installed (for example, `RbkWH_MsgEn = 1`). Messages can only be output if limit monitoring of the position feedback has been enabled.

Hysteresis

You can specify a hysteresis (`RbkHyst`) for the limits, for example, to suppress signal flutter. Please also refer to the section Limit monitoring with hysteresis (Page 82).

Alarm delays (only for the PIDConR and MotSpdCL blocks)

You can set alarm delays for coming and going warnings. Please refer to the section Area of application of the alarm delays (Page 156).

Operating in the faceplate

You can also change the limits and the hysteresis using the faceplate. Please refer to the section Limit operation and display in the faceplate (Page 255).

Limit monitoring of setpoint, manipulated variable and control deviation

Limit monitoring of setpoint, manipulated variable and control deviation

The setpoint, manipulated variable and control deviation can be monitored for the following high and low alarm limits:

- `ER_AH_Lim`: Limit for high alarm
- `ER_AL_Lim`: Limit for low alarm

Result of the limit monitoring

The result of limit monitoring is made available at the interconnectable output parameters:

- `ER_AH_Act =1`: High limit violated (reached or exceeded)
- `ER_AL_Act =1`: Low limit (reached or undershot)

made available. The `SumMsgAct = 1` output parameter is also set when at least one limit value is reached or violated. This parameter can also be 1 if the limit for the position feedback or the limit for the process value was reached or exceeded.

When the limits are reached or exceeded, messages that can be suppressed are output.

You can use `Feature`.Bit 29 Signaling limit violation (Page 142) to determine if the output parameter is to trigger limit monitoring with the value "0" or "1".

You can use `Feature`.Bit 28 Disabling operating points (Page 121) to disable limit monitoring when alarm suppression is enabled (`MsgLock = 1`).

Activating limit monitoring

Alarm monitoring is enabled using the input parameters:

- `ER_AH_En = 1`: Monitoring of the high alarm limit
- `ER_AL_En = 1`: Monitoring of the low alarm limit

Predefinition: When the block is installed, monitoring is disabled.

Message suppression

The corresponding message is suppressed using the parameters:

- `ER_AH_MsgEn = 0`: Messages from the high limit monitoring are suppressed
- `ER_AL_MsgEn = 0`: Messages from the low limit monitoring are suppressed

The output of messages is not suppressed when the block is installed (for example, `ER_AH_MsgEn = 1`). Messages can only be output if limit monitoring has been enabled.

Note

With the MotSpdCL block, messages are only output if you have enabled `Feature` bit 5 (Alarm setpoint difference (Page 143)).

Hysteresis

You can specify a hysteresis (`ER_Hyst`) for these limits, for example, in order to suppress signal flutter . Please also refer to the section Limit monitoring with hysteresis (Page 82).

Alarm delays

You can set alarm delays for coming and going alarms. Please refer to the section Area of application of the alarm delays (Page 156).

Operating in the faceplate

You can also influence the limits and the hysteresis by means of the faceplate. Please refer to the section Limit operation and display in the faceplate (Page 255).

Limit monitoring with hysteresis

Limit monitoring with hysteresis

You can additionally define a hysteresis for all limit monitoring functions (parameter `xxx_Hyst`, xxx can, for example, be `PV` for the process value). You use the hysteresis, for example, to suppress signal flutter.

Enter the hysteresis as a physical variable at the block and faceplate (if you have the appropriate operator control permissions (WinCC)).

For the WinCC operator control permissions, refer to the help on WinCC.

1.1.4.3 Feedbacks

Monitoring the feedbacks

Feedback monitoring

You can use the following monitoring functions:

- Monitoring the start-up and stop characteristics for motors or the runtime of valves
- Monitoring the operation of motors or the maintenance of the position of valves
- Disabling feedback

This monitoring function is enabled via the `Monitor = 1` input.

Static and dynamic errors are reset by disabling the monitoring (`Monitor = 0`). If you reactivate monitoring during the plant runtime, only dynamic monitoring (`MonTiDynamic`) will be performed.

Monitoring the start-up and stop characteristics for motors or the runtime of valves

Monitoring of the startup characteristics is implemented using the parameter `MonTiDynamic`. The monitoring time specifies the period within which the feedback value, for example, `FbkStart` with motors, must be available in response to a control signal. If this is not the case, the text "Feedback error" is displayed in the standard view of the faceplate. An error message is generated at the same time. The block then goes to its neutral position. In the case of motors, this is always the stop state. With other blocks, this is an neutral position you have specified (`SafePos` parameter). The block signals this at the corresponding output parameter of the error message with 1, for example, with `MonDynErr = 1` for motors.

Parameters are set in seconds.

Note

In manual mode, you can control all valves (including the motor valve) regardless of the `MonSafePos = 1` setting and (in the event of a runtime error) without reaching the neutral position.

Monitoring the operation of motors or the maintenance of the position of valves

The following applies for "Large" blocks: Monitoring of the operation or the maintenance of the position of valves is implemented using the parameter `MonTiStatic`. The monitoring time specifies the period in which the feedback value can change its value briefly without an error message being output. An example would be a running motor with the feedback via the input parameter `FbkStart`. This parameter should be static in accordance with the control function. However, its value can change within the monitoring time. If the change in the `FbkStart` parameter takes longer than the monitoring time, the text "Runtime error" is displayed in the standard view of the faceplate. An error message is generated at the same time. The block then goes to its neutral position. In the case of motors, this is always the stop state. With other blocks, this is an neutral position you have specified (`SafePos` parameter). The block signals this at the corresponding output parameter of the error message with 1, for example, with `MonStaErr = 1` for motors.

Parameters are set in seconds.

Note

Please note that `MonTiDynamic ≥ MonTiStatic` and `MonTiDynamic ≥ SampleTime` have to be configured. If something is set outside these limits, the block always returns the respective limit at the input.

If `SampleTime` changes, `MonTiDynamic` may be tracked to the new value for `SampleTime`. `MonTiStatic` is tracked if `MonTiDynamic < MonTiStatic` changes. With `MonTiStatic = 0`, each feedback change without change of the control immediately results in a runtime error.

The following applies for "Small" blocks: These blocks operate like "Large" blocks; however, the monitoring time is set to 0 within the block and cannot be changed. Any change is displayed immediately at the output parameter `MonStaErr` with 1.

Disabling feedback for valves

You can also disable feedback completely. Please refer to section Disabling feedback for valves (Page 85) for further information.

Note

This function is only supported by "Large" blocks.

Resetting the block in case of interlocks or errors

In the event of an interlock or error, the block has to be reset. Refer to the Resetting the block in case of interlocks or errors (Page 33) section for more on this.

Disabling feedback for valves

Disabling monitoring of feedback for valves

This function is only supported by "Large" blocks.

You can operate a block without feedback. To do this, set the `NoFbkxxx = 1` parameter, whereby xxx stands for the respective function, for example, `NoFbkOpen` for the valve. This means, for example, that you do not have any feedbacks for the opened state of the valve. Monitoring is thus disabled for this feedback. The feedback at the block is adjusted according to the control signal.

1.1.4.4 Motor protection function

Motor protection function

The motor protection function is used to turn off the motor if there is thermal overload (`Trip = 0`, interconnectable input parameter).

If the motor is turned off by the motor protection function, a message (process control message) is generated. This is indicated in the faceplate by the "Motor protection" text. You can influence the reset using a various `Feature` bits. Refer to the Resetting the block in case of interlocks or errors (Page 33) section for more on this.

You can find more information in Section Influence of the signal status on the interlock (Page 88).

1.1.5 Interlocking functions

1.1.5.1 Interlocks

Interlocks at blocks

A maximum of three types of interlock can be used depending on the block. Three separate inputs named `Intlock`, `Protect` and `Permit` are available for these functions.

Note

Interlocks for "Small" blocks

Ensure that "Small" blocks have only the parameter `Intlock`. The other two interlocks are not included in these block variants.

The following interlock types exist:

- **Activation enable ("Permission"):** The activation enable (input `Permit = 1`) makes it possible to leave the neutral position of the block in response to operator input or a command from the program (CFC/SFC). The activation enable has no effect if the block is not in the neutral position. See also the section Neutral position for motors, valves and controllers (Page 37) for information on the neutral position.
- **Interlock without reset ("Interlock"):** An active interlock condition brings the block to the neutral position (input `Intlock = 0`). After the interlock condition has gone, the currently active control function becomes active again in automatic or local mode. In manual mode the faceplate can be operated again after the interlock condition has gone.
- **Interlock with reset ("Protection"):** An active interlock condition brings the block to the neutral position (input `Protect = 0`). After the interlock conditions are cleared, the operator or an activation sequence must perform a reset to once again enable activation of the control according to the input parameters.

  You can influence the reset using a various `Feature` bits. Refer to the Resetting the block in case of interlocks or errors (Page 33) section for more on this.

Display of the interlock in the faceplate and in the block icon

The interlock state is visualized in the faceplate and in the block icon by a status display (padlock) as follows:

- Open padlock: No active interlock
- Closed padlock: One or more interlocks are activate
- No padlock: Individual interlocks are not active
  - `Perm_En = 0` or `Permit.ST = 16#FF`: of the input parameter `Permit` has no effect, the button in the faceplate is invisible
  - `Prot_En = 0` or `Protect.ST = 16#FF`: of the input parameter `Protect` has no effect, the button in the faceplate is invisible
  - `Intl_En = 0` or `Intlock.ST = 16#FF`: of the input parameter `Intlock` has no effect, the button in the faceplate is invisible

The block icon indicates the prioritized group status according to the active operating state. See also the Forming the group status for interlock information (Page 90) section for more on this.

The faceplate visualizes the state of each interlock type separately.

The padlock is not shown in the block icon if all parameters for enabling the button are set to 0 (`Perm_En = 0, Prot_En = 0, Intl_En = 0`) or all parameters have the signal status `16#FF` (`Permit.ST = 16#FF, Protect.ST = 16#FF, Intlock.ST = 16#FF`).

Note

Motors and values are not put into the neutral position if one of the interlock inputs is active (for example `Intlock = 0`) and the corresponding signal status is `16#FF` (`Intlock.ST = 16#FF`).

Influence of the signal status on the interlock

Refer to the Influence of the signal status on the interlock (Page 88) section for more on this.

Outputting "Interlock active" using the `LockAct` parameter

If an interlock is set at the parameter:

- `Intlock`
- `Permit`
- `Protect`
- `Trip` (only for motors and motor valves),

the `LockAct` parameter is set automatically to active (=1). The parameter `LockAct` is set to 0 if the interlock is no longer present and those interlocks which require acknowledgement have been acknowledged.

You can bypass the interlock using `BypProt = 1` in local mode and during simulation. This also makes `LockAct = 0`.

Note

The `LockAct` parameter is not set despite a pending interlock, if a value in the block is forced. Refer also to the Forcing operating modes (Page 31) section for more on this.

Messaging

No messages are assigned to the interlock types. However, if you want to have a message when an interlock condition is violated, you can use the freely interconnectable input parameters to generate the messages. See also the Generating instance-specific messages (Page 162) section for more on this.

1.1.5.2 Disabling interlocks

Disabling individual interlocks

You can disable the block interlocks that are implemented using the input parameters `Intlock`, `Protect` and `Permit`.

If you want to disable the block interlock, you have to set the following parameters:

- `Perm_En = 0` or `Permit.ST = 16#FF`: The `Permit` input parameter has no effect
- `Prot_En = 0` or `Protect.ST = 16#FF`: The `Protect` input parameter has no effect
- `Intl_En = 0` or `Intlock.ST = 16#FF`: The `Intlock` input parameter has no effect

Note

"Small" blocks have only the `Intlock` parameter

With "Small" blocks, you can only assign parameters to "Interlock without reset" (input parameter `Intlock` or for the deactivation of the interlock for the input parameter `Intl_En`).

Disabling of all the interlocks (only for local operation and for simulation)

You can use the input parameter `BypProt = 1` to disable all the interlocks, irrespective of the parameter assignment of the individual interlock, in local mode as well as for the "simulation" function.

1.1.5.3 Influence of the signal status on the interlock

Influence of the signal status on the interlock

There are three ways in which the signal status affects the interlocks:

- Simulation signal status (value 16#60)
- Signal status "Bad, device related" (value 16#00) or "Bad, process related" (value 16#28)
- Signal status ≠ "Simulation" and "Bad, device related"

"Simulation" signal status (value 16#60)

If the interlock signal with the status 16#60 brings about a cancellation of the interlock, this is processed as a bypass of the interlock in the block and displayed with the following icons in the faceplate:

If the interlock signal with the status 16#60 does not cancel the interlock, this is executed as a simulation in the block and displayed with the following icons in the faceplate:

Signal status "Bad, device related" (value 16#00) or "Bad, process related" (value 16#28)

An interlock signal with this status is always processed as an active interlock signal in the block and displayed with the following icons in the faceplate:

for 16#00 or

for 16#28 and

A motor protection signal (`Trip` parameter) with signal status 16#00 or 16#28 is used to activate motor protection. This is indicated by "Motor protection" in the standard view of the faceplates.

A torque-monitoring signal (`TorqOpen`, `TorqClose` parameters) with signal status 16#00 or 16#28 is used to activate torque monitoring for motor valve VlvMotL.

Signal status ≠ "Simulation" as well as "Bad, device related" and "Bad, process related"

Only signal states "Simulation", "Bad, device related" and "Bad, process related" have an effect on the processing in the block; all others are only displayed with their relevant icon in the faceplate.

1.1.5.4 Forming the group status for interlock information

Forming the group status for interlock information

A group status for interlock information is required for:

- Interlock state for:
  - Interlocked
  - Not interlocked
  - Deactivated

Group status for the interlock state

All the effective interlock states are combined and displayed in the block icon. The interlock states are displayed with the following prioritization:

1. Function interlocked, shown in the block icon with a closed padlock

2. Function not interlocked, shown in the block icon as an open padlock

3. Function disabled, shown in the block icon as a crossed-out, closed padlock

Overview: Display for the interlock status in faceplate

Interlocks are shown in the faceplate as follows:

Parameter: BypProt	Parameter: Perm_En or Prot_En or Intl_En	Value: Permission or Protection or Intlock	Status: Permission or Protection or Intlock	Button	Icon	Icon
x	x	X	16#FF	-	-	-
x	0	x	x	-	-	-
0	1	1	16#00	Visible		
0	1	1	16#28	Visible		
0	1	0	16#60	Visible		
0	1	1	16#60	Visible		
0	1	0	≠ 16#FF	Visible		Status based on priority

Parameter: BypProt	Parameter: Perm_En or Prot_En or Intl_En	Value: Permission or Protection or Intlock	Status: Permission or Protection or Intlock	Button	Icon	Icon
0	1	1	≠ (16#FF, 16#60, 16#00, 16#28)	Visible		Status based on priority
1 (for local mode and simulation only)	1	x	≠ 16#FF	Visible		Status based on priority

Comments on table:

- X: The value is irrelevant for the display of the icon.

Note

If values are forced in the block, this is indicated in the block icon by a crossed-out, closed padlock.

1.1.5.5 Rapid stop for motors

Rapid stop for motors

Rapid stop has the highest priority in all operating modes (manual and automatic mode as well as local mode) and operating states (such as the forcing of states). It is activated via the faceplate. This depends on the setting at the `Feature` bit Enabling rapid stop via faceplate (Page 142).

Note

"Small" blocks do not feature rapid stop.

The "rapid stop" function is supported only by "Large" blocks.

You issue the command for rapid stop state using the `RapidStp = 1` input parameter.

When you click on the "Rapid Stop" button in the faceplate, the drive stops immediately, shown as follows in the faceplate:

The `R_StpAct = 1` output parameter is set to implement the rapid stop function for local mode. You need to interconnect this parameter with the corresponding channel block and in the I/O to realize the rapid stop function in the hardware.

Rapid stop is unlocked for all operating modes using the "Reset" button in the faceplate (`RstOp = 1`); in CFC it is unlocked using the `RstLi = 1` input parameter. In automatic mode, the unlocking can also be performed via a 0-1 edge transition in the control if the `Feature` is `Bit9 = 1`.

Rapid stop can be selected even with the motor in stop state. In this case, the motor start is prevented.

1.1.6 Form signal status

1.1.6.1 Forming and outputting signal status for blocks

General information on forming and outputting the signal status

The process values of the function blocks are generated and transferred along with a signal status as a structured variable. This contains a statement about the signal quality. The function blocks determine the appropriate signal status for their process outputs depending on the signal status of the process inputs, which are involved in calculating the process outputs. If multiple process inputs are involved in calculating a process output, the signal status is formed according to prioritization defined by function block groups. The highest priority is the signal status with the value 0.

The blocks are grouped into the following function block groups:

- Technologic blocks (Page 93)
- Digital logic blocks (Page 95)
- Analog logic blocks (Page 96)
- Redundancy blocks (Page 97)
- Blocks with configurable status prioritization (Page 99)
- Interlock blocks (Page 100)
- Mathematical blocks (Page 102)
- PCS 7 channel blocks (Page 103)
- Channel blocks for field devices (Page 104)

All blocks of a group use the same priority specifications and form the signal status of the process outputs based on them.

Note

The status / quality of control inputs for logic functions and parameters have no influence on the status / quality of process values and logic functions of the blocks.

The status / quality of process values inherit the results of mathematic and logic functions, which are directly related to the process value.

The status/quality of process values immediately inherit the results of monitoring and limiting functions directly related to the process value.

1.1.6.2 Forming and outputting the signal status for technologic blocks

Forming the signal status for technologic blocks

For more general information on forming the status signal, refer to the section: Forming and outputting signal status for blocks (Page 92).

In technologic blocks, a group status is formed from the input parameters (see description of the relevant blocks) according to the priority table below (highest priority is 0). This group status is displayed in the status bar of the faceplate and of the block icon.

The group status is set to 16#68 (Uncertain, device related) with an undefined signal status at a control input, which is involved in the formation of the group status.

Signal status icon	Priority	Value	Meaning
	0	16#60	Local functional check / simulation
	1	16#00	Bad, device related
	2	16#28	Bad, process related
	3	16#68	Uncertain, device related
	4	16#78	Uncertain, process related
	5	16#A4	Maintenance request
	6	16#80	Good

Note

The priority of the signal status is contrary here to the priority specified by NAMUR. In NAMUR, the "Bad" signal status has a higher priority than the "Simulation" signal status. This enables you to overwrite a bad signal with a simulated signal.

Interconnectable output parameters for limits (for example, `PV_AH_Act`) that can be influenced directly by an interconnectable input parameter (for example, `PV`) inherit the status from the associated output parameter (for example, `PV_Out`).

If an output parameter for limits is influenced directly by several interconnectable input parameters (limit monitoring), it receives the status of the input parameter with the highest priority (see overview above). Thus, for example, the control deviation is formed from the setpoint (`SP`) and the process value (`PV`). The output parameter for limits `ER_AH_Act`, for example, which signals an active violation of the high limit for the error signal, has a signal status based on the group status formed from the process value and setpoint (`ER`).

Evaluation of the signal status in case of interlocks in technologic blocks

The signal states of the interconnectable input parameters of the interlocking and protective signals are treated exactly like process values with the following exceptions:

- The signal status is displayed in the faceplate at the buttons for calling the series-connected interlocking blocks.
- If the input signal has "Simulation" status and the input signal is therefore inactive (for example, `Protect` = 1), the input signal in this case is interpreted as a bypassed signal and is displayed by the icon for bypassing:

- If the input signal has "Simulation" status and the input signal is therefore inactive (for example, `Protect` = 0), the input signal in this case is interpreted as a simulated signal and is displayed by the icon for simulation:

- If the input signal has the "Bad, device related" or "Bad, process related" signal status, this is evaluated as an active input signal, regardless of its value, i.e. safety interlock signal (`Protect` = 1) that is inactive due to its value, triggers a safety interlock when its status is "Bad, device related" or "Bad, process related".

Display of the signal status in the faceplate and block icon for technologic blocks

The signal status is displayed for each individual input parameter in the faceplate next to the process values or the interlock buttons. The group status is displayed in the block icon and in the group display of the faceplate.

Note

The interlocks and additional values are not included in the formation of the group status.

1.1.6.3 Forming and outputting the signal status of digital logic blocks

Forming the signal status of digital logic blocks

For more general information on forming the status signal, refer to the section: Forming and outputting signal status for blocks (Page 92).

The status for the result of the output is formed within digital logic blocks from all input parameters, according to the following priority table (highest priority is 0)

Signal status icon	Priority	Value	Meaning
	0	16#00	Bad, device related
	1	16#28	Bad, process related
	2	16#60	Local functional check/simulation
	3	16#68	Uncertain, device related
	4	16#78	Uncertain, process related
	5	16#A4	Maintenance request
	6	16#80	Good

Special notes for the Andxx blocks

- If the output value is 1, it has the signal status with the highest priority of all input signals.
- If the output value is 0, it has the signal status with the lowest priority of all input signals, which have a value of 0.

Special notes for the Orxx blocks

- If the output value is 1, it has the signal status with the lowest priority of all input signals, which have a value of 1.
- If the output value is 0, it has the signal status with the highest priority of all input signals.

Special notes for the Xor04 block

The poorest signal status of all input parameters is always selected and output with the `Out` output parameter.

1.1.6.4 Forming and outputting the signal status of analog logic blocks

Forming the signal status of analog logic blocks

For more general information on forming the status signal, refer to the section: Forming and outputting signal status for blocks (Page 92).

The signal status of the Out output value within the block is taken directly from the `Inx` input value.

Special notes for the CompAn02 block

This block evaluates the signal status of the two input parameters `In1` and `In2` as shown in the following table.

Signal status icon	Priority	Value	Meaning
	0	16#60	Local functional check / simulation
	1	16#00	Bad, device related
	2	16#28	Bad, process related
	3	16#68	Uncertain, device related
	4	16#78	Uncertain, process related
	5	16#A4	Maintenance request
	6	16#80	Good

Note

The priority of the signal status is contrary here to the priority specified by NAMUR. In NAMUR, the "Bad" signal status has a higher priority than the "Simulation" signal status. This enables you to overwrite a bad signal with a simulated signal.

1.1.6.5 Forming and outputting the signal status of redundancy blocks

Forming the signal status of redundancy blocks RedAn02 and RedDi02

For more general information on forming the status signal, refer to the section: Forming and outputting signal status for blocks (Page 92).

The signal status is evaluated according to the following priority:

Signal status icon	Priority	Value	Meaning
	0	16#60	Local functional check/simulation
	1	16#80	Good
	2	16#A4	Maintenance request
	3	16#78	Uncertain, process related
	4	16#68	Uncertain, device related
	5	16#28	Bad, process related
	6	16#00	Bad, device related

The output value is generated based on the signal status of the process value with the above table of priorities. In addition, the output parameters `SimAct`, `Uncertain`, and `LossRed` are still set according to the signal status.

In1.ST	In2.ST	Out.ST	Out.Value	SimAct.Value	Uncertain.Value	LossRed.Value
16#80	16#80	16#80	In1	0	0	0
16#80	16#60	16#60	In2	1	1	0
16#80	16#A4	16#80	In1	0	1	0
16#80	16#78	16#80	In1	0	1	0
16#80	16#68	16#80	In1	0	1	0
16#80	16#28	16#68	In1	0	1	1
16#80	16#00	16#68	In1	0	1	1
16#60	16#80	16#60	In1	1	1	0
16#60	16#60	16#60	In1	1	1	0
16#60	16#A4	16#60	In1	1	1	0
16#60	16#78	16#60	In1	1	1	0
16#60	16#68	16#60	In1	1	1	0
16#60	16#28	16#60	In1	1	1	1
16#60	16#00	16#60	In1	1	1	1

In1.ST	In2.ST	Out.ST	Out.Value	SimAct.Value	Uncertain.Value	LossRed.Value
16#A4	16#80	16#80	In2	0	1	0
16#A4	16#60	16#60	In2	1	1	0
16#A4	16#A4	16#A4	In1	0	1	0
16#A4	16#78	16#A4	In1	0	1	0
16#A4	16#68	16#A4	In1	0	1	0
16#A4	16#28	16#68	In1	0	1	1
16#A4	16#00	16#68	In1	0	1	1
16#78	16#80	16#80	In2	0	1	0
16#78	16#60	16#60	In2	1	1	0
16#78	16#A4	16#A4	In2	0	1	0
16#78	16#78	16#78	In1	0	1	0
16#78	16#68	16#78	In1	0	1	0
16#78	16#28	16#68	In1	0	1	1
16#78	16#00	16#68	In1	0	1	1
16#68	16#80	16#80	In2	0	1	0
16#68	16#60	16#60	In2	1	1	0
16#68	16#A4	16#A4	In2	0	1	0
16#68	16#78	16#78	In2	0	1	0
16#68	16#68	16#68	In1	0	1	0
16#68	16#28	16#68	In1	0	1	1
16#68	16#00	16#68	In1	0	1	1
16#28	16#80	16#68	In2	0	1	1
16#28	16#60	16#60	In2	1	1	1
16#28	16#A4	16#68	In2	0	1	1
16#28	16#78	16#68	In2	0	1	1
16#28	16#68	16#68	In2	0	1	1
16#28	16#28	16#28	In1	0	1	1
16#28	16#00	16#28	In1	0	1	1
16#00	16#80	16#68	In2	0	1	1
16#00	16#60	16#60	In2	1	1	1
16#00	16#A4	16#68	In2	0	1	1
16#00	16#78	16#68	In2	0	1	1
16#00	16#68	16#68	In2	0	1	1
16#00	16#28	16#28	In2	0	1	1
16#00	16#00	16#00	In1	0	1	1

1.1.6.6 Forming and outputting the signal status for blocks with configurable status prioritization

Forming the signal status for blocks with configurable status priority

For more general information on forming the status signal, refer to the section: Forming and outputting signal status for blocks (Page 92).

The `SelPrio` parameter is used for this block to define the priority setting for linking the individual states. You have the option between the following specifications:

Priority	`SelPrio` = 0	`SelPrio` = 1	`SelPrio` = 2	`SelPrio` = 3	`SelPrio` = 4	`SelPrio` = 5	`SelPrio` = 6	`SelPrio` = 7
0	 16#60	 16#80	 16#A4	 16#80	 16#A4	 16#60	 16#80	 16#60
1	 16#00	 16#00	 16#00	 16#A4	 16#80	 16#80	 16#A4	 16#80
2	 16#28	 16#28	 16#28	 16#60	 16#60	 16#A4	 16#78	 16#A4
3	 16#68	 16#68	 16#68	 16#00	 16#00	 16#00	 16#68	 16#78
4	 16#78	 16#78	 16#78	 16#28	 16#28	 16#28	 16#28	 16#68
5	16#A4	16#60	16#60	16#68	16#68	16#68	16#00	16#28
6	16#80	16#A4	16#80	16#78	16#78	16#78	16#60	16#00

Special notes for the MuxAn03 block

The status priority for this block, which is used by the block to process the status of the `PV1` ... `PV3` process value inputs, can be set with the `SelPrio` parameter.

Note

The parameter `SelPrio` can take a value from 0 to 7 . `SelPrio = 6` is set by default.

If you enter a value greater than 7, the setting for 7 is used. If you enter a value lower than 0, the setting for 0 is used.

For information on evaluating the status of the process value inputs, refer to the section MuxAn03 functions (Page 1495).

1.1.6.7 Forming and outputting the signal status for interlock blocks

Forming the signal status for interlock blocks

For more general information on forming the status signal, refer to the section: Forming and outputting signal status for blocks (Page 92).

The block determines the signal status of the output signal, based on the signal status of the input values from the configured logical operation according to the following table (highest priority is 0):

Signal status icon	Priority	Value	Meaning
	0	16#00	Bad, device related
	1	16#28	Bad, process related
	2	16#60	Local functional check / simulation
	3	16#68	Uncertain, device related
	4	16#78	Uncertain, process related
	5	16#A4	Maintenance request
No icon	6	16#80	Good
No icon	-	16#FF	Input is not connected

General rules

- Depending on the logical operation and its result, the signal status of the output is formed by the signal status with the lowest or highest priority of the interconnected input signals.
- If no inputs are interconnected, the signal status of the output is set to simulation (16#60).
- The signal status 16#28 or 16#00 at one of the interconnected inputs has a higher priority and is written to the output.

Logical AND operation (Logic = 1)

- If the output value is 1, it has the signal status with the highest priority of all connected input signals.
- If the output value is 0, it has the signal status with the lowest priority of all connected input signals, which have a value of 0.
- If the output value is 1 and at least one input is bypassed, the signal status of the output is set to simulation at best (16#60).

Logical OR operation (Logic = 0)

- If the output value is 1, it has the signal status with the lowest priority of all connected input signals, which have a value of 1.
- If the output value is 0, it has the signal status with the highest priority of all connected input signals.
- If the output value is 0 and at least one input is excluded, the signal status of the output is set to simulation at best (16#60).

Display of the signal status in the faceplate and block icon for interlocking blocks

The signal status is displayed for each individual parameter (except for the analog values) in the faceplate next to the process values.

If you bypass a signal, it is displayed in the faceplate of the interlocking block next to the button for excluding, as well as in the block icon as follows.

The currently valid status for the output signal is also displayed in the faceplate.

1.1.6.8 Forming and outputting the signal status for mathematical blocks

Forming the signal status for mathematical blocks

For more general information on forming the status signal, refer to the section: Forming and outputting signal status for blocks (Page 92).

The status for the result of the output is formed within mathematical blocks from all process inputs involved in the calculation, according to the following table (highest priority is 0)

Signal status icon	Priority	Value	Meaning
	0	16#00	Bad, device related
	1	16#28	Bad, process related
	2	16#60	Local functional check / simulation
	3	16#68	Uncertain, device related
	4	16#78	Uncertain, process related
	5	16#A4	Maintenance request
	6	16#80	Good

If only one process input is decisive for calculating the output value, the status of the process input is transferred to the status of the output.

Special notes for the mathematical blocks Addxx, Mulxx and Sub02

If the result of the mathematic operation is a floating-point number that cannot be displayed, the result of the status is set to 16#28. Floating-point numbers that cannot be displayed are labeled in the CFC with #+Inf (+ infinite), #-Inf (- infinite) or with #NaN (not a number).

1.1.6.9 Forming and outputting the signal status for PCS 7 channel blocks

Forming the signal status for PCS7 channel blocks

For more general information on forming the status signal, refer to the section: Forming and outputting signal status for blocks (Page 92).

The signal status for PCS7 channel blocks can assume the following values:

Signal status icon	Value	Meaning
	16#80	Good
	16#78	Uncertain, process related: Limitation of input parameter `PV_In` is active (analog output channel blocks only)
	16#60	Simulation, substitute value or last valid value
	16#00	Bad, device related (value not valid)

1.1.6.10 Forming and outputting the signal status for channel blocks for field devices

Forming the signal status for channel blocks (field devices)

For more general information on forming the status signal, refer to the section: Forming and outputting signal status for blocks (Page 92).

The signal status of channel blocks for field devices can assume the following values:

Signal status icon	Value	Meaning
	16#80	Good
	16#78	Uncertain, process related
	16#68	Uncertain, device related
	16#60	Simulation, substitute value or last valid value
	16#28	Bad, process related
	16#00	Bad, device related (value not valid)
	16#A4	Maintenance required, maintenance demanded

1.1.7 Error handling

1.1.7.1 Error handling

Error handling

The channel and technologic blocks feature error handling routines. A distinction must be made between the following areas:

- Error numbers
- External process control fault (CSF)
- Process-specific errors
- Invalid signal states
- Mode switchover error
- Errors in channel blocks

Error numbers

Most blocks have an output parameter `ErrorNum` that can be used to output internal error states of the block as error numbers.

With some blocks, input parameters are checked for permissible values. They are therefore only used to prevent the output value from remaining invalid when the input value is once again in the valid range. If an invalid value is detected, and the corresponding output value is held at the last displayed value instead of an invalid value being displayed. If blocks do not have this check, an invalid value can appear at the output. However, a valid value is displayed again at the output as soon as the input values of the block have changed correspondingly.

Any value set over an interconnection or as a result of a parameter assignment that is outside the range of values (e.g. "Not a Number") is not processed by the block algorithm. The last valid value is processed instead.

In addition to the errors stated above, a limit violation is also signaled for example. Each error number is assigned to a specific error.

If there is more than one error, all error numbers have the same priority. The routine always displays the error number of the error most recently detected in a block cycle.

External process control fault (CSF)

An external process control fault always lies outside the process - it exists in the form of device or other hardware faults. If, for example, a run-time error occurs at a valve, there is an error or fault in the pneumatic system.

A process control fault is output if an external fault is set at the input `CSF`. You can enable this output function, for example, by interconnecting output `Bad` of the channel block with input `CSF` of the technologic block.

The error message "$$BlockComment$$ External error occurred" is output at `CSF = 1`.

This state is visualized in the group display by an "S" character in the faceplate overview and in the block icon.

Process-specific errors

Process-specific errors can have the following causes:

- Runtime monitoring: If the feedback signals do not match the control settings after a selected time has expired, a process-related error is output.
- Feedback monitoring: Please refer to the section Monitoring the feedbacks (Page 83).

If the block algorithm detects a monitoring error while monitoring is enabled, the corresponding output parameter is set to 1 in the block. The "$$BlockComment$$ Feedback error xxx" error message is also output, where xxx, for example, stands for the valve.

This state is visualized in the group display by an "S" character in the faceplate overview and in the block icon.

The block must be reset after the monitoring error was cleared and if automatic mode is set.

Invalid input signals

This error is output if inconsistencies are detected between associated I/Os. The close and open commands cannot be output simultaneously to the valve, for example.

If the block algorithm detects an invalid combination of input signals, an error number `(ErrorNum)` is output that depends on the block type.

The text "Invalid signal" is output in the standard view of the faceplate.

Mode switchover error

This error is reported if you change the mode of the block from:

- Manual to automatic mode or
- Local mode to automatic mode

and the previous and target state are **inconsistent** (bumpless switchover). You can only change the block mode if the subsequent state corresponds with the previous state.

Bumpless switchover can be activated / deactivated using the `Feature` connection on the Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145) or Disabling bumpless switchover to automatic mode for controllers (Page 145) bit.

Bumpless switchover from local to automatic mode is undertaken using the `LocalSetting` parameter, as described in section Local mode (Page 66).

In the standard view of the faceplate, the text "Changeover error" is displayed in the event of an unwanted switchover with bumps.

The block retains local mode if the operator changes the mode from local to automatic and the error mentioned above occurs. The block changes to manual mode if the mode is changed from local to automatic over interconnected inputs and the error mentioned above occurs.

Errors in channel blocks

The following errors may be displayed by the channel blocks:

- Channel error
- Device or module fault
- Higher-level error
- Invalid measuring range

1.1.7.2 Outputting group errors

Outputting group errors

The `GrpErr` output parameter assembles the faults of a block and makes them available to you. A group error is compiled from the following error information:

- Feedback errors (static or dynamic feedback monitoring)
- External errors
- Motor protection (only for motors)
- Module errors (only for hardware controllers)
- I/O access errors (only for hardware controllers)
- Parameter assignment errors (only for hardware controllers)

For information on how the signal is formed for the group error at the `GrpErr` output parameter, refer to the corresponding block descriptions in the "Functions" section.

Note

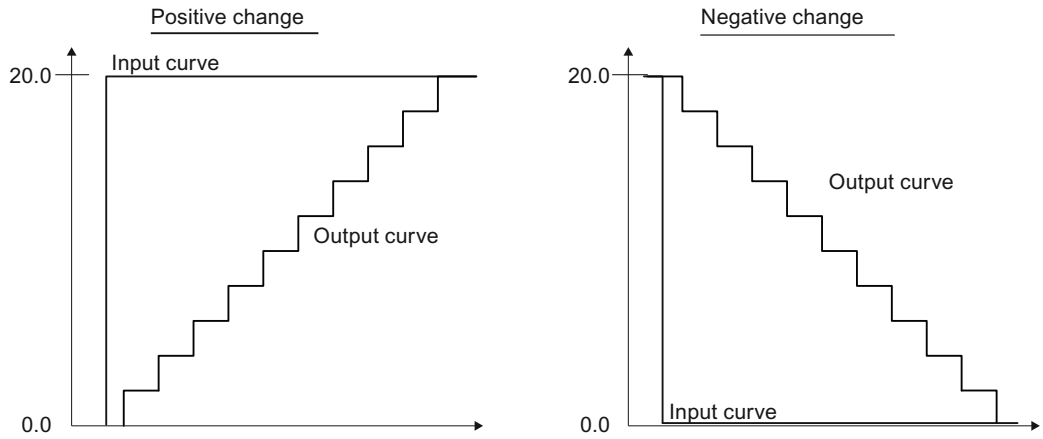
The signal status of the individual signals is not taken into consideration for forming the group error. The outputs therefore always have the status, `16#80`.

1.1.8 Ramp function

1.1.8.1 Using setpoint ramp

Using setpoint ramp

Starting at the current internal setpoint, the setpoint can be set to a target setpoint value over a ramp-shaped function. In the faceplate, you can start the function in ramp view (`SP_RmpOn = 1`).



Use the `SP_RmpModTime` input parameter or the ramp view of the faceplate to specify whether the setpoint ramp is defined by time or by gradients:

- If you select time `(SP_RmpModTime = 1)`: The ramp of the setpoint is calculated automatically by the block so that after the ramp has started `(SP_RmpOn = 1)`, the setpoint will reach the target setpoint (`SP_Target`) after the selected time `(SP_RmpTime)`.
- If you select ramp `(SP_RmpModTime = 0)`: The inclination of the ramp matches the selected rates of change `SP_UpRaLim` (positive) or `SP_DnRaLim` (negative).

Once the setpoint has reached the target setpoint, the function is terminated automatically `(SP_RmpOn = 0)`. The ramp trip can be prematurely aborted in the faceplate by setting `SP_RmpOn = 0`.

Requirements for using a setpoint ramp

Block	Manipulated variable	Gradient limit	Operating mode
Controller	Internal	Off	Automatic
OpAnL	Internal	Off	
MotSpdCL	Internal	Off	

If the requirements are not fulfilled during the ramp trip, the ramp trip is automatically canceled.

Note

Special note for the MotSpdCL block

In the case of an interlock, a monitoring error, motor protection or rapid stop, the motor is switched off and the internal ramp setpoint is reset to the starting setpoint of the ramp trip.

1.1.8.2 Gradient limit of the setpoint

Gradient limit of the setpoint

The gradient limit is activated via the `SP_RateOn = 1` input parameter.

The values are set at the `SP_UpRaLim` and `SP_DnRaLim` parameters depending on the `TimeFactor`.

- `TimeFactor = 0`: Unit of the gradient limiting is Unit/Second
- `TimeFactor = 1`: Unit of the gradient limiting is Unit/Minute
- `TimeFactor = 2`: Unit of the gradient limiting is Unit/Hour
- `SP_UpRaLim` sets the gradient high limit
- `SP_DnRaLim` sets the gradient low limit

Note

Parameters`SP_UpRaLim` and `SP_DnRaLim` are always evaluated according to their magnitude.

Displaying active limitation

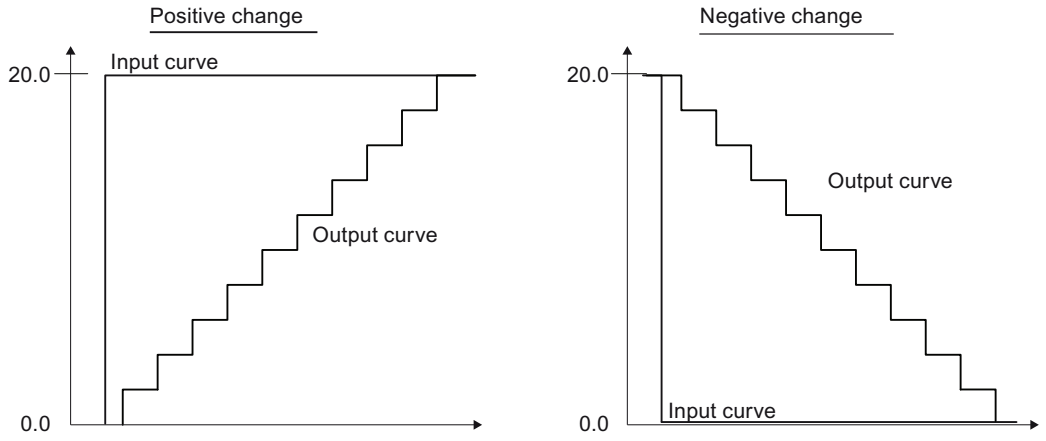
A gradient limit is indicated at the following output parameters:

- `SP_UpRaAct = 1`: Gradient has a high limit
- `SP_DnRaAct = 1`: Gradient has a low limit

1.1.8.3 Using a manipulated variable ramp

Using a manipulated variable ramp

Starting at the current internal manipulated variable, the manipulated variable can be brought to a target value in the form of a ramp. In the faceplate, you can start the function in ramp view (`MV_RmpOn = 1`).



Use the `MV_RmpModTime` input parameter or the ramp view of the faceplate to specify whether the manipulated variable ramp is defined by time or by gradients:

- If you select time `(MV_RmpModTime = 1)`: The gradients of the manipulated variable are calculated automatically by the block so that after the ramp has started `(MV_RmpOn = 1)`, the manipulated variable will reach the target value (`MV_Target`) after the configured time `(MV_RmpTime)`.
- Specification with gradients `(MV_RmpModTime = 0)`: The ramp slope matches the configured rates of change `MV_UpRaLim` (positive) or `MV_DnRaLim` (negative).

Once the manipulated variable has reached the target value, the function is terminated automatically `(MV_RmpOn = 0)`. The ramp trend can be prematurely aborted in the faceplate by setting `MV_RmpOn = 0`.

Requirements for using a manipulated value ramp:

Block	Manipulated variable	Gradient limit	Operating mode
VlvAnL without auxiliary valve	Internal	Off	Manual
VlvAnL with auxiliary valve	Internal	Off	

If the requirements are not fulfilled during the ramp trip, the ramp trip is automatically canceled.

1.1.8.4 Gradient limiting of the manipulated variable

Gradient limiting of the manipulated variable

The gradient limit is activated via the `MV_RateOn = 1` input parameter.

The values are set at the `MV_UpRaLim` and `MV_DnRaLim` parameters depending on the `TimeFactor`.

- `TimeFactor = 0`: Unit of the gradient limiting is Unit/Second
- `TimeFactor = 1`: Unit of the gradient limiting is Unit/Minute
- `TimeFactor = 2`: Unit of the gradient limiting is Unit/Hour
- `MV_UpRaLim` sets the gradient high limit
- `MV_DnRaLim` sets the gradient low limit

Note

Parameters`MV_UpRaLim` and `MV_DnRaLim` are always evaluated according to their magnitude.

Displaying active limitation

A gradient limit is indicated at the following output parameters:

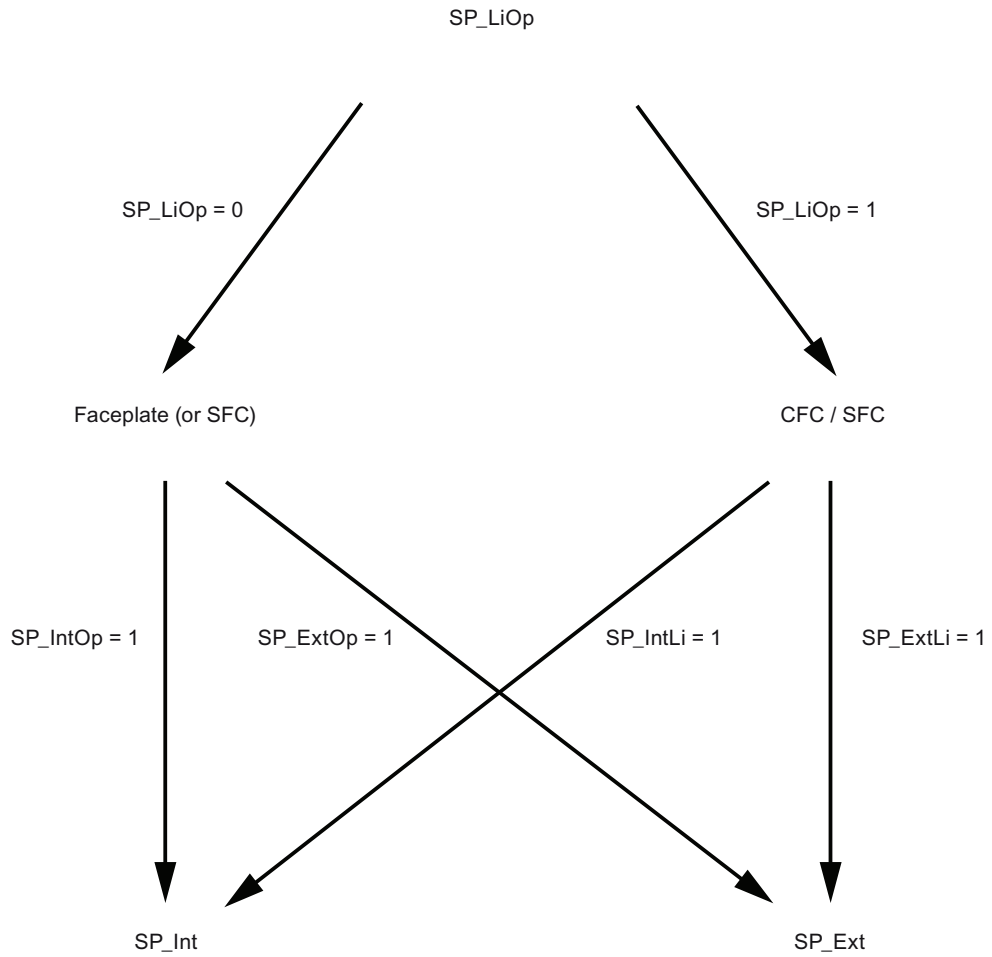
- `MV_UpRaAct = 1`: Gradient has an high limit
- `MV_DnRaAct = 1`: Gradient has a low limit

1.1.9 Internal/external setting

1.1.9.1 Setpoint specification - internal/external

Setpoint specification internal & external

Some blocks have a function that allows setpoints to be specified. This specification is carried out either by means of a CFC/SFC program or by means of the faceplate (operator). With doser blocks and frequency converters, the operator can specify the internal setpoint value (`SP_Int`) or a higher-level open-loop control will specify an external setpoint value (`SP_Ext`). In principle, the blocks operate according to the same scheme:



First you define whether the setpoint specification is to be carried out by means of a CFC/SFC program or by means of the faceplate. In the next step you specify whether the internal or the external setpoint is to be used.

Setpoint specification by means of faceplate or interconnection

With the SP_LiOp parameter, you define whether the setpoint will be set by a CFC/SFC program or using the faceplate.

- Parameterize Sp_LiOp with 0 so that the setpoint specification is carried out by means of the faceplate.
- Parameterize SP_LiOp with 1 so that the setpoint specification is carried out by means of a CFC / SFC program.

Setpoint specification internal & external

You have to set the corresponding parameters depending on how the setpoint specification is to be carried out.

If the setpoint is set in the faceplate (SP_LiOp = 0), you have to set the parameter:

- SP_IntOp = 1 in order to achieve an internal setpoint specification by means of the faceplate.
- SP_ExtOp = 1 to have an external setpoint set in the faceplate.

If both signals are set, SP_IntOp = 1 has priority.

If the setpoint is set by a CFC / SFC program (SP_LiOp =1), you have to set the parameter:

1. SP_IntLi = 1 to have an internal setpoint set by a CFC / SFC program.
2. SP_ExtLi = 1 in order to achieve an external setpoint specification by means of a CFC / SFC program.

Note

For PIDConL, PIDStepL, FmCont, FmTemp: If both signals are set, SP_IntLi = 1 has priority.

Bumpless switchover from external to internal setpoint

The parameter SP_TrkExt = 1 is used so that the internal setpoint tracks the external setpoint to achieve a Bumpless switchover from the external to the internal setpoint. This allows unwanted jumps at the output parameter to be avoided.

1.1.9.2 Manipulated variable specification - internal/external

Manipulated variable specification internal and external

The VlvAnl block provides a function for specifying manipulated variables. This specification is carried out either using a CFC/SFC program or using a faceplate (operator).

If a auxiliary valve is used for operation, it is possible to switch between internal and external in the both manual and automatic mode.

If no auxiliary valve is used for operation, the external manipulated variable is used for automatic mode and the internal manipulated variable is used for manual mode. It is not possible to switch between internal and external.

Note

If no auxiliary valve is used and either the "Open" or "Close" command is active, a new manipulated variable (internal or external) only takes effect after the change. In automatic mode, the manipulated variable is ignored as long as the "Open" or "Close" command is pending.

Manipulated variable specification using a faceplate or interconnection

You can use the `MV_LiOp` parameter to determine if the manipulated variable should be set by a CFC/SFC program or via the faceplate.

- Set `MV_LiOp` to 0 for manipulated variable specification to be performed with the faceplate.
- Set `MV_LiOp` to 1 for manipulated variable specification to be performed by a CFC/SFC program.

Manipulated variable specification internal and external

You need to set the corresponding parameters depending on the selected method for manipulated variable specification.

If the manipulated variable is to specified via the faceplate `MV_LiOp = 0`, you have to set the parameter:

- `MV_IntOp = 1` in order to achieve internal manipulated variable specification via the faceplate.
- `MV_ExtOp = 1` in order to achieve external manipulated variable specification via the faceplate.

If both signals are set, the most recently active state is retained.

If the manipulated variable is set by a CFC/SFC program (`MV_LiOp = 1`), you have to set the parameter:

- `MV_IntLi = 1` to have an internal setpoint set by a CFC/SFC program.
- `MV_ExtLi = 1` in order to achieve an external manipulated variable specification by a CFC/SFC program.

If both signals are set, `MV_IntLi = 1` has priority.

Note

It is only possible to switch between internal and external when operating with a auxiliary valve.

Bumpless switchover of the manipulated variable from external to internal

The parameter `SP_TrkExt = 1` is used so that the internal setpoint tracks the external setpoint to achieve a Bumpless switchover from the external to the internal setpoint. This allows unwanted jumps at the output parameter to be avoided.

Forming the manipulated variable externally

With external manipulated variable specification, the manipulated variable is restricted to the `MV_HiLim` and `MV_LoLim` limits and sent to the `MV_ExtOut` output.

1.1.10 Configurable response using the Feature I/O

1.1.10.1 Stopping dosing at a flow alarm

Feature bit

Number of the `Feature` bit: 11

Stopping dosing at a flow alarm

You can use this feature bit to enable stopping dosing at a flow alarm.

The default setting is 0.

Bit = 0: Disabled, dosing is not stopped when a flow alarm occurs

Bit = 1: Enabled, dosing is stopped when a flow alarm occurs

1.1.10.2 Setting the startup characteristics

Feature bit

Number of the `Feature` bit: 0

Setting the startup characteristics

With this `Feature` bit, you set the startup characteristics of the function blocks, for example, for:

- Motors, valves and controllers
- Channel blocks
- Monitoring blocks, e.g. `MonAnL` and `MonDiL`.
- Mathematical, analog logic blocks and the OpAnL block
- The OpAnL block
- Counter blocks
- The Average block

The default setting is 0.

Note

This `Feature` bit has no function in the "Out of service" operating mode. The process tag remains in the "Out of service" operating mode after a warm restart of the CPU.

Note

With a Run-Stop-Run transition of the CPU and internally pending messages, non-stuck-through messages with time stamps and auxiliary values beginning with `RunUpCycle` occur for blocks with the startup characteristic `Feature` bit `= 0` after expiration of the `RunUpCycle` counter in the following cases:

- Alarm, warning or tolerance messages from the operating points (motor, valve, dosing, controller and analog monitoring blocks)
- Feedback errors (motor and valve blocks)
- Output signals of digital process tags (MonDiL, MonDi08)
- Flutter limits violated (MonDiL)

The restart routines of the blocks reset the following outputs in OB100:

- Operating point outputs `xx_AH_Act`, `xx_AL_Act`, `xx_WH_Act`, `xx_WL_Act`, `xx_TH_Act`, `xx_TL_Act` or `GradHUpAct`, `GradHDnAct`, `GradLAct`
- Feedback error outputs `MonDynErr` and `MonStaErr`
- Output binary signals `Out`, `Out1..8` for MonDiL or MonDi08
- Flutter suppression `FlutAct` for MonDiL

This causes an outgoing message when initializing Alarm8_P in OB100 and an incoming message after expiration of the `RunUpCycle` counter on the cyclic interrupt level.

Note

With a complete download with AS stop, the blocks (with `Feature.Bit0 = 1`) cannot resume in their previous mode when restarted.

Setting the startup characteristics for motors, valves and controllers

Bit = 0: Starting the block in manual mode and in neutral position. With controllers, the setpoint is set to (`SP_Int`) internally. Refer also to the Neutral position for motors, valves and controllers (Page 37) section for more on this.

`Feature` bit 16, Neutral position manipulated variable takes effect at startup (Page 139), specifies travel to the neutral position

Bit = 1: Starting the block with the last stored values, in other words in the last operating mode set (manual, automatic or local mode) and at the last valid position.

Note

Special note following complete download to the CPU

Following a complete download to the CPU, the motor protection signal `Trip` is evaluated during the initial run as good (=1).

When a motor protection signal is pending, this causes a non-struck-through message with time stamp and auxiliary values beginning with `RunUpCycle` after the complete download and after expiration of the `RunUpCycle` counter.

Startup characteristics for the ShrdResS block

Bit = 0: The output command interface is reset to 0.

Bit = 1: The block leaves the output command interface unchanged.

Defining the startup characteristics for channel blocks

Bit = 0: The channel block uses either the process value `PV_In` or the value of `SimPV_In` as the startup value, depending on the setting of the input parameter `SimOn` (`PV_In = PV_Out` or `SimPV_In = PV_Out`).

Bit = 1: The channel block uses the value `StartVal` as the startup value (`StartVal = PV_Out`).

Defining the startup characteristics for monitoring blocks

Bit = 0: The most recently stored values are reset on startup.

Bit = 1: The most recently used value at the output parameter `Out` is output on startup.

Defining the startup characteristics for mathematical, analog logic blocks

Bit = 0: The `Out` output parameter is reset to 0 on startup.

Bit = 1: The most recently saved value is output at the `Out` output parameter on startup.

Defining startup characteristics for the OpAnL block

Bit = 0: The internal setpoint is used for startup.

Bit = 1: The most recently saved value is output at the `Out` output parameter on startup.

Defining the startup characteristics for counter blocks

Bit = 0: On startup, the counter is stopped and reset to the value specified in the input parameter.

Bit = 1: On startup, counting continues with the most recently stored value.

Input parameters for the startup characteristics of the counter blocks:

- Block CountOh: Input parameter `PresetTime`
- Block CountScL: Input parameter `PresetVal`
- Block TotalL: Input parameter `PresetVal`

Messages can be suppressed for a short time after startup. You can set the number of cycles using the input parameter `RunUpCyc`.

Note

Advanced configuration of the startup characteristics for the counter blocks

Note that you can further affect the startup characteristics via the `Feature Bit 5` as a function of this `Feature Bits 0`. Refer to the section: Use the last value following a complete download as the current value during startup of the block (Page 127).

Defining startup characteristics for the Average block

Bit = 0: At startup, averaging begins with the value that is currently at the input parameter `(Out = In, NumCycles = 1)`.

Bit = 1: When starting-up, the last `Out` and `NumCycles` values saved are used as the last value for averaging `(Out ≠ In)`.

1.1.10.3 Evaluation of signal status

Feature bit

Number of the `Feature` bit: 23

Evaluation of signal status

You can use the `Feature` bit to specify if the signal status of the inputs is to be checked for the values `16#00` or `16#28`. The signal status of the inputs itself remains unchanged here.

The default setting is 0.

Bit = 0: No evaluation of the signal status. The status display within the interlock block is always shown as "0".

Bit = 1: the signal status is determined, an input with `ST = 16#00` or `16#28` is forwarded with value = 0. The "Negate signal" function at the input of the block has no influence on the reaction in this case.

1.1.10.4 Automatic post dosing for underdosing in automatic mode

Feature bit

Number of the `Feature` bit: 12

Automatic post dosing for underdosing in automatic mode

Use this `Feature` bit to enable automatic post dosing for underdosing in automatic mode.

The default setting is 0.

Bit = 0: Disabled, no automatic post dosing is started for underdosing in automatic mode.

Bit = 1: Enabled, automatic post dosing is started for underdosing in automatic mode.

1.1.10.5 Block as summing unit or integrator

Feature bit

Number of the `Feature` bit: 6

Specifying the summing unit or integrator function mode

You can define the summing response of the block via this `Feature` bit.

The default setting is 0.

Bit = 0: The block operates as a summing unit.

Bit = 1: The block operates as an integrator.

Note

Special note for the summing unit

Note that the characteristics of the block as a summing unit `(Feature Bit 6 = 0)` can be further affected via the `Feature Bit 7 .`

Refer to the section: Summing response continuous or triggered (Page 146).

1.1.10.6 Switching operator controls for external setpoint to visible

Feature bit

Number of the `Feature` bit: 21

Switching operator controls for external setpoint to visible

Use this `Feature` bit to switch all operator controls for the external setpoint to visible in the faceplates for the OS operator. This is always required when the external setpoint should actually be used, for example, for slave controllers in cascade and ration controlling.

The default setting is 0, which keeps the faceplate as clear as possible for simple applications.

Bit = 0: The operator controls for the external setpoint are **not visible** in the faceplate.

Bit = 1: The operator controls for the external setpoint are **visible** in the faceplate.

1.1.10.7 Activating calculation of the flow rate for dosing by scale

Feature bit

Number of the `Feature` bit: 7

Calculation of the flow rate for dosing by scale

Use this `Feature` bit to activate calculation of the flow rate for dosing by scale.

The default setting is 0.

Bit = 0: Deactivated

Bit = 1: Calculation activated.

The flow is determined by the change to the dosing quantity per second.

1.1.10.8 Disabling operating points

Feature bit

Number of the `Feature` bit: 28

Disabling operating points

You can use this `Feature` bit to determine if the operating point function of a limit for disabling the message (`MsgLock = 1`) should also be disabled.

The default setting is 0.

Bit = 0: Operating point is not suppressed

Bit = 1: Operating point is suppressed

1.1.10.9 Enabling direct changeover between forward and reverse

Feature bit

Number of the `Feature` bit: 7

Direct changeover between forward and reverse

With this `Feature` bit, you can enable direct reversal of the direction of motors.

The default setting is 0.

Bit = 0: Direct reversal of the direction is disabled.

You can only change the direction of the motor by first stopping and starting the motor again in the required direction. The motor can only be started again after the time set in the `IdleTime` parameter has elapsed.

Bit = 1: Direct changeover is enabled.

You can reverse the motor direction directly. The motor block reverses the direction automatically. The motor is stopped and is started in the other direction when the time set in the `IdleTime` parameter has elapsed.

1.1.10.10 Specifying the dosing type

Feature bit

Number of the `Feature` bit: 5

Specifying the dosing type

You can specify the dosing type to be used for the block using this `Feature` bit.

The default setting is 0.

Bit = 0: Flow

Bit = 1: Scales

1.1.10.11 Flow setpoints in percent

`Feature` bit

Number of the `Feature` bit: 15

Flow setpoints in percent

You can use this `Feature` bit to specify if the doser block should display the flow setpoints in the faceplate as percentages.

The default setting is 0.

Bit = 0: Deactivated. The display of the flow setpoints is made in the unit specified with the `PV_Unit` parameter.

Bit = 1: Activated: The display of the flow setpoints is made in the unit %.

1.1.10.12 Specifying the influence of the signal status on the dosing process

`Feature` bit

Number of the `Feature` bit: 23

Specifying the influence of the signal status on the dosing process

You can use this `Feature` bit to specify how the doser should react dependent on the signal status.

The default setting is 0.

Bit = 0: Dosing process does not stop with bad signal status of the process value `PV`.

Bit = 1: Dosing process stops with bad signal status of the process values `PV`. The doser is also set to the "Off" state (see state diagram: DoseL functions (Page 783)).

See also the following section:

- Forming and outputting signal status for blocks (Page 92)

1.1.10.13 Unit for the rate of change

Feature bit

Number of the `Feature` bit: 8

Specifying the unit for the rate of change

You can use this `Feature` bit to specify the unit for the rate of change:

The default setting is 0.

Bit = 0: unit for the rate of change in the unit of measurement to or from the field device

Bit = 1: unit for the rate of change as a percentage to or from the field device

1.1.10.14 Reading messages

Feature bit

Number of the `Feature` bit: 28

Use of the input data

You can use this `Feature` bit to specify the format for reading messages.

Default setting is 0

Bit = 0: Messages are read as PV freely configurable

Bit = 1: Messages are read as MsgNamur

Note

This feature bit is only used when "Message frame type 20" and the "PZD 6" parameter are active.

1.1.10.15 Outputting a de-energized value for block-external simulation

`Feature` bit

Number of the Feature bit: 30

Outputting a de-energized value for block-external simulation

Use this `Feature` bit for channel blocks to specify whether the de-energized value is to be output if the block is in block-external simulation (Simulating signals (Page 47)).

The default setting is 1.

Bit = 0: If the input parameter has the simulation value `16#60`, the 16#0000 is output at the PZDOut1 output parameter.

Bit = 1: If input parameter has the simulation value `16#60`, this value written to the field device.

1.1.10.16 Output substitute value if raw value is invalid

Feature bit

Number of the `Feature` bit: 29

Output substitute value if raw value is invalid

Use this `Feature` bit to activate output of the substitute value (input parameter `SubsPV_In`) for channel blocks if there is no valid raw value.

The default setting is 0.

Bit = 0: The substitute value is not output.

Bit = 1: The substitute value is output. The signal status of the output value is set to "Local functional check / simulation".

If there is no valid raw value, the output parameter `Bad = 1` is set automatically.

Prioritizing the Feature bits for channel blocks:

You need to assign parameters for three Feature bits for the response to an invalid raw value for the channel blocks.

If more than one of these Feature bits are set (=1), the following priority applies:

- Output invalid raw value (Page 146) (Feature bit 28 = highest priority)
- Output substitute value if raw value is invalid (Feature bit 29)
- Issuing last valid value if raw value is invalid (Page 127) (Feature bit 30 = lowest priority)

The raw value is output of none of the Feature bits 28, 29 or 30 is set.

1.1.10.17 Activating recording of the first signal

Feature Bit

Number of the Feature bit: 31

Activating recording of the first signal

Use this Feature bit to activate recording of the first signal with interlock blocks. Please also refer to the section Recording the first signal for interlock blocks (Page 42).

Default setting is 0

Bit = 0: Recording of the first signal is deactivated.

Bit = 1: Recording of the first signal is activated.

1.1.10.18 External control deviation

Feature bit

Number of the Feature bit: 14

External control deviation

You can use this Feature bit to specify whether the external control deviation is to be activated.

The default setting is 0.

Bit = 0: The external control deviation is deactivated, the internal control deviation is active.

Bit = 1: The external control deviation is activated.

1.1.10.19 Use an internal or external setpoint for the absolute fine dosing quantity

Feature Bit

Number of the `Feature` bit: 8

Use an internal and external setpoint for the absolute fine dosing quantity

Use this `Feature` bit to determine whether the doser processes the internal and external setpoint for the fine dosing quantity in an absolute manner and is displayed or operated in an absolute manner in the faceplate.

The default setting is 0.

Bit = 0: Deactivated. The internal and external I/Os as well as the display and operation of the fine dosing quantity setpoint are processed in the % unit.

Bit = 1: Activated: The internal and external I/Os as well as the display and operation of the fine dosing quantity setpoint are processed in the unit that was set using the parameter `DQ_Unit`.

1.1.10.20 Activating the run time of feedback signals

Feature Bit

Number of the `Feature` bit: 11

Activating the run time of feedback signals

Use this `Feature` bit to activate the run time of feedback signals.

The default setting is 0.

Bit = 0: Deactivated: Tracking of feedback for simulation immediately after the trigger signal.

Bit = 1: Activated: Tracking of feedback for simulation after the trigger signal and expiration of the monitoring time (`MonTiDynamic`). The feedback signals are generated after expiration of the monitoring time.

1.1.10.21 Issuing last valid value if raw value is invalid

Feature Bit

Number of the `Feature` bit: 30

Issuing last valid value if raw value is invalid

Use this `Feature` bit to activate output of the last valid value for channel blocks if there is no valid raw value.

The default setting is 0.

Bit = 0: If there is no valid raw value the last valid value is not output.

Bit = 1: If there is no valid raw value the last valid value is output. The signal status of the output value is set to Local "functional check / simulation".

If there is no valid raw value the output parameter `Bad = 1` is set automatically.

Prioritizing the `Feature` bits for channel blocks:

You need to assign parameters for three `Feature` bits for the response to an invalid raw value for the channel blocks.

If more than one of these `Feature` bits are set (=1), the following priority applies:

- Output invalid raw value (Page 146) (`Feature` bit 28 = highest priority)
- Output substitute value if raw value is invalid (Page 124)(`Feature` bit 29)
- Output the last valid value if raw value is invalid (`Feature` bit 30, lowest priority)

The raw value is output of none of the `Feature` bits 28, 29 or 30 is set.

1.1.10.22 Use the last value following a complete download as the current value during startup of the block

Feature bit

Number of the `Feature` bit: 5

Use the last value during startup of the block after a complete download of the CPU

You can use this `Feature Bit` to define the startup characteristics of the block as a function of the `Feature Bits 0`.

This feature bit is used on the following parameters:

- Block TotalL: `OldOut`, `OldCntOut`
- Block CountScL: `OldOut`
- Block CountOh: `OldDays`, `OldHours`, `OldMinutes`, `OldSeconds`

For the settings on `Feature Bit 0`, refer to the settings: Setting the startup characteristics (Page 116).

Note

If you want to use this function, you must read back the marked parameters in addition to the operated and monitored parameters before a complete download.

The default setting is 0.

Bit = 0: Define the startup characteristics as a function of `Feature Bit 0`:

- `Feature Bit0 = 0`: the block is set to the default value (input parameter `Preset`) during startup.
- `Feature Bit0 = 1`: on startup, counting continues with the most recently stored value.

Bit = 1: During startup of the block after a complete download, the last value `(Oldxxx)` is used as the current value regardless of `Feature` bit 0 (Setting the startup characteristics (Page 116)).

1.1.10.23 Selecting values associated with messages

Feature Bit

Number of the `Feature` bit: 27

Selecting values associated with messages

Use this `Feature` bit to select which values associated with messages are to be output.

The default setting is 0.

Bit = 0: The signal status of the binary input is output as the value associated with messages.

Bit = 1: The associated analog value is output as the value associated with messages.

1.1.10.24 Reporting with BATCH parameters

Feature bit

Number of the `Feature` bit: 8

Reporting with BATCH parameters

You can use this `Feature` bit to specify whether the block transfers the BATCH parameters

- `BatchID`: Batch ID
- `BatchName`: Batch name
- `StepNo`: Batch step number

Are transferred as associated values to the OS during messaging.

The default setting is 0.

Bit = 0: The block does not transfer any BATCH parameters to the OS.

Bit = 1: The block transfers BATCH parameters to the OS.

Note

Information about the setting "Bit = 1:

The Event block can no longer transfer the `In8.ST` or `AV8.Value` as an associated value.

The EventTS block can no longer transfer the signal status of the signal `In7` and `In8` or `InTS7` and `InTS8` as an associated value.

You will find more information in the following chapters:

- Event messaging (Page 1265)
- EventTs messaging (Page 1292)

1.1.10.25 Display only input values that are interconnected in the faceplate

`Feature` bit

Number of the `Feature` bit: 5

Display only input values that are interconnected in the faceplate

You can use this feature bit to specify whether only interconnected input values `In01..In16` (status not equal to 16#FF) should be displayed in the faceplate.

The default setting is 0.

Bit = 0: Display all input values

Bit = 1: Display only interconnected input values (status not equal to 16#FF)

1.1.10.26 Disabling opening and closing

Feature Bit

Number of the Feature bit: 6

Disabling the Open and Close commands

Only applicable when no auxiliary valve is used (bit 5 = 0)

Bit = 0: Open and Close commands affect control valve

Bit = 1: Disable the Open and Close commands

1.1.10.27 Activating local operating permission

Feature bit

Number of the `Feature` bit: 24

Activating local operating permission

You can use this `Feature` bit to activate local permission for a technologic block.

The default setting is 0.

Bit = 0: Deactivated

Bit = 1: Selected

For information on this operator control permission, refer to the section Operator control permissions (Page 205).

1.1.10.28 Configurable functions with the Feature I/O

Configurable functions using the `Feature` I/O

Some blocks have an input called `Feature`. This input can be used to influence the way in which the block works.

The `Feature` bits are assigned in the following order:

Bit number	Meaning	Block
0	Setting the startup characteristics (Page 116)	AV, Average, CountOh, CountScL, DeadTime, Derivative, DoseL, FmCont, FmTemp, Integral, Lag, MeanTime, ModPreCon, MonAnL, MonAnS, MonDi08, MonDiL, MonDiS, MotL, MotS, MotRevL, MotSpdCL, MotSpdL, OpAnL, Pcs7AnOu, Pcs7DiOu, PIDConL, PIDConR, PIDStepL, RateLim, Ratio, ShrdResS, TotalL, VIv2WayL, VIvAnL, VIvMotL, VIvL, VIvS
1	Reaction to the out of service mode (Page 148)	ConPerMon, CountOh, CountScL, DoseL, Event, EventNck, EventTs, FmCont, ModPreCont, MonAnL, MonAnS, MonDi08, MonDiL, MonDiS, MotL, MotS, MotRevL, MotRevSpdL, OpAnL, OpDi01, OpDi03, OpTrig, PIDConL, PIDConR, PIDStepL, Ratio, SaleA16In, TotalL, VIv2Way, VIvAnL, VIvL, VIvS, VIvMotL
2	Resetting the commands for changing the mode (Page 135)	DoseL, FmCont, FmTemp, ModPreCon, MotL, MotS, MotRevL, MotSpdCL, MotSpdL, PIDConL, PIDConR, PIDStepL, VIv2WayL, VIvAnL, VIvL, VIvS, VIvMotL
3	Enabling resetting of commands for the control settings (Page 136)	DoseL, MotL, MotS, MotRevl, MptSpdCL, MotSpdL, VIv2WayL, VIvAnL, VIvL, VIvMotL
4	Setting switch or button mode (Page 140)	DoseL, FMCont, FMTemp, ModPreCon, MotL, MotRevL, MotSpdCL, MotSpdL, PIDConL, PIDStepL, VIv2WayL, VIvAnL, VIvL, VIvMotL
5	Specifying the dosing type (Page 122)	DoseL
	Control via auxiliary valve (Page 143)	VIvAnL
	Alarm setpoint difference (Page 143)	MotSpdCL
	Specifying switching mode (Page 141)	MotSpdL

Bit number	Meaning	Block
	Use the last value following a complete download as the current value during startup of the block (Page 127)	TotalL
	Display only input values that are interconnected in the faceplate (Page 129)	SelA16In
6	Resetting the dosing quantity when dosing starts (Page 136)	DoseL
	Block as summing unit or integrator (Page 120)	TotalL
	Disabling opening and closing (Page 130)	VlvAnL
7	Enabling direct changeover between forward and reverse (Page 121)	MotRevL, MotSpdCL
	Summing response continuous or triggered (Page 146)	TotalL
	Activating calculation of the flow rate for dosing by scale (Page 121)	DoseL
8	Unit for the rate of change (Page 123)	RateLim
	Use an internal or external setpoint for the absolute fine dosing quantity (Page 126)	DoseL
	Reporting with BATCH parameters (Page 129)	Event, EventTS
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)	DoseL, MotL, MotS, MotRevL, MotSpdCL, MotSpdL, Vlv2WayL, VlvAnL, VlvL, VlvS, VlvMotL
10	Exiting local mode (Page 149)	DoseL, MotL, MotS, MotRevL, MotSpdCL, MotSpdL, Vlv2WayL, VlvAnL, VlvL, VlvS, VlvMotL
11	Stopping dosing at a flow alarm (Page 115)	DoseL
	Activating the run time of feedback signals (Page 126)	MotL, MotS, MotRevL, MotSpdL, MotSpdCL, VlvL, Vlv2WayL, VlvMotL, VlvAnL
12	Automatic post dosing for underdosing in automatic mode (Page 119)	DoseL
13	Creep rate is always detected in the dosing quantity (Page 141)	DoseL
14	Enabling rapid stop via faceplate (Page 142)	MotL, MotRevL, MotSpdCL, MotSpdL, VlvMotL
	External control deviation (Page 125)	PIDConL
15	Neutral position manipulated variable takes effect with "out of service" operating mode (Page 139)	ModPreCon, PIDConL, PIDConR, PIDStepL, VlvAnL
	Flow setpoints in percent (Page 122)	DoseL
16	Neutral position manipulated variable takes effect at startup (Page 139)	ModPreCon, PIDConL, PIDConR, PIDStepL, VlvAnL
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)	DoseL, MotL, MotRevL, MotSpdCL, MotSpdL, Vlv2WayL, VlvAnL, VlvL, VlvMotL
18	Disabling bumpless switchover to automatic mode for controllers (Page 145)	PIDConL, PIDConR, PIDStepL
19	Enabling program mode (Page 134)	PIDConR
	Reset even with locked state (Page 138)	MotL, MotS, MotRevL, MotSpdCL, MotSpdL, VlvMotL
20	Enabling bumpless change to the proportional gain, derivative time and amplification of the differentiator (Page 144)	PIDConR
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)	MotL, MotRevL, MotSpdCL, MotSpdL, VlvMotL, VlvL, Vlv2WayV, VlvAnl, DoseL

Bit number	Meaning	Block
	Switching operator controls for external setpoint to visible (Page 120)	PIDConR
22	Update acknowledgment and error status of the message call (Page 135)	AssetM, AV, ConPerMon, CountOh, CoutnScL, DoseL, Event, EventTs, FmCont, FmTemp, MonAnL, MonDi08, MonDiL, MotL, MotRevL, MotSpdCL, MotSpdL, OpAnL, PIDConL, PIDConR, PIDStepL, TotalL, Vlv2WayL, VlvAnL, VlvL, VlvMotL
23	Evaluation of signal status (Page 119)	Intlk02, Intlk04, Intlk08, Intlk16
	Specifying the influence of the signal status on the dosing process (Page 123)	DoseL
24	Activating local operating permission (Page 130)	ConPerMon, CountOh, CountScL, DoseL, FmCont, FmTemp, GainSched, Intlk02, Intlk04, Intlk08, Intlk16, ModPreCon, MonAnL, MonAnS, MonDi08, MonDiL, MonDiS, MotL, MotS, MotRevL, MotSpdCL, MotSpdL, OpAnL, OpDi01, OpDi03, OpTrig, PIDConL, PIDConR, PIDStepL, Ratio, SelA16In, TotalL, Vlv2WayL, VlvAnL, VlvL, VlvS, VlvMotL
25	Suppression of all messages (Page 146)	ConPerMon, DoseL, FmCont, FmTemp, MonAnL, MonAnS, MonDiL, MonDiS, MotL, MotS, MotRevL, MotSpdCL, MotSpdL, PIDConL, PIDConR, PIDStepL, Vlv2WayL, VlvAnL, VlvL, VlvS, VlvMotL
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)	ConPerMon, FmCont, FmTemp, PIDConL, PIDConR, PIDStepL, AV, MotL, MotRevL, MotSpdL, VlvMotL, MotSpdCL, VlvAnL, DoseL, CountOh, CountScL, TotalL, MonAnL, MonAnS, CntOhSc, PIDConS
27	Selecting values associated with messages (Page 128)	Event, EventNck, EventTs
	Interlock display with LocalSetting 2 or 4 (Page 149)	MotL, MotS, MotRevL, MotSpdCL, MotSpdL, Vlv2WayL, VlvAnL, VlvL, VlvS, VlvMotL
28	Output invalid raw value (Page 146)	Pcs7AnIn, Pcs7DiIn, Pcs7DiIT
	Disabling operating points (Page 121)	AssetM, AV, ConPerMon, CountOh, CountScL, DoseL, FmCont, MonAnL, PIDConL, PIDStepL, VlvAnL, FmTemp, PIDConR, MotL, MotRevL, MotSpdCL, MotSpdL, TotalL, VlvMotL
	Reading messages (Page 123)	FbDrive

Bit number	Meaning	Block
29	Output substitute value if raw value is invalid (Page 124)	FbAnIn, FbDiIn, Pcs7AnIn, Pcs7DiIn, Pcs7DiIT
	Signaling limit violation (Page 142)	AV, ConPerMon, CountOh, CountScL, DoseL, FmCont, FmTemp, MonAnL, MotL, MotRevL, MotSpdCL, MotSpdL, PIDConL, PIDConR, PIDStepL, TotalL, VlvAnL, VlvMotL
	Transmission of messages (Page 147)	FbDrive, FbSwtMMS
30	Issuing last valid value if raw value is invalid (Page 127)	FbAnIn, FbDiIn, Pcs7AnIn, Pcs7DiIn, Pcs7DiIT
	Outputting a de-energized value for block-external simulation (Page 124)	FbAnOu, FbDiOu, Pcs7AnOu, Pcs7DiOu, FbDrive, FbSwtMMS
	Resetting depending on the operating mode (Page 137)	DoseL, MotL, MotS, MotRevL, MotSpdL, MotspdCL, VlvL, VlvS, VlvMotL, VlvAnL, Vlv2WayL
31	Activating recording of the first signal (Page 125)	Intlk02, Intlk04, Intlk08, Intlk16
	Activating reset of interlocks in manual mode (Page 138)	DoseL, MotL, MotS, MotRevL, MotSpdL, MotspdCL, VlvL, VlvS, VlvMotL, VlvAnL, Vlv2WayL

1.1.10.29 Enabling program mode

Feature bit

Number of the `Feature` bit: 19

Enabling program mode

You can use this feature bit to specify whether or not the controller block should be used for program mode.

Default setting is 0.

Bit = 0: The block is not intended for program mode.

Bit = 1: The block can be used for program mode. The operator control elements required for this are then visible in the faceplate.

What is the program mode?

Program mode provides primary controller functions (external Advanced Control software package), which run on an external PC as an OPC client, the option of using the control from the controller function block and specifying the setpoint or manipulated variable from a remote location.

1.1.10.30 Update acknowledgment and error status of the message call

Feature Bit

Number of the `Feature` bit: 22

Update acknowledgment and error status of the message call

You can use the `Feature` bit to determine if the acknowledgment and error status of the message call at the block output should be updated.

The default setting is 0.

- **Bit = 0**:The `MsgErr`, `MsgStat` and `MsgAckn` block outputs are set to the default setting and not updated. The block will run faster with this setting.
- **Bit = 1**: The `MsgErr`, `MsgStat`and `MsgAckn` block outputs re updated based on the feedback of the lower level message blocks. The lower level message blocks are called every other cycle as long as an acknowledgment is expected or error information is pending.

1.1.10.31 Resetting the commands for changing the mode

Feature Bit

Number of the `Feature` bit: 2

Resetting the commands for changing the mode

Using this `Feature` bit, you define how the block handles the incoming control commands `SP_IntLi`, `SP_ExtLi` (for controllers) as well as `AutModLi` and `ManModLi` .

The default setting is 0.

Bit = 0: The control commands are not reset by the block. If there are two pending control commands for changing mode, the mode is not changed. In this case, the note text "Invalid command" is displayed in the faceplate.

Bit = 1: The control commands are reset by the block. This, for example, ensures that if a control command is sent from the SFC, the command is reset automatically after a step is exited.

1.1.10.32 Enabling resetting of commands for the control settings

Feature bit

Number of the `Feature` bit: 3

Enabling resetting of commands for the control settings

With this `Feature` bit, you select how the block handles commands for the control settings (for example motor on) via the interconnected input parameters.

The default setting is 0.

Bit = 0: The control commands are not reset by the block. If there are two commands relating to the control settings at the same time, the status of the control settings is retained. In this case, the "Invalid signal" message is displayed in the standard view of the faceplate.

Bit = 1: The control commands are reset by the block. This, for example, ensures that if a control command is sent from the SFC, the command is reset automatically after a step is exited.

1.1.10.33 Resetting the dosing quantity when dosing starts

Feature bit

Number of the `Feature` bit: 6

Resetting the dosing quantity when dosing starts

Use this feature bit to enable resetting the dosing quantity when dosing starts.

The default setting is 0.

Bit = 0: Disabled, the dosing quantity is not reset when dosing starts

Bit = 1: Enabled, the dosing quantity is reset when dosing starts.

1.1.10.34 Resetting via input signals in the event of interlocking (Protection) or errors

Feature Bit

Number of the `Feature` bit: 9

Resetting the block in the event of interlocking (only Protection: Input parameter `Protect`) or errors via input signals

With this `Feature` bit, you define how automatic control is to be re-enabled after an active interlock.

The default setting is 0.

Bit = 0: After an interlock (only Protection: Input parameter `Protect`) or errors, the system can only be restarted using a reset command. Reset is initiated either by operator input in the faceplate or via the interconnectable input parameter (`RstLi = 1`) in the block. Thereafter, the currently pending command takes effect in automatic mode.

Bit = 1: It is also possible to reset with a 0-1 edge change in the control signal in automatic mode.

1.1.10.35 Resetting depending on the operating mode

`Feature` bit

Number of the `Feature` bit: 30

Resetting depending on the operating mode

When the "Protection" interlock, feedback error ("Runtime error", "Control deviation") or "Motor protection" signal is present again, use this `Feature` bit to specify if a reset can be made depending on the mode only by the operator in manual mode or only by the automatic I/Os in automatic mode.

Reset in manual mode is enabled with `Feature` bit 31 (Activating reset of interlocks in manual mode (Page 138)). Also refer to the Resetting the block in case of interlocks or errors (Page 33) section.

The default setting is 0.

Bit = 0: Reset depends on the operating mode

Bit = 1: In manual mode, manual reset by the operator is only possible if `Feature` bit 31 is set, otherwise no reset is required in manual mode.

In automatic mode, reset can only be made with automatic I/Os, regardless of `Feature` bit 31. This is performed either with a 0-1 edge transition at the `RstLi` input or, when `Feature` bit 9 is set, with a 0-1 edge transition at the automatic inputs, for example `OpenAut`, `CloseAut`.

Note

Rapid stop is unlocked for all operating modes using the "Reset" button in the faceplate (`RstOp = 1`); in CFC it is unlocked using the `RstLi = 1` input parameter.

Note

The local operating mode does not depend on this `Feature` bit and has a separate reset mechanism.

1.1.10.36 Activating reset of interlocks in manual mode

`Feature` bit

Number of the `Feature` bit: 31

Activating reset of interlocks in manual mode

Use this `Feature` bit to specify whether a reset is necessary once the "Protection" interlock signal, feedback errors ("Runtime error", "Control deviation"), or "Motor protection" are present again. See also the following section: Resetting the block in case of interlocks or errors (Page 33).

The default setting is 0.

Bit = 0: No reset required in manual mode.

Bit = 1: Reset required in manual mode. The reset is performed using the "Reset" button (`RstOp = 1`) or, in CFC, using the input parameter `RstLi`.

Note

Rapid stop is unlocked for all operating modes using the "Reset" button in the faceplate (`RstOp = 1`); in CFC it is unlocked using the `RstLi = 1` input parameter.

Note

The local operating mode has a separate reset mechanism.

1.1.10.37 Reset even with locked state

Feature Bit

Number of the `Feature` bit: 19

Reset even with locked state

With this `Feature` bit, you specify if it is possible to perform a reset with an active "Protection" or "Motor protection" type interlock. This can be used, for example, to reset hardware interlocks.

The default setting is 0.

Bit = 0: No reset is possible with a "Protection" type interlock or with active motor protection.

Bit = 1: Reset is possible with a "Protection" type interlock or with active motor protection.

1.1.10.38 Neutral position manipulated variable takes effect at startup

Feature Bit

Number of the `Feature` bit: 16

Neutral position manipulated variable takes effect at startup

You can use this `Feature` bit to specify if the block should go to the neutral position at startup.

Default setting is 0

Bit = 0: The block does not go to the neutral position at startup

With control valve VlvAnL, the main valve is closed and the auxiliary valve (if configured) opened.

Bit = 1: The block goes to the neutral position at startup

With control valve VlvAnL, the main valve and auxiliary valve (if configured) go to the neutral position.

You can find more information in Section Neutral position for motors, valves and controllers (Page 37).

Note:

`Feature` bit 16 is only effective when `Feature` bit 0 = 0.

1.1.10.39 Neutral position manipulated variable takes effect with "out of service" operating mode

Feature Bit

Number of the `Feature` bit: 15

Neutral position manipulated variable takes effect with "out of service" operating mode

You can use this `Feature` bit to specify if the block should go to the neutral position when it transitions to the "Out of service" operating mode.

Default position is "0".

Bit = 0: The block does not go to the neutral position at the transition to the "out of service" operating mode.

Bit = 1: The block goes to the neutral position at the transition to the "out of service" operating mode.

Refer to the Neutral position for motors, valves and controllers (Page 37) section for more information.

1.1.10.40 Setting switch or button mode

Feature bit

Number of the `Feature` bit: 4

Setting switch or button mode (input signal as pulse signal or as static signal)

You can use this `Feature` bit to determine whether a separate interconnectable 1-active control input has to be used for every automatic command of the block or a control input is assigned to two automatic commands.

The `Feature` bit affects the following control inputs:

- starting and stopping a motor
- Opening and closing a valve
- switching modes (parameters `AutModLi` and `ManModLi`)
- Setpoint input internal and external (parameters`SP_ExtLi` and `SP_IntLi`)

is given in the form of a pulse (pushbutton operation) or a static signal (switching mode).

You can find the commands for controlling the block in the relevant section on block operating modes. They are always the parameters that are used for the automatic operation of a block.

Bit = 0: Button mode: Each automatic command is assigned to a control input. This has a latching reaction and is 1-active.

Example with a motorMotRevL: In this case, use the interconnectable input parameters.

- `FwdAut =1` for the command "Start forward"
- `RevAut = 1` for the command "Start backwards"
- `StopAut = 1` for the stop command and
- `AutModLi = 1` for setting "Automatic" operating mode
- `ManModLi = 1` for setting "Manual" operating mode

Bit = 1: Switching mode: two static automatic commands are assigned to a control input.

Example with a motorMotRevL: In this case, use the interconnectable input parameters.

- `FwdAut =1` for the command "Start forward"
- `RevAut = 1` for the command "Start backwards" and
- `FwdAut= 0` and `RevAut = 0` for the stop command
- `AutModLi = 1` for setting "Automatic" operating mode
- `AutModLi = 0` for setting "Manual" operating mode

The `StopAut` and `ManModLi` control inputs are irrelevant in this case.

1.1.10.41 Specifying switching mode

Feature Bit

Number of the `Feature` bit: 5

Specifying switching mode

Use this `Feature` bit to specify switching mode for the motor block.

The default setting is 0.

Bit = 0: Switching mode "On over speed 1" with the `SwOverTi > 0` parameter

Bit = 1: Switching mode "Off over speed 1" with the `SwOverTi > 0` parameter

Note

This `Feature` bit is only used with the `SwOverTi > 0` parameter. Refer also to the Functions of MotSpdL (Page 976) section for more on this.

1.1.10.42 Creep rate is always detected in the dosing quantity

Feature Bit

Number of the `Feature` bit: 13

Enable: Creep rate is always detected in the dosing quantity

Use the `Feature` bit to specify the response for detecting the creep rate in the dosing quantity.

The default setting is 0.

Bit = 0: Disabled, the creep rate is only detected in the dosing quantity over the limit `CR_AH_Lim` (high alarm for creep rate). With `CR_AH_En = 0`, the creep rate has no effect on the dosing quantity calculation.

Bit = 1: Enabled, the creep rate is always detected in the dosing quantity.

Note

Creep rate is the flow in the states "End", "Off", and "Pause".

1.1.10.43 Enabling rapid stop via faceplate

Feature bit

Number of the `Feature` bit: 14

Enabling rapid stop via faceplate

You can use the `Feature` bit "Enable rapid stop via faceplate" to specify if the OS operator can use rapid stop for the block via the standard view of the faceplate.

The default setting is 0.

Bit = 0: The "Rapid stop" button is not visible in the faceplate.

Bit = 1: The OS operator can use the button for rapid stop.

1.1.10.44 Signaling limit violation

Feature bit

Number of the `Feature` bit: 29

Signaling limit violation

With this `Feature` bit, you specify how limit violation should be sent to the respective limit outputs.

The default setting is 0.

Bit = 0: Output value of the limit output = 1 (1 active)

Bit = 1: Output value of the limit output = 0 (0 active)

Note

To learn about the parameters with which you can influence this behavior, refer to the description of the connections for the respective blocks.

1.1.10.45 Alarm setpoint difference

`Feature` bit

Number of the `Feature` bit: 5

Setpoint difference should be alarmed

Use this `Feature` bit to activate alarming when a setpoint difference occurs.

The default setting is 0.

Bit = 0: Deactivated: The message for the `ExtMsg2` and `ExtMsg3` parameters are output.

Bit = 1: Activated: The messages for the `ER_H_Lim` or `ER_L_Lim` parameter are output instead of the message parameters `ExtMsg2` and `ExtMsg3`.

1.1.10.46 Control via auxiliary valve

Feature Bit

Number of the `Feature` bit: 5

Control via a auxiliary valve

You can use this `Feature` bit to specify if control should be performed by a auxiliary valve.

The default setting is 0.

Bit = 0: Control without auxiliary valve / no auxiliary valve present

Bit = 1: Control via auxiliary valve

1.1.10.47 Enabling bumpless change to the proportional gain, derivative time and amplification of the differentiator

Feature Bit

Number of the `Feature` bit: 20

Enabling bumpless change to the proportional gain, derivative time and amplification of the differentiator

Use this `Feature` bit to enable bumpless change to proportional gain `Gain`, derivative action time `TD` and gain of the differentiator in automatic mode.

The default setting is 0.

Bit = 0: The bumpless switchover is deactivated.

Bit = 1: The bumpless switchover is activated.

1.1.10.48 Enabling bumpless switchover to automatic mode for valves, motors, and dosers

Feature bit

Number of the `Feature` bit: 21

Bumpless switchover to automatic mode for valves, motors, and dosers

You can use this `Feature` bit to specify whether bumpless switchover to automatic mode for valves, motors and dosing unit should be enabled only if switching via the faceplate is in effect, or whether switching using interconnectable inputs `AutModLi` and `ManModLi` (`ModLiOp = 1`) is also possible.

The default setting is 0

Bit = 0: The function "Bumpless switchover to automatic mode for valves, motors and dosers" works when switching via the faceplate and switching using interconnectable inputs `AutModLi` and `ManModLi` (`ModLiOp = 1`).

Bit = 1: The function "Bumpless switchover to automatic mode for valves, motors and dosers" only works when switching via the faceplate. Bump switchover is possible with the interconnectable inputs `AutModLi` and `ManModLi` (`ModLiOp = 1`).

1.1.10.49 Disabling bumpless switchover to automatic mode for controllers

Feature Bit

Number of the `Feature` bit: 18

Changeover with or without P step change when the internal setpoint is not in tracking mode

Use this `Feature` bit to specify if a changeover should occur with or without a P step change when the internal setpoint (`SP_TrkPv = 0`) does not track the process value.

The default setting is 0.

Bit = 0: Changeover without P step change (bumpless)

Bit = 1: Changeover with P step change (not bumpless)

For more detailed information, refer to the description of Manual and automatic mode for control blocks (Page 59).

1.1.10.50 Enabling bumpless switchover to automatic mode for valves, motors, and dosers

Feature bit

Number of the `Feature` bit: 17

Bumpless switchover

You can use this `Feature` bit to enable the bumpless switchover from local/manual mode to automatic mode.

Default setting is 0

Bit = 0: Bumpless switchover is disabled. You can switch from local/manual mode to automatic mode at any time.

Bit = 1: Bumpless switchover from local/manual mode to automatic mode is enabled. A switchover from local/manual mode to automatic mode is only possible if the control settings of the local/manual mode and automatic modes match. If switchover occurs at a different point in time, this is indicated in the faceplate with the text "Switchover error".

Refer to the Manual and automatic mode for motors, valves and dosers (Page 63) section for more on this.

A second feature bit is used to specify if bumpless switchover to automatic mode is only possible via the faceplate or if switching is also possible via the interconnectable parameters `AutModLi` and `ManModLi` (`ModLiOp = 1`).

Refer to the section Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)

1.1.10.51 Summing response continuous or triggered

Feature Bit

Number of the `Feature` bit: 7

Define summing response

You can use this `Feature` bit to define the summing response of the block as a function of the `Feature Bits 6 = 0`. If you have set the `Feature Bit 6 = 1`, this `Feature Bit` is not operational.

The default setting is 0.

Bit = 0: Triggered summing response.

Bit = 1: Continuous summing response.

1.1.10.52 Suppression of all messages

Feature Bit

Number of the `Feature` bit: 25

Suppression of all messages

You can use this `Feature` bit to determine whether all messages of the block are to be suppressed.

Bit = 0: Process messages are suppressed.

Bit = 1: All messages are suppressed.

1.1.10.53 Output invalid raw value

Feature Bit

Number of the `Feature` bit: 28

Output invalid raw value

Use this `Feature` bit to activate output of the invalid raw value for channel blocks.

The default setting is **1**(!).

Bit = 0: The invalid raw value is not output. Either the substitute value (`Feature` bit Output substitute value if raw value is invalid (Page 124)) or the last valid value (`Feature` bit Issuing last valid value if raw value is invalid (Page 127)) is output.

Bit = 1: The invalid raw value is output. The signal status of the output value is set to "Bad, device related" or "Bad, process related".

If there is no valid raw value the output parameter `Bad = 1` is set automatically.

Prioritizing the `Feature` bits for channel blocks:

You need to assign parameters for three `Feature` bits for the response to an invalid raw value for the channel blocks.

If more than one of these `Feature` bits are set (=1), the following priority applies:

- Output invalid raw value (`Feature` bit 28 = highest priority)
- Output substitute value if raw value is invalid (Page 124)(`Feature` bit 29)
- Issuing last valid value if raw value is invalid (Page 127) (`Feature` bit 30 = lowest priority)

The raw value is output of none of the `Feature` bits 28, 29 or 30 is set.

1.1.10.54 Transmission of messages

Feature bit

Number of the `Feature` bit: 29

Transmission of messages

You can use this `Feature` bit to specify if messages should be transferred to the upstream diagnostic block.

The default setting is 1

Bit = 0: No transfer of information

Bit = 1: Transfer messages to the upstream diagnostic block

1.1.10.55 Reaction of the switching points in the "Out of service" operating mode

Feature Bit

Number of the `Feature` bit: 26

Reaction of the switching points in the "Out of service" operating mode

You can use this `Feature` bit to specify the reaction of the switching points to the "Out of service" operating mode.

The default setting is 0.

Bit = 0: Last state of the switching points before switching to the "Out of service" operating mode is retained.

Bit = 1: The state of the switching points is reset to "Good".

1.1.10.56 Reaction to the out of service mode

Feature bit

Number of the `Feature` bit: 1

Reaction to the out of service mode

You can use this `Feature` bit to define the reaction of the technologic block based on the interconnectable input parameter `OosLi = 1`.

The default setting is 0.

- **Bit = 0**: The symbol for the "In progress" status (see above) appears in the block icon and in the faceplate of the assigned technologic block. A 0-1 edge transition at the input parameter OosLi has no further influence on the reaction of the technologic block; the previous status is retained. No switch to the "Out of service" mode is performed.
- **Bit = 1**: The mode switches to "Out of service" assuming that the block is "On" or "Manual" mode. If this is not the case, the mode does not change. The symbol for the "In progress" (see below) status also appears in the block icon and in the faceplate of the assigned technologic block regardless of the mode change. No message is output to indicate whether or not the mode change took place.

The status display for "In progress" appears as follows:

A 1-0 edge transition at the input parameter `OosLi` has no influence on the reaction of the technologic block, the previous status is retained.

See also the Release for maintenance (Page 52) section for more on this.

1.1.10.57 Exiting local mode

Feature Bit

Number of the Feature bit: 10

Reaction to exiting local mode

Use this `Feature` bit to define how the "Local mode" is to be exited with `LocalSetting = 1` or `LocalSetting = 2` and if the mode is not specified by `AutModLi` or `ManModLi`.

Default setting is 0

Bit = 0: Exiting local mode in manual mode (bumpless because the control signals are continuously adjusted).

Bit = 1: When local mode is exited, the mode changes back to the last mode that was active prior to local mode (not bumpless).

For more detailed information, refer to the description of Local mode (Page 66).

1.1.10.58 Interlock display with LocalSetting 2 or 4

Feature bit

Number of the `Feature` bit: 27

Interlock display with LocalSetting 2 or 4

Use this `Feature` bit to specify the display of interlocks with `LocalSetting 2` or `4` at the faceplate and at the faceplate output `LockAct` .

The default setting is 0

Bit = 0: `LocalSetting 2` and `4` crossed out locks are displayed in the standard view. `LockAct` is not set with interlock.

Bit = 1: `LocalSetting 2` and `4` locks are displayed in the standard view according to the interlock. `LockAct` is set according to interlock. This setting is used for hardware interlock.

Note

A decreasing motor protection (`Trip.Value`=0) is displayed at the output parameter `LockAct` , regardless of the feature bit setting.

1.1.11 Functions for controllers

1.1.11.1 Delay alarm for control deviation at setpoint step changes

Alarm delay for blocks with the function "Delay alarm for control deviation at setpoint step changes"

This type of alarm delay is used when temporary violations of set alarm thresholds of the control deviation are to be suppressed at setpoint step changes. The alarm delay is parameterized at the following inputs:

Parameter for the delay time	Explanation
ER_AH_DFac	Delay factor at positive setpoint step changes for incoming alarms at the control deviation monitoring ER_AH_Lim
ER_AL_DFac	Delay factor at negative setpoint step changes for incoming alarms at the control deviation monitoring ER_AL_Lim

The effective delay time is calculated from the delay factor and the setpoint difference:

- Positive setpoint step change: ER_A_DCOut = Maximum

  The maximum is formed from the parameters ER_A_DC as well as ER_AH_DFac• Setpoint difference

- Negative setpoint step change: Maximum

  The maximum is formed from the parameters ER_A_DC as well as -1• ER_AL_DFac• Setpoint difference

The effective delay time is specified at the output parameter:

Parameter	Explanation
ER_A_DCOut	Effective delay time at setpoint step changes for incoming alarms during control deviation monitoring

Before a setpoint change, the effective delay time amounts to
ER_A_DCOut = ER_A_DC.

For a setpoint step change, the effective delay time increases depending on the factors ER_AH_DFac as well as ER_AL_DFac.

When the control loop has settled again, meaning that
(ER_AL_Lim + ER_Hyst) <= ER <= (ER_AH_Lim – ER_Hyst)
and that the delay time for outgoing alarms (ER_A_DG) has expired, the output is reset again to
ER_A_DC: ER_A_DCOut = ER_A_DC
.

Activating the alarm delay

The alarm delay factors have a default value of 0, meaning that the function is deactivated. Specify a delay factor > 0 in order to use the function.

Pending alarms

Pending alarms are output at the output parameters ER_AL_Act and ER_AH_Act.

1.1.11.2 Inverting control direction

Inverting control direction

For some processes (for example cooling processes), negative control gain is necessary. This is achieved by the inverting the control direction by means of the input parameter `NegGain = 1`. The gain is always entered positively at the input parameter `Gain` . If there is an inversion, this is indicated at the output parameter `GainEff` by a negative number.

1.1.11.3 Control deviation generation and dead band

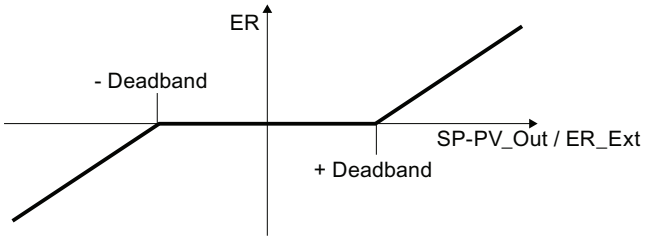
Control deviation generation and dead band

The control deviation is formed from the effective setpoint `SP` and the process value`PV` (`ER = SP - PV_Out`) and is available at the `ER` output.

In the case of activated control deviation generation (only at block PIDConL, `Feature` bit 14), `ER` is formed by `ER_Ext`.

To suppress disturbances in the steady state, you can assign a dead band `(Deadband)`:

- `Deadband = 0`: Dead band is disabled
- `Deadband ≠ 0`: Dead band is enabled



1.1.11.4 Using control zones

Using control zones

The control zone function is mainly used for temperature processes.

If `ConZone ≠ 0`, the controller works with a control zone; if `ConZone = 0`, the "control zone" function is deactivated. This means that the controller operates based on the following algorithm:

- If the process value `PV` exceeds the setpoint `SP` by more than the value defined for `ConZone`, the value `MV_LoLim` is output as the manipulated value (controlled closed-loop mode).
- If the process value `PV` falls below the setpoint `SP` by more than `ConZone`, `MV_HiLim` is output (controlled closed-loop mode).
- With controlled closed-loop mode, the integral component is set so that the controller works bumplessly when automatic closed-loop mode is activated. To this end, feature bit 18, "Disable bumpless switchover to automatic mode for the controller", must be zero. Setting the integral component has a higher priority than freezing the integral component by `IntHoldPos` or `IntHoldNeg`.
- If the process value `PV` stays within the control zone (`ConZone`), the manipulated value assumes the value of the PID algorithm (automatic closed-loop mode).

Note

The change from controlled closed-loop mode to automatic closed-loop mode is based on a hysteresis of 20% of the control zone. Make sure that the control zone has an adequate width before you manually activate the control zone. An insufficient width of the control zone leads to oscillation of the manipulated variable and of the process value.

Advantages of the control zone:

Once the control zone is entered, the manipulated variable is quickly reduced by the applied D action. The control zone is therefore only useful if the derivitive action is activated. Without the derivative component, only the reducing proportional component would reduce the manipulated variable to any significant degree. The control zone speeds up settling without overshoot or undershoot if the value of the output minimum or maximum manipulated variable is a long way from the stationary manipulated variable required for the new operating point.

1.1.11.5 Setpoint limiting for external setpoints

Setpoint limiting for external setpoints

With this function you can limit the external setpoint to a range by means of the parameters SP_ExHiLim (high limit) and SP_ExLoLim (low limit). If the setpoint lies outside the range defined by you, it is limited to the valid range.

If the external setpoint lies on or above the limit SP_ExHiLim, this is displayed at the output SP_ExHiAct = 1.

If the external setpoint lies on or below the limit of SP_ExLoLim, this is displayed at the output SP_ExLoAct = 1.

The external setpoint limits can be tracked internally via the interconnection of the output parameters SP_InHiOut or SP_InLoOut following SP_ExHiLim or SP_ExLoLim. You can control the two limit pairs from the faceplate.

1.1.11.6 Tracking setpoint in manual mode

Tracking setpoint in manual mode

To allow a bumpless transfer to automatic mode, the setpoint tracks the process value. When tracking,(SP_TrkPV = 1) the internal setpoint SP_Int is tracked to the process value PV.

Additional information on setpoint tracking is available in Manual and automatic mode for control blocks (Page 59).

1.1.11.7 Tracking and limiting a manipulated variable

Manipulated variable tracking

You adjust the manipulated value (tracking) in order to implement a Bumpless switchover of controllers. A typical use case is cascade control: If the assigned secondary controller is no longer in automatic mode with external setpoint, the primary controller must track it.

To adjust the manipulated variable (tracking), you have to set the parameter MV_TrkOn = 1. Now the manipulated variable is taken from the interconnected tracking value MV_Trk and passed to the output MV. The MV output is limited to the MV_HiLim and MV_LoLim parameters.

Manual mode takes priority over tracking to allow a plant operator to set the controller to manual mode using the faceplate even when tracking the manipulated variable and therefore continue to normal operation.

The text "Tracking" is also displayed in the standard view of the faceplate.

Activating forced tracking mode for the manipulated variable

Forced tracking is used to set the controller output of a higher-level controller to a value that can be specified.

You can use forced tracking, for example, to implement a centralized emergency stop in the plant. This can be put into effect regardless of the operating mode the controller is currently in.

To force adjustment of the manipulated variable (tracking), you have to set the parameter `MV_ForOn = 1`. Now the manipulated variable is taken from the interconnected tracking value `MV_Forced` and passed to the output `MV`.

With forced tracking, it is not possible to limit the manipulated variable, nor can the plant operator change to manual mode in the faceplate. The text "Forced tracking" is also displayed in the standard view of the faceplate.

Note

This function is not available for the FmCont, FmTemp, and ModPreCon blocks.

Limiting the value of a manipulated variable in automatic mode

In automatic mode, the manipulated variable is set to its automatic manipulated variable limits as specified by the input parameters `MV_HiLim` and `MV_LoLim` and output at the output parameter `MV`. Reaching the limit is then displayed at the output parameter `MV_HiAct = 1` for the high limit and `MV_LoAct = 1` for the low limit.

Interconnecting the output parameter `ManHiOut` or `ManLoOut` to `MV_HiLim` or `MV_LoLim` allows the automatic manipulated variable limits to tracked to manual manipulated variable limits. You can keep both limit pairs in synch and control the manual manipulated variable limits in the faceplate.

Limiting the value of a manipulated variable in manual mode

In manual mode, the manipulated variable is set to its manual manipulated variable limits as specified by the input parameters `ManHiLim` and `ManLoLim` and output at the output parameter `MV`.

See also

Forcing operating modes (Page 31)

1.1.11.8 Feedforwarding and limiting disturbance variables

Feedforward control and limitation

The feedforward control is used in order to compensate measurable disturbance variables, such as temperature or pressure, that can have an effect on the process. In automatic mode, the disturbance variable is added to the result of the PID algorithm.

The disturbance variable is connected to the `FFwd` Parameter. It is limited to the `FFwdHiLim` and `FFwdLoLim` limits. If the disturbance variable is outside or at the limits, this is indicated by the `FFwdHiAct = 1` or `FFwdLoAct = 1` output parameters.

1.1.11.9 Structure segmentation at controllers

Structure segmentation at controllers

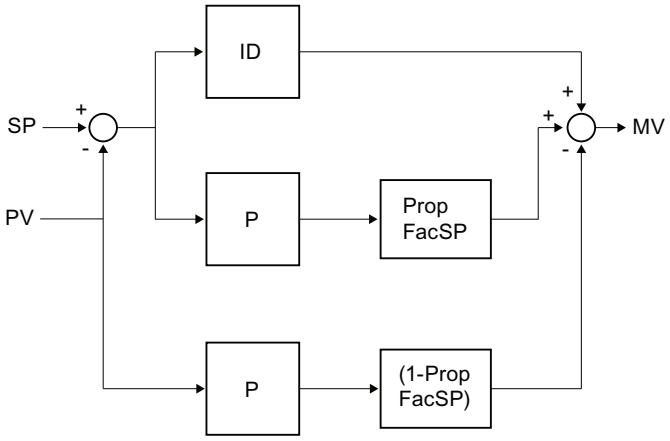
In order to avoid jumps at the manipulated value (controller output) during setpoint changes, proportional and derivative actions can be switched into the feedback path. I.e.: The proportional action (proportionally) and the derivative action are then only influenced by the process value.

Switching proportional action into the feedback path

A proportion of the P action can be placed in the feedback using the `PropFacSP` parameter. Setpoint jumps then only affect the derivative action proportionally.

`PropFacSP = 0`: Proportional action is completely in the feedback path

`PropFacSP = 1`: Proportional action is not in the feedback path (default setting)

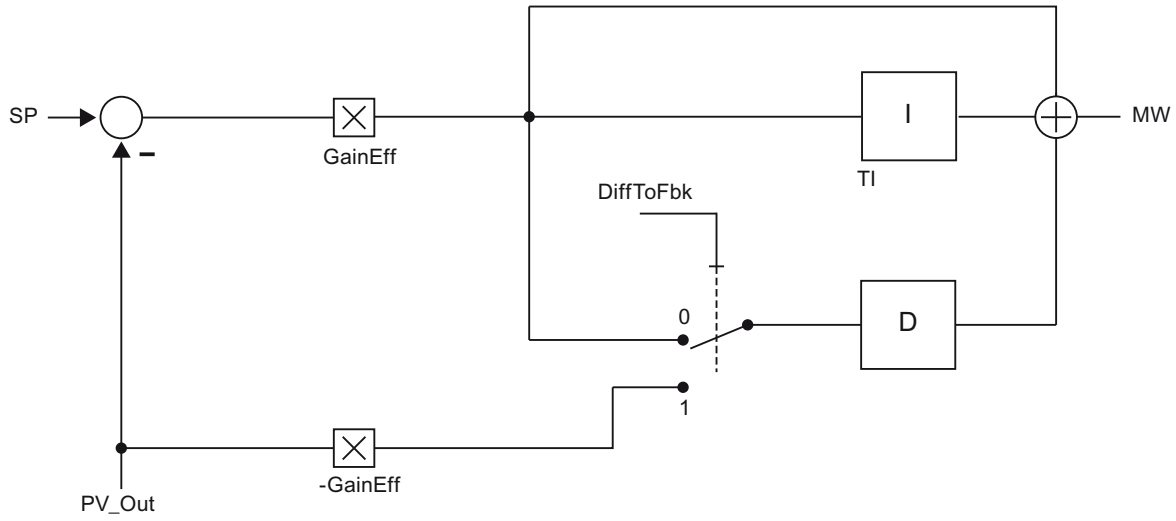


Switching derivative action into the feedback path

The parameter `DiffToFbk` can be used to switch the D action into the feedback path. Setpoint jumps then no longer affect the derivative action directly.

`DiffToFbk = 0`: Derivative action is not in the feedback path (default setting).

`DiffToFbk = 1`: Derivative action is in the feedback path.



1.1.12 Messaging

1.1.12.1 Area of application of the alarm delays

Area of application

A sensible area of application for setting alarm delays can, for example, be a motor. When it is started, an elevated starting current can occur and this could be reported depending on the configured limit. Since this usually settles down to a value below the set limit, the alarm would not make sense. In this case, the alarm delay that is intended to bridge the duration of the active alarm is used.

Note

Alarms that are really wanted are, naturally, also delayed when an alarm delay is used. Therefore select the delay period prudently!

Alarm delays in the Advanced Process Library

There are three block types with a different application of the alarm delay for:

- One time value for all limits (Page 157)
- One time value per limit pair (Page 157)
- Two time values per limit pair (Page 158)
- Two time values for each individual limit (Page 160)

1.1.12.2 One time value for all limits

Blocks with one time value for the alarm delay

This form of alarm delay is used for blocks without a unit designation in the name, for example, ConPerMon.

The alarm delay is used when brief violations of the set alarm thresholds are to be suppressed. The duration of the time delay is parameterized at the input `AlmDelay`. Parameter assignment is always carried out in seconds.

Activating the alarm delay

The alarm delay is disabled by default (`AlmDelay = 0`). To use the function, set a delay time [s] with the `AlmDelay` parameter.

1.1.12.3 One time value per limit pair

Blocks with one time value for the alarm delay per limit pair

The alarm delay is used when brief violations of the set alarm thresholds are to be suppressed.

The alarm delay is parameterized at the following inputs:

Parameter for the delay time	Explanation
`XXX_A_DC`	Delay time for coming events of the class • Alarm **XXX_A**larm_**D**elay**C**oming XXX: Value to be monitored
`XXX_W_DC`	Delay time for coming events of the class • Warning **XXX_W**arning_**D**elay**C**oming XXX: Value to be monitored

Activating the alarm delay

By default, the alarm delay is disabled for each limit, meaning that each individual parameter has 0 [s] pre-assigned.

To use the function, set a delay time [s] for each parameter.

Pending alarms

Pending alarms, warnings, or tolerances are output at the corresponding output parameters:

- `XXX_AH_Act = 1`: Alarm limit (high) reached or violated
- `XXX_AL_Act = 1`: Alarm limit (low) reached or violated
- `XXX_WH_Act = 1`: Warning limit (high) reached or violated
- `XXX_WL_Act = 1`: Warning limit (low) reached or violated

If a message is active at one of these outputs, this is indicated by a 1.

1.1.12.4 Two time values per limit pair

Blocks with two time values for the alarm delay per limit pair

The alarm delay is used when brief violations of the set alarm thresholds are to be suppressed.

The alarm delay is parameterized at the following inputs:

Parameter for the delay time	Explanation
`XXX_A_DC`	Delay time for coming events of the class • Alarm **XXX_A**larm_**D**elay**C**oming XXX: Value to be monitored
`XXX_A_DG`	Delay time for going events of the class • Alarm **XXX_A**larm_**D**elay**G**oing XXX: Value to be monitored
`XXX_W_DC`	Delay time for coming events of the class • Warning **XXX_W**arning_**D**elay**C**oming XXX: Value to be monitored
`XXX_W_DG`	Delay time for going events of the class • Warning **XXX_W**arning_**D**elay**G**oing XXX: Value to be monitored

Parameter for the delay time	Explanation
XXX_T_DC	Delay time for coming events of the class • Tolerance **XXX_T**olerance_**D**elay**C**oming XXX: Value to be monitored
XXX_T_DG	Delay time for going events of the class • Tolerance **XXX_T**olerance_**D**elay**G**oing XXX: Value to be monitored

Activating the alarm delay

By default, the alarm delay is disabled for each individual pair, meaning that each individual parameter has 0 [s] pre-assigned.

To use the function, set a delay time [s] for each parameter.

Pending alarms

Pending alarms, warnings, or tolerances are output at the corresponding output parameters:

- XXX_AH_Act = 1: Alarm limit (high) reached or violated
- XXX_AL_Act = 1: Alarm limit (low) reached or violated
- XXX_WH_Act = 1: Warning limit (high) reached or violated
- XXX_WL_Act = 1: Warning limit (low) reached or violated
- XXX_TH_Act = 1: Tolerance limit (high) reached or violated
- XXX_TL_Act = 1: Tolerance limit (low) reached or violated

If a message is active at one of these outputs, this is indicated by a 1.

1.1.12.5 Two time values for each individual limit

Alarm delay for blocks with two time values for each individual limit

This form of alarm delay is used for blocks with a R unit designation in the name, for example, PIDConR.

The alarm delay is used when brief violations of the set alarm thresholds are to be suppressed. The alarm delay is parameterized at the following inputs:

Parameter for the delay time	Explanation
XX_AH_DC	Delay time for coming events of the class • Alarm (for high limit) **XX_A**larm**H**igh_**D**elay**C**oming XX: Value to be monitored
XX_AH_DG	Delay time for going events of the class • Alarm (for high limit) **XX_A**larm**H**igh_**D**elay**G**oing XX: Value to be monitored
XX_AL_DC	Delay time for coming events of the class • Alarm (for low limit) **XX_A**larm**L**ow_**D**elay**C**oming XX: Value to be monitored
XX_AL_DG	Delay time for going events of the class • Alarm (for low limit) **XX_A**larm**L**ow_**D**elay**G**oing XX: Value to be monitored
XX_WH_DC	Delay time for coming events of the class • Warning (for high limit) **XX_W**arning**H**igh_**D**elay**C**oming XX: Value to be monitored
XX_WH_DG	Delay time for going events of the class • Warning (for high limit) **XX_W**arning**H**igh_**D**elay**G**oing XX: Value to be monitored
XX_WL_DC	Delay time for coming events of the class • Warning (for low limit) **XX_W**arning**L**ow_**D**elay**C**oming XX: Value to be monitored
XX_WL_DG	Delay time for going events of the class • Warning (for low limit) **XX_W**arning**L**ow_**D**elay**G**oing XX: Value to be monitored

Parameter for the delay time	Explanation
XX_TH_DC	Delay time for coming events of the class • Tolerance (for high limit) **XX_T**olerance**H**igh_**D**elay**C**oming XX: Value to be monitored
XX_TH_DG	Delay time for going events of the class • Tolerance (for high limit) **XX_T**olerance**H**igh_**D**elay**G**oing XX: Value to be monitored
XX_TL_DC	Delay time for coming events of the class • Tolerance (for low limit) **XX_T**olerance**L**ow_**D**elay**C**oming XX: Value to be monitored
XX_TL_DG	Delay time for going events of the class • Tolerance (for low limit) **XX_T**olerance**L**ow_**D**elay**G**oing XX: Value to be monitored

Activating the alarm delay

By default, the alarm delay is disabled for each individual limit, meaning that each individual parameter has 0 [s] pre-assigned.

To use the function, set a delay time [s] for each parameter.

Pending alarms

Pending alarms, warnings, or tolerances are output at the corresponding output parameters:

- `XX_AL_Act = 1`: Alarm limit (low) reached or violated
- `XX_AH_Act = 1`: Alarm limit (high) reached or violated
- `XX_WL_Act = 1`: Warning limit (low) reached or violated
- `XX_WH_Act = 1`: Warning limit (high) reached or violated
- `XX_TL_Act = 1`: Tolerance limit (low) reached or violated
- `XX_TH_Act = 1`: Tolerance limit (high) reached or violated

If a message is active at one of these outputs, this is indicated by a 1.

1.1.12.6 Generating instance-specific messages

Generating instance-specific messages

You can generate instance-specific messages for a binary signal of every block.

The number of interconnectable input parameters that can be used freely varies with relation to the blocks. The X in the parameter name designates the position.

You can specify the following messages for these instance-specific messages:

- Message class
- Priority of the message
- Message text
- Message auxiliary value
- Acknowledge behavior

Additional information is available in the descriptions of the message functionality of the individual blocks and in the PCS 7 Configuration Manual Operator Station under "How to configure the user-specific messages".

See also

Time stamp (Page 163)

1.1.12.7 Suppressing messages using the MsgLock parameter

The `MsgLock = 1` parameter is used to selectively suppress the following messages depending on `Feature` bit 25:

- All messages at the block

or

- All messages at the block, except for process control messages, the message class of which is disabled by default (for example, `CSF`, motor protection, feedback error) and external messages.

Messages already queued received the "outgoing" status with `MsgLock = 1` .

You can find additional information on `Feature` bit 25 in the secton Suppression of all messages (Page 146).

1.1.12.8 Time stamp

Time stamp

The time stamp is the assignment of time information to the status change of a binary process signal. The status change of the signal is signaled together with the time information.

Use the EventTS block to report time stamped signals.

For more information on time stamping and how to configure it, please refer to the "PCS 7 - High-Precision Time Stamping Function Manual".

Areas of application

Areas of application of the time stamp are for example:

- Accurately-timed detection of problems in process-related equipment. The time stamp enables you to explicitly identify signals that indicate the cause of the failure of a process unit.
- Analysis of system-wide interrelationships
- Detection and reporting of the sequence of time-critical signal changes

Forming the time information

The time information is generated by one of the following methods and is specified at the block by means of the input parameter `TimeStampOn`:

- `TimeStampOn = 0`: Use time stamp of the CPU (default)
- `TimeStampOn = 1`: Use time stamp of the I/O

Time stamping in the EventTS block

Connect the binary output parameter of another block (e.g. Pcs7DiIn) with a message input Inx (x = 1 ... 8) of the EventTS block.

When the EventTS block recognizes a change in the signal state at this message input, it uses the current time of the CPU as the time stamp. Only the signal changes that are slower than the cycle time of the block can be detected.

High-precision time stamp in the process I/O

You have configured the hardware of your system for high-precision time stamping as explained in the "PCS 7 - High-Precision Time Stamping Function Manual". The signal changes are recognized in the I/O devices and the time stamp assigned to them. This data is available at the output parameter `TS_Out` of the Pcs7DiIT block.

The high-precision time stamp is independent of the cycle time of the blocks. The actual time resolution for two different status changes depends on your plant configuration and the hardware you are using.

Interconnect the output parameter `TS_Out` of Pcs7DiIT with a message input `InTSx(x = 1 ... 8)` of the EventTS block.

Error handling

The system block ImDrvTs recognizes when the time stamp function in the I/O devices is defective and forwards this information to the Pcs7DiIT block. This then forms the time stamp using the current CPU time and sets the signal status of `TS_Out` output parameter to "Bad, due to device". The EventTS block then uses the current time of the CPU as the time stamp. You can find additional information in the "PCS 7 - High-Precision Time Stamping Function Manual".

1.1.13 Settings for operator control and monitoring

1.1.13.1 Display and operator input area for process values and setpoints

Display and operator input area for process values and setpoints

You specify the upper and lower area limits in the faceplate using interconnectable input parameters for the following:

- Display areas (bar display)
- Operator input area (for example setpoint and manipulated value)
- Input area for the limit values
  - Up to 7 numbers (including a decimal separator and a minus sign) are possible in the faceplates

The interconnectable input parameter is a structured variable that contains two analog values. Refer to the descriptions of the individual blocks for the relevant input parameters.

Using a structured variable for scaling

There are three possibilities with which you can influence the contents of the structured variables, namely with:

- The corresponding channel function block, for example, the FbAnIn block
- A conversion block, for example, the StruScIn block
- Direct parameter assignment at the block input

Additional information on data types is available in the documentation of CFC and STEP 7.

As well as operations

1.1.13.2 Opening additional faceplates

Opening additional faceplates

You can open standard views of other faceplates from various faceplate views. Here, you have the following options:

- Two buttons that you can assign freely and that are used to call faceplates of other blocks.
- Two predefined buttons for calling faceplates with a fixed assignment to the controller blocks.
- Buttons predefined for interlock functions

Note

"Small" blocks

With "Small" blocks, you can call up only one faceplate from the standard view.

Freely assignable buttons

From the standard view and from the preview, you can use a button to open the standard view of a block that can be selected freely. In order to use this function, in the CFC you need to interconnect the `SelFp1` input parameter for the button in the standard view or `SelFp2` for the button in the preview to any given output parameter of the block whose faceplate is to be opened. This makes the buttons in the faceplates visible.

Note

You can only configure the button in the standard view (`SelFp1`) with interlock blocks. There are no buttons with the GainSched block.

Button label

You can change button labels as follows:

- Open the process picture in WinCC GraphicsDesigner.
- Open the object properties of the block icon.
- Under Configurations, assign the desired text to the attribute UserButtonText1 or UserButtonText2.

Predefined buttons for controller blocks

You can open the standard view for the following blocks from a controller standard view or parameter view (for example PIDConL):

- ConPerMon (can be called from the standard view)
  - To do this, you need to interconnect the output parameter `CPI` of the ConPerMon block to the input parameter `CPI_In` of the controller block.
- GainSched (can be called from the parameter view)
  - To do this, you need to interconnect the output parameter `Link2Gain` of the GainSched block to the input parameter `Gain` of the controller block.

The labels of the buttons cannot be changed here.

Predefined buttons for interlocks

You can open the following interlock blocks from the standard view of the technologic blocks:

- Activation enable
- Interlock without reset (interlock)
- Interlock with reset (protection)

The buttons intended for this are visible when the relevant input parameter (`Permit`, `Intlock` or `Protect`) is interconnected to an interlock block.

You can open the standard view for the following faceplates from the standard view of the interlock blocks:

- The blocks interconnected to the input values.
- The block interconnected to the output value.

The buttons intended for this are visible when the input parameters (for example `In01`) or the `Out` output parameter of the interlock block is interconnected to a block that has a faceplate.

Note

Interconnection of the `Out` output parameter to multiple blocks is not permitted. The reason for this is that a direct relationship must be established between the button in the faceplate and the faceplate to be opened by it.

1.1.13.3 Labeling of buttons and text

Labeling of buttons and text

You can change the text of buttons (such as start/stop) for each specific instance. For binary OpDiXX operator blocks, you can also change the static text for the "x command" for each specific instance.

To do this, you need to specify how the buttons are labeled yourself using the attributes "Text0" and "Text1" in the object properties of the block. These texts are displayed in the standard view and preview of the faceplate.

The default text is shown if no text is configured.

If the text is longer than can be displayed with the default font size, the font size is automatically reduced until the text is fully shown. The smallest font size is 7 point.

Refer to the function description of the faceplate to learn which parameters are affected by this function.

1.1.13.4 Displaying auxiliary values

Displaying auxiliary values

Up to two auxiliary values can be displayed in the standard view of some faceplates. This feature can be used, for example, with motors to indicate the motor current and winding temperature.

To do so interconnect the value that you want to have displayed with the input parameters `UserAna1` or `UserAna2`.

In the object properties (I/Os > Identifier) of the block in CFC, you can specify the text to be displayed for these parameters in the standard view of the faceplate.

1.1.13.5 Selecting a unit of measure

Coded unit of measure

The parameter `XXX_Unit` is used to specify the unit of measure for the corresponding input parameter (XXX stands for a specific parameter, for example, `PV_Unit`). Entry is carried out in the form of a code. Exactly one unit of measure is assigned to each code and is displayed on the faceplate.

You can interconnect the `XXX_Unit` input parameter of a technologic block with the `XXXUnit` output parameter of an analog input channel block. At the analog input channel block, enter the unit of measure at the `XXXUnit` input parameter (`XXX` stands for a specific parameter, for example `PV_InUnit, PVOutUnit`).

Note

Special notes for channel blocks PCS7AnIn, PCS7AnOu, FbAnIn and FbAnOu

You can use the S7_enum attribute to display the unit in plain text in the CFC editor for these blocks.

Using the unit of measure with controllers for the ConPerMon block

For controller blocks, the current unit of measure is output via output parameter `XX_UnitOut` . If you use the ConPerMon block, you must switch this output parameter with the corresponding input parameter `XXX_Unit` on the ConPerMon block.

Using the S7_unit attribute

If you set the `xxx_Unit` parameter to 0, the entry is displayed by the `S7_Unit` attribute in the faceplate and in the block icon.

Overview of the units of measure

The units of measure are listed in the following tables:

List of the most commonly used units of measure in accordance with IEC 61158

Value	Display	Description
1000	K	Kelvin
1001	°C	Degrees Celsius
1002	°F	Degrees Fahrenheit
1005	°	Degree
1006	'	Minute
1007	"	Second
1010	m	Meter
1013	mm	Millimeter
1018	ft	Foot

Value	Display	Description
1023	m^2	Square meter
1038	L	Liter
1041	hl	Hectoliter
1054	s	Second
1058	min	Minute
1059	h	Hour
1060	d	Day
1061	m/s	Meters per second
1077	Hz	Hertz
1081	kHz	Kilohertz
1082	1/s	Per second
1083	1/min	Per minute
1088	kg	Kilogram
1092	t	Metric ton
1100	g/cm^3	Grams per cubic centimeter
1105	g/L	Grams per liter
1120	N	Newton
1123	mN	Millinewton
1130	Pa	Pascal
1133	kPa	Kilopascal
1137	bar	Bar
1138	mbar	Millibar
1149	mmH_2O	Millimeters of water[1]
1175	W·h	Watt hour
1179	kW·h	Kilowatt hour
1181	$kcal_{th}$	Kilocalories[1]
1190	kW	Kilowatt
1209	A	Ampere
1211	mA	Milliampere
1221	A·h	Ampere hour
1240	V	Volt
1349	m^3/h	Cubic meters per hour
1353	L/h	Liters per hour
1384	mol	Mol
1422	pH	pH value

List of all units of measure in accordance with IEC 61158

Value	Display	Description
1000	K	Kelvin
1001	°C	Degrees Celsius
1002	°F	Degrees Fahrenheit
1003	°R	Degree Rankine
1004	rad	Radian
1005	°	Degree
1006	'	Minute
1007	''	Second
1008	gon	Gon
1009	r	Revolution
1010	m	Meter
1011	km	Kilometer
1012	cm	Centimeter
1013	mm	Millimeter
1014	µm	Micrometer
1015	nm	Nanometer
1016	pm	Picometer
1017	Å	angstrom
1018	ft	Foot
1019	in	Inch
1020	yd	Yard
1021	mile	Mile
1022	nautical mile	Nautical mile
1023	m^2	Square meter
1024	km^2	Square kilometer
1025	cm^2	Square centimeter
1026	dm^2	Square decimeter
1027	mm^2	Square millimeter
1028	a	Are
1029	ha	Hectare
1030	in^2	Square inch
1031	ft^2	Square foot
1032	yd^2	Square yard
1033	$mile^2$	Square mile
1034	m^3	Cubic meter
1035	dm^3	Cubic decimeter
1036	cm^3	Cubic centimeter
1037	mm^3	Cubic millimeter
1038	L	Liter
1039	cl	Centiliter

Value	Display	Description
1040	ml	Milliliter
1041	hl	Hectoliter
1042	in^3	Cubic inch
1043	ft^3	Cubic foot
1044	yd^3	Cubic yard
1045	$mile^3$	Cubic mile
1046	pint	Pint
1047	quart	Quart
1048	gal	US gallon
1049	ImpGal	Imperial gallon
1050	bushel	Bushel
1051	bbl	Barrel = 42 gallons
1052	bbl(liq)	Liquid barrel = 31.5 gallons
1053	ft^3 std.	Standard cubic foot
1054	s	Second
1055	ks	Kilosecond
1056	ms	Millisecond
1057	µs	Microsecond
1058	min	Minute
1059	h	Hour
1060	d	Day
1061	m/s	Meters per second
1062	mm/s	Millimeters per second
1063	m/h	Meters per hour
1064	km/h	Kilometers per hour
1065	knot	Knot
1066	in/s	Inches per second
1067	ft/s	Feet per second
1068	yd/s	Yards per second
1069	in/min	Inches per minute
1070	ft/min	Feet per minute
1071	yd/min	Yards per minute
1072	in/h	Inches per hour
1073	ft/h	Feet per hour
1074	yd/h	Yards per hour
1075	mi/h	Miles per hour
1076	m/s^2	Meter/second squared
1077	Hz	Hertz
1078	THz	Terahertz
1079	GHz	Gigahertz
1080	MHz	Megahertz
1081	kHz	Kilohertz

Value	Display	Description
1082	1/s	Per second
1083	1/min	Per minute
1084	rad/s	Revolutions per second
1085	r/min	Revolutions per minute
1086	rad/s	Radians per second
1087	$1/s^2$	Per second squared
1088	kg	Kilogram
1089	g	Gram
1090	mg	Milligram
1091	Mg	Megagram
1092	t	Metric ton
1093	oz	Ounce
1094	lb	Pound
1095	STon	US ton (short ton)
1096	LTon	British ton (long ton)
1097	kg/m^3	Kilograms per cubic meter
1098	Mg/dm^3	Megagrams per cubic meter
1099	kg/dm^3	Kilograms per cubic decimeter
1100	g/cm^3	Grams per cubic centimeter
1101	g/m^3	Grams per cubic meter
1102	t/m^3	Metric tons per cubic meter
1103	kg/L	Kilogram per liter
1104	g/ml	Grams per milliliter
1105	g/L	Grams per liter
1106	lb/in^3	Pounds per cubic inch
1107	lb/ft^3	Pounds per cubic foot
1108	lb/gal	Pounds per US gallon
1109	$STon/yd^3$	US tons per cubic yard
1110	°Twad	Degree Twaddell
1111	°Baum (hv)	Degree Baumé (heavy)
1112	°Baum (lt)	Degree Baumé (light)
1113	°API	Degrees API
1114	SGU	Specific gravity units
1115	kg/m	Kilograms per meter
1116	mg/m	Milligrams per meter
1117	tex	Tex
1118	$kg \cdot m^2$	Kilograms per square meter
1119	kg·m/s	Kilograms per meter per second
1120	N	Newton
1121	MN	Meganewton
1122	kN	Kilonewton
1123	mN	Millinewton

Value	Display	Description
1124	µN	Micronewton
1125	kg·m²/s	Kilograms per square meter per second
1126	N·m	Newton meter
1127	MN·m	Meganewton meter
1128	kN·m	Kilonewton meter
1129	mN·m	Millinewton meter
1130	Pa	Pascal
1131	GPa	Gigapascal
1132	MPa	Megapascal
1133	kPa	Kilopascal
1134	mPa	Millipascal
1135	µPa	Micropascal
1136	hPa	Hectopascal
1137	bar	Bar
1138	mbar	Millibar
1139	torr	Torr
1140	atm	Atmosphere
1141	psi	Pounds per square inch
1142	psia	Pounds per square inch (absolute)
1143	psig	Pounds per square inch (gauge)
1144	g/cm²	Grams per square centimeter
1145	kg/cm²	Kilograms per square centimeter
1146	inH_2O	Inches of water
1147	inH_2O (4°C)	Inches of water at 4 degrees Celsius
1148	inH_2O (68°F)	Inches of water at 68 degrees Fahrenheit
1149	mmH_2O	Millimeters of water[1]
1150	mmH_2O (4°C)	Millimeters of water at 4 degrees Celsius[1]
1151	mmH_2O (68°F)	Millimeters of water at 68 degrees Fahrenheit[1]
1152	ftH_2O	Feet of water[1]
1153	ftH_2O (4°C)	Feet of water at 4 degrees Celsius[1]
1154	ftH_2O (68°F)	Feet of water at 68 degrees Fahrenheit[1]
1155	inHg	Inches of mercury
1156	inHg (0°C)	Inches of mercury at 0 degrees Celsius
1157	mmHg	Millimeters of mercury
1158	mmHg (0°C)	Millimeters of mercury at 0 degrees Celsius
1159	Pa·s	Pascal second
1160	m²/s	Square meters per second
1161	P	Poise
1162	cP	Centipoise
1163	St	Stokes
1164	cSt	Centistokes
1165	N/m	Newtons per meter

Value	Display	Description
1166	mN/m	Millinewtons per meter
1167	J	Joule
1168	EJ	Exajoule
1169	PJ	Petajoule
1170	TJ	Terajoule
1171	GJ	Gigajoule
1172	MJ	Megajoule
1173	kJ	Kilojoule
1174	mJ	Millijoule
1175	W·h	Watt hour
1176	TW·h	Terawatt hour
1177	GW·h	Gigawatt hour
1178	MW·h	Megawatt hour
1179	kW·h	Kilowatt hour
1180	cal_{th}	Calorie (thermo chemical)[1]
1181	$kcal_{th}$	Kilocalorie (thermo chemical)[1]
1182	$Mcal_{th}$	Megacalorie (thermo chemical)[1]
1183	Btu_{th}	British thermal unit[1]
1184	datherm	Decatherm
1185	ft·lbf	Foot pound
1186	W	Watt
1187	TW	Terawatt
1188	GW	Gigawatt
1189	MW	Megawatt
1190	kW	Kilowatt
1191	mW	Milliwatt
1192	µW	Microwatt
1193	nW	Nanowatt
1194	pW	Picowatt
1195	$Mcal_{th}/h$	Megacalorie per hour[1]
1196	MJ/h	Megajoule per hour
1197	Btu_{th}/h	British thermal units per hour[1]
1198	hp	Horsepower
1199	W/(m·K)	Watts per meter kelvin
1200	$W/(m^2·K)$	Watts per (square meter kelvin)
1201	$m^2·K/W$	Square meters kelvin per Watt
1202	J/K	Joules per kelvin
1203	kJ/K	Kilojoules per kelvin
1204	J/(kg·K)	Joules per (kilogram kelvin)
1205	kJ/(kg·K)	Kilojoules per (kilogram kelvin)
1206	J/kg	Joules per kilogram
1207	MJ/kg	Megajoules per kilogram

Value	Display	Description
1208	kJ/kg	Kilojoules per kilogramm
1209	A	Ampere
1210	kA	Kiloampere
1211	mA	Milliampere
1212	µA	Microampere
1213	nA	Nanoampere
1214	pA	Picoampere
1215	C	Coulomb
1216	MC	Megacoulomb
1217	kC	Kilocoulomb
1218	µC	Microcoulomb
1219	nC	Nanocoulomb
1220	pC	Picocoulomb
1221	A·h	Ampere hour
1222	C/m^3	Coulombs per cubic meter
1223	C/mm^3	Coulombs per cubic millimeter
1224	C/cm^3	Coulombs per cubic centimeter
1225	kC/m^3	Kilocoulombs per cubic meter
1226	mC/m^3	Millicoulombs per cubic meter
1227	$µC/m^3$	Microcoulombs per cubic meter
1228	C/m^2	Coulombs per square meter
1229	C/mm^2	Coulombs per square millimeter
1230	C/cm^2	Coulombs per square centimeter
1231	kC/m^2	Kilocoulombs per square meter
1232	mC/m^2	Millicoulombs per square meter
1233	$µC/m^2$	Microcoulombs per square meter
1234	V/m	Volts per meter
1235	MV/m	Megavolts per meter
1236	kV/m	Kilovolts per meter
1237	V/cm	Volts per centimeter
1238	mV/m	Millivolts per meter
1239	µV/m	Microvolts per meter
1240	V	Volt
1241	MV	Megavolt
1242	kV	Kilovolt
1243	mV	Millivolt
1244	µV	Microvolt
1245	F	Farad
1246	mF	Millifarad
1247	µF	Microfarad
1248	nF	Nanofarad
1249	pF	Picofarad

Value	Display	Description
1250	F/m	Farad per meter
1251	µF/m	Microfarad per meter
1252	nF/m	Nanofarad per meter
1253	pF/m	Picofarad per meter
1254	C·m	Coulomb meter
1255	A/m^2	Amperes per square meter
1256	MA/m^2	Megaamperes per square meter
1257	A/cm^2	Amperes per square centimeter
1258	kA/m^2	Kiloamperes per square meter
1259	A/m	Amperes per meter
1260	kA/m	Kiloamperes per meter
1261	A/cm	Amperes per centimeter
1262	T	Tesla
1263	mT	Millitesla
1264	µT	Microtesla
1265	nT	Nanotesla
1266	Wb	Weber
1267	mWb	Milliweber
1268	Wb/m	Webers per meter
1269	kWb/m	Kilowebers per meter
1270	H	Henry
1271	mH	Millihenry
1272	µH	Microhenry
1273	nH	Nanohenry
1274	pH	Picohenry
1275	H/m	Henries per meter
1276	µH/m	Microhenries per meter
1277	nH/m	Nanohenries per meter
1278	$A·m^2$	Ampere square meters
1279	$N·m^2/A$	Newton meter squared per ampere
1280	Wb·m	Weber meter
1281	Ω	Ohm[1]
1282	GΩ	Gigaohm[1]
1283	MΩ	Megaohm[1]
1284	kΩ	Kiloohm[1]
1285	mΩ	Milliohm[1]
1286	µΩ	Microohm[1]
1287	S	Siemens
1288	kS	Kilosiemens
1289	mS	Millisiemens
1290	µS	Microsiemens
1291	Ω·m	Ohms times meters[1]

Value	Display	Description
1292	GΩ·m	Gigaohms times meters[1]
1293	MΩ·m	Megaohms times meters[1]
1294	kΩ·m	Kiloohms times meters[1]
1295	Ω·cm	Ohms times centimeters[1]
1296	mΩ·m	Milliohms times meters[1]
1297	µΩ·m	Microohms times meters[1]
1298	nΩ·m	Nanoohms times meters[1]
1299	S/m	Siemens per meter
1300	MS/m	Megasiemens per meter
1301	kS/m	Kilosiemens per meter
1302	mS/cm	Millisiemens per centimeter
1303	µS/mm	Microsiemens per millimeter
1304	1/H	Per henry
1305	sr	Steradian
1306	W/sr	Watts per steradian
1307	W/(sr·m^2)	Watts per (steradian square meter)
1308	W/(m^2)	Watts per square meter
1309	lm	Lumen
1310	lm·s	Lumen second
1311	lm·h	Lumen hour
1312	lm/m^2	Lumens per square meter
1313	lm/W	Lumens per watt
1314	lx	Lux
1315	lx·s	Lux second
1316	cd	Candela
1317	cd/m^2	Candela per square meter
1318	g/s	Grams per second
1319	g/min	Grams per minute
1320	g/h	Grams per hour
1321	g/d	Grams per day
1322	kg/s	Kilograms per second
1323	kg/min	Kilograms per minute
1324	kg/h	Kilograms per hour
1325	kg/d	Kilograms per day
1326	t/s	Metric tons per second
1327	t/min	Metric tons per minute
1328	t/h	Metric tons per hour
1329	t/d	Metric tons per day
1330	lb/s	Pounds per second
1331	lb/min	Pounds per minute
1332	lb/h	Pounds per hour
1333	lb/d	Pounds per day

Value	Display	Description
1334	STon/s	US tons per second
1335	STon/min	US tons per minute
1336	STon/h	US tons per hour
1337	STon/d	US tons per day
1338	LTon/s	British tons per second
1339	LTon/min	British tons per minute
1340	LTon/h	British tons per hour
1341	LTon/d	British tons per day
1342	%	Percent
1343	% sol/wt	Percentage solids per weight unit
1344	% sol/vol	Percentage solids per volume unit
1345	% stm qual	Percentage steam quality
1346	°Plato	Degree plato
1347	m^3/s	Cubic meters per second
1348	m^3/min	Cubic meters per minute
1349	m^3/h	Cubic meters per hour
1350	m^3/d	Cubic meters per day
1351	L/s	Liters per second
1352	L/min	Liters per minute
1353	L/h	Liters per hour
1354	L/d	Liters per day
1355	ML/d	Megaliters per day
1356	ft^3/s	Cubic feet per second
1357	ft^3/m	Cubic feet per minute
1358	ft^3/h	Cubic feet per hour
1359	ft^3/d	Cubic feet per day
1360	ft^3/min std	Standard cubic feet per minute
1361	ft^3/h std	Standard cubic feet per hour
1362	gal/s	US gallons per second
1363	gal/min	US gallons per minute
1364	gal/h	US gallons per hour
1365	gal/d	US gallons per day
1366	Mgal/d	Mega US gallons per day
1367	ImpGal/s	Imperial gallons per second
1368	ImpGal/min	Imperial gallons per minute
1369	ImpGal/h	Imperial gallons per hour
1370	ImpGal/d	Imperial gallons per day
1371	bbl/s	Barrels per second
1372	bbl/min	Barrels per minute
1373	bbl/h	Barrels per hour
1374	bbl/d	Barrels per day
1375	W/m^2	Watts per square meter

Value	Display	Description
1376	mW/m^2	Milliwatts per square meter
1377	$\mu W/m^2$	Microwatts per square meter
1378	pW/m^2	Picowatts per square meter
1379	$Pa \cdot s/m^3$	Pascal seconds per cubic meter
1380	$N \cdot s/m$	Newton seconds per meter
1381	$Pa \cdot s/m$	Pascal seconds per meter
1382	B	Bel
1383	dB	Decibel
1384	mol	Mol
1385	kmol	Kilomole
1386	mmol	Millimole
1387	µmol	Micromole
1388	kg/mol	Kilograms per mole
1389	g/mol	Grams per mole
1390	m^3/mol	Cubic meters per mole
1391	dm^3/mol	Cubic decimeters per mole
1392	cm^3/mol	Cubic centimeters per mole
1393	L/mol	Liters per mole
1394	J/mol	Joules per mole
1395	kJ/mol	Kilojoules per mole
1396	$J/(mol \cdot K)$	Joules per mole kelvin
1397	mol/m^3	Moles per cubic meter
1398	mol/dm^3	Moles per cubic decimeter
1399	mol/L	Moles per liter
1400	mol/kg	Moles per kilogram
1401	mmol/kg	Millimoles per kilogram
1402	Bq	Becquerel
1403	MBq	Megabecquerel
1404	kBq	Kilobecquerel
1405	Bq/kg	Becquerels per kilogram
1406	kBq/kg	Kilobecquerels per kilogram
1407	MBq/kg	Megabecquerels per kilogram
1408	Gy	Gray
1409	mGy	Milligray
1410	rd	Rad
1411	Sv	Sievert
1412	mSv	Millisievert
1413	rem	Rem
1414	C/kg	Coulombs per kilogram
1415	mC/kg	Millicoulombs per kilogram
1416	R	Röntgen
1417	$1/Jm^3$	Density of magnetic energy

Value	Display	Description
1418	e/Vm^3	
1419	m^3/C	Cubic meters per coulomb
1420	V/K	Volts per kelvin
1421	mV/K	Millivolts per kelvin
1422	pH	pH value
1423	ppm	Parts per million
1424	ppb	Parts per billion
1425	ppth	Parts per trillion
1426	°Brix	Degrees Brix
1427	°Ball	Degrees Balling
1428	proof/vol	Proof per volume
1429	proof/mass	Proof per mass
1430	lb/ImpGal	Pounds per Imperial gallon
1431	kcal$_{th}$/s	Kilocalories per second[1]
1432	kcal$_{th}$/min	Kilocalories per minute[1]
1433	kcal$_{th}$/h	Kilocalories per hour[1]
1434	kcal$_{th}$/d	Kilocalories per day[1]
1435	Mcal$_{th}$/s	Megacalories per second[1]
1436	Mcal$_{th}$/min	Megacalories per minute[1]
1437	Mcal$_{th}$/d	Megacalories per day[1]
1438	kJ/s	Kilojoules per second
1439	kJ/min	Kilojoules per minute
1440	kJ/h	Kilojoule per hour
1441	kJ/d	Kilojoules per day
1442	MJ/s	Megajoules per second
1443	MJ/min	Megajoules per minute
1444	MJ/d	Megajoules per day
1445	Btu$_{th}$/s	British thermal units per second[1]
1446	Btu$_{th}$/min	British thermal units per minute[1]
1447	Btu$_{th}$/d	British thermal units per day[1]
1448	µgal/s	Micro US gallons per second
1449	mgal/s	Milli US gallons per second
1450	kgal/s	Kilo US gallons per second
1451	Mgal/s	Mega US gallons per second
1452	µgal/min	Micro US gallons per minute
1453	mgal/min	Milli US gallons per minute
1454	kgal/min	Kilo US gallons per minute
1455	Mgal/min	Mega US gallons per minute
1456	µgal/h	Micro US gallons per hour
1457	mgal/h	Milli US gallons per hour
1458	kgal/h	Kilo US gallons per hour
1459	Mgal/h	Mega US gallons per hour

Value	Display	Description
1460	µgal/d	Micro US gallons per day
1461	mgal/d	Milli US gallons per day
1462	kgal/d	Kilo US gallons per day
1463	µImpGal/s	Micro Imperial gallons per second
1464	mImpGal/s	Milli Imperial gallons per second
1465	kImpGal/s	Kilo Imperial gallons per second
1466	MImpGal/s	Mega Imperial gallons per second
1467	µImpGal/min	Micro Imperial gallons per minute
1468	mImpGal/min	Milli Imperial gallons per minute
1469	kImpGal/min	Kilo Imperial gallons per minute
1470	MImpGal/min	Mega Imperial gallons per minute
1471	µImpGal/h	Micro Imperial gallons per hour
1472	mImpGal/h	Milli Imperial gallons per hour
1473	kImpGal/h	Kilo Imperial gallons per hour
1474	MImpGal/h	Mega Imperial gallons per hour
1475	µImpgal/d	Micro Imperial gallons per day
1476	mImpgal/d	Milli Imperial gallons per day
1477	kImpgal/d	Kilo Imperial gallons per day
1478	MImpgal/d	Mega Imperial gallons per day
1479	µbbl/s	Microbarrels per second
1480	mbbl/s	Millibarrels per second
1481	kbbl/s	Kilobarrels per second
1482	Mbbl/s	Megabarrels per second
1483	µbbl/min	Microbarrels per minute
1484	mbbl/min	Millibarrels per minute
1485	kbbl/min	Kilobarrels per minute
1486	Mbbl/min	Megabarrels per minute
1487	µbbl/h	Microbarrels per hour
1488	mbbl/h	Millibarrels per hour
1489	kbbl/h	Kilobarrels per hour
1490	Mbbl/h	Megabarrels per hour
1491	µbbl/d	Microbarrels per day
1492	mbbl/d	Millibarrels per day
1493	kbbl/d	Kilobarrels per day
1494	Mbbl/d	Megabarrels per day
1495	$\mu m^3/s$	Cubic micrometers per second
1496	mm^3/s	Cubic millimeters per second
1497	km^3/s	Cubic kilometers per second
1498	Mm^3/s	Cubic megameters per second
1499	$\mu m^3/min$	Cubic micrometers per minute
1500	mm^3/min	Cubic millimeters per minute
1501	km^3/min	Cubic kilometers per minute

Value	Display	Description
1502	mm^3/min	Cubic megameters per minute
1503	$\mu m^3/h$	Cubic micrometers per minute
1504	mm^3/h	Cubic millimeters per minute
1505	km^3/h	Cubic kilometers per minute
1506	Mm^3/h	Cubic megameters per minute
1507	$\mu m^3/d$	Cubic micrometers per day
1508	mm^3/d	Cubic millimeters per day
1509	km^3/d	Cubic kilometers per day
1510	Mm^3/d	Cubic megameters per day
1511	cm^3/s	Cubic centimeters per second
1512	cm^3/min	Cubic centimeters per minute
1513	cm^3/h	Cubic centimeters per hour
1514	cm^3/d	Cubic centimeters per day
1515	$kcal_{th}/kg$	Kilocalories per kilogram[1]
1516	Btu_{th}/lb	British thermal units per pound[1]
1517	kL	Kiloliter
1518	kL/min	Kiloliters per minute
1519	kL/h	Kiloliters per hour
1520	kL/d	Kiloliters per day
1551	S/cm	Siemens per centimeter
1552	µS/cm	Microsiemens per centimeter
1553	mS/m	Millisiemens per meter
1554	µS/m	Microsiemens per meter
1555	MΩ · cm	Megaohm centimeter[1]
1556	kΩ · cm	Kiloohm centimeter[1]
1557	Weight%	Weight percent
1558	mg/L	Milligram per liter
1559	µg/L	Microgram per liter
1560	%Sat	-
1561	vpm	-
1562	%vol	Volume percent
1563	ml/min	Milliliters per minute
1564	mg/dm^3	Milligrams per cubic centimeter
1565	mg/L	Milligram per liter
1566	mg/m^3	Milligrams per cubic meter
1567	ct	Carat (jewels) = $200.0 \cdot 10^{-6}$ kg
1568	lb (tr)	Pound (troy or apothecary) = 0.3732417216 kg
1569	oz (tr)	Ounce (troy or apothecary) = 1/12 lb (tr)
1570	fl oz (U.S.)	Ounce (U.S. fluid) = (1/128) gal
1571	cm^3	Cubic centimeter = 10^{-6} m^3
1572	af	acre foot = 43560 ft^3
1573	m^3 normal	Cubic meter

Value	Display	Description
1574	L normal	Liter
1575	m^3 std.	Standard cubic meter
1576	L std.	Standard liter
1577	ml/s	Milliliters per second
1578	ml/h	Milliliters per hour
1579	ml/d	Milliliters per day
1580	af/s	Acre foot per second
1581	af/min	Acre foot per minute
1582	af/h	Acre foot per hour
1583	af/d	Acre foot per day
1584	fl oz (U.S.)/s	Ounces per second
1585	fl oz (U.S.) /min	Ounces per minute
1586	fl oz (U.S.)/h	Ounces per hour
1587	fl oz (U.S.)/d	Ounces per day
1588	m^3/s normal	Standard cubic meters per second
1589	m^3/min normal	Standard cubic meters per minute
1590	m^3/h normal	Standard cubic meters per hour
1591	m^3/d normal	Standard cubic meters per day
1592	L/s normal	Standard liters per second
1593	L/min normal	Standard liters per minute
1594	L/h normal	Standard liters per hour
1595	L/d normal	Standard liters per second
1596	m^3/s std.	Standard cubic meters per second
1597	m^3/min std.	Standard cubic meters per minute
1598	m^3/h std.	Standard cubic meters per hour
1599	m^3/d std.	Standard cubic meters per day
1600	L/s std.	Standard liters per second
1601	L/min std.	Standard liters per minute
1602	L/h std.	Standard liters per hour
1603	L/d std.	Standard liters per day
1604	ft^3/s std.	Standard cubic feet per second
1605	ft^3/d std.	Standard cubic feet per day
1606	oz/s	Ounces per second
1607	oz/min	Ounces per minute
1608	oz/h	Ounces per hour
1609	oz/d	Ounces per day
1610	Paa	Pascal (absolute)
1611	Pag	Pascal (gauge)
1612	GPaa	Gigapasacal (absolute)
1613	GPag	Gigapascal (gauge)
1614	MPaa	Megapascal (absolute)
1615	MPag	Megapascal (gauge)

Value	Display	Description
1616	kPaa	Kilopascal (absolute)
1617	kPag	Kilopascal (gauge)
1618	mPaa	Millipascal (absolute)
1619	mPag	Millipascal (gauge)
1620	µPaa	Micropascal (absolute)
1621	µPag	Micropascal (gauge)
1622	hPaa	Hectopascal (absolute)
1623	hPag	Hectopascal (gauge)
1624	gf/cm^{2}a	
1625	gf/cm^{2}g	
1626	kgf/cm^{2}a	
1627	kgf/cm^{2}g	
1628	SD4°C	Standard density at 4°C
1629	SD15°C	Standard density at 15°C
1630	SD20°C	Standard density at 20°C
1631	PS	Metric horsepower
1632	ppt	Parts per trillion = 10^{12}
1633	hl/s	Hectoliters per second
1634	hl/min	Hectoliters per minute
1635	hl/h	Hectoliters per hour
1636	hl/d	Hectoliters per day
1637	bbl (liq)/s	Barrels (US liquid) per second
1638	bbl (liq)/min	Barrels (US liquid) per minute
1639	bbl (liq)/h	Barrels (US liquid) per hour
1640	bbl (liq)/d	Barrels (US liquid) per day
1641	bbl (fed)	Barrel (U.S. federal) = 31 gallons
1642	bbl (fed)/s	Barrels (US federal) per second
1643	bbl (fed)/min	Barrels (US federal) per minute
1644	bbl (fed)/h	Barrels (US federal) per hour
1645	bbl (fed)/d	Barrels (US federal) per day
1998	Unknown unit	Use in configuration when the unit of measure is not known
1999	Special	Special units

[1] A notation different to the PA profile must be used in order to represent this unit in conformity with the system.

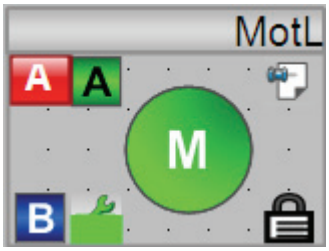
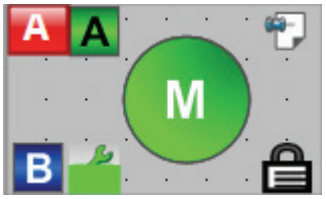
1.2 Functions of the block symbols

1.2.1 Block icon structure

Block icon structure

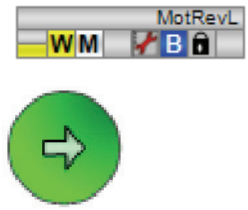
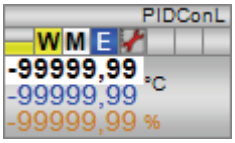
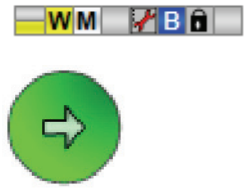
The new block icons are located in the template "@PCS7TypicalsAPL8.pdl" and "@TemplateAPL8.PDL".

There are two types of block icons (V8.0), those with a display of the instance-specific name and those without:

	Block icon of MotL with instance-specific name
	Block icon of PIDConL with instance-specific name
	Block icon of MotL without instance-specific name The toolbar only shows the information that is actually available.
	Block icon of PIDConL without instance-specific name The toolbar only shows the information that is actually available.

The old block icons are located in the template "PCS7TypicalsAPL7.pdl" and "@TemplateAPL7.PDL".

There are two types of block icons (V7.1), those with a display of the instance-specific name and those without:

	Block icon of MotRevL with instance-specific name
	Block icon of PIDConL with instance-specific name
	Block icon of MotRevL without instance-specific name The toolbar only shows the information that is actually available.
	Block icon of PIDConL without instance-specific name The toolbar only shows the information that is actually available.

You can select one of these block icons. See section Configuring the block icons (Page 191) for more information.

A block icon has several display areas:

- CPU stop
- Instance-specific name
- Icon for the block
- Analog value display
- Status bar for the block status

Displaying CPU stop

With a CPU stop, boxes are unavailable and a yellow warning triangle is displayed in the group display for blocks with messaging.

Instance-specific name

The name of the associated block is shown in the instance-specific name, for example for the PIDConL block:

You can change this name in the object properties of the instance block.

There are block icons with or without display of the instance-specific name. Refer to the individual block descriptions to learn about them.

You can reach the visible display for blocks without display of the instance-specific name in two different ways:

- **Displaying individual instance-specific names**: Click on the block icon while holding down the Shift key: The name remains visible as long as the process picture is displayed.
- **Displaying all instance-specific names at once**: All instance-specific names can be made visible in a process picture at once by clicking a button. To do this, copy this button into the process picture of the chart from the @PCS7TypicalsAPLV7.PDL/@PCS7TypicalsAPLV8.PDL or insert this button in the "Key area" of WinCC. If you insert it into the key area, read the manual section "PCS 7 OS Process Control " > "Layout of the User Interface".

  The instance-specific names are hidden once more by clicking the button again.

Icon for the block

Block icons for technologic blocks have their own operable icons (for example, for the MotRevL block) and represent a status display of the block.

This icon can be positioned at various locations, 0°, 90°, 180° and 270°. Refer to the Configuring the block icons (Page 191) section for more on this. You can change the operating mode of the block by right-clicking on the status display. Refer to the Operation via the block icon (Page 193) section for more on this.

Analog value display

For block icons with analog value displays (for example, for the PIDConL block), there are four basic settings that differ depending of the associated unit of measure:

Refer to the Configuring the block icons (Page 191) section for more on this.

These analog values can be controlled according to the Operator control permissions (Page 205). See also the Operation via the block icon (Page 193) section for more on this.

Status bar for the block status

The status bar of the block icon provides an overview of the overall status of the block (see figure below).

The arrangement of icons in the following tables is prioritized from high to low.

The following elements can be displayed:

Alarms, warnings, tolerances, and messages

Refer to the Monitoring functions in the Advanced Process Library (Page 72) section for more on this.

Icon	Meaning
	No messages are output.
	A fault has occurred.
	An alarm is triggered.
	An alarm for the high alarm limit is triggered.
	An alarm for the low alarm limit is triggered.
	An warning is triggered.
	A warning for the high warning limit is triggered.
	A warning for the low warning limit is triggered.
	A tolerance violation has occurred.
	A tolerance violation for the high tolerance limit has been triggered.
	A tolerance violation for the low tolerance limit has been triggered.
	The block has an operator prompt.
	There is a process status determination.

Operating modes

Refer to the Overview of the modes (Page 56) section for more on this.

Icon	Meaning
	The block is in automatic mode.
	The block is in the "On" operating mode.
	The block is in manual mode.
	A program is running.
	The block is in local mode.
	The block is in the "Out of service" operating mode. In this operating mode, no other icons are displayed and no values are shown in the analog value display except for: - Display for an active message in the memo view - Display for the maintenance enable

Note

No icon is displayed for the "On" operating mode (no green "O" displayed) if the block only has the operating modes "On" and "Out of service".

Internal or external setpoint

Refer to the section Setpoint specification - internal/external (Page 112).

Icon	Meaning
	Setting the setpoint internally
	External setpoint specification

Signal status

Refer to the Forming and outputting signal status for blocks (Page 92) section for more on this.

Icon	Meaning
	The block is in simulation.
	Signal status is "Bad, device related".
	Signal status is "Bad, process related".
	Signal status is "Uncertain, device related".
	Signal status is "Uncertain, process related".
	A maintenance request is pending.
	Block is released for maintenance

Tracking and forcing of values and bypasses

See sections Forcing operating modes (Page 31) , Interlocks (Page 85) and Manual and automatic mode for control blocks (Page 59).

Icon	Meaning
	At least one value has been forced
	Value is tracked
	There is a bypass of an interlock or a bypass condition of an upstream Intlock FB.

Interlocks

Refer to the Interlocks (Page 85) section for more on this.

Icon	Meaning
	Block is not interlocked.
	Block is interlocked.
	Bypass protection

Memo display

Icon	Meaning
	A message is available in the memo view.

See also

Motor protection function (Page 85)

Forming the group status for interlock information (Page 90)

1.2.2 Configuring the block icons

Configuring the block icons

There are two ways to configure your block icons:

- Automatically
- Manually

The new block icons are located in the template "@PCS7TypicalsAPL8.pdl" and "@TemplateAPL8.PDL".

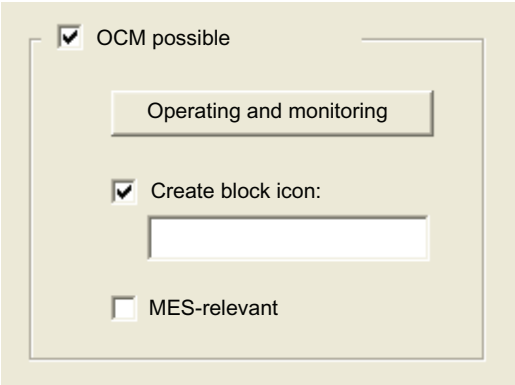
The old block icons are located in the template "PCS7TypicalsAPL7.pdl" and "@TemplateAPL7.PDL".

If you still want to continue using the V7.1 block icons in the project, you need to delete the V8.0 template or remove the "@" and deselect the update for the V8 template in the OS project editor on the basic data tab.

The block icons V7.1 are to remain in status V7.1 and be set to care and maintenance. New blocks are not to be integrated any longer.

Automatic configuration of block icons

There is a variety of block icons, which you can select for a block. You select a block icon by entering the number of the block icon in the field "OCM possible" > "Create block icon" in the object properties of the block instance:



You can find the names (numerical entry) of the respective block icons in the description for the blocks (Operator Control and Monitoring section).

If you do not enter a number for a block icon, the number 1 is always used for the block icon. The template for automatically generated block icons is @PCS7TypicalsAPLV7.PDL/@PCS7TypicalsAPLV8.PDL.

Additional information

- Manual *Process Control System PCS 7; Engineering System*

Manual configuration of block icons

You can configure block icons manually by copying them from the @TemplateAPLV7.PDL/@TemplateAPLV8.PDL template and inserting them into plant pictures.

The connection to the process tag is established with the "Connect faceplate with process tag" Wizard, see WinCC Information System, section "Making Process Pictures Dynamic" and "Standard Dynamics".

You can find information on exporting/importing and updating these objects in the WinCC Information System, section "Graphic Object Update Wizard". Use the "TemplateControlAPL.cfg" configuration file for these wizards.

Note

The procedure for changing the tooltip text of the block icons is described in the *APL Style Guide*. Otherwise, this property may not be changed.

1.2.3 Operation via the block icon

Operation via the block icon

The block icon can be used to operate all elements displayed there if a relevant operator control permission (OS_Perm) is available. This operator control permission can be configured in the engineering system (ES).

The operation is performed by right-clicking on the element involved. The operable elements in the block icon include:

- Switching the operating mode
- Internal and external setpoint specification
- Changing the process value, setpoint and manipulated variable
- Changing the operating state

The operation is then performed in the same way as in the faceplate. Refer to the section Switching operating states and operating modes (Page 208) as well as Changing values (Page 210).

1.2.4 Block icons for PID and FM controller

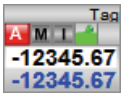
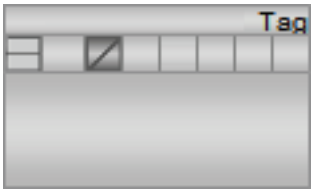
Block icons for PID and FM controller

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault CSF
- Operating modes
- Internal and external setpoint specification
- Signal status, release for maintenance
- Memo display
- Process value (black, with and without decimal places, with and without color change at limit violations)
- Setpoint (blue, with decimal places)
- Feedback value (red, with decimal points), not available for types 3 and 4

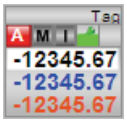
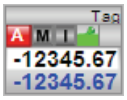
  With FmCont and FmTemp as a step controller without feedback, there is no feedback value
- only PIDStepL: Position feedback value (green, with decimal points), not available for types 3 and 4

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

Icons	Selection of the block icon in CFC	Special features
Special case for `PIDStepL`:		
	-	In the case of the `PIDStepL` block only, the green value shows the position feedback (only visible if `WithRbk = 1` has been assigned parameters). With operation by means of the block icon, however, the manipulated variable is operated.

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in the CFC	Special features
	1	
	2	
	3	
	4	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

1.2.5 Block icon for interlock blocks

Properties of the block icon for interlock blocks Intlk02, Intlk04, Intlk08, Intlk16

A variety of block icons are available with the following functions:

- Signal status
- Memo display
- Output signal

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Block icon for
	1	Intlk02
	1	Intlk04
	1	Intlk08
	1	Intlk16
	2	Intlk02
	2	Intlk04
	2	Intlk08
	2	Intlk16
	3	Intlk02
	3	Intlk04
	3	Intlk08
	3	Intlk16

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Block icon for
	1	Intlk02
	1	Intlk04
	1	Intlk08
	1	Intlk16
	2	Intlk02
	2	Intlk04
	2	Intlk08
	2	Intlk16

Block icons (mini) without display of instance-specific names

These icons only show the output signal. They take the form of a small rectangle.

Display of the output signal

The display can show the following states for the output signal (priority from high to low):

- Gray: No inputs interconnected at the interlock block, the block is not used
- Blue: The output signal is 1, at least one input signal is bypassed. There is no gray state.
- Yellow: The signal status is 16#60; the output signal is simulated. There are no gray and blue states.
- Red: The output signal is 0; there is an interlock. There are no gray, blue, and yellow states.
- Green: The output signal is 1; the block is in the good state. There are no gray, blue, yellow, and red states.

Additional information on the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

1.2.6 Adding block icons to a static picture component

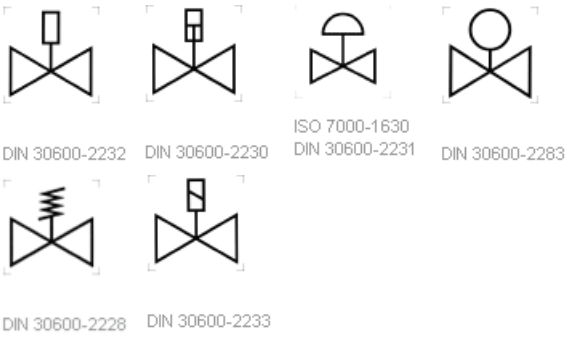
Static picture component for the block icons

The block icons for drives and valves contain no static picture components. However, you can add static picture components to the block icons by copying them from the @TemplateAPLV7.PDL/@TemplateAPLV8.PDL template and placing them over the block icons.

The following static picture components are available:

- Static picture components for motor blocks:

- Static picture components for valve blocks:



Note

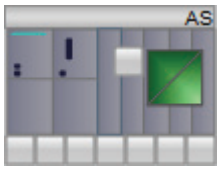
The static picture components for the valves are visible here above the valve icon.

Note that all the block icons of the APL are located on layer 0 of the process picture. Layer 1 is intended for the static picture component. This ensures that the static picture component is always over the block icon. If you have changed this layer of the block icon, the static picture component should always be placed in a higher layer.

1.2.7 Display for avoiding stop without asset management

"OB_BEGIN" block icon

If your system does not have ASSET diagnostics, a separate block icon is provided to display stop avoidance on the OS in the template @TemplateAPLV7.PDL/@TemplateAPLV8.PDL. The block icon is stored in the "Diagnostics" section under the name "OB_BEGIN".



Configuration

You configure the OB_BEGIN block icon for each AS. You then interconnect each block icon with the corresponding OB_BEGIN structure variable.

To achieve all the required interconnections to the block icon, it is best to use the PCS 7 WinCC Wizard for interconnecting faceplates to process tags. In the tag dialog "List of all structure variables", you can select the relevant OB_BEGIN instance.

Note on the "OB_BEGIN" faceplate

In the OB_BEGIN faceplate for the OB_BEGIN and CPU_RT blocks without asset management, the message view, the performance view and the detailed views (OB3x and OB8x/OB1) are displayed if SFC78 is supported on the AS. If SFC78 is not supported, only the message view of the faceplate is displayed.

The identification view and parameter view are not shown.

Icons for user-defined SFC types

The following icons are available in the template for user-defined SFC types.

1.3 Functions of the faceplates

1.3.1 Structure of the faceplate

General functions of the faceplates

This section provides general information that applies to all faceplates.

Recommended screen resolution

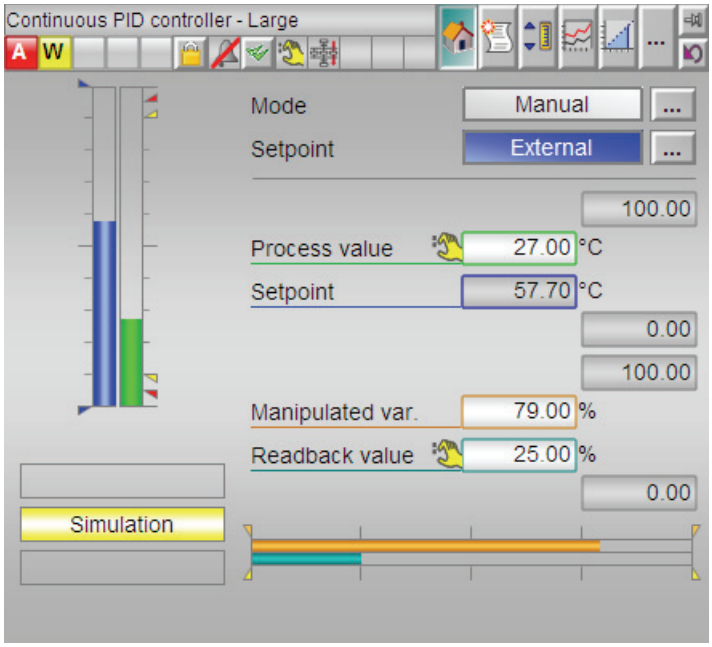
The faceplates are shown in full on the screen with a resolution of 1280 x 1024. The full-screen mode (press the F11 key) must also be activated on the Web client.

Displaying CPU stop

With a CPU stop, boxes are unavailable or hidden and a yellow warning triangle is displayed in the group display for blocks with messaging. No operations are possible.

Opening the faceplate

Click on the block icon in WinCC to open the faceplate with the standard view; in this example this is the standard view of PIDConL:



Note

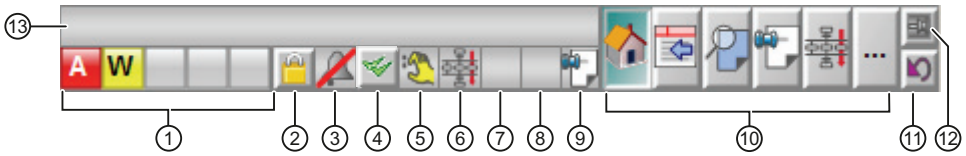
Some of the illustrations of the faceplate views and block icons in the help for the PCS 7 Advanced Process Library are examples or offline representations. The representations on runtime may vary.

The views differ depending on the block functions. All blocks that have faceplates provide a status bar where you can see the most important information relating to the block status. There are additional functions available that are described in the next sections.

Note

Display elements of block inputs with `16#FF` as their status default, are only shown when their block inputs are interconnected (status ≠ FF). Exception: The values for `Gain`, `TI` and `TD` are always displayed for controller blocks.

Displays and operator controls



The faceplate provides the following display and operator controls:

(1) Group display

(2) Lock alarms

(3) Suppress alarms

(4) Acknowledge alarms

(5) Worst signal status

(6) Batch display

(7) At least one delay time effective at the block

(8) Maintenance request and release

(9) Memo display

(10) Open views of the block

(11) Back to block icon

(12) Pin block

(13) Instance name of the block

(1) Group display

The group display shows the information that is transferred from ALARM_8P of the block instance to WinCC.

- Alarms
- Warnings
- Tolerances
- Faults
- Operator prompts

(2) Lock/unlock alarms

You can use this button to lock or unlock block alarms.

If you lock the alarms of the block, it is shown in the group display of alarms as a white x. When alarms are locked, the block instance does not send any new alarms. Previous alarms are also no longer displayed in the alarm view of the faceplate.

The alarms are displayed again in the group view when you unlock the block's alarms. The block instance then resumes sending new alarms. Alarms generated in the locked phase are displayed when you enable the alarm function.

The operator authorization level for this button is set in the internal variable @LockMessageAuthLevel. This variable is set by the OS project editor.

For reasons of optimization, the operator authorization level set in @LockMessageAuthLevel also has to exist at an OperationLevelx of the block icon of the process tag (for example higher process control). Otherwise, operator control of the button "Disable messages" is not possible.

You can hide this button from specific users / user groups using the permissions in PCS 7-OS. Refer to the PCS 7-OS help system.

(3) Suppress alarms

Message suppression indicates whether or not the "Suppress process messages" function in the AS block is activated with the `MsgLock` parameter. If message suppression is activated, all messages in this block instance – except for process control messages – are suppressed.

(4) Acknowledge alarms

You can acknowledge all alarms from the block instance using this button.

You can hide this button from specific users / user groups using the permissions in PCS 7-OS. Refer to the *Process Control System PCS 7; OS Process Control* documentation for more on this.

(5) Display for worst signal status

This display shows the worst signal status currently present. Refer to the Forming and outputting signal status for blocks (Page 92) section for more on this.

(6) Batch display

The batch display shows whether or not the block instance is in use by SIMATIC BATCH.

Refer to the SIMATIC BATCH functionality (Page 55) section for more on this.

(7) At least one delay time effective at the block

(8) Maintenance request and release

This display shows you if a maintenance request or release has been made for this block.

Refer to the Release for maintenance (Page 52) section for more on this.

(9) Memo display

This display shows you if a message has been left in the memo view for you. Refer to the Memo view (Page 252) section for more on this.

(10) Open views of a block

You can use this field to open the various views of a block. Refer to the block description to learn of the available views. Left clicking shows the view in the same window. Right clicking opens a new window.

You can select from the following typical views here:

Icon	Identifier
	Standard view
	Alarm view
	Limit value view (several limit value views within a block are possible)
	Trend view
	Ramp view
	Parameter view (several parameter views within a block are possible)
	Preview

Icon	Identifier
	Memo view
	Batch view
	Setpoint view
	Parameter view 1 (continues to parameter view 4, see line below)
	Parameter view 4
	Quantity view
	Flow view

Note

The buttons are unavailable when views cannot be selected.

(11) Back to block icon

Use this button to return to the block icon in the process image of the corresponding faceplate. You can use this function, for example, when you have pinned a block **(12)** and the process picture has changed in the meantime.

(12) Pin block

You can pin the faceplate on top of the user interface using this button. This allows you to change to another picture or area without closing the faceplate.

Note

You can learn about additional operator controls in the descriptions of the individual blocks.

1.3.2 Operator control permissions

Operator control permissions for blocks

The following conditions have an effect on operator control permissions:

- User management in the PCS 7 OS
- Local operating permission using the OpStations block
- Dependencies on operating modes in blocks
- Permissions via parameter assignment / interconnection of blocks
- Permissions via the `OS_Perm` input parameter at the block itself

User management in the PCS 7 OS

The following operator authorization levels from user management are used in the APL:

- Process control (for example, manual/automatic mode switchover, changing setpoints and manipulated variables).

  With this operator control permission, operations can be performed in the standard view of all blocks and input can be made in the ramp and memo views. The "Out of service" operating mode cannot be used with process controlling.

- Higher process controls (for example, changing limits, controller parameters and monitoring times).

  With this operator control permission, all operations in all views of all blocks are possible, including the operations for "Out of service" operating mode. Exception: The operations listed under "Highest process controlling".

- Highest process controls (simulate process values and release process tag for maintenance).

  With this operator control permission, simulation can be switched on and off in the parameter view and the process tag for maintenance work can be released.

- Extended operation 1

  Free project-specific operator authorization

- Extended operation 2

  Free project-specific operator authorization

Note

Exceptions to the uses described above are listed in the descriptions of the individual views.

Each operation is assigned with an operator authorization level in the faceplates. This fixed assignment can be changed for each instance at the "operator authorization level" property of an I/O in the AS block (for example, SP_Int with PIDConL). The following assignment applies:

Operator authorization level in the user management	Value "Operator authorization level" property
Process controls	1
Higher process controls	2
Highest process controls	3
Extended operation 1	4
Extended operation 2	5

Note

- The free three assignments in the upper table can be changed in the block icon at the properties "OperationLevel1_backup", "OperationLevel2_backup" and "OperationLevel3_backup". Any operator authorization level from the user management can be assigned the values 1 to 3. This type of instance-specific configuration is still available only for reasons of downward compatibility and should no longer be used in new projects.
- The controls for the message system (e.g. acknowledge messages) and trend display (e.g. export) are fixed across the system and cannot be changed via the AS block. The "Lock messages" control can be changed system-wide via the internal variable "`@LockMessageAuthLevel`" with the value of the operator authorization level from the user management (for example, value "6" for "Higher process controls").

Local operating permission using the OpStations block

Local operating permission is an upstream operator control permission which is determined before the operator control permissions for user management and the release of the block, and is realized via the OpStations (Page 304) block.

If local operating permission is missing, operation of a block instance on an OS is usually blocked. Otherwise, when local operating permission is allowed, the operator control permission is normally determined through user management and the block.

Local operating permission can be set for each specific instance; in other words, block instances can be enabled or disabled for use on an operator station independently of one another.

You can find additional information for the use of local operating permission in the section Description of OpStations (Page 304).

Dependencies on operating modes in blocks

You can execute various functions depending on the block mode. These permissions are stored in the block algorithm and are determined dynamically in online mode.

Permissions via parameter assignment / interconnection of blocks

The block is either controlled by the operator or by the controller, depending on parameter settings or on the interconnection. An example for this is the switchover from manual to automatic mode by a higher-level controller or by the operator. These permissions are stored in the block algorithm and are determined dynamically in online mode.

Permissions via the OS_Perm input parameter at the block itself

Controllable blocks have the OS_Perm input parameter which allows you to implement individual operator control strategies by setting the operator control permissions. A pressure relief valve, for example, can only be opened by the master control system. The operator may only close the valve. These authorizations are defined during configuration. These operator control permissions are displayed in the preview view of the faceplate. For information about setting the individual operator control permissions (OS_Perm) refer to the description of the functions of the individual blocks.

The relevant operator controls are enabled if the operator has suitable permissions. The block algorithm processes the input data.

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

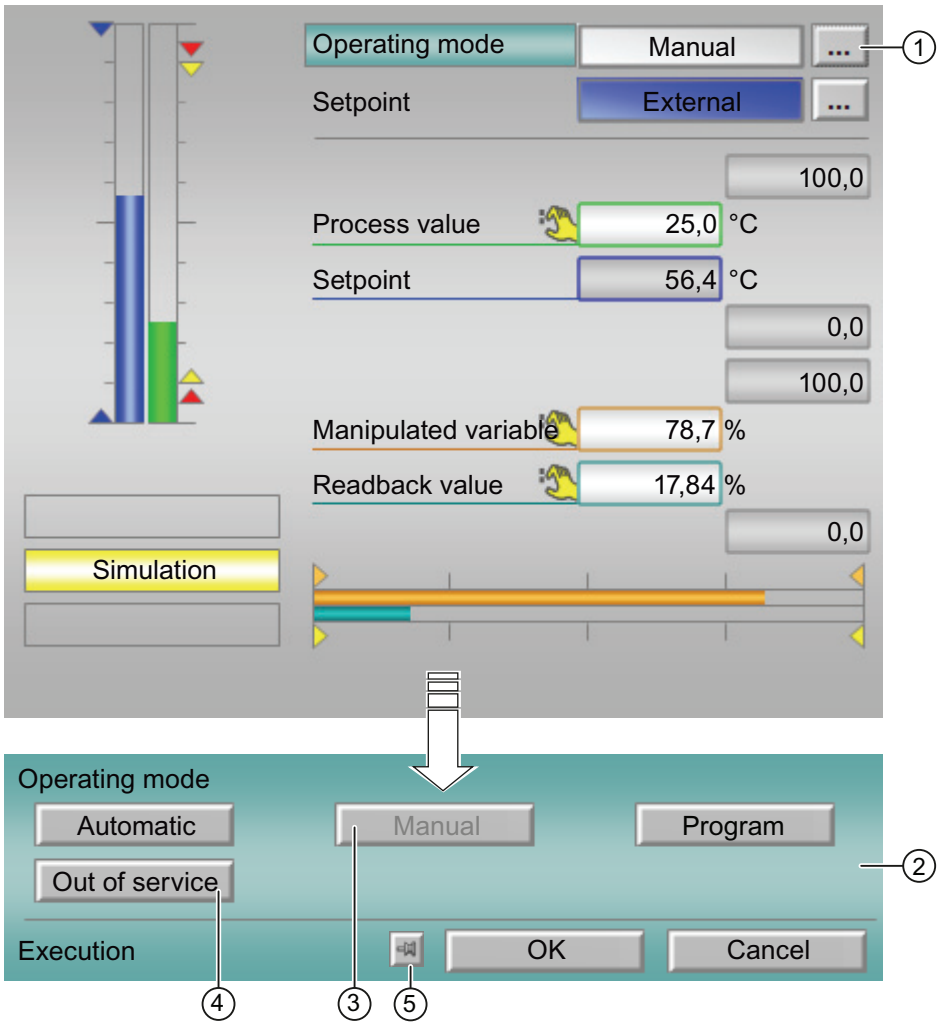
See also

Activating local operating permission (Page 130)

1.3.3 Switching operating states and operating modes

Requirements

You can change the operating state, operating mode and other parameters if needed in faceplates if you have the corresponding operator control permission (`OS_Perm`). This operator control permission can be configured in the engineering system (ES).



(1) The mouse cursor changes when you place it over the following button:

The mouse pointer now looks as follows:

When you click on the button with the mouse pointer, the bottom of the faceplate expands. You now see the field for changing the operating mode, for example.

(2) Field for changing the operating mode, operating state etc. This example describes changing the operating mode.

If the indicators for the operating state is currently located in this field and you have configured text for specific instances, this text is also shown. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) The text on this button is gray. You cannot select this operating mode due to the following reasons:

- This operator control permission for this operating mode cannot be configured in the engineering system (ES).

or

- The operating mode is already selected at this time.

or

- Due to the technology, you cannot switch from the operating mode currently set and the desired operating mode.

(4) The text on this button is black. You can switch to this operating mode.

How to change the operating mode (using the PIDConL block in standard view as an example)

1. Click one of the selectable buttons in the operating mode field.
2. Confirm your selection by clicking "OK".
3. If you do not want to apply your selection, click "Cancel".

After clicking the "OK" or "Cancel" button, the faceplate is reduced again to its original form.

(5) Multiple operation

If the operating window is not to close after the confirmation of a command, it can be "attached". The following button is located below the operating window for this purpose:

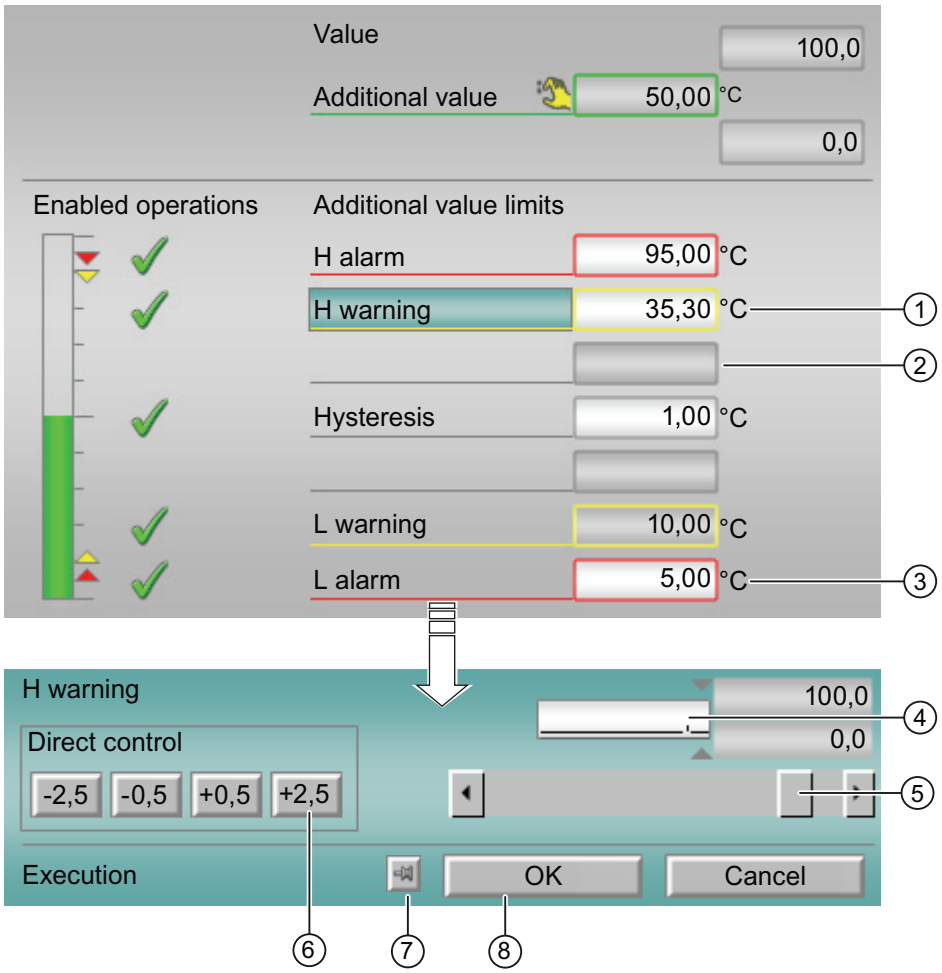
Operating window is closed after the value is applied

Operating window remains open after the value is applied

1.3.4 Changing values

Requirements

You can change the values in faceplates and in the block icons if you have the corresponding operator authorization (`OS_Perm`). This operator control permission can be configured in the engineering system (ES). The following example shows how values are changed via the faceplate.



(1) The background color of the input box is white. You can change the value. The mouse pointer changes when you place it over the input box:

(2) The background color of the input box is gray. You cannot change the value.

(3) If you click on the input box, the bottom of the faceplate expands. You now see the field for changing values.

How to change values in faceplates

You have three options for changing values:

- "Direct control": Click on a button such as "-2.5" in the box **(6)**. The value is immediately changed and applied. It is no longer necessary to confirm this value.
- Changing values using the slide control **(5)**: move the slide control until the desired value is shown in the box. Then confirm the value using the Enter key or by clicking "OK". Read the section "Setting the multiple step operation".
- Change the values in the input box **(4)**: Click the input box and enter the new value. Then confirm the value using the Enter key and clicking "OK". Read the section "Setting the multiple step operation".

Setting the multiple step operation

You can use the internal @APLCommandExecutionSteps tag in the Tag Management of the WinCC Explorer to specify if values are to be changed in two or three steps.

Follow the steps outlined below:

1. Double-click on the internal @APLCommandExecutionSteps tag
2. Change the start value to 2 or 3 in the Limits/Reporting tab.

   Start value = 2: It is no longer necessary to confirm the value in the faceplate by clicking "OK"; values are applied immediately.

   Start value = 3: Each value change in the faceplate (with the exception of those for direct control) needs to be confirmed with "OK".

Changing the values for "Direct control"

Specify the percentage values for the two inner keys for direct control with the `DirectOperationValue` property at the block icon. The outer two keys are automatically determined with `DirectOperationValue` times the factor 5.

If `DirectOperationValue` is not an integer but the values in the faceplate are integers, then `DirectOperationValue` is rounded up to the next integer.

If the rounded value is 0, 1 is used for `DirectOperationValue`.

The default value for `DirectOperationValue` is 0.5. With integer format, the "+/-1%" results for the inner keys and "+/-5%" for the outer keys.

(7) Multiple operation

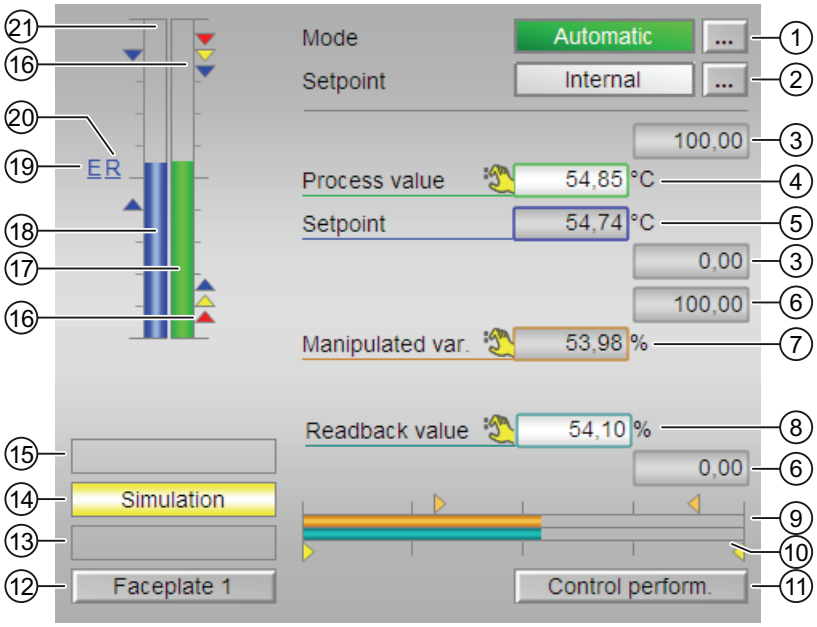
If the operating window is not to close after the confirmation of a command, it can be "attached". The following button is located below the operating window for this purpose:

Operating window is closed after the value is applied

Operating window remains open after the value is applied

1.3.5 FM controllers standard view (analog)

Standard view (analog) of FM controllers



(1) Display and switch the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 59)
- Automatic mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Display and switch the setpoint specification

This area shows how to specify the setpoint. The setpoint can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

For more information on the setpoint specification, refer to the Setpoint specification - internal/external (Page 112) section.

If text is configure for these commands, it is displayed as additional text and as button labels for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) High and low scale range for the process value

These values provide information on the display range (`PV_OpScale`) for the bar graph of the process value. The scale range is defined in the engineering system.

(4) Display of the process value including signal status

This area provides information on the current process value (`PV`) with the corresponding signal status.

(5) Display and change the setpoint including signal status

This area provides information on the current setpoint (`SP`) with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the setpoint. The setpoint specification **(2)** also needs to be set to "Internal" for this block.

(6) High and low scale range for the setpoint

This area is already set and cannot be changed.

(7) Display and change the manipulated variable including signal status

This area shows the current "Manipulated variable" (`MV`) with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the manipulated variable. You can only make a change in manual mode.

(8) Display of the position feedback including signal status

This display is only visible when the corresponding block input is connected.

This area provides information on the current readback value of the manipulated variable with the corresponding signal status. This display is only available when the readback value in the box is interconnected to the `Rbk` input parameter.

(9) Bar graph for the "Manipulated variable"

This area shows the current "Manipulated variable" in the form of a bar graph (`MV_OpScale`). The visible area in the bar graph depends on the configuration in the engineering system (ES).

(10) Bar graph for the position feedback

This display is only visible when the corresponding block input is connected.

This area shows the current position feedback in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(11) Navigation button for switching to the standard view of the ConPerMon block

Use this navigation button to reach the standard view of the ConPerMon block. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See also the Opening additional faceplates (Page 165) section for more on this.

(12) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See also the Opening additional faceplates (Page 165) section for more on this.

(13) Display area for states of the block

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(14) Display area for states of the block

This area provides additional information on the operating state of the block:

- "Simulation"

Additional information is available in the section Simulating signals (Page 47).

(15) Display area for states of the block

This area provides additional information on the operating state of the block (from high to low according to priority):

- "Fuzzy Optim." (FmCont only)
- "Tracking FB"
- "Tracking FM"
- "Safety mode FM"
- "Fuzzy control" (FmCont only)

(16) Limit display

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning
- Blue: Tolerance

(17) Bar graph for the "Process value"

This area shows the current "Process value" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(18) Bar graph for the "Setpoint"

This area shows the current "Setpoint" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(19) Display for external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(20) Display for the target setpoint of the setpoint ramp

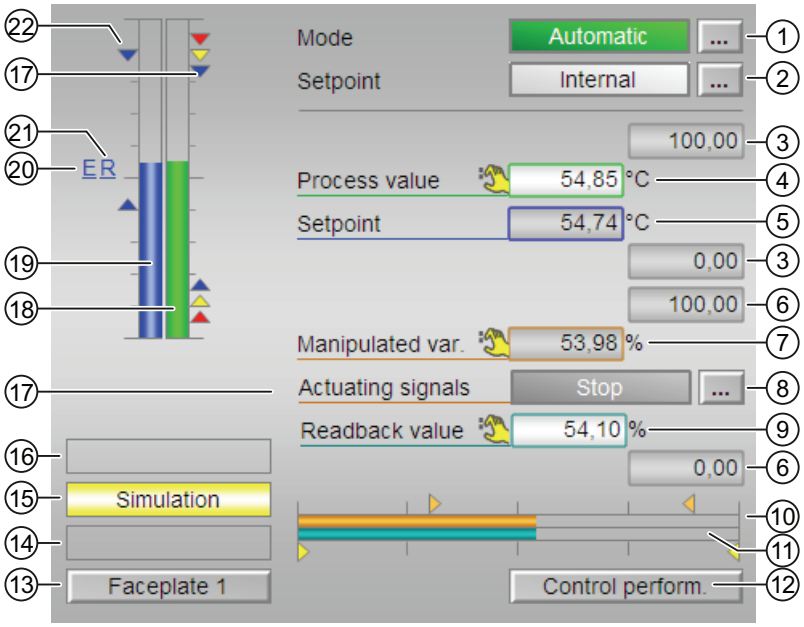
This display [R] shows you the target setpoint and is only visible if you have enabled ramp generation in the Ramp view (Page 248).

(21) Limit display for the setpoint

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the ES.

1.3.6 FM controllers standard view (pulse controller)

Standard view (pulse) of FM controllers



(1) Display and switch the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 59)
- Automatic mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Display and switch the setpoint specification

This area shows how to specify the setpoint. The setpoint can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

For more information on the setpoint specification, refer to the Setpoint specification - internal/external (Page 112) section.

(3) High and low scale range for the process value

These values provide information on the display range (PV_OpScale) for the bar graph of the process value. The scale range is defined in the engineering system.

(4) Display of the process value including signal status

This area provides information on the current process value (PV) with the corresponding signal status.

(5) Display and change the setpoint including signal status

This area provides information on the current setpoint (SP) with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the setpoint. The setpoint specification **(2)** also needs to be set to "Internal" for this block.

(6) High and low scale range for the setpoint

This area is already set and cannot be changed.

(7) Display and change the manipulated variable including signal status

This area shows the current "Manipulated variable" (MV) with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the manipulated variable. You can only make a change in manual mode.

(8) Display of the actuating signal

This area shows the current feedback of the actuating signal.

- "Open"
- "Close"

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167).

(9) Display of the position feedback including signal status

This display is only visible when the corresponding block input is connected.

This area shows the current feedback of the manipulated variable with the corresponding signal status. This display is only available when the readback value in the box is interconnected to the Rbk input parameter.

(10) Bar graph for the "Manipulated variable"

This area shows the current "Manipulated variable" in the form of a bar graph (`MV_OpScale`). The visible area in the bar graph depends on the configuration in the engineering system (ES).

(11) Bar graph for the position feedback

This display is only visible when the corresponding block input is connected.

This area shows the current position feedback in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(12) Navigation button for switching to the standard view of the ConPerMon block

Use this navigation button to reach the standard view of the ConPerMon block. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See the section Opening additional faceplates (Page 165) for more information.

(13) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See the section Opening additional faceplates (Page 165) for more information.

(14) Display area for states of the block

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(15) Display area for states of the block

This area provides additional information on the operating state of the block:

- "Simulation"

Additional information is available in the section Simulating signals (Page 47).

(16) Display area for states of the block

This area provides additional information on the operating state of the block (from high to low according to priority):

- "Fuzzy Optim." (FmCont only)
- "Tracking FB"
- "Tracking FM"
- "Safety mode FM"
- "Fuzzy control" (FmCont only)

(17) Limit display

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning
- Blue: Tolerance

(18) Bar graph for the "Process value"

This area shows the current "Process value" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(19) Bar graph for the "Setpoint"

This area shows the current "Setpoint" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(20) Display for external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(21) Display for the target setpoint of the setpoint ramp

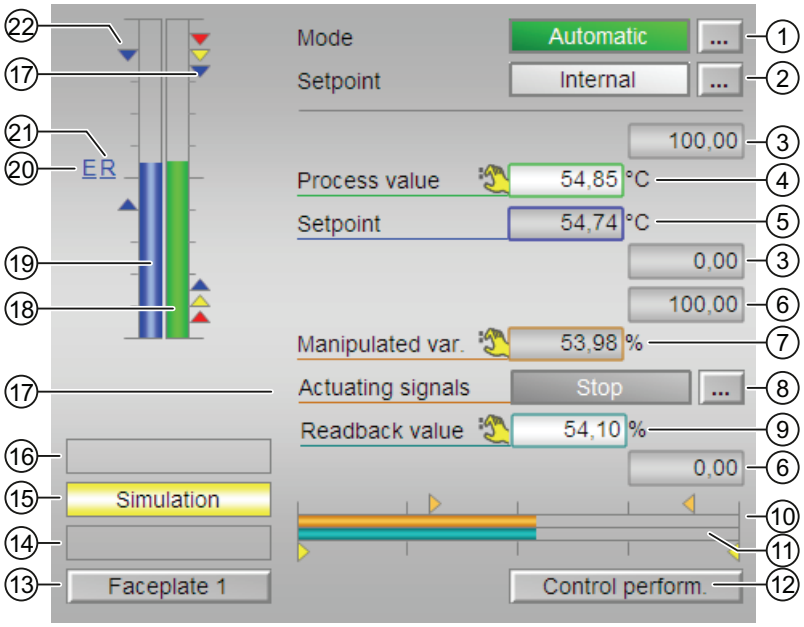
This display [R] shows the target setpoint and is only visible if you have enabled ramp generation in the Ramp view (Page 248).

(22) Limit display for the setpoint

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the ES.

1.3.7 FM controllers standard view (step controller with position feedback)

Standard view with position feedback of FM controllers



(1) Display and switch the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 59)
- Automatic mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Display and switch the setpoint specification

This area shows how to specify the setpoint. The setpoint can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

For more information on the setpoint specification, refer to the Setpoint specification - internal/external (Page 112) section.

(3) High and low scale range for the process value

These values provide information on the display range (PV_OpScale) for the bar graph of the process value. The scale range is defined in the engineering system.

(4) Display of the process value including signal status

This area provides information on the current process value (PV) with the corresponding signal status.

(5) Display and change the setpoint including signal status

This area provides information on the current setpoint (SP) with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the setpoint. The setpoint specification **(2)** also needs to be set to "Internal" for this block.

(6) High and low scale range for the setpoint

This area is already set and cannot be changed.

(7) Display and change the manipulated variable including signal status

This area shows the current "Manipulated variable" (MV) with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the manipulated variable. You can only make a change in manual mode.

(8) Display of the actuating signal

This area shows the current feedback of the actuating signal.

- "Open"
- "Stop"
- "Close"

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167).

(9) Display of the position feedback including signal status

This display is only visible when the corresponding block input is connected.

This area shows the current feedback of the manipulated variable with the corresponding signal status. This display is only available when the readback value in the box is interconnected to the Rbk input parameter.

(10) Bar graph for the "Manipulated variable"

This area shows the current "Manipulated variable" in the form of a bar graph (`MV_OpScale`). The visible area in the bar graph depends on the configuration in the engineering system (ES).

(11) Bar graph for the position feedback

This display is only visible when the corresponding block input is connected.

This area shows the current position feedback in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(12) Navigation button for switching to the standard view of the ConPerMon block

Use this navigation button to reach the standard view of the ConPerMon block. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See the section Opening additional faceplates (Page 165) for more information.

(13) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See the section Opening additional faceplates (Page 165) for more information.

(14) Display area for states of the block

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(15) Display area for states of the block

This area provides additional information on the operating state of the block:

- "Simulation"

Additional information is available in the section Simulating signals (Page 47).

(16) Display area for states of the block

This area provides additional information on the operating state of the block (from high to low according to priority):

- "Fuzzy Optim." (FmCont only)
- "Tracking FB"
- "Tracking FM"
- "Safety mode FM"
- "Fuzzy control" (FmCont only)

(17) Limit display

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning
- Blue: Tolerance

(18) Bar graph for the "Process value"

This area shows the current "Process value" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(19) Bar graph for the "Setpoint"

This area shows the current "Setpoint" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(20) Display for external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(21) Display for the target setpoint of the setpoint ramp

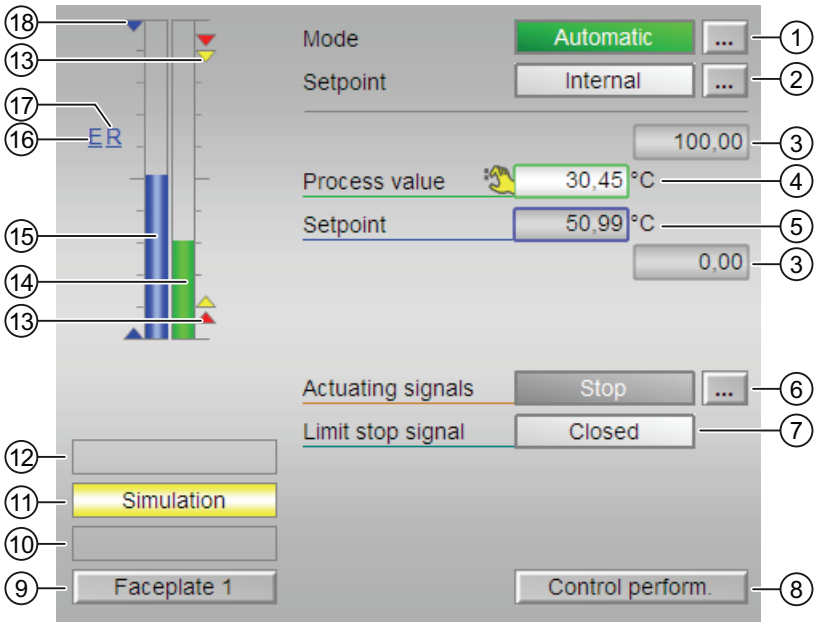
This display [R] shows the target setpoint and is only visible if you have enabled ramp generation in the Ramp view (Page 248).

(22) Limit display for the setpoint

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the ES.

1.3.8 FM controllers standard view (step controller without position feedback)

Standard view without position feedback of FM controllers



(1) Display and switch the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 59)
- Automatic mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Display and switch the setpoint specification

This area shows how to specify the setpoint. The setpoint can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

For more information on the setpoint specification, refer to the Setpoint specification - internal/external (Page 112) section.

(3) High and low scale range for the process value

These values provide information on the display range (`PV_OpScale`) for the bar graph of the process value. The scale range is defined in the engineering system.

(4) Display of the process value including signal status

This area provides information on the current process value (`PV`) with the corresponding signal status.

(5) Display and change the setpoint including signal status

This area provides information on the current setpoint (`SP`) with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the setpoint. The setpoint specification **(2)** also needs to be set to "Internal" for this block.

(6) Operating and displaying the actuating signal

This area shows the current feedback of the actuating signal.

- "Open"
- "Stop"
- "Close"

The button is shown next to the display in manual mode. You can influence the actuating signal here. Refer to the Switching operating states and operating modes (Page 208) section for more on this.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167).

(7) Display of the limit stop value including signal status

This area shows the limit stop signal with the corresponding signal status.

- "Open"
- "Closed"

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167).

(8) Navigation button for switching to the standard view of the ConPerMon block

Use this navigation button to reach the standard view of the ConPerMon block. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See the section Opening additional faceplates (Page 165) for more information.

(9) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See the section Opening additional faceplates (Page 165) for more information.

(10) Display area for states of the block

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(11) Display area for states of the block

This area provides additional information on the operating state of the block:

- "Simulation"

Additional information is available in the section Simulating signals (Page 47).

(12) Display area for states of the block

This area provides additional information on the operating state of the block (from high to low according to priority):

- "Fuzzy Optim." (FmCont only)
- "Tracking FB"
- "Tracking FM"
- "Safety mode FM"
- "Fuzzy control" (FmCont only)

(13) Limit display

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning
- Blue: Tolerance

(14) Bar graph for the "Process value"

This area shows the current "Process value" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(15) Bar graph for the "Setpoint"

This area shows the current "Setpoint" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(16) Display for external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(17) Display for the target setpoint of the setpoint ramp

This display [R] shows the target setpoint and is only visible if you have enabled ramp generation in the Ramp view (Page 248).

(18) Limit display for the setpoint

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the ES.

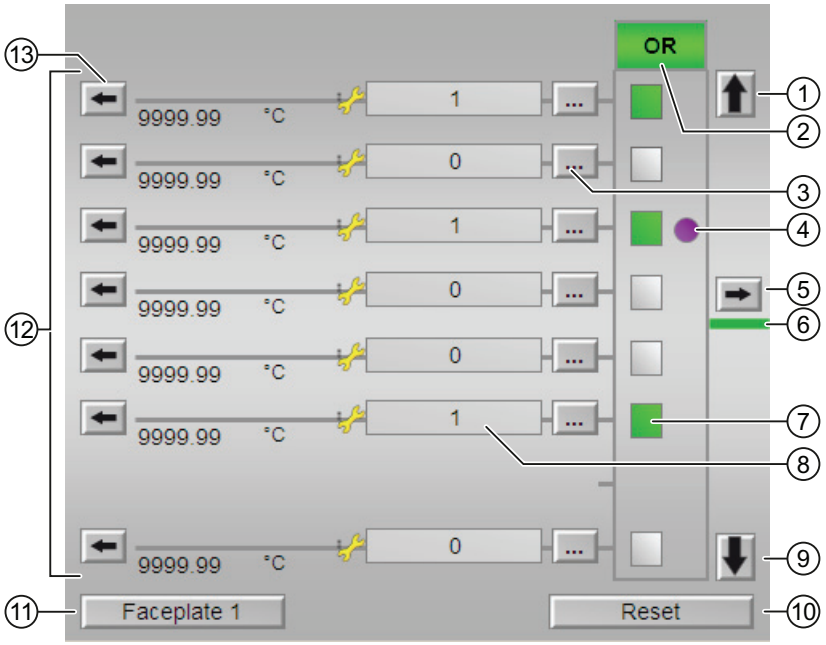
1.3.9 Interlock blocks standard view

Interlock blocks standard view Intlk02, Intlk04, Intlk08, Intlk16

The number of the displayed input values depends on the interlock block you have selected.

The operation and functions are identical for all interlock blocks and do not depend on the number of input values.

The **Intlk16** interlock block has two additional buttons for switching between the input values 1 to 8 and 9 to 16.



(1), (9) Switching between the input values 1 to 8 and 9 to 16 (for Intlk16 only)

The buttons (1) or (9) are displayed depending on the view you are in. These buttons are only available for the **Intlk16** block.

The **Intlk16** block provides two views:

- When you are in the first view, the input values 1 to 8 are available in the area (12). The button (9) is displayed. You switch to the second view by clicking on the button (9).
- When you are in the second view, the input values 9 to 16 are available in the area (12). The button (1) is displayed. You switch back to the first view by clicking on the button (1).

(2) Status of the output signal of the interlock block

This area (2) shows the status of the output signal of the interlock block (priority from high to low). You can configure the logic in the engineering system (ES).

	Logic	
Color of the field	**AND**	**OR**
Gray	Interlock signal not used by the technologic block.	
Blue	Excluded (bypass)	
Yellow	Simulated	
Red	Interlocked	
Green	Not interlocked	

(3) Exclude input values

You can use the button (3) to exclude input values from processing. Depending on the previous settings, you can "Set" or "Reset" this property.

If the input value has been excluded, the following icon appears in the field (8):

For more information on the operation, refer to the section Switching operating states and operating modes (Page 208).

Note

This function can only be executed in the faceplate with "high-level operator control permission".

(4) "First in" status display

The following icon is displayed next to an input value, if this input value has caused the last output signal change from 1 to 0 (good state to locked):

You can reset the first-in (initial) signal with the button (10).

Note

This function can only be executed in the faceplate with "process control" operator control permission.

You can find additional information on this in the Recording the first signal for interlock blocks (Page 42) section.

For more information on the operation, refer to the section Switching operating states and operating modes (Page 208).

(5) Open faceplate of the output value

When you press the button (5), you can open the faceplate associated with the output value. The function of this button depends on the configuration in the engineering system (ES). See also the Opening additional faceplates (Page 165) section for more on this.

(6) Status of the block output

The line color indicates the status of the block output:

Color of the line	Output status
Green	Output is enabled
White	Output is disabled

(7) Display the status for further processing

The icon shows the status for further processing of the input values:

Icon	Further processing
	The input value will be further processed (value=1).
	The input value is excluded from further processing.
	The input value is not connected (value=0).

(8) Display of input values (BOOL) with signal status (in front of the field)

These fields show the interlock information associated with the analog value (13) with a signal status:

- 1 = "Good" state
- 0 = "Locked"

Changing the display

You can change the displays for 0 and 1 in the CFC in the object properties of the Interlock block:

- Navigate to the I/Os (object properties).
- Change the default for the input parameters (`Inxx`) in the Text 0 and Text 1 columns to what you later want to see in runtime.

(9) Switching input values

Read point (1) for this.

(10) "Reset" the settings for further processing

When you press the button (10), you can "Reset" all input values:

- "Reset exclusions": the exclusions of the input values are reset.
- "Reset first-in": First-in detection / status display (4) is reset.

You can find additional information on this in the Recording the first signal for interlock blocks (Page 42) section.

(11) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(12) Displaying analog input values

The interconnected analog input values (`AVxx`) are displayed in this area. Set a unit of measure (`AVxx_Unit` as shown in the picture with [Unit]) for each input in the engineering system (ES).

Changing the display

You can change the displays in the CFC in the object properties of the Interlock block:

- Navigate to the I/Os (object properties).
- In the "Identifier" column, change the default setting for the input parameter (`AVxx`) to what you want to see during runtime later.
- The text is used as a label and is therefore always displayed, in other words, it is independent of the signal status of the corresponding `AVxxx` input.

The number of input values may vary depending on the selected interlock block:

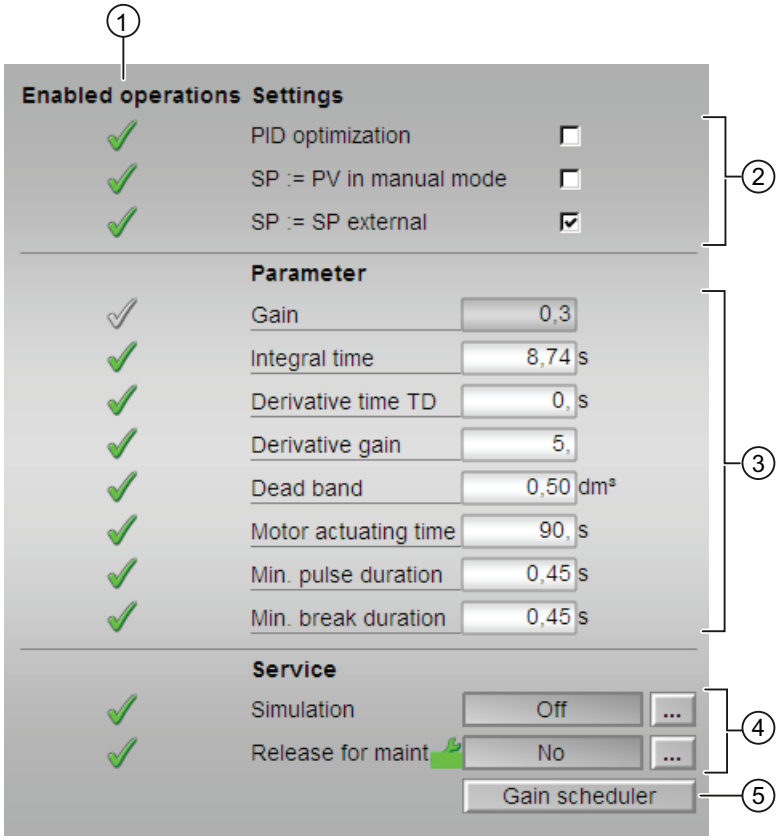
- **Intlk02:** the input values 1 and 2 are available.
- **Intlk04:** the input values 1 to 4 are available.
- **Intlk08:** the input values 1 to 8 are available.
- **Intlk16:** the input values 1 to 8 are available. The input values 9 to 16 become available by pressing the button (9). You can find additional information on this topic in the description for (1) and (9).

(13) Open faceplate of the input value

When you press the button (13), you can open the faceplate associated with each input value. The function of this button depends on the configuration in the engineering system (ES). See also the Opening additional faceplates (Page 165) section for more on this.

1.3.10 Parameter view of PID controllers

Parameter view of PID controllers



(1) "Enabled operations"

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (OS_Perm or OS1Perm).

(2) "Settings"

You can activate the following functions for the controller in this area:

- "PID optimization": ☑ activate controller optimization
- "SP := PV in manual mode": ☑ Bumpless switchover from manual mode to automatic mode
- "SP := SP external": ☑ Bumpless switchover of the setpoint for setpoint switchover from "external" to "internal". The internal setpoint is tracked to the external one.
  - With the PIDConR block, this area is only visible if you have set the `Feature` bit Switching operator controls for external setpoint to visible (Page 120) to 1.

(3) "Parameters"

In this area, you change parameters and therefore influence the controller. Refer to the Changing values (Page 210) section for more on this.

You can influence the following parameters:

- "Gain": Proportional gain
- "Integral time" Integral action time in [s]
- "Derivative time TD": Derivative action time in [s]
- "Derivative gain": Gain of the derivative action
- "Dead band": Width of dead band
- "Control zone": Width of the control zone (only with PIDConL block)
- "Motor actuating time": Motor actuating time [s] (for PIDStepL block only)
- "Minimum pulse duration": Minimum pulse duration [s] (for PIDStepL block only)
- "Minimum break duration": Minimum break duration [s] (for PIDStepL block only)

(4) "Service"

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance" (with display for a maintenance request)

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

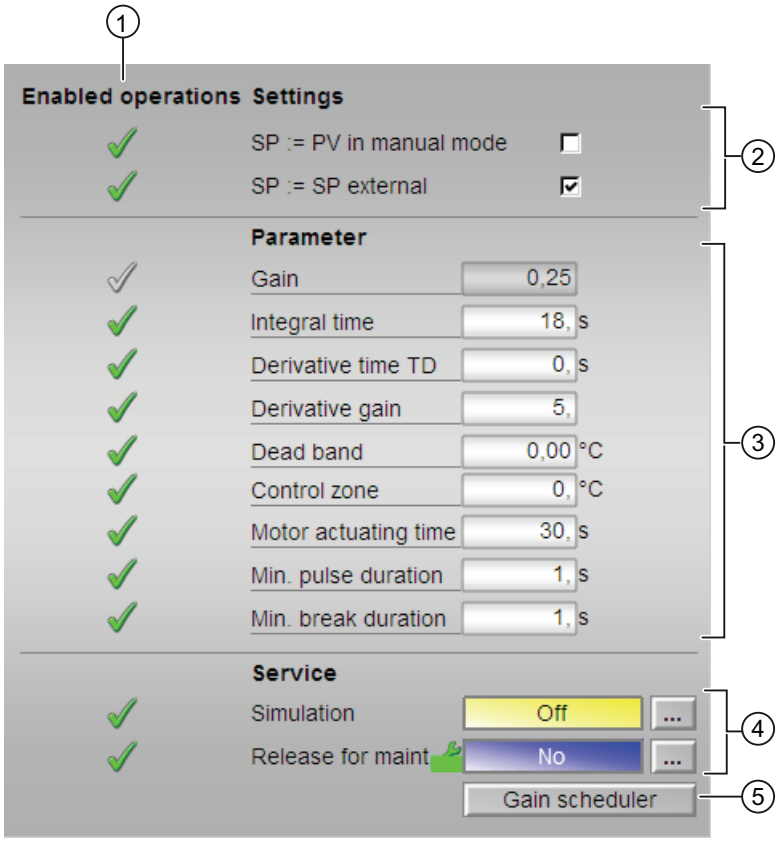
(5) Navigation button for the GainSched block

You can use this navigation button to reach the GainSched block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

1.3.11 Parameter view of FM controllers

Parameter view of FM controllers



(1) "Enabled operations"

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (OS_Perm or OS1Perm).

(2) "Settings"

You can activate the following functions for the controller in this area:

- "SP := PV in manual mode": ☑ Bumpless switchover from manual mode to automatic mode
- "SP := SP external": ☑ Bumpless switchover of the setpoint for setpoint switchover from "external" to "internal" The internal setpoint is tracked to the external one.

(3) "Parameters"

In this area, you change parameters and therefore influence the controller. Refer to the Changing values (Page 210) section for more on this.

You can influence the following parameters:

- "Gain": Proportional gain
- "Integral time" Integral action time in [s]
- "Derivative time TD": Derivative action time in [s]
- "Derivative gain": Gain of the derivative action
- "Dead band": Width of dead band
- "Control zone": Width of the control zone (for block FmTemp only)
- "Motor actuating time": Motor actuating time [s]
- "Minimum pulse duration": Minimum pulse duration [s]
- "Minimum break duration": Minimum break duration [s]

(4) "Service"

You can activate the following functions in this area:

- "Simulation"
- "Release for maintenance" (with display for a maintenance request)

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

(5) Navigation button for the GainSched block

You can use this navigation button to reach the GainSched block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

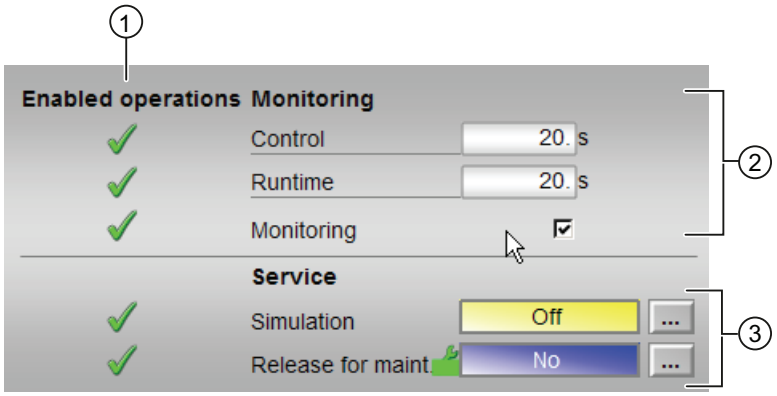
You can find additional information on this in the Opening additional faceplates (Page 165) section.

1.3.12 Parameter view for motors and valves

Parameter view for motors and valves

The following parameter view applies to the following bocks:

- MotL - motor (Large) (Page 839)
- MotS - motor (Small) (Page 870)
- MotSpdL - Two-speed motor (Page 971)
- VlvL - valve (Large) (Page 1060)
- Auto-Hotspot



(1) "Enabled operations"

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (OS_Perm or OS1Perm).

(2) "Monitoring"

In this area, you change parameters and therefore influence the motor. Refer to the Changing values (Page 210) section for more on this.

You can influence the following parameters:

- "Control": Monitoring time during startup and shutdown of the motor (dynamic)
- "Runtime": Monitoring time during permanent operation of the motor (static)

  The runtime does not appear for small blocks.

Enabling "Monitoring"

You can enable monitoring by clicking the check box (☑)

You can find additional information on this in the Monitoring the feedbacks (Page 83) section.

(3) "Service"

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance" (with display for a maintenance request)

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

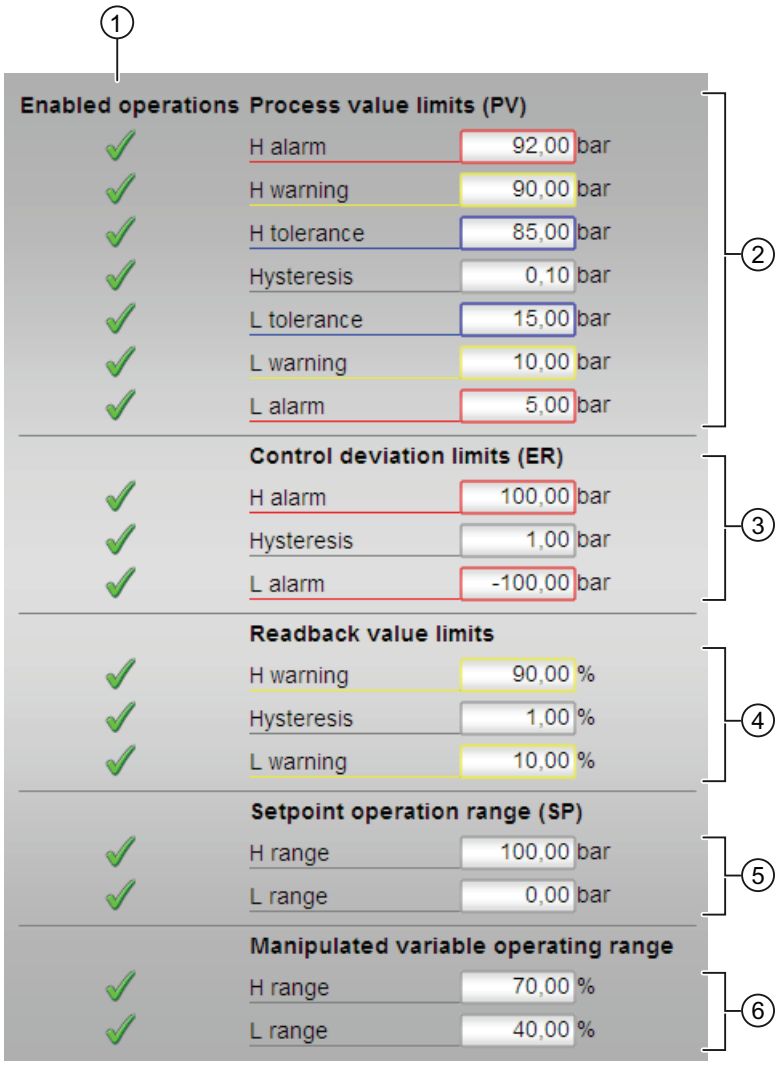
1.3.13 Limit value view of FM controllers

Limit value view of FM controllers

Several values are set in this view by default:

- Process value limits
- Control deviation limits
- Readback value limits
- Setpoint operation range

The toolbars of the faceplate and the block icon indicate when the limit(s) is reached or exceeded.



(1) "Enabled operations"

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (OS_Perm or OS1Perm).

(2) "Process value limits (PV)"

In this area, you can enter the limits for the process value. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high
- "H tolerance": Tolerance high
- "Hysteresis"
- "L tolerance": Tolerance low
- "L warning": Warning low
- "L alarm": Alarm low

(3) "Control deviation limits (ER)"

In this area, you can enter the limits for the control deviation. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "Hysteresis"
- "L alarm": Alarm low

(4) "Readback value limits (Rbk)"

In this area, you can enter the limits for the readback value. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H warning": Warning high
- "Hysteresis"
- "L warning": Warning low

(5) "Setpoint operation range (SP)"

In this area, you can enter the limits for the setpoint operation range. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H range": Range limit high
- "L range": Range limit low

(6) "Manipulated variable operating range"

In this area, you can enter the limits for the manipulated variable operation range. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H range": Range limit high
- "L range": Range limit low

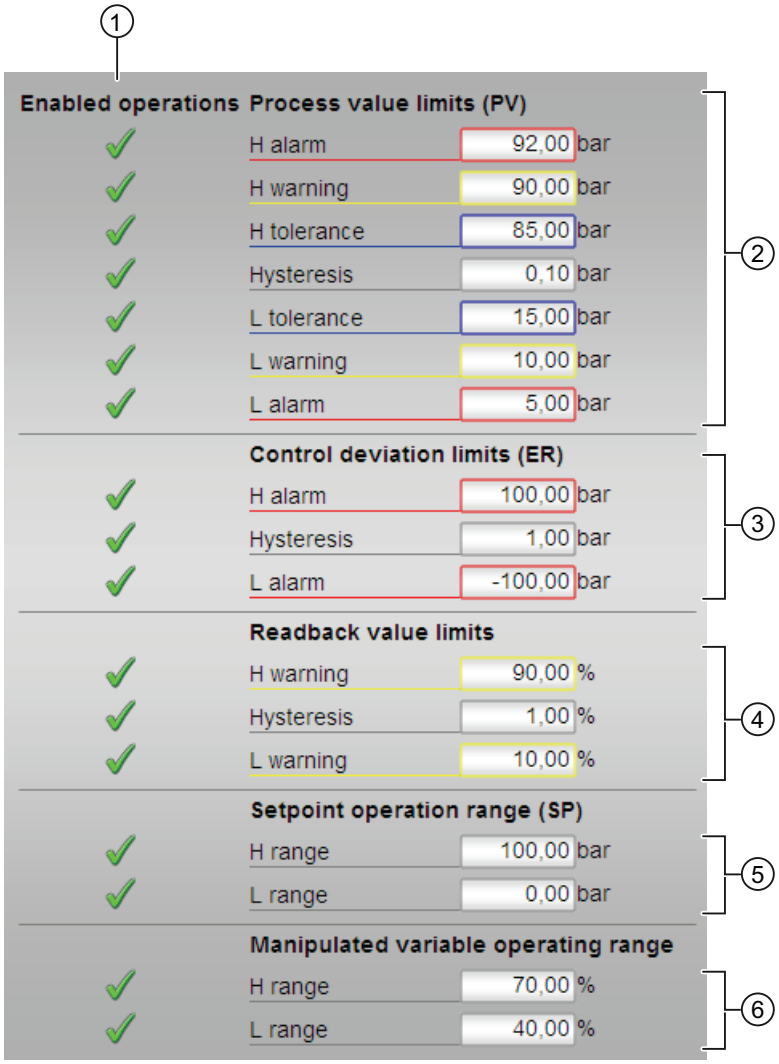
1.3.14 Limit value view of PID controllers

Limit value view of PID controllers

Several values are set in this view by default:

- Process value limits
- Control deviation limits
- Readback value limits
- Setpoint operation range

The toolbars of the faceplate and the block icon indicate when the limit(s) is reached or exceeded.



(1) "Enabled operations"

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (OS_Perm or OS1Perm).

(2) "Process value limits (PV)"

In this area, you can enter the limits for the process value. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high
- "H tolerance": Tolerance high
- "Hysteresis"
- "L tolerance": Tolerance low
- "L warning": Warning low
- "L alarm": Alarm low

(3) "Control deviation limits (ER)"

In this area, you can enter the limits for the control deviation. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "Hysteresis"
- "L alarm": Alarm low

(4) "Readback value limits (Rbk)"

In this area, you can enter the limits for the readback value. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H warning": Warning high
- "Hysteresis"
- "L warning": Warning low

(5) Setpoint operation range (SP)

In this area, you can enter the limits for the setpoint operation range. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H range": Range limit high
- "L range": Range limit low

(6) Manipulated variable operating range

In this area, you can enter the limits for the manipulated variable operation range. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

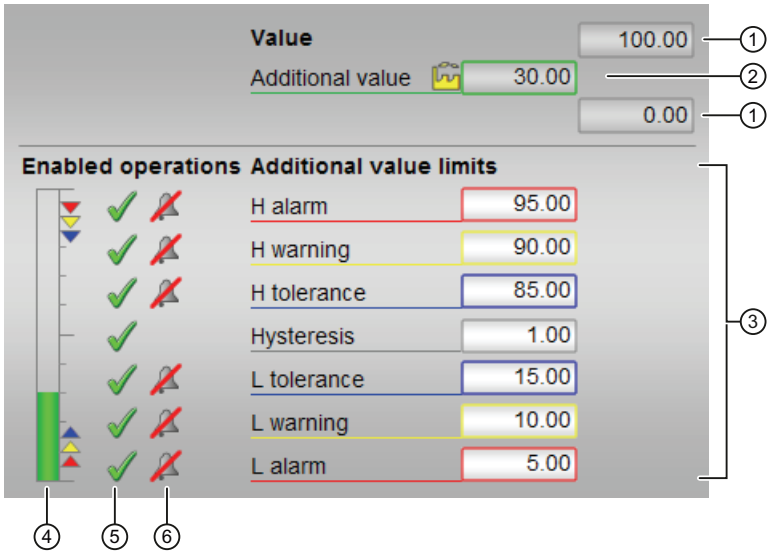
- "H range": Range limit high
- "L range": Range limit low

1.3.15 Limit value view of motors

Limit value view of motors

The limit value view of motors is only available when an AV block has been interconnected to the motor.

The toolbars of the faceplate and the block icon indicate when the limit(s) is reached or exceeded.



(1) High and low scale range for the additional value

These values provide information on the display range for the bar graph of the additional value. The scale range is defined in the engineering system.

(2) Display of the additional value including signal status

This area shows the current additional value with the corresponding signal status.

(3) "Limits for the additional value"

In this area, you can enter the limits for the additional value. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high
- "H tolerance": Tolerance high
- Hysteresis
- "L tolerance": Tolerance low
- "L warning": Warning low
- "L alarm": Alarm low

(4) Bar graph for the additional value

This area shows you the current additional value in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(5) "Enabled operations"

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (OS_Perm or OS1Perm).

The colored triangles indicate the specified limits **(3)** for the additional value.

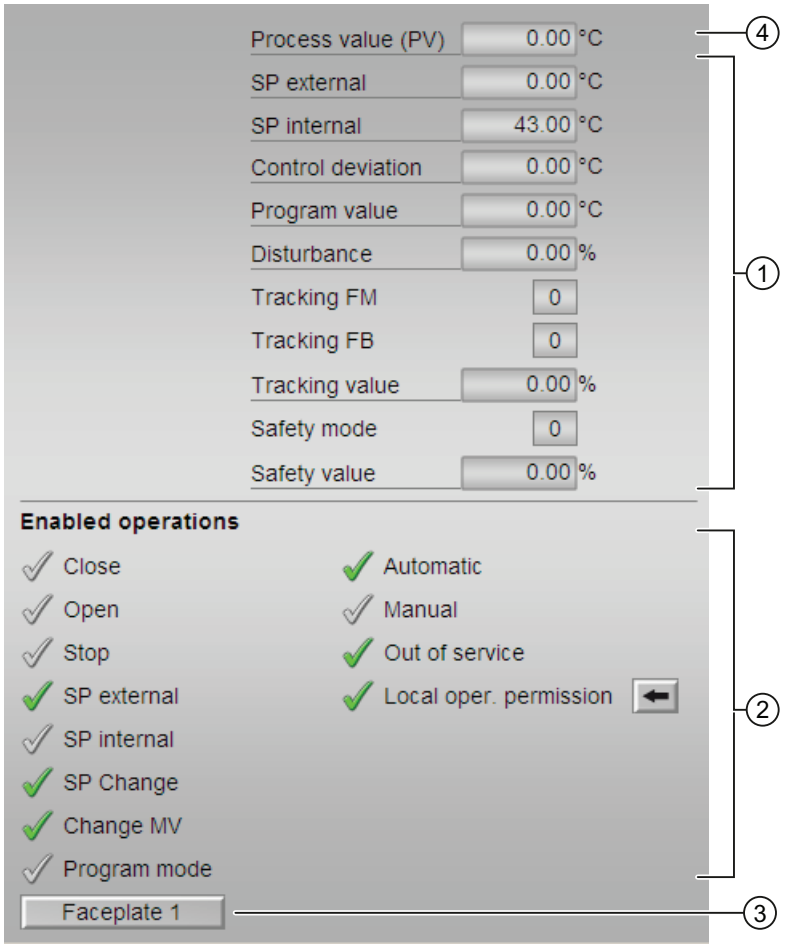
(6) Message suppression

Message suppression indicates whether or not the suppression of the associated message in the AS block is activated with the `xx_MsgEn` parameter. The output of messages is not suppressed when the block is installed (all `xx_MsgEn` parameters are preset to 1). Messages can only be output if limit monitoring of the additional analog value has been enabled.

1.3.16 Preview of FM controllers

Preview of FM controllers

The preview shows you the parameters that you, as an OS operator, can control in the entire block. You cannot control anything in this view, however.



(1) Preview area

This area shows you a preview for the following values:

- "SP external": currently applicable external setpoint
- "SP internal": currently applicable internal setpoint
- "Control deviation": Current control deviation
- "Program mode": Specified value for program mode
- "Disturbance variable": additive value for feedforward control
- "Tracking FM": track a manipulated variable in the FM module (value is 1)
- "Tracking FB": Track manipulated variable at the block (value is 1)
- "Tracking value": Effective manipulated variable for "Track manipulated variable at block"
- "Safety mode": safety mode in the FM module (value is 1)
- "Safety value": effective manipulated variable for "Safety mode"

(2) "Enabled operations"

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Close": You can select the manipulated variable "Close". If text is configured for this command, it is also displayed in brackets. You can find more information about this in the Section Labeling of buttons and text (Page 167).
- "Open": You can select the manipulated variable "Open". If text is configured for this command, it is also displayed in brackets. You can find more information about this in the Section Labeling of buttons and text (Page 167).
- "Stop": You can select the manipulated variable "Stop". If text is configured for this command, it is also displayed in brackets. You can find more information about this in the Section Labeling of buttons and text (Page 167).
- "SP external": You can feedforward the external setpoint.
- "SP internal": You can feedforward the internal setpoint.
- "Change SP": You can change the setpoint.
- "Change MV": You can change the manipulated variable.
- "Program mode": You can switch to program mode.
- "Automatic": You can switch to automatic mode.
- "Manual": You can switch to manual mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the "OpStations"" block. Additional information is available in the section Operator control permissions (Page 205).

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

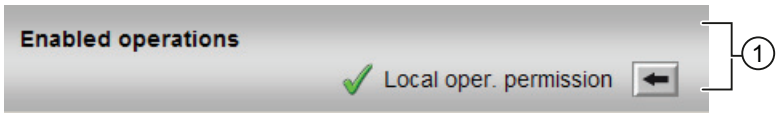
See also the Opening additional faceplates (Page 165) section for more on this.

(4) Process value

This area displays the real process value (PV).

1.3.17 Preview of interlock blocks

Preview of interlock blocks



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

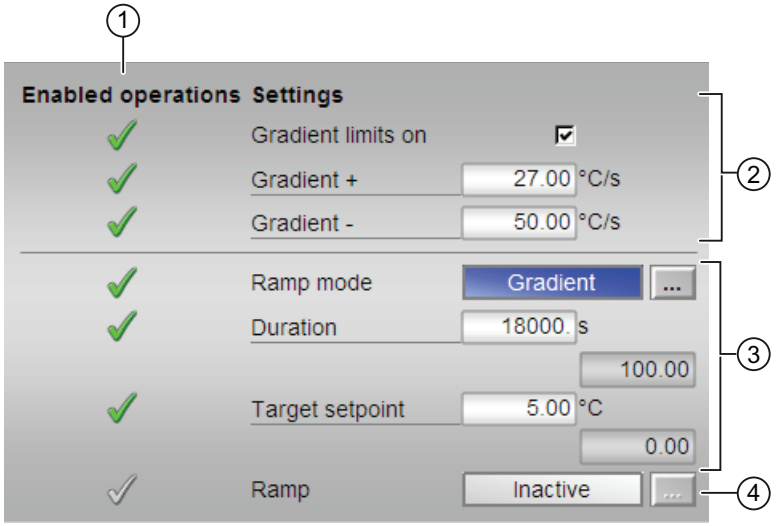
- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (OS_Perm or OS1Perm).

The following enabled operations are shown here:

- "Local operating permission": Use the <-- button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

1.3.18 Ramp view

Ramp view



(1) "Enabled operations"

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

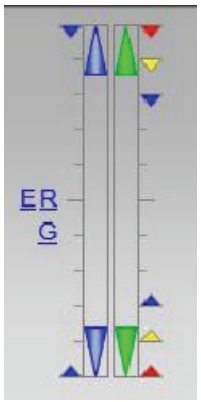
Symbols for enabled operations:

- Green check mark: the OS operator can control this parameter
- Gray check mark: the OS operator cannot control this parameter at this time due to the process
- Red cross: the OS operator cannot control this parameter due to the configured AS operator control permissions (OS_Perm or OS1Perm)

(2) Enable "gradient limit"

Use this check box to enable "gradient limit" for the setpoint. "Gradient limit" can be set separately for positive or negative setpoint changes ("Gradient +" or "Gradient -"). Refer to the Changing values (Page 210) section for more on this.

If there is a difference between target setpoint and currently effective setpoint, a blue "G" may be displayed at the bar in standard view of FmCont, FmTemp, PidConL, PIDConR, PIDStepL, OpAnL and MotSpdCL with parameter assignment of `SP_RateTarget` (target setpoint for gradient limit).



If there is a difference between the target manipulated variable and the currently effective manipulated variable, an orange "G" may be displayed at the bar in the standard view of VlvAnl with parameter assignment of `MV_RateTarget` (target manipulated variable for gradient limit).

(3) "Ramp function"

In this area, you can set the type of ramp function for the setpoint.

You can set the following types of ramp functions:

- "Time duration"
- "Target setpoint"

You can set the time duration and the target setpoint. Refer to the Changing values (Page 210) section for more on this.

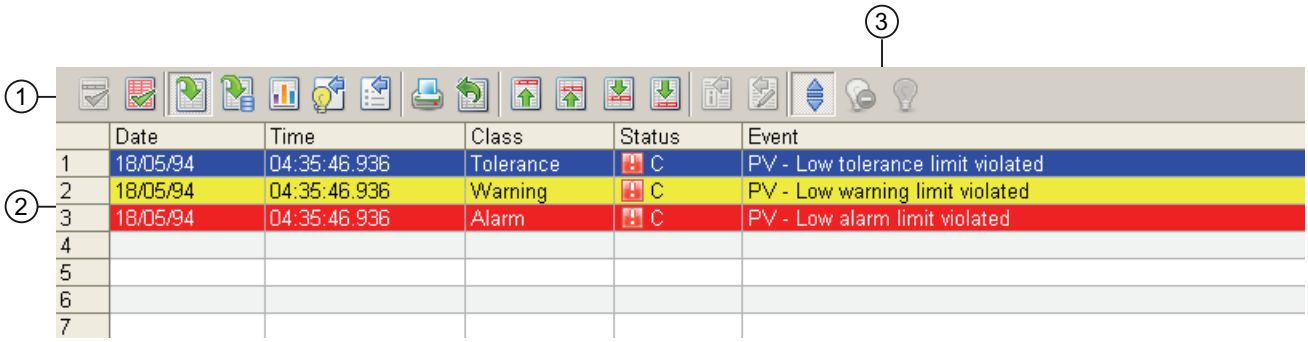
(4) Enable "ramp"

You can use this control to enable or disable the configured function in the ramp function for the setpoint change.

You can only enable this when the setpoint specification is set to "Internal" in the standard view of the block. The enable is only valid for one setpoint change and is subsequently disabled again.

1.3.19 Alarm view

Alarm view



(1) Toolbar

If the short-term archive list is selected, a new button appears in the toolbar:

You can use this button to toggle between the "History" and "Operator messages" views.

You must be registered with the "Higher process control" operating permission in order to export and hide messages.

(2) Display area for alarms

For additional information about the alarm view, refer to the *WinCC Information System* Online Help.

(3) "Hide messages" button

Messages can be displayed and/or hidden with this button. The view of this button changes accordingly:

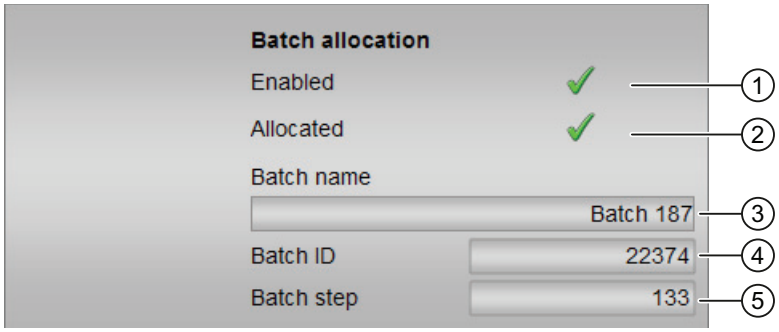
Show messages

Hide messages

"Higher process controlling" operating permission is required and manual hiding must be active. You can find additional information in the manual "Process Control System PCS 7 Operator Station".

1.3.20 Batch view

Batch view



(1) "Enabled"

This area shows you if the block is enabled for operation via SIMATIC BATCH `(BatchEn = 1)`.

(2) "In use"

This area shows if the block is currently in use by SIMATIC BATCH (Occupied = 1).

(3) "Batch name"

This area shows the name of the batch that is currently running `(Batchname)`.

(4) "Batch ID"

This area shows the identification number of the batch that is currently running `(BatchID)`.

(5) "Batch step"

This area shows the step number of the batch that is currently running `(StepNo)`.

1.3.21 Memo view

Memo view

You can leave temporary messages for other OS operators in this view. Messages are entered in the text box, and saved and activated by selecting the check box in the lower right corner of the faceplate.

(1) Text box for notes

(2) Check box for activating the note

The next time the faceplate is opened or there is a process picture change, you can see in the status bar of the block icon and the faceplate that there is a new message for you.

Clearing the check box deletes the indicators in the status bars.

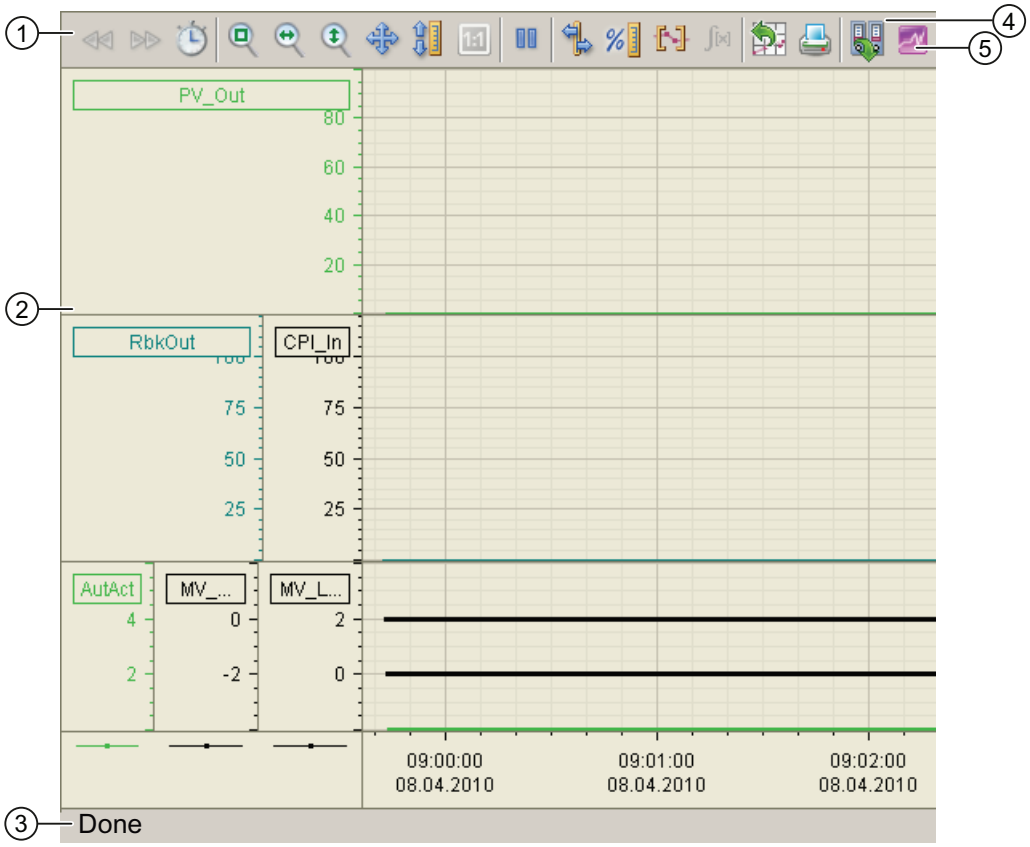
The message is not deleted automatically.

Note

The content of the memo view is cleared when you perform a full compilation and download of the OS.

1.3.22 Trend view

Trend view



(1) Toolbar

(2) Display area for trends

(3) Status bar

(4) Button for switching between archive tags and online tags. The status bar shows if the trend view is working with online data or archive data.

(5) Button for opening the "Scatter plot" window

The Export button is only visible and operable with the "Higher-level process control" operating permission.

For additional information about the trend view, refer to the *WinCC Information System* Online Help.

Configuration of the trend view

The trend view can be configured so that archive values are displayed immediately after opening. A prerequisite for this is that archive variables exist. Proceed as follows:

- A "1" is attached at the block icon in the "TrendPictureName" property. A semicolon is used as the separator to the name of the trend view.

  Example: @pg_apl_trendPID_Statistic.pdl;1

Special considerations for controllers

You can select two different representations for the display area:

1. Detailed display (default setting):

Display area consisting of three coordinate systems:

- Setpoint trend, actual value trend;
- Manipulated variable, control performance index trend;
- Binary trend via automatic/manual, manipulated variable at high or low limit

Open the scatterplot diagram with the second user button (number 2) in the toolbar. It shows a coordinate system with the process value on the value axis and the manipulated variable or position feedback on the X axis. A new value pair is entered into the coordinate system with each cycle.

If you want to use the detail display, you need to enter the following in the block icon under Trends in the WinCC Graphics Designer:

TrendPictureName = @pg_apl_trendPID_Statistic.pdl

2. Simple display:

Display area consisting of two coordinate systems:

- Setpoint trend, actual value trend;
- Manipulated variable, control performance index trend;

If you want to use the detail display, you need to enter the following in the block icon under Trends in the WinCC Graphics Designer:

TrendPictureName =@pg_apl_trendPID.pdl

Notes on step controllers with position feedback:

If you use a step controller with position feedback as the controller type, you need to enter the following in the block icon under Trends in the WinCC Graphics Designer:

TrendConfiguration5 = *.MV#Value;...

TrendConfiguration6 = .RbkOut#Value;...

The following applies to all other controller types (default setting):

TrendConfiguration5 = .MV#Value;...

TrendConfiguration6 = *.RbkOut#Value;...

1.3.23 Limit operation and display in the faceplate

Limit operation and display in the faceplate

The limit value view of the faceplate can be used to modify limits and the hysteresis if the corresponding operator control permission (higher process controlling) is available. The limits are displayed graphically in the standard view of the faceplate.

If the limits are reached or exceeded, an alarm, warning or tolerance class message is triggered. This is indicated graphically as follows:

Icon	Meaning
	Alarm
	Warning
	Tolerance

Operator control blocks

2

2.1 OpAnL- check and output analog signals

2.1.1 Description of OpAnL

Object name (type + number) and family

Type + number: FB 1865

Family: Operate

Area of application for OpAnL

The block is used for the following applications:

- Checking and transferring analog input values

How it works

The block checks incoming, internal (entered in the faceplate) or external (CFC/SFC) analog signals for their limits at the `SP_Int` or `SP_Ext` input and forwards them to the output `SP`, depending on the setting of the `SP_LiOp` input parameter.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

For a description of the individual parameters, see the section OpAnL I/Os (Page 264).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7	`SP_UpRaAct`, `SP_DnRaAct` limits enabled for gradient mode (`SP_RateOn = 1`)
8	`SP_ExtAct.Value`
9	`SP_LoAct.Value`
10	`SP_HiAct.Value`
11 - 13	Not used
14	`SP_RmpOn`
15	`SP_RmpModTime`
16 - 31	Not used

See also

OpAnL functions (Page 259)
OpAnL messaging (Page 262)
OpAnL block diagram (Page 268)
OpAnL error handling (Page 262)
OpAnL modes (Page 258)

2.1.2 OpAnL modes

OpAnL modes

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

OpAnL I/Os (Page 264)

OpAnL messaging (Page 262)

OpAnL error handling (Page 262)

Description of OpAnL (Page 257)

OpAnL functions (Page 259)

OpAnL block diagram (Page 268)

2.1.3 OpAnL functions

Functions of OpAnL

The functions for this block are listed below.

Internal or external setpoint selection

This block provides the standard function Setpoint specification - internal/external (Page 112).

Setpoint limitation

Use the `SP_HiLim` and `SP_LoLim` input parameters to limit the setpoint to maximum and minimum limits. If a limit is violated, the setpoint is limited to the limits you have set. If the limits are infringed, the output parameters `SP_HiAct` and `SP_LoAct` display 1.

Using setpoint ramp

This block provides the standard function Using setpoint ramp (Page 108).

Gradient limit of the setpoint

This block provides the standard function Gradient limit of the setpoint (Page 109).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `SP_Out.ST`
- `PV_In.ST`

The signal status of output parameter `SP` is always equivalent to the signal status of input parameter `SP_Ext` or `SP_Int`, depending on how the setpoint is specified. If the internal setpoint `SP_Int` is used, the signal status is always output as 16#80.

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Simulating signals

This block provides the standard function Simulating signals (Page 47).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4 - 9	Not used
10	1 = Operator can switch to internal
11	1 = Operator can switch to external

Bit	Function
12	1 = Operator can enable bumpless switchover
13	1 = Operator can change SP_Int
14	1 = Operator can enable SP_RateOn
15	1 = Operator can change SP_UpRaLim
16	1 = Operator can change SP_DnRaLim
17	1 = Operator can activate the setpoint ramp (SP_RmpOn)
18	1 = Operator can switch between specification of the duration (SP_RmpTime) and gradient (SP_DnRaLim, SP_UpRaLim) for calculating the ramp slope
19	1 = Operator can change the time for the setpoint ramp (SP_RmpTime)
20	1 = Operator can change the target setpoint (SP_RmpTarget)
21 - 31	Not used

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Specifying the display area for process and setpoint values as well as operations

The block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Opening additional faceplates

The block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

The block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of OpAnL (Page 257)

OpAnL messaging (Page 262)

OpAnL I/Os (Page 264)

OpAnL block diagram (Page 268)

OpAnL error handling (Page 262)

OpAnL modes (Page 258)

2.1.4 OpAnL error handling

Error handling of OpAnL

Refer to the section Error handling (Page 104) in the basic instructions.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
51	Invalid signal `SP_LiOp` = 1 and `SP_ExtLi` = 1 and `SP_IntLi` = 1

See also

OpAnL block diagram (Page 268)

OpAnL I/Os (Page 264)

OpAnL messaging (Page 262)

OpAnL functions (Page 259)

OpAnL modes (Page 258)

Description of OpAnL (Page 257)

2.1.5 OpAnL messaging

Messaging

The following messages can be generated for this block:

- Process messages

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId	SIG 1	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 2	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 3	AS process control message - fault	$$BlockComment$$ External message 3
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 4
	SIG 5	Reserved	$$BlockComment$$ Reserved
	SIG 6	Reserved	$$BlockComment$$ Reserved
	SIG 7	Reserved	$$BlockComment$$ Reserved
	SIG 8	Reserved	$$BlockComment$$ Reserved

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId`

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	ExtVa104
5	ExtVa105
6	ExtVa106
7	ExtVa107

The associated values 4 ... 7 are allocated to the parameters `ExtVa104` ... `ExtVa107` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

OpAnL error handling (Page 262)

OpAnL modes (Page 258)

OpAnL block diagram (Page 268)

2.1.6 OpAnL I/Os

OpAnL I/Os

Input parameters

Parameter	Description	Type	Default
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
EN	1 = Called block will be processed	BOOL	1
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg4	Binary input for freely selectable message 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
Feature	I/O for additional functions (Page 259)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
MsgEvId	Message number (assigned automatically)	DWORD	16#00000000
Occupied	1 = Occupied by batch control	BOOL	0
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0

Parameter	Description	Type	Default
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 259)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
PV_In	Process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_Unit	Unit of measure for process value	INT	1001
PV_OpScale	Reserved for future functions	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SP_DnRaLim	Limit (low) for the gradient of the setpoint [SP_Unit/s]	REAL	100.0
SP_Ext	external setpoint - (to interconnection)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_ExtLi	1 = Select internal setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOp*	1 = Select external setpoint (via operator)	BOOL	0
SP_HiLim	Limit (high) of setpoint	REAL	100.0
SP_LoLim	Limit (low) of setpoint	REAL	0.0
SP_Int*	Internal setpoint for operation	REAL	0.0
SP_IntLi	1 = Select internal setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_IntOp*	1 = Select internal setpoint (via operator)	BOOL	1
SP_LiOp	Select internal/external setpoint source: 1 = Via interconnection 0 = Via operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_OpScale	OS display range for setpoint	STRUCT • High: REAL • Low: REAL	- 100.0 0.0
SP_RateOn	1 = Activate limitation of setpoint gradients	BOOL	0

Parameter	Description	Type	Default
SP_RmpModTime	1 = Use time (SP_RmpTime) for setpoint ramp 0 = Use gradient	BOOL	0
SP_RmpOn*	1 = Activate setpoint ramp to target setpoint SP_RmpTarget	BOOL	0
SP_RmpTarget	Target setpoint for setpoint ramp	REAL	0.0
SP_RmpTime*	Time for setpoint ramp [s] from current SP up to SP_RmpTarget	REAL	0.0
SP_TrkExt	1 = Bumpless switchover from external to internal setpoint active	BOOL	0
SP_Unit	Unit of measure for setpoint	INT	1001
SP_UpRaLim	Gradient limit (high) for the setpoint [SP_Unit/s]	REAL	100.0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
StepNo	Batch step number	DWORD	16#00000000
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see OpAnL error handling (Page 262)	INT	-1
MsgAckn	Alarm acknowledgement status (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr	1 = Alarm error (output ERROR of the first ALARM_8P)	BOOL	0
MsgStat	Alarm status (output ERROR of the first ALARM_8P)	WORD	16#0000
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
SP_Out	Setpoint used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_DnRaAct	1 = Negative gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtAct	1 = External setpoint is active 0 = Internal setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_HiAct	High limit for SP_Ext or SP_Int reached or exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_LoAct	Low limit for SP_Ext or SP_Int reached or undershot	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_RateTarget	Target setpoint for the gradient limitation	REAL	0.0
SP_UpRaAct	1 = Positive gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word (Page 257)	DWORD	16#00000000

See also

OpAnL messaging (Page 262)
OpAnL block diagram (Page 268)
OpAnL modes (Page 258)

2.1.7 OpAnL block diagram

OpAnL block diagram

A block diagram is not provided for this block.

See also

OpAnL I/Os (Page 264)
OpAnL error handling (Page 262)
OpAnL functions (Page 259)
Description of OpAnL (Page 257)
OpAnL modes (Page 258)
OpAnL messaging (Page 262)

2.1.8 Operator control and monitoring

2.1.8.1 OpAnL views

Views of the OpAnL block

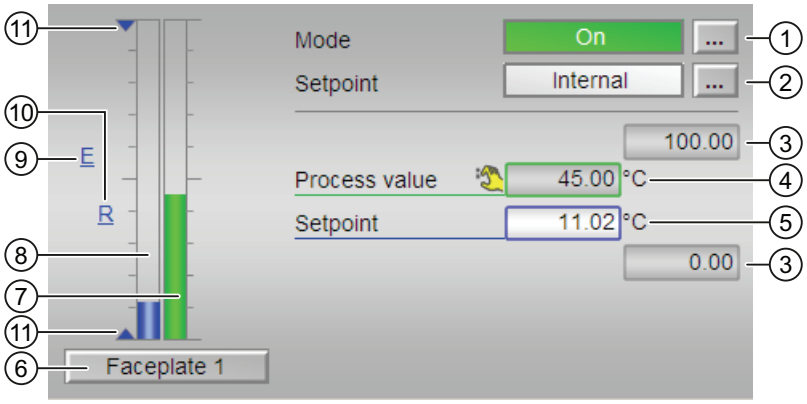
The block OpAnL provides the following views:

- OpAnL standard view (Page 269)
- Alarm view (Page 250)
- Trend view (Page 253)
- Ramp view (Page 248)
- OpAnL parameter view (Page 271)
- OpAnL preview (Page 271)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for OpAnL (Page 272)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

2.1.8.2 OpAnL standard view

OpAnL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Displaying and switching the setpoint

This area shows how to specify the setpoint. The setpoint can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

You can find additional information on this in the Setpoint specification - internal/external (Page 112) section.

(3) High and low scale range for the process value

These values provide information on the display range for the bar graph of the process value. The scale range is defined in the engineering system.

(4) Display of the process value including signal status

This area shows the current process value with the corresponding signal status.

(5) Displaying and changing the setpoint including signal status

This area shows the current setpoint with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the setpoint. The setpoint specification also needs to be set to "Internal" for this block.

(6) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

See also the Opening additional faceplates (Page 165) section for more on this.

(7) Bar graph for the process value

This area shows the current process value in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(8) Bar graph for the setpoint

This area shows the current setpoint in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(9) Display of external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(10) Display for the target setpoint of the setpoint ramp

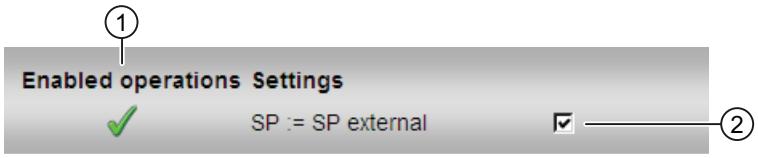
This display [R] shows the target setpoint and is only visible if you have enabled ramp generation in the Ramp view (Page 248).

(11) Displaying the limits

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the Engineering System (ES).

2.1.8.3 OpAnL parameter view

Parameter view of OpAnL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

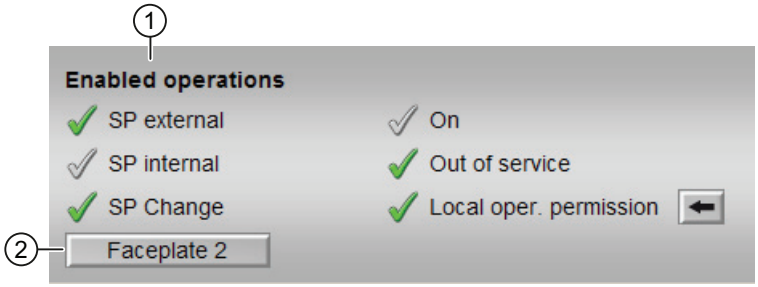
(2) Settings

You can select the following functions in this area:

- "SP := SP external": ☑ Bumpless switchover of setpoint from external to internal. The internal setpoint is tracked to the external one.

2.1.8.4 OpAnL preview

Preview of OpAnL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "SP external": You can feedforward the external setpoint.
- "SP internal": You can feedforward the internal setpoint.
- "Change SP": You can change the setpoint.
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

Refer also to the Opening additional faceplates (Page 165) section for more on this.

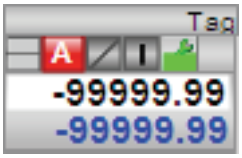
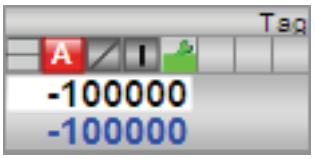
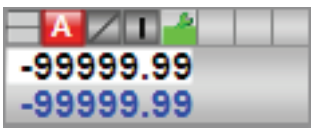
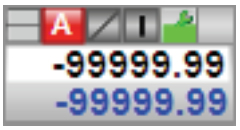
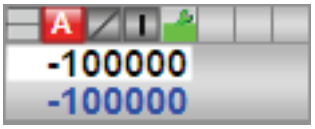
2.1.8.5 Block icon for OpAnL

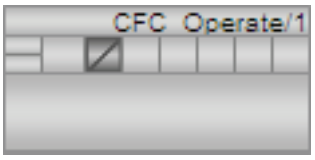
Block icons for OpAnL

A variety of block icons are available with the following functions:

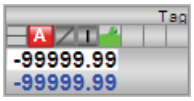
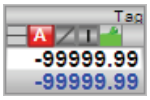
- Process tag type
- Operating modes
- Internal and external setpoint specification
- Signal status, release for maintenance
- Memo display
- Process value (black, with and without decimal places)
- Setpoint (blue, with and without decimal places)

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	
	7	

Icons	Selection of the block icon in CFC	Special features
	8	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	
	3	
	4	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

2.2 OpDi01 - Manipulating a digital value (2 pushbuttons)

2.2.1 Description of OpDi01

Object name (type + number) and family

Type + number: FB 1866

Family: Operate

Area of application for OpDi01

The block is used for the following applications:

- Manipulating a digital value

How it works

A digital value is manipulated by interconnection or via the faceplate.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section OpDi01 I/Os (Page 281).

Status bit	Parameter
0 - 2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7	`Out.Value`
8	`LiOp`
9	`FbkIn.Value`
10 - 13	Not used
14	1 = Invalid signal status
15	Not used
16	0: Open padlock in the block icon 1: Closed padlock in the block icon
17 - 22	Not used
23	"Interlock" button is enabled
24 - 25	Not used
26	Bypass information from previous function block
27 - 31	Not used

See also

OpDi01 functions (Page 277)
OpDi01 messaging (Page 281)
OpDi01 block diagram (Page 283)
OpDi01 error handling (Page 280)
OpDi01 modes (Page 277)

2.2.2 OpDi01 modes

OpDi01 operating modes

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

OpDi01 block diagram (Page 283)

OpDi01 I/Os (Page 281)

OpDi01 messaging (Page 281)

OpDi01 error handling (Page 280)

OpDi01 functions (Page 277)

Description of OpDi01 (Page 275)

2.2.3 OpDi01 functions

Functions of OpDi01

The functions for this block are listed below.

Internal or external digital value

Use the `LiOp` input parameter to define whether the digital value is set (0 - 1, parameter `SetOp` or `SetLi`) or is reset (1 - 0, parameter `RstOp` or `RstLi`) via the faceplate or an interconnection.

`LiOp` = 0: Specification of digital value via faceplate (`SetOp` or `RstOp`)

`LiOp` = 1: Specification of digital value via interconnection (`SetLi` or `RstLi`)

Interlocks

Use the `Intl_En` = 1 and `Intlock.ST` ≠ 16#FF input parameters to activate the interlock function on this block.

An active interlock condition brings the block to the neutral position (`Intlock.Value` = 0 or `Intlock.ST` = 16#00 input). Output parameter `Out` is set to 0. When the interlocking condition no longer applies, the digital value currently valid is output again.

Input parameter for feedback value

This block has a `FbkIn` input parameter for displaying a feedback value in the faceplate.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Changing labels on buttons and text

This block provides the standard function Labeling of buttons and text (Page 167).

Instance-specific text can be configured for the following parameters:

- `Out`
- `SetOp`
- `RstOp`
- `FbkIn`

Forming the signal status for blocks

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `FbkIn.ST`

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can set the digital value
5	1 = Operator can reset the digital value
6 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
1	Reaction to the out of service mode (Page 148)
24	Activating local operating permission (Page 130)

See also

Description of OpDi01 (Page 275)

OpDi01 messaging (Page 281)

OpDi01 I/Os (Page 281)

OpDi01 block diagram (Page 283)

OpDi01 error handling (Page 280)

OpDi01 modes (Page 277)

2.2.4 OpDi01 error handling

Error handling of OpDi01

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	There is no error.
51	`SetLi` = 1 and `RstLi` = 1 and `LiOp` = 1

See also

OpDi01 block diagram (Page 283)

OpDi01 I/Os (Page 281)

OpDi01 messaging (Page 281)

OpDi01 functions (Page 277)

OpDi01 modes (Page 277)

Description of OpDi01 (Page 275)

2.2.5 OpDi01 messaging

Messaging

This block does not offer messaging.

See also

Description of OpDi01 (Page 275)
OpDi01 functions (Page 277)
OpDi01 I/Os (Page 281)
OpDi01 block diagram (Page 283)
OpDi01 error handling (Page 280)
OpDi01 modes (Page 277)

2.2.6 OpDi01 I/Os

I/Os of OpDi01

Input parameters

Parameter	Description	Type	Default
`EN`	1 = Called block will be processed	BOOL	1
`FbkIn`	Input for feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
`Feature`	I/O for additional functions (Page 277)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
`Intlock`	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
`Intl_En`	1 = Interlock without reset (interlock, parameter `Intlock`) can be used	BOOL	1
`LiOp`	Switchover of operating mode between: 1 = Interconnection 0 = Operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	Edge transition (0-1) = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 277)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
RstLi	Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	Reset by the operator	BOOL	0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SetLi	Connected digital input	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SetOp*	Digital input for operator	BOOL	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see OpDi01 error handling (Page 280)	INT	-1
LockAct	1 = Interlock (Intlock) is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
Out	Digital output value	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status	Status word (Page 275)	DWORD	16#00000000

See also

OpDi01 messaging (Page 281)

OpDi01 block diagram (Page 283)

OpDi01 modes (Page 277)

2.2.7 OpDi01 block diagram

OpDi01 block diagram

A block diagram is not provided for this block.

See also

OpDi01 I/Os (Page 281)

OpDi01 messaging (Page 281)

OpDi01 error handling (Page 280)

OpDi01 functions (Page 277)

OpDi01 modes (Page 277)

Description of OpDi01 (Page 275)

2.2.8 Operator control and monitoring

2.2.8.1 OpDi01 views

Views of the OpDi01 block

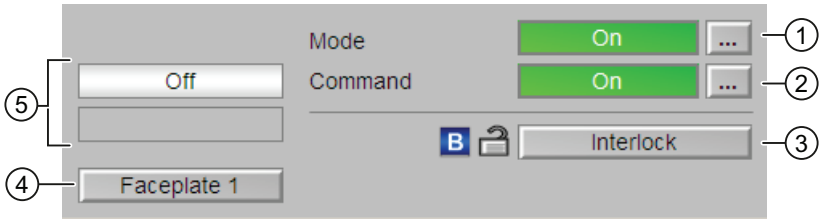
The block OpDi01 provides the following views:

- OpDi01 standard view (Page 284)
- Trend view (Page 253)
- OpDi01 preview (Page 286)
- Memo view (Page 252)
- Block icon for OpDi01 (Page 287)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

2.2.8.2 OpDi01 standard view

OpDi01 standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

You can find additional information on this in the Switching operating states and operating modes (Page 208) section.

(2) Displaying and switching the command

This area shows you the current selection. You can output a continuous signal as follows:

- "On": Continuous signal is output
- "Off"

You can find additional information on this in the Switching operating states and operating modes (Page 208) section.

You can rename the display text as you please, as described in the section Labeling of buttons and text (Page 167).

Do this with the following parameters:

- Text for "Command": Parameter `SetOp#string_1`
- Text for "On/Off": Parameter `Out#string_0` / `Out#string_1`

(3) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the OpDi01 functions (Page 277) section.

(4) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(5) Displaying the feedback of the command

This area shows you the currently valid command. The following commands can be shown here:

- "On"
- "Off"
- "Invalid signal"

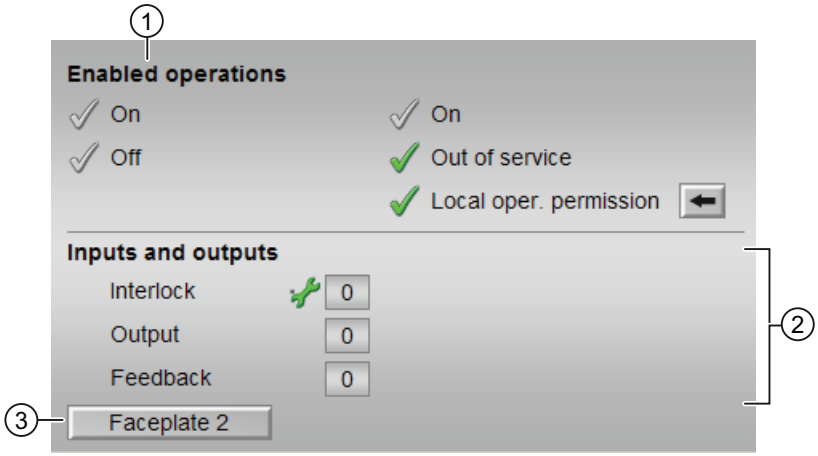
You can rename the display text as you please, as described in the section Labeling of buttons and text (Page 167).

Do this with the following parameter:

- Text for "On/Off": Parameter `FbkIn#string_0` / `FbkIn#string_1`

2.2.8.3 OpDi01 preview

Preview of OpDi01



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "On": You can set the digital value (0 - 1 edge).

  You can rename the display text as you please, as described in the section Labeling of buttons and text (Page 167).

  Do this with the following parameters:

  – Text for "Command": Parameter `SetOp#string_1`
- "Off": You can set the digital value (1 - 0 edge).

You can rename the display text as you please, as described in the section Labeling of buttons and text (Page 167).

Do this with the following parameters:

– Text for "Command": Parameter `RstOp#string_1`

- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Display of current inputs and outputs

This area shows the most important parameters for this block with the current selection:

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Output": 1= Digital output value set
- "Feedback": 1= Feedback set

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

Refer also to the Opening additional faceplates (Page 165) section for more on this.

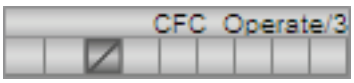
2.2.8.4 Block icon for OpDi01

Block icons for OpDi01

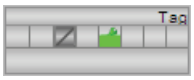
A variety of block icons are available with the following functions:

- Process tag type
- Operating modes
- Signal status, release for maintenance
- Bypass
- Interlocks
- Output signal
- Memo display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

2.3 OpDi03 - Manipulating a digital value (3 pushbuttons)

2.3.1 Description of OpDi03

Object name (type + number) and family

Type + number: FB 1867

Family: Operate

Area of application for OpDi03

The block is used for the following applications:

- Manipulating a digital value (3 pushbuttons)

How it works

A digital value is manipulated at three possible outputs by interconnection or via the faceplate.

If two or three input parameters are set for an interconnection (parameter `SetLix`), the input parameter with the highest index will be set to the corresponding output parameter. For example, if the `SetLi1` and `SetLi2` input parameters are set (= 1), then `Out2` will be set (= 1).

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section OpDi03 I/Os (Page 295).

Status bit	Parameter
0 - 2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7	`Out1.Value`
8	`Out2.Value`
9	`Out3.Value`
10	`LiOp.Value`
11	`Fbk1In.Value`
12	`Fbk2In.Value`
13	`Fbk3In.Value`
14	1 = Invalid signal status
15	Not used
16	0: Open padlock in the block icon 1: Closed padlock in the block icon
17 - 22	Not used
23	"Interlock" button is enabled
24 - 25	Not used
26	Bypass information from previous function block
27 - 31	Not used

See also

OpDi03 functions (Page 291)

OpDi03 messaging (Page 295)

OpDi03 block diagram (Page 298)

OpDi03 error handling (Page 294)

OpDi03 modes (Page 291)

2.3.2 OpDi03 modes

OpDi03 operating modes

The block can be operated using the following modes

- On (Page 58)
- Out of service (Page 58)

"On"

You can find general information about the "On" mode in the On (Page 58) section.

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

OpDi03 block diagram (Page 298)

OpDi03 I/Os (Page 295)

OpDi03 messaging (Page 295)

OpDi03 error handling (Page 294)

OpDi03 functions (Page 291)

Description of OpDi03 (Page 289)

2.3.3 OpDi03 functions

Functions of OpDi03

The functions for this block are listed below.

Internal or external digital value

Use the LiOp input parameter to define whether it is through the faceplate or an interconnection using a 1 out of 3 that the selection of the digital value is set (0 - 1) or reset (1 - 0, input parameter RstOut).

- LiOp = 0: Specification of digital value via faceplate. One of the input parameters SetOp1, SetOp2 or SetOp3 is now routed to the relevant output Out1, Out2 or Out3. For example, if SetOp2 = 1 , then Out2 = 1.
- LiOp = 1: Specification of digital value via interconnection. One of the input parameters SetLi1, SetLi2 or SetLi3 is now routed to the relevant output Out1, Out2 or Out3. For example, if SetLi2 = 1 , then Out2 = 1.

The reset (1 - 0) is always undertaken using the RstOut input parameter.

Interlocks

Use the Intl_En = 1 and Intlock.ST ≠ 16#FF input parameters to activate the interlock function on this block.

An active interlock condition brings the block to the neutral position (Intlock.Value = 0 or Intlock.ST = 16#00 input). Output parameter Out is set to 0. When the interlocking condition no longer applies, the digital value currently valid is output again.

Input parameter for feedback value

This block has three input parameters Fbk1In, Fbk2In and Fbk3In for displaying three feedback values in the faceplate.

Resetting all output values

Reset all output parameters (Out1 ... Out3) by setting all interconnected input parameters for setting (SetLi1 ... SetLi3) or enabled input parameters for setting (SetOp1 ... SetOp3) to 0.

A 0 - 1 edge at the RstOut parameter then resets the three output parameters Out1 ... Out3.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Changing labels on buttons and text

This block provides the standard function Labeling of buttons and text (Page 167).

Instance-specific text can be configured for the following parameters:

- OutX
- SetOpX
- FbkXIn

X = (1 ... 3)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `Fbk1In.ST`
- `Fbk2In.ST`
- `Fbk3In.ST`

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can set the digital value `SetOp1`
5	1 = Operator can set the digital value `SetOp2`
6	1 = Operator can set the digital value `SetOp3`
7 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
1	Reaction to the out of service mode (Page 148)
24	Activating local operating permission (Page 130)

See also

Description of OpDi03 (Page 289)

OpDi03 messaging (Page 295)

OpDi03 I/Os (Page 295)

OpDi03 block diagram (Page 298)

OpDi03 error handling (Page 294)

OpDi03 modes (Page 291)

2.3.4 OpDi03 error handling

Error handling of OpDi03

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	There is no error.
51	The value 1 is set at two or more inputs (`SetLi1` = 1 AND `SetLi2` = 1) or (`SetLi2` = 1 AND `SetLi3` = 1) or (`SetLi1` = 1 AND SetLi3 = 1) and `LiOp` = 1

See also

OpDi03 block diagram (Page 298)

OpDi03 I/Os (Page 295)

OpDi03 messaging (Page 295)

OpDi03 functions (Page 291)

OpDi03 modes (Page 291)

Description of OpDi03 (Page 289)

2.3.5 OpDi03 messaging

Messaging

This block does not offer messaging.

See also

Description of OpDi03 (Page 289)
OpDi03 functions (Page 291)
OpDi03 I/Os (Page 295)
OpDi03 block diagram (Page 298)
OpDi03 error handling (Page 294)
OpDi03 modes (Page 291)

2.3.6 OpDi03 I/Os

I/Os of OpDi03

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Fbk1In	Feedback for input In1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Fbk2In	Feedback for input In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Fbk3In	Feedback for input In3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Feature	I/O for additional functions (Page 291)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0

Parameter	Description	Type	Default
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, parameter Intlock) can be used	BOOL	1
LiOp	Switchover of operating mode between: 1 = Interconnection 0 = Operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 291)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
RstOut	Reset by the operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SetLi1	Connected digital input 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SetLi2	Connected digital input 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SetLi3	Connected digital input 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SetOp1*	Digital input 1 for operator	BOOL	0

Parameter	Description	Type	Default
SetOp2*	Digital input 2 for operator	BOOL	0
SetOp3*	Digital input 3 for operator	BOOL	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see OpDi03 error handling (Page 294)	INT	-1
LockAct	1 = Interlock (Intlock) is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
Out1	Digital output value 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out2	Digital output value 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out3	Digital output value 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ST_Worst	Worst signal status	BYTE	16#80
Status	Status word (Page 289)	DWORD	16#00000000

See also

OpDi03 messaging (Page 295)
OpDi03 block diagram (Page 298)
OpDi03 modes (Page 291)

2.3.7 OpDi03 block diagram

OpDi03 block diagram

A block diagram is not provided for this block.

See also

OpDi03 I/Os (Page 295)
OpDi03 messaging (Page 295)
OpDi03 error handling (Page 294)
OpDi03 functions (Page 291)
OpDi03 modes (Page 291)
Description of OpDi03 (Page 289)

2.3.8 Operator control and monitoring

2.3.8.1 OpDi03 view

Views of the OpDi03 block

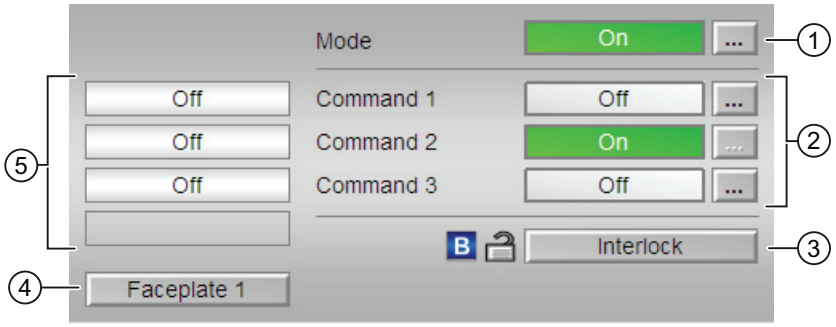
The block OpDi03 provides the following views:

- OpDi03 standard view (Page 299)
- Trend view (Page 253)
- OpDi03 preview (Page 301)
- Memo view (Page 252)
- Block icon for OpDi03 (Page 302)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

2.3.8.2 OpDi03 standard view

OpDi03 standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

You can find additional information on this in the Switching operating states and operating modes (Page 208) section.

(2) Displaying and switching the command 1 to 3

This area shows you the current selection. You can output a continuous signal at the outputs `Out1` to `Out3` as follows:

- "On": Continuous signal is output
- "Off"

You can find additional information on this in the Switching operating states and operating modes (Page 208) section.

You can rename the display text as you please, as described in the section Labeling of buttons and text (Page 167).

Do this with the following parameters:

- Text for "Command 1/Command 2/Command 3": Parameter `SetOpX#string_1`, (X = 1 ... 3)
- Text for "On/Off": Parameter `OutX#string_0`, `OutX#string_1`, (X = 1 ... 3)

(3) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the OpDi03 functions (Page 291) section.

(4) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(5) Displaying the feedback of the command 1 to 3

This area shows you the current valid selection from `Out1` to `Out3`.

- "On"
- "Off"
- "Invalid signal"

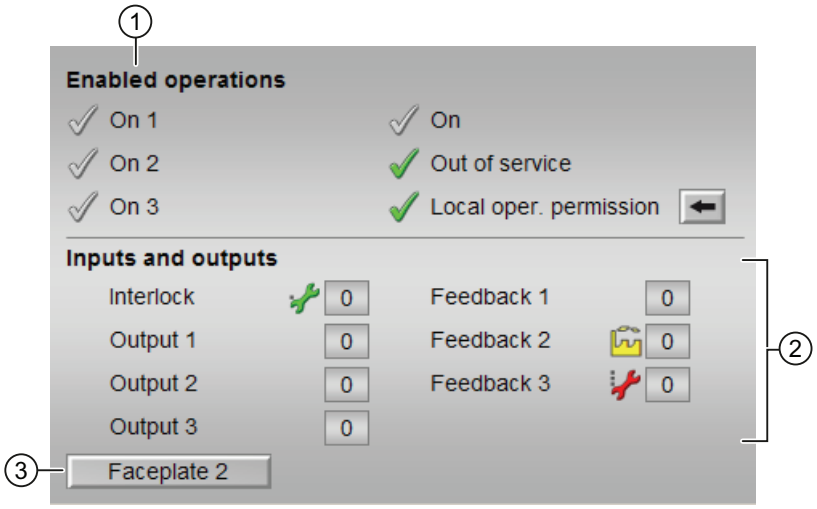
You can rename the display text as you please, as described in the section Labeling of buttons and text (Page 167).

Do this with the following parameters:

- Text for "On/Off": Parameter `FbkInX#string_1`, `FbkInX#string_0`, (X = 1 ... 3)

2.3.8.3 OpDi03 preview

Preview of OpDi03



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "On 1 to 3": You can now set the digital value (0 - 1 edge).

  You can rename the display text as you please, as described in the section Labeling of buttons and text (Page 167).

  Do this with the following parameters:

  – Text for "Command X": Parameter `SetOpX#string_1`, (X = 1 ... 3)
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Display of current inputs and outputs

This area shows the most important parameters for this block with the current selection:

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Output 1 to 3": 1= Digital output value set
- "Feedback 1 to 3": 1= Feedback set

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Refer also to the Opening additional faceplates (Page 165) section for more on this.

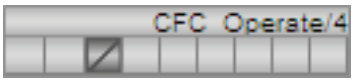
2.3.8.4 Block icon for OpDi03

Block icons for OpDi03

A variety of block icons are available with the following functions:

- Process tag type
- Operating modes
- Signal status, release for maintenance
- Bypass
- Interlocks
- Output signal
- Memo display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

2.4 OpStations - Configuration of the local operating permission

2.4.1 Description of OpStations

Object name (type + number) and family

Type + number: FB 1901

Family: Operate

Area of application for OpStations

The block is used for the following applications:

- Configuration of the local operating permission

How it works

The block converts the enabled operations or locks for up to 16 individual permissions in the bit-coded `Out` output.

Refer also to OpStations block diagram (Page 311).

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The OpStations block and the technologic block must be installed into the same cyclic interrupt OB.

Note

Install the blocks in a slower cyclic interrupt OB.

With the default, the local operating permission for all block instances on the faceplate is disabled (= 0) and is configured as follows:

1. Assign each operator station a bit-coded ID (1, 2, 4, 8, 16, …), which you set in the internal APLOpStation variables as a start value. You can set up to 16 different operator stations.

   The variable is automatically created using the OS project editor and is located in the Split Screen Manager group.

2. Place the OpStations block in the chart.

   Note

   If you use the Opening additional faceplates (Page 165) function in multiple technologic blocks, you need to use one OpStations block for every technologic block. Otherwise, the call of the technologic block from the OpStations block is only possible for a technologic block.

3. Enable the function at the technologic block via `Feature` Bit 24(Activating local operating permission (Page 130)).
4. Interconnect the `OpSt_In` input parameter of the technologic block to the `Out` output parameter of the OpStations block.
5. Select the operator stations on which the technologic block will usually be used. You can select several at once. The selection is sent bit-coded to the `Out` output of the OpStations block.
6. Specify a list for the texts for the standard view in the OpStations faceplate in the shared declarations under the name APLOpStations in the SIMATIC Manager. Refer also to the section OpStations standard view (Page 313) for more information.

Once these configuration steps are completed, the local operating permission is enabled. The enable for a technologic block is made when the bit-by-bit comparison between the `OpSt_Out` parameter and the operator station ID "APLOpStation" does not equal 0.

Note

The local operating permission is not visualized in the "Enabled operations" icons of the block I/Os.

Startup characteristics

This block does not have any startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section OpStations I/Os (Page 309).

Status bit	Parameter
0	`In0`
1	`In1`
2	`In2`
3	`In3`
4	`In4`
5	`In5`
6	`In6`
7	`In7`
8	`In8`
9	`In9`
10	`In10`
11	`In11`
12	`In12`
13	`In13`
14	`In14`
15	`In15`
16 - 31	Not used

See also

OpStations operating modes (Page 307)

OpStations functions (Page 307)

OpStations error handling (Page 308)

OpStations messaging (Page 309)

2.4.2 OpStations operating modes

OpStations operating modes

This block does not have any modes.

See also

Description of OpStations (Page 304)
OpStations functions (Page 307)
OpStations error handling (Page 308)
OpStations messaging (Page 309)
OpStations I/Os (Page 309)
OpStations block diagram (Page 311)

2.4.3 OpStations functions

Functions of OpStations

The functions for this block are listed below.

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can enable `In0`
1	1 = Operator can enable `In1`
2	1 = Operator can enable `In2`
3	1 = Operator can enable `In3`
4	1 = Operator can enable `In4`
5	1 = Operator can enable `In5`
6	1 = Operator can enable `In6`
7	1 = Operator can enable `In7`
8	1 = Operator can enable `In8`
9	1 = Operator can enable `In9`
10	1 = Operator can enable `In10`
11	1 = Operator can enable `In11`
12	1 = Operator can enable `In12`
13	1 = Operator can enable `In13`

Bit	Function
14	1 = Operator can enable `In14`
15	1 = Operator can enable `In15`
16 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

See also

Description of OpStations (Page 304)
OpStations operating modes (Page 307)
OpStations error handling (Page 308)
OpStations messaging (Page 309)
OpStations I/Os (Page 309)
OpStations block diagram (Page 311)

2.4.4 OpStations error handling

OpStations error handling

This block does not have any error handling.

See also

Description of OpStations (Page 304)
OpStations operating modes (Page 307)
OpStations functions (Page 307)
OpStations messaging (Page 309)
OpStations I/Os (Page 309)
OpStations block diagram (Page 311)

2.4.5 OpStations messaging

OpStations messaging

This block does not offer messaging.

See also

Description of OpStations (Page 304)
OpStations operating modes (Page 307)
OpStations functions (Page 307)
OpStations error handling (Page 308)
OpStations I/Os (Page 309)
OpStations block diagram (Page 311)

2.4.6 OpStations I/Os

OpStations I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 307)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
In0	1 = Enable for operator station 1	BOOL	0
In1	1 = Enable for operator station 2	BOOL	0
In2	1 = Enable for operator station 3	BOOL	0
In3	1 = Enable for operator station 4	BOOL	0
In4	1 = Enable for operator station 5	BOOL	0
In5	1 = Enable for operator station 6	BOOL	0
In6	1 = Enable for operator station 7	BOOL	0
In7	1 = Enable for operator station 8	BOOL	0
In8	1 = Enable for operator station 9	BOOL	0
In9	1 = Enable for operator station 10	BOOL	0
In10	1 = Enable for operator station 11	BOOL	0
In11	1 = Enable for operator station 12	BOOL	0

Parameter	Description	Type	Default
In12	1 = Enable for operator station 13	BOOL	0
In13	1 = Enable for operator station 14	BOOL	0
In14	1 = Enable for operator station 15	BOOL	0
In15	1 = Enable for operator station 16	BOOL	0
OS_Perm	I/O for operator control permissions (Page 307)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
Out	Output value: for additional interconnections to the OpSt_In input of a technologic block	DWORD	16#00000000
Status	Status word (Page 304)	DWORD	16#00000000

See also

OpStations operating modes (Page 307)

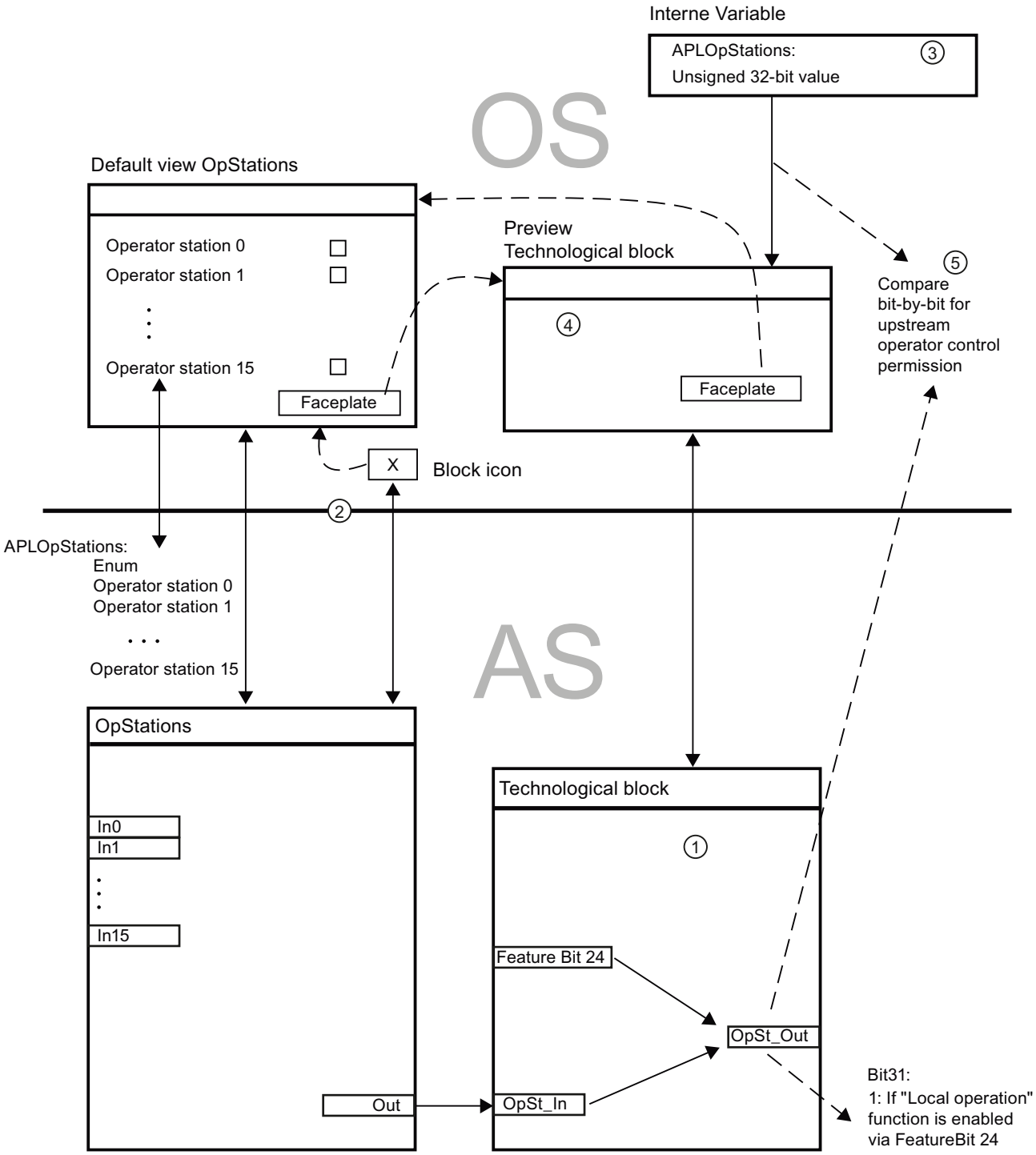
OpStations error handling (Page 308)

OpStations messaging (Page 309)

OpStations block diagram (Page 311)

2.4.7 OpStations block diagram

OpStations block diagram



See also

Description of OpStations (Page 304)

OpStations operating modes (Page 307)

OpStations functions (Page 307)

OpStations error handling (Page 308)

OpStations messaging (Page 309)

OpStations I/Os (Page 309)

2.4.8 Operator control and monitoring

2.4.8.1 OpStations views

Views of the OpStations block

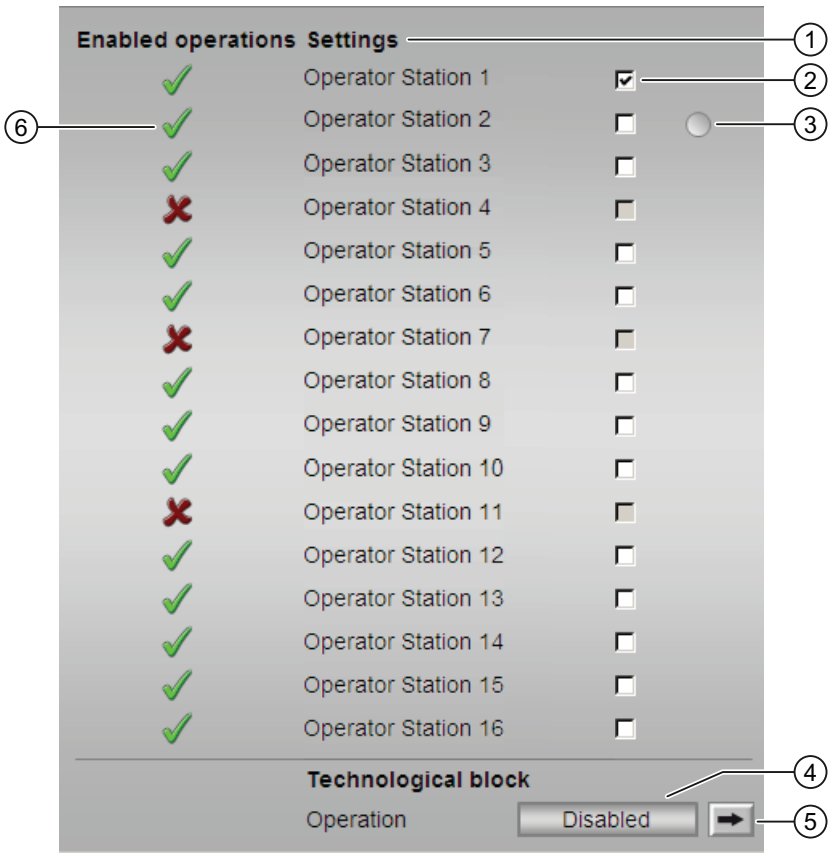
The `OpStations` block provides the following views:

- OpStations standard view (Page 313)
- Memo view (Page 252)
- Block icon of OpStations (Page 315)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

2.4.8.2 OpStations standard view

OpStations standard view



(1) Configurable display text under the settings

You yourself can define the text for operator station 1 to operator station 15 to replace the default text. Follow the steps outlined below:

- Create a list with the name "APLOpStations" in the SIMATIC Manager in the shared declarations. To learn more on this, refer to "How to save shared declarations" in the Process Control System PCS 7 Engineering System Configuration Manual.

Only values from 0 to 15 are permitted, other values will not be saved in the list.

The display names of the values are changed with the names of the operator stations. The display name corresponds to the value 0 of the display for the check box `In0` in the standard view etc.

If the text is not configured, the entire line is not displayed.

(2) Disabling or enabling operation for operator stations

In this area, you can disable the operation for an operator station or enable the operator station for the connected technologic block. In this case, the upper check box corresponds to the `In0` I/O and the lower check box to the `In15` I/O. Operation is only possible with the highest-level operator control permission (same as simulation) .

(3) Display for the current operator station

The value of the current operator station is displayed as a gray dot in the corresponding line.

(4) Display for operability

Display of the operability of the technologic block on the current operator station.

(5) Navigation button for switching to the standard view of the technologic block

Use this navigation button to reach the standard view of the technologic block. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

(6) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

2.4.8.3 Block icon of OpStations

Block icons for OpStations

A variety of block icons are available with the following functions:

- Opening the faceplate

Icons	Selection of the block icon in CFC	Special features
Without icon	1	Default no block icon
	2	The block icon is transparent, if operation on the operator station is possible

Note

The block icon is the size of a field in the status bar of a technologic block icon and can be used as an add-on to the status bar. The layer of the block icon here should always be higher than the layer of the technologic block icon, otherwise the block icon may be hidden after an update.

2.5 OpTrig - Manipulating a digital value (1 pushbutton)

2.5.1 Description of OpTrig

Object name (type + number) and family

Type + number: FB 1868

Family: Operate

Area of application for OpTrig

The block is used for the following applications:

- Generation of a pulse signal (trigger)

How it works

Operator control block is used to implement single pushbutton control (comparable with RESET pushbutton).

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section OpTrig I/Os (Page 320).

Status bit	Parameter
0 - 2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7	`Out.Value`
8	`LiOpAct.Value`
9	`FbkIn.Value`
10 - 31	Not used

See also

OpTrig functions (Page 317)

OpTrig messaging (Page 319)

OpTrig block diagram (Page 322)

OpTrig error handling (Page 319)

OpTrig modes (Page 316)

2.5.2 OpTrig modes

OpTrig operating modes

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

OpTrig block diagram (Page 322)

OpTrig I/Os (Page 320)

OpTrig messaging (Page 319)

OpTrig functions (Page 317)

OpTrig error handling (Page 319)

Description of OpTrig (Page 315)

2.5.3 OpTrig functions

Functions of OpTrig

The functions for this block are listed below.

Issuing trigger signal internally or externally

Use the parameter `LiOp` to define whether the trigger signal is to be output by interconnection or by the OS operator:

`LiOp` = 0: Trigger signal by OS operator (input parameter `InOp`)

`LiOp` = 1: Trigger signal via interconnection (input parameter `InLi`)

Input parameter for feedback value

This block has a `FbkIn` input parameter for displaying a feedback value in the faceplate.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `FbkIn.ST`
- `Out.ST`

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can set the input parameter `In`
5 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Simulating signals

This block provides the standard function Simulating signals (Page 47).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
1	Reaction to the out of service mode (Page 148)
24	Activating local operating permission (Page 130)

See also

Description of OpTrig (Page 315)

OpTrig messaging (Page 319)

OpTrig I/Os (Page 320)

OpTrig block diagram (Page 322)

OpTrig error handling (Page 319)

OpTrig modes (Page 316)

2.5.4 OpTrig error handling

OpTrig error handling

The block does not report any errors.

See also

OpTrig block diagram (Page 322)
OpTrig I/Os (Page 320)
OpTrig messaging (Page 319)
OpTrig functions (Page 317)
OpTrig modes (Page 316)
Description of OpTrig (Page 315)

2.5.5 OpTrig messaging

Messaging

This block does not offer messaging.

See also

Description of OpTrig (Page 315)
OpTrig functions (Page 317)
OpTrig I/Os (Page 320)
OpTrig block diagram (Page 322)
OpTrig error handling (Page 319)
OpTrig modes (Page 316)

2.5.6 OpTrig I/Os

OpTrig I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
FbkIn	Input for feedback	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
Feature	I/O for additional functions (Page 317)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
InLi	Interconnectable binary input	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
InOp*	Binary input for operator	BOOL	0
LiOp	Switchover of operating mode between: 1 = Interconnection 0 = Operator	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 317)	STRUCT	-
		• Bit 0: BOOL	• 1
		• ...	• 1
		• Bit 31: BOOL	• 1
SelFp1	Call a block saved in this parameter as additional faceplate (Page 165) in standard view	ANY	-

Parameter	Description	Type	Default
SelFp2	Call a block saved in this parameter as additional faceplate (Page 165) in the preview	ANY	-
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Reserved	INT	-1
LiOpAct	Operator/interconnection is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
Out	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status	Status word (Page 315)	DWORD	16#00000000

See also

OpTrig messaging (Page 319)
OpTrig block diagram (Page 322)
OpTrig error handling (Page 319)
OpTrig modes (Page 316)

2.5.7 OpTrig block diagram

OpTrig block diagram

A block diagram is not provided for this block.

See also

OpTrig I/Os (Page 320)
OpTrig messaging (Page 319)
OpTrig functions (Page 317)
OpTrig error handling (Page 319)
OpTrig modes (Page 316)
Description of OpTrig (Page 315)

2.5.8 Operator control and monitoring

2.5.8.1 OpTrig views

Views of the OpTrig block

The block OpTrig provides the following views:

- OpTrig standard view (Page 323)
- OpTrig preview (Page 324)
- Memo view (Page 252)
- Block icon for OpTrig (Page 325)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

2.5.8.2 OpTrig standard view

OpTrig standard view

(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

You can find additional information on this in the Switching operating states and operating modes (Page 208) section.

(2) Set

Clicking "Set", outputs a pulse signal with the length of the cycle time at the `Out` output.

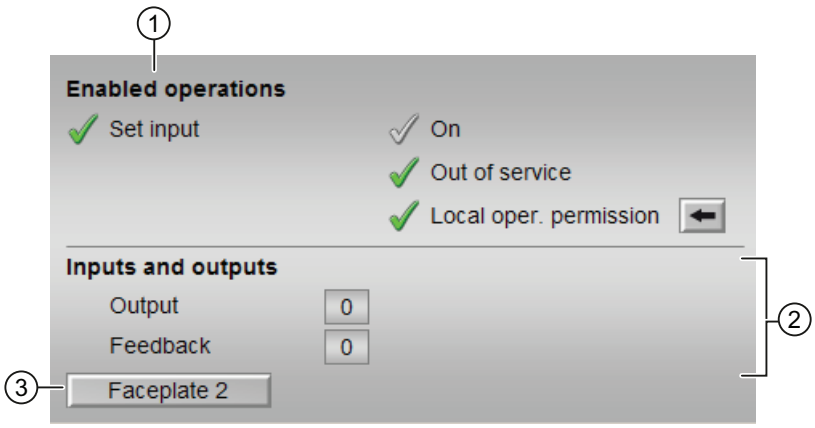
(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

2.5.8.3 OpTrig preview

Preview of OpTrig



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter.
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process.
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

The following enabled operations are shown here:

- "Set input": You can set the input.
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Display of current inputs and outputs

This area shows the most important parameters for this block with the current selection:

- "Output": 1= Digital output value set
- "Feedback": 1= Feedback set

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Refer also to the Opening additional faceplates (Page 165) section for more on this.

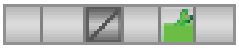
2.5.8.4 Block icon for OpTrig

Block icons for OpTrig

A variety of block icons are available with the following functions:

- Process tag type
- Operating modes
- Signal status, release for maintenance
- Memo display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Monitoring blocks

3

3.1 Comparison of large & small blocks

3.1.1 MonAnL compared to MonAnS

Comparison of the MonAnL and MonAnS blocks

The following tables are intended to help you decide which block to use.

Memory and runtime savings of the small block compared to the large block

You save the following resources for each instance:

- Memory space: ~ 45%
- Runtime: ~ 30%

Operating modes of the blocks

	MonAnL	MonAnS
On (Page 58)	x	x
Out of service (Page 58)	x	x

Functions of the blocks

	MonAnL	MonAnS
Alarm delays with two time values per limit pair (Page 158)	x	
Alarm delays with one time value per limit pair (Page 157)		x
Limit monitoring (Page 72)	x	x
Suppressing messages using the MsgLock parameter (Page 162)	x	x
Gradient monitoring (Page 343)	x	
Displaying auxiliary values (Page 167)	x	
Forming and outputting the signal status for technologic blocks (Page 93)	x	x
Dead band (Page 52)	x	x
Release for maintenance (Page 52)	x	x

	MonAnL	MonAnS
Simulating signals (Page 47)	x	x
Selecting a unit of measure (Page 168)	x	x
Operator control permissions (Page 205)	x	x
Generating instance-specific messages (Page 162)	x	x
Display and operator input area for process values and setpoints (Page 164)	x	x
Opening additional faceplates (Page 165)	x	x
Time stamp (Page 1289)	x	
SIMATIC BATCH functionality (Page 55)	x	x

Configurable functions using the `Feature` parameter

Bit number	`Feature` bit function	MonAnL	MonAnS
0	Setting the startup characteristics (Page 116)	x	x
1	Reaction to the out of service mode (Page 148)	x	x
22	Update acknowledgment and error status of the message call (Page 135)	x	
24	Activating local operating permission (Page 130)	x	x
25	Suppression of all messages (Page 146)	x	x
28	Disabling operating points (Page 121)	x	
29	Signaling limit violation (Page 142)	x	

3.1.2 MonDiL compared to MonDiS

Comparison of the MonDiL and MonDiS blocks

The following tables are intended to help you decide which block to use.

Memory and runtime savings of the small block compared to the large block

You save the following resources for each instance:

- Memory space: ~ 55%
- Runtime: ~ 12%

Operating modes of the blocks

	MonDiL	MonDiS
On (Page 58)	x	x
Out of service (Page 58)	x	x

Functions of the blocks

	MonDiL	MonDiS
Suppression and reporting of signal flutter (Page 393)	x	
Delaying on and off function (Page 393)	x	
Delay on function (Page 414)		x
Specifying status display for the block icon (Page 393)	x	x
Displaying auxiliary values (Page 167)	x	
Labeling of buttons and text (Page 167)	x	x
Generating instance-specific messages (Page 162)	x	x
Suppressing messages using the MsgLock parameter (Page 162)	x	x
Forming and outputting the signal status for technologic blocks (Page 93)	x	x
Release for maintenance (Page 52)	x	x
Simulating signals (Page 47)	x	x
Operator control permissions (Page 205)	x	x
Opening additional faceplates (Page 165)	x	x
Time stamp (Page 1289)	x	
SIMATIC BATCH functionality (Page 55)	x	x

Configurable functions using the `Feature` parameter

Bit number	`Feature` bit function	MonDiL	MonDiS
0	Setting the startup characteristics (Page 116)	x	x
1	Reaction to the out of service mode (Page 148)	x	x
22	Update acknowledgment and error status of the message call (Page 135)	x	
24	Activating local operating permission (Page 130)	x	x
25	Suppression of all messages (Page 146)	x	x

3.2 AV - displaying and monitoring additional value

3.2.1 Description of AV

Object name (type + number) and family

Type + number: FB 1903

Family: Monitor

Area of application for AV

The block is used for the following applications:

- Monitoring an additional analog value at a technologic block (for example, motor, valve).

How it works

The block must be connected to a channel block and monitors an additional analog value. The messages of the AV block appear in the alarm view of the technologic block connected to it. Monitoring limits are configured and controlled at the technologic block.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100). The AV block and the technologic block must be installed in the same cyclic interrupt OB.

Interconnect the `AV_Tech` output parameter of the AV block to the input parameter `AV` of the technologic block in the CFC.

Note

Interconnection of the block to multiple technologic blocks is not permitted.

For the AV block, the Advanced Process Library contains process tag type templates; these serve as examples by providing various application scenarios for this block.

Examples of process tag types:

- Motor with an additional analog value and time-stamped signals (Motor_AV_EventTs) (Page 1823)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section AV I/Os (Page 336).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`MsgLock`
4	`AV_AH_Act.Value`
5	`AV_WH_Act.Value`
6	`AV_TH_Act.Value`
7	`AV_TL_Act.Value`
8	`AV_WL_Act.Value`
9	`AV_AL_Act.Value`
10	`AV_AH_En`
11	`AV_WH_En`
12	`AV_TH_En`
13	`AV_TL_En`
14	`AV_WL_En`
15	`AV_AL_En`
16	`AV_AH_MsgEn`
17	`AV_WH_MsgEn`
18	`AV_TH_MsgEn`
19	`AV_TL_MsgEn`
20	`AV_WL_MsgEn`
21	`AV_AL_MsgEn`
22 - 31	Not used

See also

AV modes (Page 332)

AV functions (Page 332)

AV error handling (Page 334)

AV messaging (Page 335)

AV block diagram (Page 339)

3.2.2 AV modes

AV operating modes

The block does not have any of its own operating modes.

If the interconnected technologic block is set to the "Out of service" operating mode, the AV block is also set to the "Out of service" mode. In this case `AV_Out` = `AV`.

See also

Description of AV (Page 330)

AV functions (Page 332)

AV error handling (Page 334)

AV messaging (Page 335)

AV I/Os (Page 336)

AV block diagram (Page 339)

3.2.3 AV functions

Functions of AV

The functions for this block are listed below.

Alarm delays with two time values per limit pair

This block includes the standard function alarm delay for Two time values per limit pair (Page 158).

Limit monitoring of an additional analog value

This block provides the standard function Limit monitoring of an additional analog value (Page 77).

Limit monitoring with hysteresis

This block provides the standard function Limit monitoring with hysteresis (Page 82). It is performed via the input parameter `AV_Hyst`.

Forming the signal status for blocks

The worst signal status `ST_Worst` for the block is formed from the following parameter:

- `AV_Out.ST`

Simulating signals

The simulation in the block AV is activated at the technologic block (`SimOn` = 1). There, the simulation value `SimAV` for the block AV is also specified.

Release for maintenance

The release for maintenance in the AV block is activated at the technologic block (`MS_Release` = 1).

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
22	Update acknowledgment and error status of the message call (Page 135)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148) (transferred to AV via AV_Tech.Mode.Bit)
29	Signaling limit violation (Page 142) (transferred to AV via AV_Tech.Mode.Bit)

See also

AV modes (Page 332)

AV error handling (Page 334)

AV messaging (Page 335)

AV I/Os (Page 336)

AV block diagram (Page 339)

Description of AV (Page 330)

3.2.4 AV error handling

Error handling of AV

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error

Overview of error numbers

The `ErrorNum` I/O can be used to output various error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	No active fault
30	The value of `AV` can no longer be displayed in the REAL number field.

Mode switchover error

This error can be output by the block, see the section Error handling (Page 104).

See also

Description of AV (Page 330)

AV modes (Page 332)

AV functions (Page 332)

AV messaging (Page 335)

AV I/Os (Page 336)

AV block diagram (Page 339)

3.2.5 AV messaging

Messaging

The following messages can be generated for this block:

- Process messages

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ AV - high alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ AV - high warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ AV - high tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ AV - low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ AV - Low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ AV - low alarm limit violated

Explanation

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	Reserved
2	Reserved
3	Reserved
4	AV_Out
5	ExtVa105
6	ExtVa106
7	ExtVa107
8	Reserved
9	Reserved
10	Reserved

The associated values 5 ... 7 are allocated to the parameters `ExtVa105` ... `ExtVa107` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of AV (Page 330)
AV modes (Page 332)
AV functions (Page 332)
AV error handling (Page 334)
AV I/Os (Page 336)
AV block diagram (Page 339)

3.2.6 AV I/Os

I/Os of AV

Input parameters

Parameter	Description	Type	Default
`AV`	Analog value	STRUCT • Value:REAL • ST:BYTE	- • 0.0 • 16#80
`AV_Unit`	Unit of measure for input parameter	INT	1001
`AV_A_DC*`	Delay time for incoming alarms [s]	REAL	0.0
`AV_A_DG*`	Delay time for outgoing alarms [s]	REAL	0.0
`AV_AH_En`	1 = Enable high alarm	BOOL	1
`AV_AH_MsgEn`	1 = Enable high alarm message	BOOL	1
`AV_AL_En`	1 = Enable low alarm	BOOL	1
`AV_AL_MsgEn`	1 = Enable low alarm message	BOOL	1
`AV_OpScale`	Limit for scale in bar graph of faceplate for the analog value	STRUCT • High:REAL • Low:REAL	- • 100.0 • 0.0
`AV_T_DC*`	Delay time for incoming tolerances [s]	REAL	0.0
`AV_T_DG*`	Delay time for outgoing tolerances [s]	REAL	0.0
`AV_TH_En`	1 = Enable high tolerance	BOOL	0
`AV_TH_MsgEn`	1 = Enable high tolerance message	BOOL	1
`AV_TL_En`	1 = Enable low tolerance	BOOL	0
`AV_TL_MsgEn`	1 = Enable low tolerance message	BOOL	1

Parameter	Description	Type	Default
AV_W_DC*	Delay time for incoming warnings [s]	REAL	0.0
AV_W_DG*	Delay time for outgoing warnings [s]	REAL	0.0
AV_WH_En	1 = Enable high warning	BOOL	1
AV_WH_MsgEn	1 = Enable high warning message	BOOL	1
AV_WL_En	1 = Enable low warning	BOOL	1
AV_WL_MsgEn	1 = Enable low warning message	BOOL	1
EN	1 = Called block will be processed	BOOL	1
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
Feature	I/O for additional functions (Page 332)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AV_AH_Act	1 = High alarm active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AV_AL_Act	1 = Low alarm active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AV_Out	Analog value output	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
AV_Tech	Output parameter with which the input parameter AV of the technologic block has to be connected. This includes tags which are passed on to the technologic block for additional processing.	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#00

Parameter	Description	Type	Default
AV_TH_Act	1 = High tolerance active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AV_TL_Act	1 = Low tolerance active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AV_WH_Act	1 = High warning active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AV_WL_Act	1 = Low warning active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see AV error handling (Page 334)	INT	-1
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 330)	DWORD	16#00000000

See also

AV modes (Page 332)

AV messaging (Page 335)

AV block diagram (Page 339)

3.2.7 AV block diagram

AV block diagram

A block diagram is not provided for this block.

See also

Description of AV (Page 330)
AV modes (Page 332)
AV functions (Page 332)
AV error handling (Page 334)
AV messaging (Page 335)
AV I/Os (Page 336)

3.3 MonAnL - Monitoring of an analog process tag (Large)

3.3.1 Description of MonAnL

Object name (type+number) and family

Type + number: FB 1845

Family: Monitor

Area of application for MonAnL

The block is used for the following fields of applications:

- Monitoring an analog process value
- Monitoring of the gradient of an analog process value

Note

This block is also available as a small block. A comparison of the MonAnL and MonAnS blocks is available in the section: MonAnL compared to MonAnS (Page 327)

How it works

The MonAnL block is used to monitor an analog process tag and the corresponding limits. It also monitors the gradient of these signals. The block generates and outputs corresponding messages if limits are violated or if a signal gradient does not meet requirements.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the MonAnL block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Monitoring an analog process tag (AnalogMonitoring) (Page 1818)
- Monitoring of an analog process tag for PA/FF devices (AnalogMonitoring_Fb) (Page 1819)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section MonAnL I/Os (Page 352).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7 - 9	Not used
10	`SimLiOp.Value`
11 - 29	Not used
30	Auxiliary value 1 visible
31	Auxiliary value 2 visible

Status word allocation for `Status2` parameter

Status bit	Parameter
0	MsgLock
1	PV_AH_Act.Value
2	PV_WH_Act.Value
3	PV_TH_Act.Value
4	PV_TL_Act.Value
5	PV_WL_Act.Value
6	PV_AL_Act.Value
7	PV_AH_En
8	PV_WH_En
9	PV_TH_En
10	PV_TL_En
11	PV_WL_En
12	PV_AL_En
13	PV_AH_MsgEn
14	PV_WH_MsgEn
15	PV_TH_MsgEn
16	PV_TL_MsgEn
17	PV_WL_MsgEn
18	PV_AL_MsgEn
19	GradHUpAct.Value
20	GradHDnAct.Value
21	GradLAct.Value
22	GradHUpEn
23	GradHDnEn
24	GradLEn
25	GradHUpMsgEn
26	GradHDnMsgEn
27	GradLMsgEn
28	0 = falling measured value 1 = rising measured value
29	Not used
30	Not used
31	MS_RelOp

Status word allocation for `Status3` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal `3` of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8 - 31	Not used

See also

MonAnL functions (Page 343)
MonAnL messaging (Page 349)
MonAnL block diagram (Page 358)
MonAnL error handling (Page 348)
MonAnL modes (Page 342)

3.3.2 MonAnL modes

MonAnL operating modes

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

You can find general information about the "On" mode in the On (Page 58) section.

"Out of service"

You can find general information about the "Out of service" mode in the Out of service (Page 58) section.

See also

MonAnL block diagram (Page 358)

MonAnL I/Os (Page 352)

MonAnL messaging (Page 349)

MonAnL error handling (Page 348)

MonAnL functions (Page 343)

Description of MonAnL (Page 339)

3.3.3 MonAnL functions

Functions of MonAnL

The functions for this block are listed below.

Alarm delays with two time values per limit pair

This block includes the standard function alarm delay for Two time values per limit pair (Page 158).

Limit monitoring of the process value

This block provides the standard function Limit monitoring of the process value (Page 72).

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Gradient monitoring

The PV_Grad gradient is calculated with a delay function, LagTime. This setting smoothes the jumps of the PV input value with gradient calculation.

The gradient peak values are output at the output parameters PV_GradNP (negative slope) and PV_GradPP (positive slope). They are reset as soon as the operator issues the reset command.

The slope of the PV_Grad gradient can be monitored for the following limits:

- Limit (high) for positive gradients (GradHUpLim)
- Limit (high) for negative gradients (GradHDnLim)
- Limit (low) for absolute gradients (GradLLim)

The individual monitoring functions are activated at the corresponding "Enable" parameters, e.g. GradHUpEn for activating the high gradient limit for positive gradients (GradHUpLim).

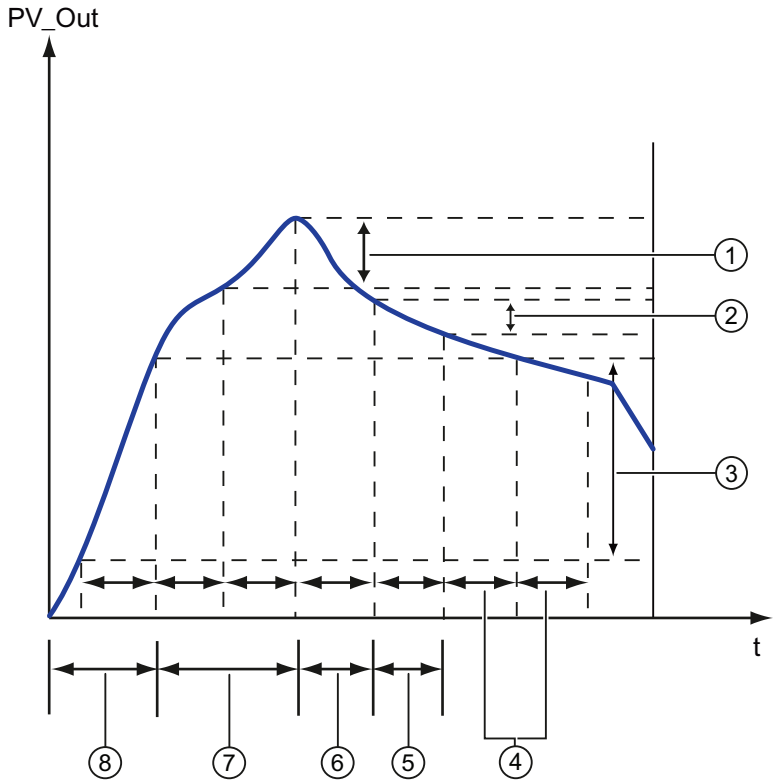
When the values you have defined are reached or exceeded, this is indicated at the corresponding "Active" output parameters, e.g. with GradHUpAct = 1 for the limit (high) for positive gradients.

Messages can be output for these alarms. You activate these as follows:

- Message for alarms (high) for positive gradients: GradHUpMsgEn = 1
- Message for alarms (high) for negative gradients: GradHDnMsgEn = 1
- Message for alarms (low) for absolute gradients: GradLMsgEn = 1

Example of generating alarms for gradient monitoring

The following example shows how alarms for gradient monitoring are generated.



Number	Description
1	Absolute gradient difference ≥ `GradHDnLim`
2	Absolute gradient difference ≤ `GradLLim`
3	Gradient difference ≥ `GradHUpLim`
4	Sampling time (`SampleTime`)
5	Alarm (low) for absolute gradients
6	Alarm (high) for negative gradients
7	No alarm
8	Alarm (high) for positive gradients

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `PV_Out.ST`

Dead band

To suppress values that fluctuate about zero, this block has the standard function Dead band (Page 52).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Simulating signals

This block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Process value (`SimPV`, `SimPV_Li`)

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in chapter Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4 - 6	Not used
7	1 = Operator can reset the maximum values
8 - 10	Not used
11	1 = Operator can activate the Simulation function
12	1 = Operator can activate the Release for maintenance function
13	1 = Operator can change the limit (`PV`) for high alarm
14	1 = Operator can change the limit (`PV`) for high warning
15	1 = Operator can change the limit (`PV`) for high tolerance
16	1 = Operator can change the limit (`PV`) for hysteresis
17	1 = Operator can change the limit (`PV`) for low alarm
18	1 = Operator can change the limit (`PV`) for low warning
19	1 = Operator can change the limit (`PV`) for low tolerance
20	1 = Operator can change the value for the high gradient limit for positive slopes (`GradHUpLim`)
21	1 = Operator can change the value for high gradient limit for negative slopes (`GradHDnLim`)
22	1 = Operator can change the value for the low gradient limit for positive and negative slopes (`GradLLim`)
23	1 = Operator can change the dead band parameter
24 - 31	Not used
32	1 = Operator can change the dead band parameter (`DeadBand`)

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Specifying the display area for process and setpoint values as well as operations

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Time stamp

This block receives a time stamp value via the EventTSIn input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of MonAnL (Page 339)

MonAnL messaging (Page 349)

MonAnL I/Os (Page 352)

MonAnL block diagram (Page 358)

MonAnL error handling (Page 348)

MonAnL modes (Page 342)

3.3.4 MonAnL error handling

Error handling of MonAnL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following error message can be generated at this block:

- Error numbers
- Process control fault (CSF)

Overview of error numbers

The ErrorNum I/O can be used to output various error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of PV can no longer be displayed in the REAL number field.
43	TimeFactor < 0 or TimeFactor > 2

Process control fault (CSF)

An external signal can be activated via the CSF input. If this signal changes to = 1, a process control fault is triggered. Refer to the Error handling (Page 104) section for more on this.

See also

MonAnL block diagram (Page 358)

MonAnL I/Os (Page 352)

MonAnL messaging (Page 349)

MonAnL functions (Page 343)

MonAnL modes (Page 342)

Description of MonAnL (Page 339)

3.3.5 MonAnL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId2, SIG 2).

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ PV - high alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ PV - high warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ PV - high tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ PV - low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ PV - low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ PV - low alarm limit violated
	SIG 7	Alarm - high	$$BlockComment$$ Limit (high) for positive gradients violated
	SIG 8	Alarm - high	$$BlockComment$$ Limit (high) for negative gradients violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 1	Alarm - low	$$BlockComment$$ Limit (low) for absolute gradients violated
	SIG 2	AS process control message - fault	$$BlockComment$$ External error has occurred
	SIG 3	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 5	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVa104`
5	`ExtVa105`
6	`ExtVa106`
7	`ExtVa107`
8	`ExtVa108`
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters `ExtVa104` ... `ExtVa108` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

Associated values for message instance `MsgEvId2`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVa204`
5	`ExtVa205`
6	`ExtVa206`
7	`ExtVa207`
8	`ExtVa208`
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters `ExtVa204` ... `ExtVa208` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of MonAnL (Page 339)
MonAnL functions (Page 343)
MonAnL I/Os (Page 352)
MonAnL block diagram (Page 358)
MonAnL error handling (Page 348)
MonAnL modes (Page 342)

3.3.6 MonAnL I/Os

MonAnL I/Os

Input parameters

Parameter	Description	Type	Default
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DeadBand	Width of dead band	REAL	0.0
EN	1 = Called block will be processed	BOOL	1
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
ExtVa204	Associated value 4 for messages (MsgEvID2)	ANY	
ExtVa205	Associated value 5 for messages (MsgEvID2)	ANY	
ExtVa206	Associated value 6 for messages (MsgEvID2)	ANY	
ExtVa207	Associated value 7 for messages (MsgEvID2)	ANY	
ExtVa208	Associated value 8 for messages (MsgEvID2)	ANY	
Feature	I/O for additional functions (Page 343)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
GradHUpLim	Gradient monitoring: Limit (high) for positive gradients	REAL	10.0
GradHDnLim	Gradient monitoring: Limit (high) for negative gradients	REAL	10.0
GradLLim	Gradient monitoring: Limit (low) for absolute gradients	REAL	1.0
GradHUpEn	1 = Activate gradient monitoring (high) for positive changes	BOOL	1
GradHDnEn	1 = Activate gradient monitoring (high) for negative changes	BOOL	1
GradLEn	1 = Activate gradient monitoring (low)	BOOL	0
GradHUpMsgEn	1 = Activate gradient (high) message for positive changes	BOOL	1
GradHDnMsgEn	1 = Activate gradient (high) message for negative changes	BOOL	1
GradLMsgEn	1 = Activate gradient (low) message	BOOL	1
LagTime	Delay time [s]	REAL	1.0
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgEvId2	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = Occupied by batch control	BOOL	0
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000

Parameter	Description	Type	Default
OS_Perm	I/O for operator control permissions (Page 343)	STRUCT • Bit 0: BOOL • Bit 10: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
PV*	Process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_A_DC*	Delay time for incoming PV alarms [s]	REAL	0.0
PV_A_DG*	Delay time for outgoing PV alarms [s]	REAL	0.0
PV_AH_En	1 = Enable PV alarm limit (high)	BOOL	1
PV_AH_Lim	Limit PV alarm (high)	REAL	95.0
PV_AH_MsgEn	1 = Enable PV alarm (high) message	BOOL	1
PV_AL_En	1 = Enable PV alarm limit (low)	BOOL	1
PV_AL_Lim	PV alarm limit (low)	REAL	5.0
PV_AL_MsgEn	1 = Enable PV alarm (low) message	BOOL	1
PV_Hyst*	Hysteresis for PV alarm, warning and tolerance limits	REAL	0.0
PV_OpScale	Limit for scale in PV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
PV_T_DC*	Delay time for incoming PV tolerance messages [s]	REAL	0.0
PV_T_DG*	Delay time for outgoing PV tolerance messages [s]	REAL	0.0
PV_TH_En	1 = Enable PV tolerance limit (high)	BOOL	0
PV_TH_Lim	Limit PV tolerance message (high)	REAL	85.0
PV_TH_MsgEn	1 = Enable message for PV tolerance message (high)	BOOL	1
PV_TL_En	1 = Enable PV tolerance limit (low)	BOOL	0
PV_TL_Lim	Limit PV tolerance message (low)	REAL	15.0
PV_TL_MsgEn	1 = Activate message for PV tolerance message (low)	BOOL	1
PV_Unit	Unit of measure for process value	INT	1001
PV_W_DC*	Delay time for incoming PV warnings [s]	REAL	0.0
PV_W_DG*	Delay time for outgoing PV warnings [s]	REAL	0.0
PV_WH_En	1 = Enable PV warning limit (high)	BOOL	1
PV_WH_Lim	Limit PV warning (high)	REAL	90.0
PV_WH_MsgEn	1 = Enable PV warning (high) message	BOOL	1
PV_WL_En	1 = Enable PV warning limit (low)	BOOL	1
PV_WL_Lim	Limit PV warning (low)	REAL	10.0
PV_WL_MsgEn	1 = Enable PV warning (low) message	BOOL	1
RstOp*	1 = Operator reset of the gradient's peak values	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1

Parameter	Description	Type	Default
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimPV*	Process value that is used for SimOnLi = 1	REAL	0.0
SimPV_Li	Process value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
StepNo	Batch step number	DWORD	16#00000000
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserAna1	Analog auxiliary value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UserAna2	Analog auxiliary value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MonAnL error handling (Page 348)	INT	-1
GradHUpAct	1 = Gradient alarm (high) for positive changes. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GradHDnAct	1 = Gradient alarm (high) for negative changes. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GradLAct	1 = Low gradient alarm. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgAckn2	Alarm acknowledgement status 2 (output STATUS of second ALARM_8P)	WORD	16#0000
MsgErr1	1 = Alarm error 1 (output ERROR of the first ALARM_8P)	BOOL	0
MsgErr2	1 = Alarm error 2 (output ERROR of the second ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
MsgStat2	Alarm status 2 (output ERROR of second ALARM_8P)	WORD	16#0000
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF

Parameter	Description	Type	Default
PV_AH_Act	1 = PV alarm (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_AL_Act	1 = PV alarm (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Grad	Gradient value.	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_GradPP	Gradient maximum peak value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_GradNP	Gradient minimum peak value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_Out	Output for process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_TH_Act	1 = PV tolerance message (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_TL_Act	1 = PV tolerance message (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_WH_Act	1 = PV warning (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_WL_Act	1 = PV warning (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 339)	DWORD	16#00000000
Status2	Status word 2 (Page 339)	DWORD	16#00000000

Parameter	Description	Type	Default
Status3	Status word 3 (Page 339)	DWORD	16#00000000
SumMsgAct	1 = Group message is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

MonAnL messaging (Page 349)

MonAnL block diagram (Page 358)

MonAnL modes (Page 342)

3.3.7 MonAnL block diagram

MonAnL block diagram

A block diagram is not provided for this block.

See also

MonAnL I/Os (Page 352)

MonAnL messaging (Page 349)

MonAnL error handling (Page 348)

MonAnL functions (Page 343)

MonAnL modes (Page 342)

Description of MonAnL (Page 339)

3.3.8 Operator control and monitoring

3.3.8.1 MonAnL views

Views of the MonAnL block

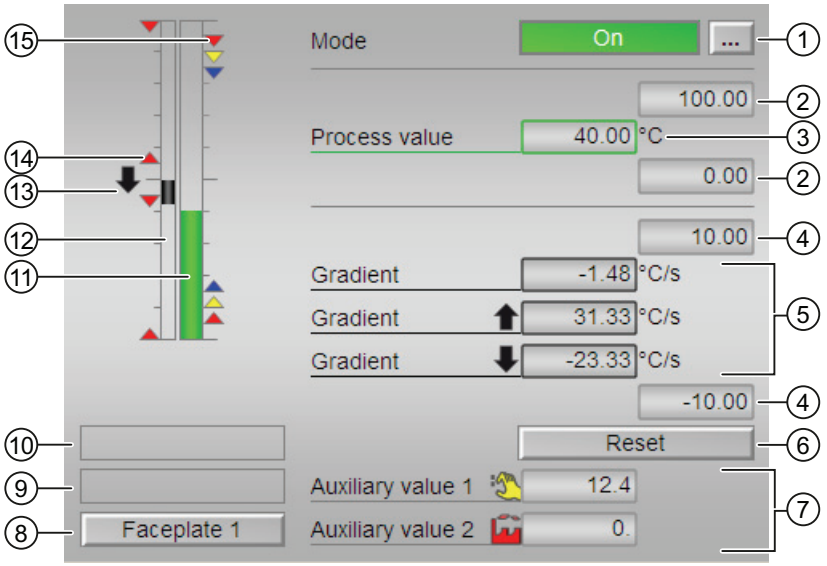
The block MonAnL provides the following views:

- MonAnL standard view (Page 359)
- Alarm view (Page 250)
- MonAnL limit value view (Page 363)
- Trend view (Page 253)
- MonAnL parameter view (Page 364)
- MonAnL preview (Page 365)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for MonAnL (Page 366)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

3.3.8.2 MonAnL standard view

MonAnL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) High and low scale range for the process value

These values provide information on the display range for the bar graph of the process value. The scale range is defined in the engineering system.

(3) Display of the process value including signal status

This area shows the current process value with the corresponding signal status.

If text is configured for this command, it is displayed as additional text and button label for command selection. Additional information is available in the section Labeling of buttons and text (Page 167).

You can change the text for the process value with the `PV_Out` parameter.

(4) High and low scale range for the gradient value

These values provide information on the display range for the bar graph of the gradient. The scale range corresponds to 10% of the scale range for the process value: For example, once you have specified a process value scale range of 0 to 100, the scale range of the gradient will be automatically set to a value between -10 and 10.

The current gradient value is displayed when one of the following monitoring functions is activated:

- Gradient monitoring for positive changes `(GradHUpEn = 1)`
- Gradient monitoring for negative changes `(GradHDnEn = 1)`
- Gradient monitoring `(GradLEn = 1)`

(5) Display of the gradient

This area shows the current, minimum and maximum gradient value and the rise and fall of the value. This display of the minimum and maximum gradient value functions like a min/max pointer.

The current gradient value is displayed when one of the following monitoring functions is activated:

- Gradient monitoring for positive changes `(GradHUpEn = 1)`
- Gradient monitoring for negative changes `(GradHDnEn = 1)`
- Gradient monitoring `(GradLEn = 1)`

The maximum peak gradient value is displayed when the gradient monitoring is activated for positive changes `(GradHUpEn = 1)`

The minimum peak gradient value is displayed when the gradient monitoring is activated for negative changes `(GradHDnEn = 1)`

(6) Resetting the peak values of the gradient

You can use this button to reset the maximum or minimum peak value of the gradient (`PV_GradPP` and `PV_GradNP` output parameters).

The button is displayed when gradient monitoring is activated for positive `(GradHUpEn = 1)` or negative changes `(GradHDnEn = 1)`.

(7) Display of auxiliary values

You can use this area to display two auxiliary values that have been configured in the engineering system. You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(8) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(9) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

(10) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

(11) Bar graph for the "process value"

This area shows the current "Process value" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(12) Bar graph for the gradient

This area shows the current gradient value in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

The bar graph is displayed when gradient monitoring is activated for positive `(GradHUpEn = 1)` or negative changes `(GradHDnEn = 1)`.

(13) Display of the gradient

This display indicates the movement of the gradient up (↑) or down (↓).

Gradient monitoring is displayed when the gradient value PV_Grad ≠ 0 and one of the following monitoring functions is activated:

- Gradient monitoring for positive changes `(GradHUpEn = 1)`
- Gradient monitoring for negative changes `(GradHDnEn = 1)`
- Gradient monitoring `(GradLEn = 1)`

(14) Display of limits in the bar graph

This area shows you the specified limits. Refer to the MonAnL limit value view (Page 363) section for more on this.

The display only appears when the bar for the gradients is also displayed.

(15) Limit display

These colored triangles show you the configured limits in the respective bar graph.

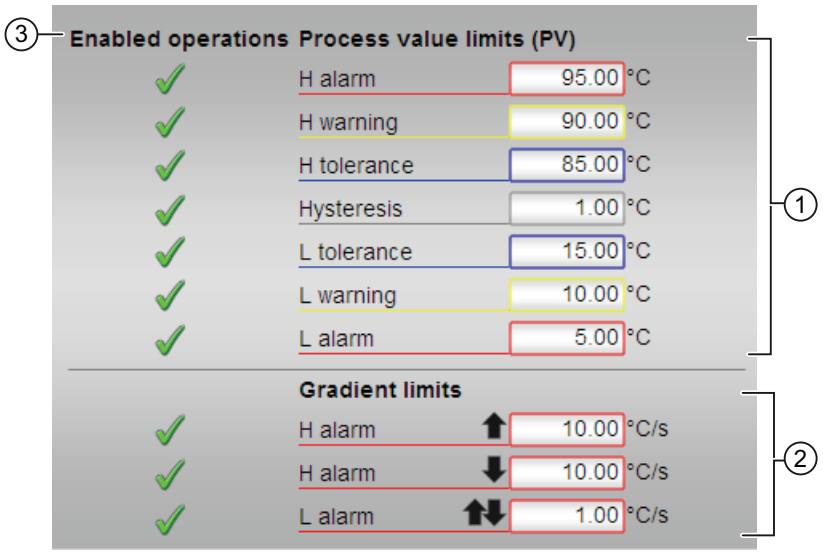
3.3.8.3 MonAnL limit value view

Limit value view of MonAnL

Several values are set in this view by default:

- Process value limits
- Gradient limits

The toolbars of the faceplate and the block icon indicate when the limits are reached or exceeded.



(1) Process value limits

In this area, you can enter the limits for the process value. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high
- "H tolerance": Tolerance high
- "Hysteresis"
- "L tolerance": Tolerance low
- "L warning": Warning low
- "L alarm": Alarm low

(2) Gradient limits

You can enter the gradient limits in this area. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm ⇑": Gradient for the high slope for positive changes
- "H alarm ⇓": Gradient for the high slope for negative changes
- "L alarm ⇑⇓": Gradient for the low slope (absolute)

(3) Enabled operations

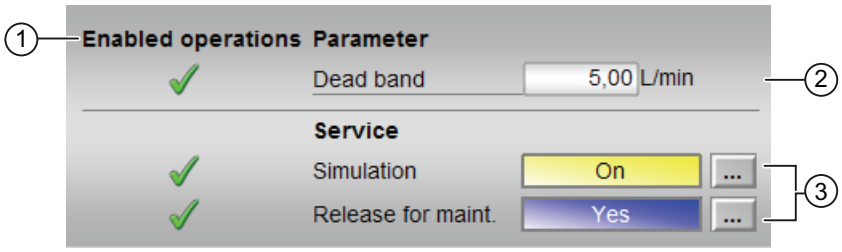
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

3.3.8.4 MonAnL parameter view

Parameter view of MonAnL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(2) Parameter

You can change the following parameter in this area:

- "Dead band"

You can find more information about this in the section Changing values (Page 210).

(3) Service

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance"

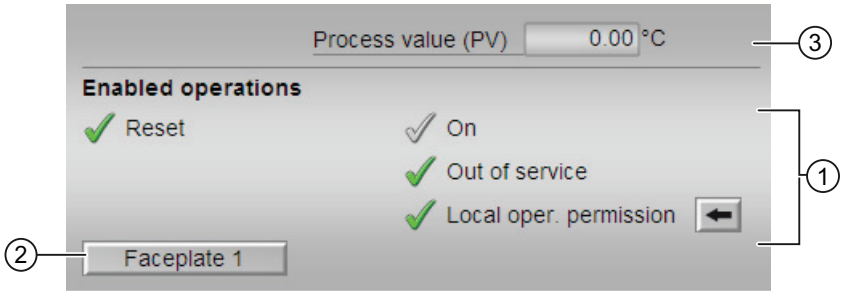
Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

3.3.8.5 MonAnL preview

Preview of MonAnL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- Reset: You can reset block errors.
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(3) Process value

This area displays the real process value (`PV`).

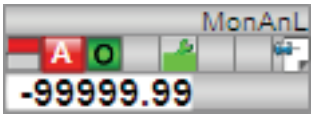
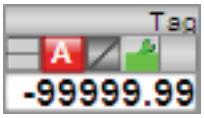
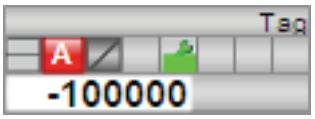
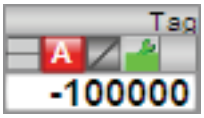
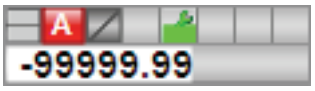
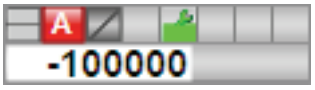
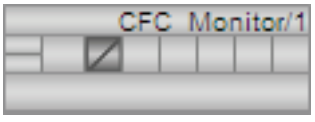
3.3.8.6 Block icon for MonAnL

Block icons for MonAnL

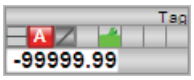
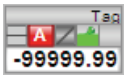
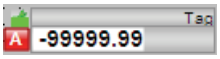
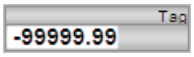
A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault `CSF`
- Operating modes
- Signal status, release for maintenance
- Memo display
- Process value

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	-	Block icon in "Out of service" operating mode (example with type 1) block icon

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	
	3	
	4	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

3.4 MonAnS - Monitoring of an analog process tag (Small)

3.4.1 Description of MonAnS

Object name (type + number)

Type + number: FB 1912

Family: Monitor

Area of application for MonAnS

The block is used for the following fields of application

- Monitoring an analog process value

Note

This block is also available as a large block. A comparison of the MonAnL and MonAnS blocks is available in the section: MonAnL compared to MonAnS (Page 327)

How it works

The MonAnS block is used to monitor an analog process tag and the corresponding limits. The block generates and outputs messages if any violation of limits is detected.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section MonAnS I/Os (Page 377).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock`
1	`PV_AH_Act.Value`
2	`PV_WH_Act.Value`
3 - 4	Not used
5	`PV_WL_Act.Value`
6	`PV_AL_Act.Value`
7	`PV_AH_En`
8	`PV_WH_En`
9 - 10	Not used
11	`PV_WL_En`
12	`PV_AL_En`
13	`PV_AH_MsgEn`
14	`PV_WH_MsgEn`
15 - 16	Not used
17	`PV_WL_MsgEn`
18	`PV_AL_MsgEn`
19 - 30	Not used
31	`MS_RelOp`

See also

MonAnS operating modes (Page 370)
MonAnS functions (Page 371)
MonAnS error handling (Page 374)
MonAnS messaging (Page 375)
MonAnS block diagram (Page 380)

3.4.2 MonAnS operating modes

MonAnS operating modes

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of MonAnS (Page 368)

MonAnS functions (Page 371)

MonAnS error handling (Page 374)

MonAnS messaging (Page 375)

MonAnS I/Os (Page 377)

MonAnS block diagram (Page 380)

3.4.3 MonAnS functions

Functions of MonAnS

The functions for this block are listed below.

Alarm delays with one time value per limit pair

This block includes the standard function alarm delay for One time value per limit pair (Page 157) .

Limit monitoring of the process value

This block provides the standard function Limit monitoring of the process value (Page 72).

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `PV_Out.ST`

Dead band

To suppress values that fluctuate about zero, this block has the standard function Dead band (Page 52).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Simulating signals

This block provides the standard function Simulating signals (Page 47).

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4 - 9	Not used
10	1 = Operator can change the simulation value SimPV
11	Not used
12	1 = Operator can activate the release for maintenance function
13	1 = Operator can change the limit (`PV`) for high alarm

Bit	Function
14	1 = Operator can change the limit (PV) for high warning
15	Not used
16	1 = Operator can change the limit (PV) for hysteresis
17	1 = Operator can change the limit (PV) for low alarm
18	1 = Operator can change the limit (PV) for low warning
19 - 22	Not used
23	1 = Operator can change the dead band parameter DeadBand
19 - 31	Not used

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Specifying the display area for process and setpoint values as well as operations

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of MonAnS (Page 368)

MonAnS operating modes (Page 370)

MonAnS error handling (Page 374)

MonAnS messaging (Page 375)

MonAnS I/Os (Page 377)

MonAnS block diagram (Page 380)

3.4.4 MonAnS error handling

Error handling of MonAnS

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following error message can be generated at this block:

- Error numbers
- Process control fault (CSF)

Overview of error numbers

The ErrorNum I/O can be used to output various error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of PV can no longer be displayed in the REAL number field.

Process control fault (CSF)

An external signal can be activated via the CSF input. If this signal changes to = 1, a process control fault is triggered. Refer to the Error handling (Page 104) section for more on this.

See also

Description of MonAnS (Page 368)

MonAnS operating modes (Page 370)

MonAnS functions (Page 371)

MonAnS messaging (Page 375)

MonAnS I/Os (Page 377)

MonAnS block diagram (Page 380)

3.4.5 MonAnS messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId1, SIG 5).

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ PV - high alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ PV - high warning limit violated
	SIG 3	Warning - low	$$BlockComment$$ PV - low warning limit violated
	SIG 4	Alarm - low	$$BlockComment$$ PV - low alarm limit violated
	SIG 5	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You have the option to use two instance-specific messages for this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 6	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 7	AS process control message - fault	$$BlockComment$$ External message 2

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	ExtVa104
5	ExtVa105
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved

The associated values 4 ... 5 are allocated to the parameters ExtVa104 ... ExtVa105 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of MonAnS (Page 368)

MonAnS operating modes (Page 370)

MonAnS functions (Page 371)

MonAnS error handling (Page 374)

MonAnS I/Os (Page 377)

MonAnS block diagram (Page 380)

3.4.6 MonAnS I/Os

MonAnS I/Os

Input parameters

Parameter	Description	Type	Default
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
CSF	1 = External error (control system error)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
DeadBand	Width of dead band	REAL	0.0
EN	1 = Called block will be processed	BOOL	1
ExtMsg1	Binary input for freely selectable message 1	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
Feature	I/O for additional functions (Page 371)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
Occupied	1 = Occupied by batch control	BOOL	0
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0

Parameter	Description	Type	Default
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 371)	STRUCT • Bit 0: BOOL • Bit 10: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
PV*	Process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_A_DC*	Delay time for incoming PV alarms [s]	REAL	0.0
PV_AH_En	1 = Enable PV alarm limit (high)	BOOL	1
PV_AH_Lim	Limit PV alarm (high)	REAL	95.0
PV_AH_MsgEn	1 = Enable PV alarm (high) message	BOOL	1
PV_AL_En	1 = Enable PV alarm limit (low)	BOOL	1
PV_AL_Lim	PV alarm limit (low)	REAL	5.0
PV_AL_MsgEn	1 = Enable PV alarm (low) message	BOOL	1
PV_Hyst*	Hysteresis for PV alarm, warning and tolerance limits	REAL	0.0
PV_OpScale	Limit for scale in PV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
PV_Unit	Unit of measure for process value	INT	1001
PV_W_DC*	Delay time for incoming PV warnings [s]	REAL	0.0
PV_WH_En	1 = Enable PV warning limit (high)	BOOL	1
PV_WH_Lim	Limit PV warning (high)	REAL	90.0
PV_WH_MsgEn	1 = Enable PV warning (high) message	BOOL	1
PV_WL_En	1 = Enable PV warning limit (low)	BOOL	1
PV_WL_Lim	Limit PV warning (low)	REAL	10.0
PV_WL_MsgEn	1 = Enable PV warning (low) message	BOOL	1
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SimOn	1 = Simulation on	BOOL	0
SimPV*	Process value used for SimOn = 1	REAL	0.0
StepNo	Batch step number	DWORD	16#00000000
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MonAnS error handling (Page 374)	INT	-1
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
PV_AH_Act	1 = PV alarm (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_AL_Act	1 = PV alarm (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Out	Output for process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_WH_Act	1 = PV warning (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_WL_Act	1 = PV warning (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 368)	DWORD	16#00000000
Status2	Status word 2 (Page 368)	DWORD	16#00000000
SumMsgAct	1 = Group message is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

MonAnS operating modes (Page 370)

MonAnS messaging (Page 375)

MonAnS block diagram (Page 380)

3.4.7 MonAnS block diagram

MonAnS block diagram

A block diagram is not provided for this block.

See also

Description of MonAnS (Page 368)

MonAnS operating modes (Page 370)

MonAnS functions (Page 371)

MonAnS error handling (Page 374)

MonAnS messaging (Page 375)

MonAnS I/Os (Page 377)

3.4.8 Operator control and monitoring

3.4.8.1 MonAnS views

Views of the MonAnS block

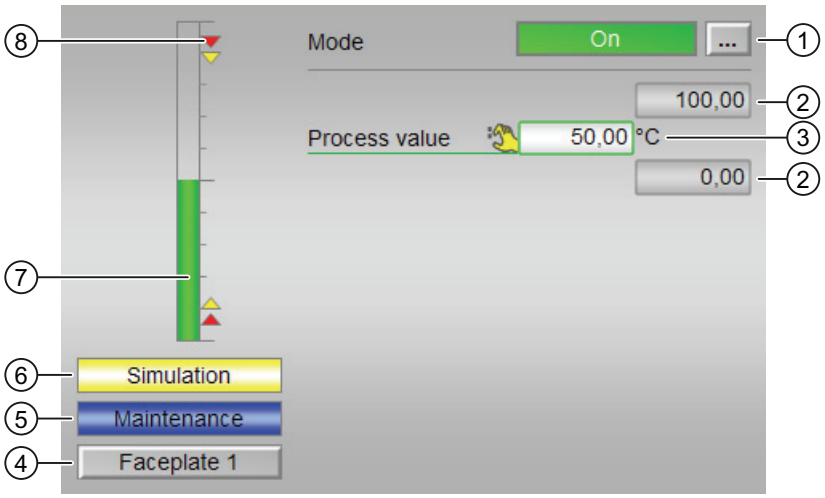
The block MonAnS provides the following views:

- MonAnS standard view (Page 381)
- Alarm view (Page 250)
- MonAnS limit value view (Page 383)
- Trend view (Page 253)
- MonAnS parameter view (Page 384)
- MonAnS preview (Page 385)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for MonAnS (Page 386)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

3.4.8.2 MonAnS standard view

MonAnS standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) High and low scale range for the process value

These values provide information on the display range for the bar graph of the process value. The scale range is defined in the engineering system.

(3) Display of the process value including signal status

This area shows the current process value with the corresponding signal status.

If text is configured for this command, it is displayed as additional text and button label for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

You can change the text for the process value with the `PV_Out` parameter.

(4) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

(5) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

(6) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

(7) Bar graph for the "process value"

This area shows the current "Process value" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(8) Limit display

These colored triangles show you the configured limits in the respective bar graph.

See also

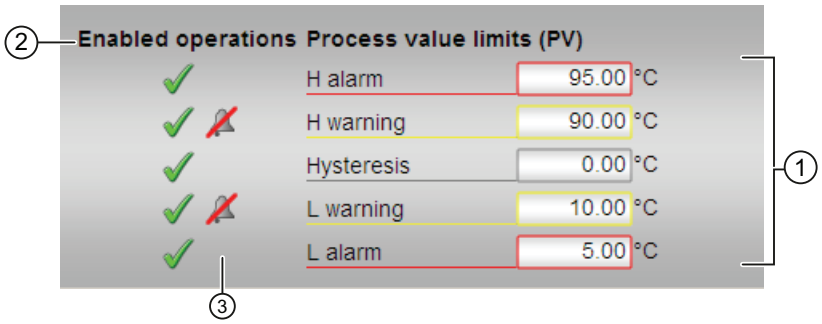
Displaying auxiliary values (Page 167)

3.4.8.3 MonAnS limit value view

Limit value view of MonAnS

You can specify the process value limits in this view:

The toolbars of the faceplate and the block icon indicate when the limits are reached or exceeded.



(1) Process value limits

In this area, you can enter the limits for the process value. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high
- "Hysteresis"
- "L warning": Warning low
- "L alarm": Alarm low

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

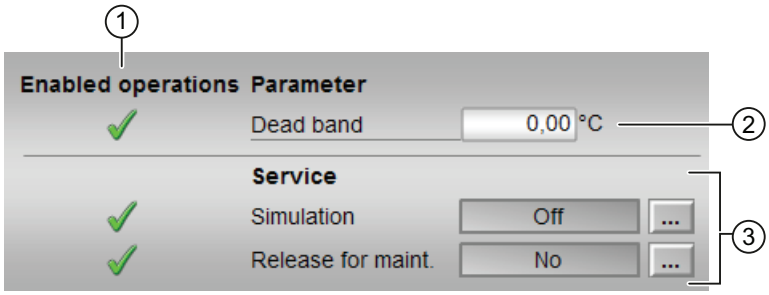
- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

(3) Message suppression

Message suppression indicates whether or not the suppression of the associated message in the AS block is activated with the `xx_MsgEn` parameter. The output of messages is not suppressed when the block is installed (all `xx_MsgEn` parameters are preset to 1). Messages can only be output if limit monitoring of the additional analog value has been enabled.

3.4.8.4 MonAnS parameter view

Parameter view of MonAnS



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(2)Parameter

You can change parameters in this area. Refer to the section Changing values (Page 210).

You can influence the following parameters:

- "Dead band": Width of dead band

(3)Service

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance"

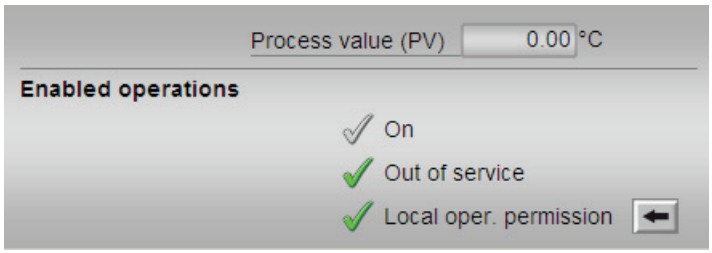
Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

3.4.8.5 MonAnS preview

Preview of MonAnS



Process value

This area displays the real process value (PV).

Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

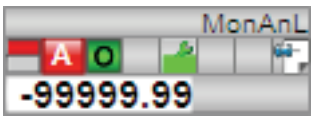
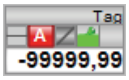
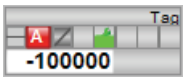
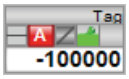
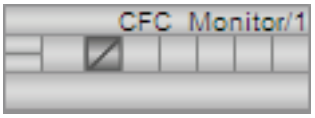
3.4.8.6 Block icon for MonAnS

Block icons for MonAnS

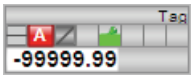
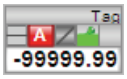
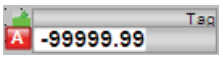
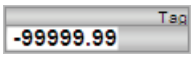
A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault `CSF`
- Operating modes
- Signal status, release for maintenance
- Memo display
- Process value

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	-	Block icon in "Out of service" operating mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	
	3	
	4	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

3.5 MonDiL - Monitoring of a digital process tag (Large)

3.5.1 Description of MonDiL

Object name (type + number) and family

Type + number: FB 1848

Family: Monitor

Area of application for MonDiL

The block is used for the following applications:

- Monitoring a digital process tag

Note

This block is also available as a small block. A comparison of the MonDiL and MonDiS blocks is available in the section: MonDiL compared to MonDiS (Page 328)

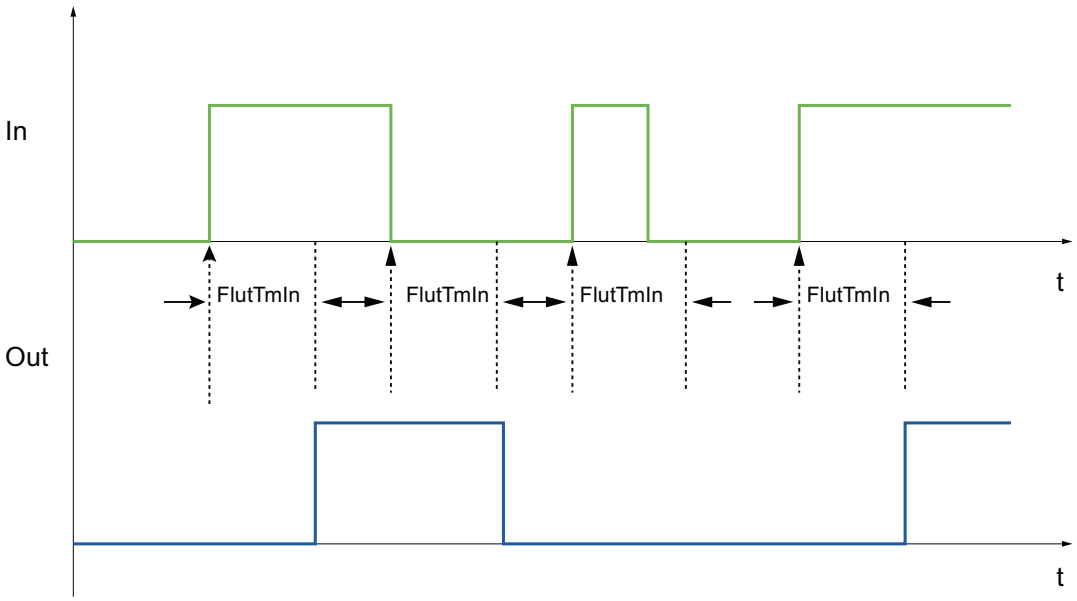
How it works

The MonDiL block is used to monitor a digital process tag with flutter suppression. The block reports excess flutter signals which are generated within a defined period.

The digital value to be monitored is interconnected to the `In` input parameter. Every time there is a signal change (1 - 0 or 0 - 1) the configurable timer (`FlutTmIn`) for flutter suppression is started as shown in the figure below.

When the time you have specified expires and no single change occurs, the input signal is written to the `Out` output parameter.

Set the time in the timer (`FlutTmIn`) to 0 seconds; the input signal is written directly to the output.



Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the MonDiL block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Monitoring of a digital process tag (DigitalMonitoring) (Page 1817)
- Monitoring a digital process tag for PA/FF devices (DigitalMonitoring_Fb) (Page 1817)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block. The `Out` and `FlutAct` parameters are affected.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section MonDiL I/Os (Page 400).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7	`Out.Value`
8	`AlmMsgEn`
9	Not used
10	`SimLiOp.Value`
11 - 29	Not used
30	Auxiliary value 1 is visible
31	Auxiliary value 2 is visible

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock.Value`
1	`FlutAct.Value`
2	`FlutEn`
3	`FlutMsgEn`
4 - 30	Not used
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8 - 19	Not used
20	Color = 6 (Violet, operator prompt) and `Out = 1`
21	Not used
22	Color = 5 (Pastel green, process) and `Out = 1`
23 - 24	Not used
25	Color = 4 (Black, control system) and `Out = 1`
26	Not used
27	Color = 3 (Blue, tolerance) and `Out = 1`
28	Not used
29	Color = 2 (Yellow, warning) and `Out = 1`
30	Not used
31	Color = 1 (Red, alarm) and `Out = 1`

See also

MonDiL functions (Page 393)
MonDiL messaging (Page 398)
MonDiL block diagram (Page 404)
MonDiL error handling (Page 397)
MonDiL modes (Page 392)

3.5.2 MonDiL modes

MonDiL operating modes

This block provides the following modes.

- On (Page 58)
- Out of service (Page 58)

"On"

You can find general information about the "On" mode in the On (Page 58) section.

Out of service

You can find general information about the "Out of service" mode in the Out of service (Page 58) section.

See also

MonDiL block diagram (Page 404)

MonDiL I/Os (Page 400)

MonDiL messaging (Page 398)

MonDiL error handling (Page 397)

MonDiL functions (Page 393)

Description of MonDiL (Page 388)

3.5.3 MonDiL functions

Functions of MonDiL

The functions for this block are listed below.

Suppression and reporting of signal flutter

The block is operated as "flutter filter". The block receives digital signals at the `In` input parameter and ideally these do not develop any flutter. The block monitors this if you activate the function via the `FlutEn` = 1 input parameter.

Use the `FlutTmIn` input parameter to set how long a continuous signal should last in order to be transferred to the process without flutter.

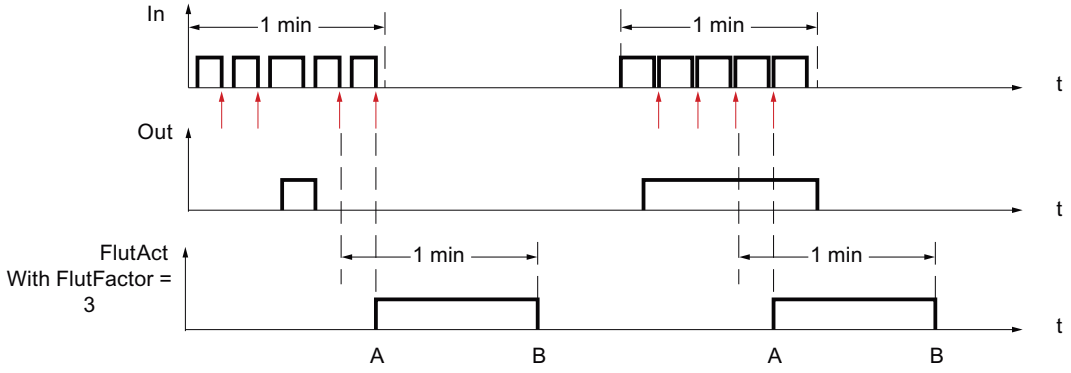
The preprocessed signal is sent to the process via the `Out` output parameter.

The block can be set up to report signal flutter. To do this, set parameter `FlutMsgEn` = 1. Monitoring starts at the next 0 - 1 - 0 edge transition at the input signal `In`.

Use the `FlutFactor` input parameter to specify the maximum number of signals to be filtered per minute by the block. If this maximum value is reached or exceeded, this is indicated at the output parameter `FlutAct` by a 1. The message (`FlutAct` = 0). is cleared after the maximum value has dropped again by more than half.

Example of the flutter suppression

You can use the `FlutFactor` input parameter to limit flutter signals to 4 per minute.



Case A:

Four flutter signals have occurred within a minute. `FlutFactor` is set to three, in other words, a maximum of three flutter signal per minute are allowed, the `FlutAct` output is set to one.

Case B:

Only one flutter signal has occurred within a minute, which corresponds to less than half the `FlutFactor`. The `FlutAct` output is reset.

Delaying on and off switching functions

You set delay times for setting the output using the input parameter `Out_DC` or `Out_DG`:

- `Out_DC`: delay time [s] for rising edges (0 - 1 edge)
- `Out_DG`: delay time [s] for falling edge (1 - 0 edge)

The `Out` output parameter is after expiration of the delay time.

You disable this function if you set the value of the respective parameter to 0 seconds.

Adapting the color representation in the configured message class

You can set the background color of instance-specific texts for the block icons 3 to 6 and thereby adapt them to the configured message class. This background color is displayed when the output parameter is `Out` = 1.

You set the color coding with the `Color` parameter:

Value `Color`	Color
0	Old reactions
1	Red (alarm)
2	Yellow (warning)
3	Blue (tolerance)
4	Black (control system)
5	Pastel green (process)
6	Violet (operator prompt)

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Changing labels on buttons and text

This block provides the standard function Labeling of buttons and text (Page 167).

You can change the label for "Process value" for this block as you please. The change is made with the `FlutTmIn` parameter.

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `In.ST`

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Simulating signals

This block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Value (`SimIn`, `SimInLi`)

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can change the delay time for rising edges (`Out_DC`)
5	1 = Operator can change the delay time for falling edges (`Out_DG`)
6 - 10	Not used
11	1 = Operator can activate the Simulation function
12	1 = Operator can activate the Release for maintenance function
13	Not used
14	1 = The user can input the duration for flutter suppression.
15	1 = The user can specify the number of flutter signals that should be suppressed.
16 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of MonDiL (Page 388)

MonDiL messaging (Page 398)

MonDiL I/Os (Page 400)

MonDiL block diagram (Page 404)

MonDiL error handling (Page 397)

MonDiL modes (Page 392)

Reaction of the switching points in the "Out of service" operating mode (Page 148)

3.5.4 MonDiL error handling

Error handling of MonDiL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Process control fault (CSF)
- Flutter alarm

Overview of error numbers

The ErrorNum I/O can be used to output various error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
11	FlutTmIn < 0
16	FlutFactor is -ve or > 100

Process control fault (CSF)

An external signal can be activated via the CSF input. If this signal changes to = 1, a process control fault is triggered. Refer to the Error handling (Page 104) section for more on this.

Flutter alarm

An alarm is output at output `FlutAct` with 1 if signal flutter is detected. Refer to the functions of the block > Suppression and reporting of signal flutter (Page 393).

See also

MonDiL block diagram (Page 404)

MonDiL I/Os (Page 400)

MonDiL messaging (Page 398)

MonDiL modes (Page 392)

Description of MonDiL (Page 388)

3.5.5 MonDiL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

You can interconnect an external fault (signal) to input parameter `CSF`. If it changes to `CSF` = 1, a process control fault is triggered (`MsgEvId1`, SIG 3).

Process messages

You can use up to four instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
`MsgEvId1`	SIG 1	Alarm - high	$$BlockComment$$ `Out` - Binary value set
	SIG 2	Warning - high	$$BlockComment$$ Flutter limits violated
	SIG 3	AS process control message - fault	$$BlockComment$$ External error has occurred
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 1

Message instance	Message identifier	Message class	Event
	SIG 5	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 6	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVa104`
5	`ExtVa105`
6	`ExtVa106`
7	`ExtVa107`
8	`ExtVa108`
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters `ExtVa104` ... `ExtVa108` and can be used. Additional information is available in the "Process Control System PCS7 - Engineering System" manual.

See also

Description of MonDiL (Page 388)

MonDiL functions (Page 393)

MonDiL I/Os (Page 400)

MonDiL block diagram (Page 404)

MonDiL error handling (Page 397)

MonDiL modes (Page 392)

Time stamp (Page 163)

3.5.6 MonDiL I/Os

I/Os of MonDiL

Input parameters

Parameter	Description	Type	Default
AlmMsgEn	1 = Alarms are output.	BOOL	1
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Color	Display for status display in the block icon: 0 = Default setting 1 = Red (alarm) 2 = Yellow (warning) 3 = Blue (tolerance) 4 = Black (control system message) 5 = Pastel green (process message) 6 = Violet (operator prompt)	BYTE	16#00
EN	1 = Called block will be processed	BOOL	1
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	

Parameter	Description	Type	Default
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
Feature	I/O for additional functions (Page 393)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
FlutEn	1 = Flutter suppression on	BOOL	1
FlutFactor	Number of flutter signals that can be suppressed	INT	2
FlutMsgEn	1 = Signal flutter is reported if the period of the signal flutter is < FlutTmIn.	BOOL	1
FlutTmIn	Period during which signal flutter is suppressed.	REAL	0.0
In	Digital input value	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = Occupied by batch control	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnOp*	1 = "On" mode via operator	BOOL	0
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 393)	STRUCT • Bit 0: BOOL • Bit 10: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
Out_DC	Delay time for setting the output parameter Out for rising edges	REAL	0.0
Out_DG	Delay time for setting the output parameter Out for falling edges	REAL	0.0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1

Parameter	Description	Type	Default
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimIn*	Value used for SimOn = 1	BOOL	0
SimInLi	Value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StepNo	Batch step number	DWORD	16#00000000
UserAna1	Analog auxiliary value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UserAna2	Analog auxiliary value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MonDiL error handling (Page 397)	INT	-1
FlutAct	1 = Suppresses flutter signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	1 = Alarm error 1 (output ERROR of the first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
Out	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 388)	DWORD	16#00000000
Status2	Status word 2 (Page 388)	DWORD	16#00000000
Status3	Status word 3 (Page 388)	DWORD	16#00000000

See also

MonDiL messaging (Page 398)

MonDiL block diagram (Page 404)

MonDiL modes (Page 392)

3.5.7 MonDiL block diagram

MonDiL block diagram

A block diagram is not provided for this block.

See also

MonDiL I/Os (Page 400)

MonDiL messaging (Page 398)

MonDiL error handling (Page 397)

MonDiL functions (Page 393)

MonDiL modes (Page 392)

Description of MonDiL (Page 388)

3.5.8 Operator control and monitoring

3.5.8.1 MonDiL views

Views of the MonDiL block

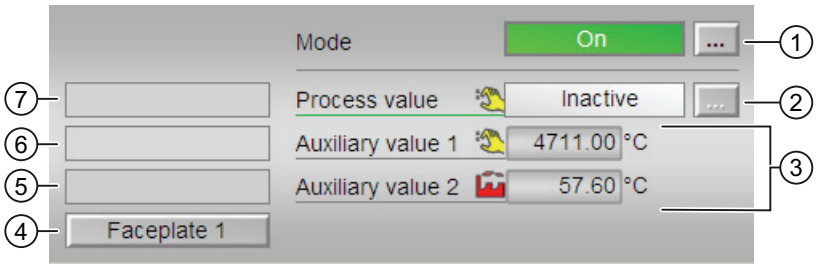
The block MonDiL provides the following views:

- MonDiL standard view (Page 405)
- Alarm view (Page 250)
- Trend view (Page 253)
- MonDiL parameter view (Page 406)
- MonDiL preview (Page 408)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for MonDiL (Page 409)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

3.5.8.2 MonDiL standard view

MonDiL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Display of process value enabled/disabled

This area shows you the status of the individual connected parameters.

The identifier can be changed using Text 0 / Text 1 at the output parameter `Out`.

If the block is in simulation, you can enable or disable the process value. To do this, click on the display to open the operator input area.

If text is configure for these commands, it is displayed as additional text and as button labels for command selection. Additional information is available in the section Labeling of buttons and text (Page 167).

You can change the text for the process value with the `FlutTmIn` parameter.

(3) Display of auxiliary values

You can use this area to display two auxiliary values that have been configured in the engineering system. You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(4) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(5) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

(6) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

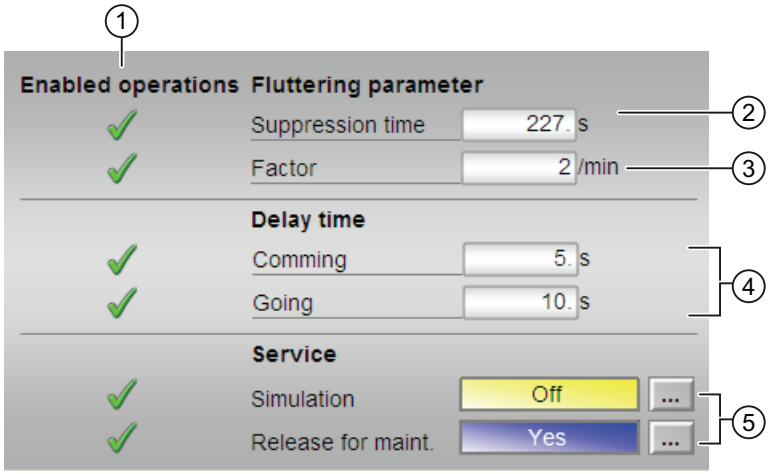
(7) Display area for block states

This area provides additional information on the operating state of the block:

- "Fluttering"

3.5.8.3 MonDiL parameter view

Parameter view of MonDiL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(2) Suppression time

Enter the time period during which signal flutter is suppressed. You can find additional information on this in the Changing values (Page 210) section.

(3) Factor

Enter the number of flutter signals that can be suppressed. You can find additional information on this in the Changing values (Page 210) section.

(4) Delay time

Enter here the delay time by which the output should be set. Enter delay times here for positive ("incoming", 0 - 1 edge) and negative edges ("outgoing", 1 - 0 edge). You can find additional information on this in the Changing values (Page 210) section.

(5) Service

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance"

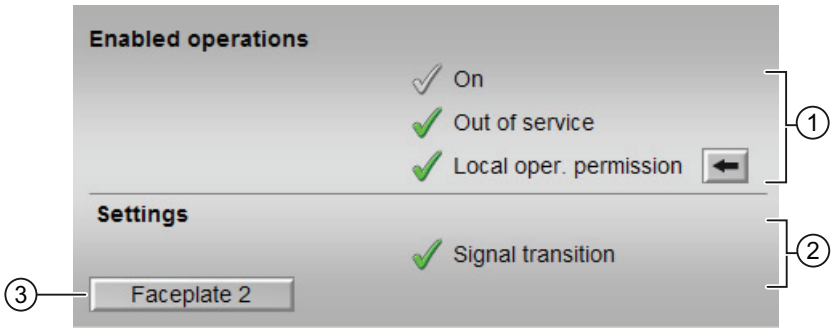
Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

3.5.8.4 MonDiL preview

Preview of MonDiL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Settings

- "Signal transition":
  - Activated: A message is generated with a "0 → 1" signal transition at the monitored input.
  - Deactivated: No message is generated.

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

3.5.8.5 Block icon for MonDiL

Block icons for MonDiL

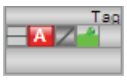
A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault `CSF`
- Operating modes
- Signal status, release for maintenance
- Memo display
- Display of the output signal
- Status display
- Display configured instance-specific text for the process value (only for block icons 3 to 6). The instance-specific text for the process value can be changed using Text 0 / Text 1 at the output parameter `Out`.

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	The text background color for output `Out = 1` depends on the configuration of the input "`Color`".
	4	See 3
	5	See 3
	6	See 3
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	The text background color for output `Out = 1` depends on the configuration of the input "`Color`".
	3	See 2
	4	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

3.6 MonDiS - Monitoring of a digital process tag (Small)

3.6.1 Description of MonDiS

Object name (type + number) and family

Type + number: FB 1913

Family: Monitor

Area of application for MonDiS

The block is used for the following applications:

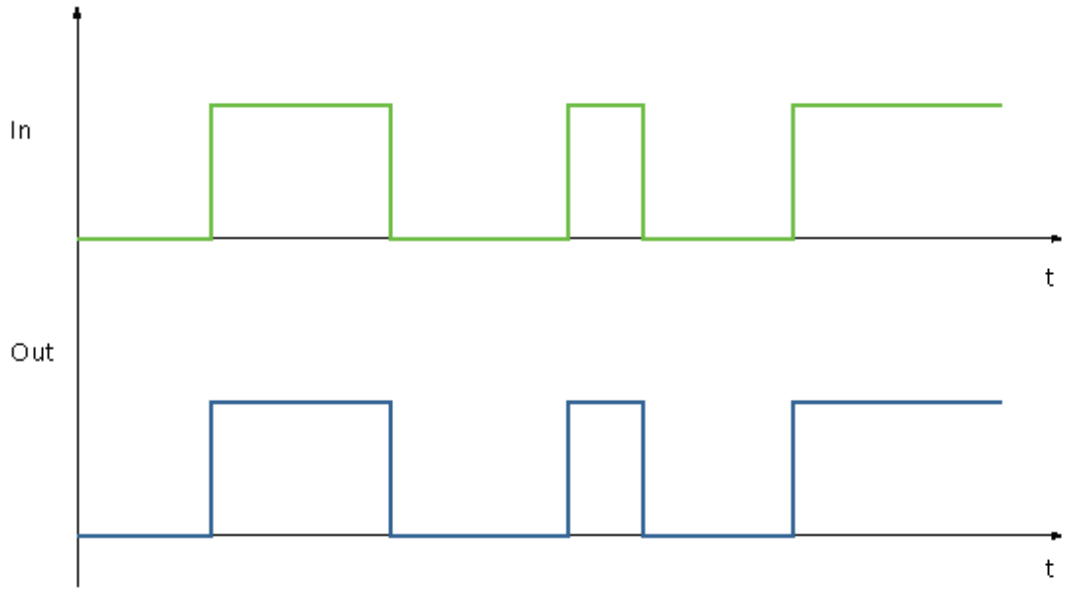
- Monitoring a digital process tag

Note

This block is also available as a large block. A comparison of the MonDiL and MonDiS blocks is available in the section: MonDiL compared to MonDiS (Page 328)

How it works

The MonDiS is used to monitor a digital process tag. The digital value to be monitored is interconnected to the `In` input parameter. The input signal is written directly to the `Out` output parameter.



Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block. The `Out` parameter is affected.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section MonDiS I/Os (Page 420).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7	`Out.Value`
8	`AlmMsgEn`
9 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock.Value`
1 - 30	Not used
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0 - 19	Not used
20	Color = 6 (Violet, operator prompt) and `Out = 1`
21	Not used
22	Color = 5 (Pastel green, process) and `Out = 1`
23 - 24	Not used
25	Color = 4 (Black, control system) and `Out = 1`
26	Not used
27	Color = 3 (Blue, tolerance) and `Out = 1`
28	Not used
29	Color = 2 (Yellow, warning) and `Out = 1`
30	Not used
31	Color = 1 (Red, alarm) and `Out = 1`

See also

MonDiS operating modes (Page 413)
MonDiS functions (Page 414)
MonDiS error handling (Page 417)
MonDiS messaging (Page 418)
MonDiS block diagram (Page 422)

3.6.2 MonDiS operating modes

MonDiS operating modes

This block provides the following modes.

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

Out of service

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of MonDiS (Page 411)

MonDiS functions (Page 414)

MonDiS error handling (Page 417)

MonDiS messaging (Page 418)

MonDiS I/Os (Page 420)

MonDiS block diagram (Page 422)

3.6.3 MonDiS functions

Functions of MonDiS

The functions for this block are listed below.

Delay on function

You set delay times for setting the output using the input parameter `Out_DC`:

- `Out_DC`: delay time [s] for rising edges (0 - 1 edge)

The `Out` output parameter is after expiration of the delay time.

You disable this function if you set the value of the respective parameter to 0 seconds.

Adapting the color representation in the configured message class

You can set the background color of instance-specific texts for the block icons 2 and 3 and thereby adapt them to the configured message class. This background color is displayed when the output parameter is `Out` = 1.

You set the color coding with the `Color` parameter:

Value `Color`	Color
0	Old reactions
1	Red (alarm)
2	Yellow (warning)
3	Blue (tolerance)
4	Black (control system)
5	Pastel green (process)
6	Violet (operator prompt)

Changing labels on buttons and text

This block provides the standard function Labeling of buttons and text (Page 167).

You can change the label for "Process value" for this block as you please. The change is made with the `OnOp` parameter.

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `In.ST`

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Simulating signals

This block provides the standard function Simulating signals (Page 47).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can change the delay time for rising edges (`Out_DC`)
5 - 9	Not used
10	Operator can change the simulation value SimIn
12	1 = Operator can activate the Release for maintenance function
13 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of MonDiS (Page 411)

MonDiS operating modes (Page 413)

MonDiS error handling (Page 417)

MonDiS messaging (Page 418)

MonDiS I/Os (Page 420)

MonDiS block diagram (Page 422)

3.6.4 MonDiS error handling

Error handling of MonDiS

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Process control fault (CSF)

Overview of error numbers

The ErrorNum I/O can be used to output various error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.

Process control fault (CSF)

An external signal can be activated via the CSF input. If this signal changes to = 1, a process control fault is triggered. Refer to the Error handling (Page 104) section for more on this.

See also

Description of MonDiS (Page 411)

MonDiS operating modes (Page 413)

MonDiS functions (Page 414)

MonDiS messaging (Page 418)

MonDiS I/Os (Page 420)

MonDiS block diagram (Page 422)

3.6.5 MonDiS messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

You can interconnect an external fault (signal) to input parameter `CSF`. If it changes to `CSF` = 1, a process control fault is triggered (`MsgEvId1`, SIG 3).

Process messages

You can use up to four instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
`MsgEvId1`	SIG 1	Alarm - high	$$BlockComment$$ `Out` - Binary value set
	SIG 2	Not used	
	SIG 3	AS process control message - fault	$$BlockComment$$ External error has occurred
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 5	AS process control message - fault	$$BlockComment$$ External message 2

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVa104`
5	`ExtVa105`
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved

The associated values 4 and 5 are allocated to the parameters `ExtVa104` and `ExtVa105` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of MonDiS (Page 411)

MonDiS operating modes (Page 413)

MonDiS functions (Page 414)

MonDiS error handling (Page 417)

MonDiS block diagram (Page 422)

3.6.6 MonDiS I/Os

I/Os of MonDiS

Input parameters

Parameter	Description	Type	Default
AlmMsgEn	1 = Alarms are output.	BOOL	1
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Color	Color for status display in the block icon: 0 = Default setting 1 = Red (alarm) 2 = Yellow (warning) 3 = Blue (tolerance) 4 = Black (control system message) 5 = Pastel green (process message) 6 = Violet (operator prompt)	BYTE	16#00
EN	1 = Called block will be processed	BOOL	1
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
Feature	I/O for additional functions (Page 414)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
In	Digital input value	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000

Parameter	Description	Type	Default
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = Occupied by batch control	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnOp*	1 = "On" mode via operator	BOOL	0
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 414)	STRUCT • Bit 0: BOOL • Bit 10: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
Out_DC	Delay time for setting the output parameter Out for rising edges	REAL	0.0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SimOn	1 = Simulation on	BOOL	0
SimIn*	Value used for SimOn = 1	BOOL	0
StepNo	Batch step number	DWORD	16#00000000
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MonDiS error handling (Page 417)	INT	-1
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
Out	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 411)	DWORD	16#00000000
Status2	Status word 2 (Page 411)	DWORD	16#00000000
Status3	Status word 3 (Page 411)	DWORD	16#00000000

See also

MonDiS operating modes (Page 413)

MonDiS block diagram (Page 422)

3.6.7 MonDiS block diagram

MonDiS block diagram

A block diagram is not provided for this block.

See also

Description of MonDiS (Page 411)

MonDiS operating modes (Page 413)

MonDiS functions (Page 414)

MonDiS messaging (Page 418)

MonDiS I/Os (Page 420)

MonDiS error handling (Page 417)

3.6.8 Operator control and monitoring

3.6.8.1 MonDiS views

Views of the MonDiS block

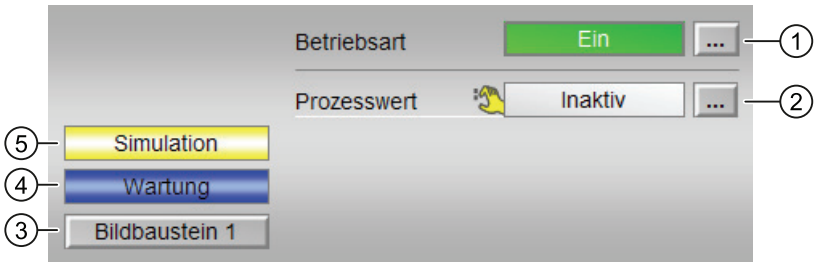
The block MonDiS provides the following views:

- MonDiS standard view (Page 423)
- Alarm view (Page 250)
- Trend view (Page 253)
- MonDiS parameter view (Page 424)
- MonDiS preview (Page 426)
- Memo view (Page 252)
- Batch view (Page 251)
- MonDiS block icon (Page 427)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

3.6.8.2 MonDiS standard view

MonDiS standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Display of process value enabled/disabled

This area shows you the status of the individual connected parameters.

The identifier can be changed using Text 0 / Text 1 at the output parameter `Out`.

If the block is in simulation, you can enable or disable the process value. To do this, click on the display to open the operator input area.

If text is configure for these commands, it is displayed as additional text and as button labels for command selection. Additional information is available in the section Labeling of buttons and text (Page 167).

You can change the text for the process value with the `OnOp` parameter.

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

(4) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

(5) Display area for block states

This area provides additional information on the operating state of the block:

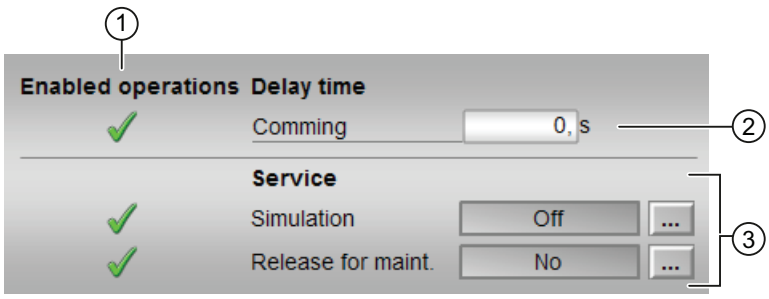
- "Simulation"

See also

Displaying auxiliary values (Page 167)

3.6.8.3 MonDiS parameter view

Parameter view of MonDiS



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(2) Delay time

Enter here the delay time by which the output should be set. Enter delay times here for positive ("incoming", 0 - 1 edge) edges. Additional information is available in the section Switching operating states and operating modes (Page 208).

(3) Service

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance"

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

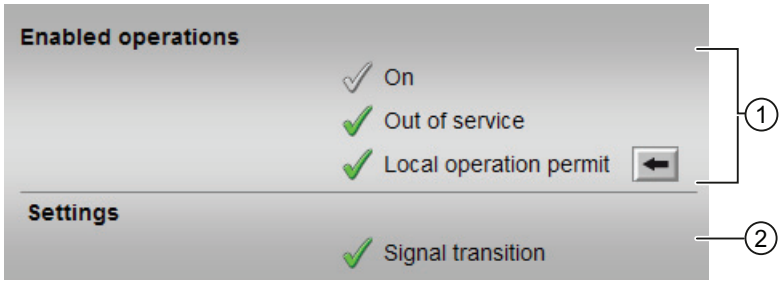
- Simulating signals (Page 47)
- Release for maintenance (Page 52)

See also

Changing values (Page 210)

3.6.8.4 MonDiS preview

Preview of MonDiS



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Settings

- "Signal transition":
  - Activated: A message is generated with a "0 → 1" signal transition at the monitored input.
  - Deactivated: No message is generated.

3.6.8.5 MonDiS block icon

Block icons for MonDiS

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault `CSF`
- Operating modes
- Signal status, release for maintenance
- Memo display
- Display of the output signal
- Status display
- Display configured instance-specific text for the process value (only for block icons 2 and 3). The instance-specific text for the process value can be changed using Text 0 / Text 1 at the output parameter `Out`.

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	The text background color for output `Out = 1` depends on the configuration of the input "`Color`".
	3	See 2
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	The text background color for output `Out = 1` depends on the configuration of the input "`Color`".
	3	See 2
	-	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

3.7 MonDi08 - Monitoring 8 digital process tags

3.7.1 Description of MonDi08

Object name (type + number) and family

Type + number: FB 1847

Family: Monitor

Area of application for MonDi08

The block is used for the following applications:

- Monitoring of up to eight digital process tags

How it works

The MonDi08 block is used to monitor up to eight digital process tags with flutter suppression.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the MonDi08 block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Monitoring eight digital process tags (Digital8Monitoring) (Page 1818)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section MonDi08 I/Os (Page 436).

Status bit	Parameter
0 - 2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7	`Out1.Value`
8	`Out2.Value`
9	`Out3.Value`
10	`Out4.Value`
11	`Out5.Value`
12	`Out6.Value`
13	`Out7.Value`
14	`Out8.Value`
15 - 19	Not used
20	`In1` is used
21	`In2` is used
22	`In3` is used
23	`In4` is used
24	`In5` is used
25	`In6` is used
26	`In7` is used
27	`In8` is used
28 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock.Value`
1	`Alm1MsgEn`
2	`Alm2MsgEn`
3	`Alm3MsgEn`
4	`Alm4MsgEn`
5	`Alm5MsgEn`
6	`Alm6MsgEn`
7	`Alm7MsgEn`
8	`Alm8MsgEn`
9 - 30	Not used
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8 - 31	Not used

See also

MonDi08 messaging (Page 435)
MonDi08 functions (Page 431)
MonDi08 block diagram (Page 440)
MonDi08 error handling (Page 434)
MonDi08 modes (Page 431)

3.7.2 MonDi08 modes

MonDi08 operating modes

This block provides the following modes.

- On (Page 58)
- Out of service (Page 58)

"On"

You can find general information about the "On" mode in the On (Page 58) section.

Out of service

You can find general information about the "Out of service" mode in the Out of service (Page 58) section.

See also

MonDi08 block diagram (Page 440)

MonDi08 I/Os (Page 436)

MonDi08 messaging (Page 435)

MonDi08 error handling (Page 434)

MonDi08 functions (Page 431)

Description of MonDi08 (Page 428)

3.7.3 MonDi08 functions

Functions of MonDi08

The functions for this block are listed below.

Monitoring and output of digital signals

The block is operated as "flutter filter". The block receives digital signals at the input `Inx` (x = 1 ... 8) which ideally do not develop any flutter. The block monitors these signals. Use the `FlutTmInx` (x = 1 ... 8) input to determine the duration of a continuous signal in order to transfer it to the process without flutter.

The preprocessed signal is sent to the process via the `Outx` (x = 1 ... 8) output.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `In1.ST`
- `In2.ST`
- `In3.ST`
- `In4.ST`
- `In5.ST`
- `In6.ST`
- `In7.ST`
- `In8.ST`

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Simulating signals

This block provides the standard function Simulating signals (Page 47).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4 - 11	Not used
12	1 = Operator can activate the Release for maintenance function
13	1 = Operator can change the time for flutter suppression at the `In1` input
14	1 = Operator can change the time for flutter suppression at the `In2` input
15	1 = Operator can change the time for flutter suppression at the `In3` input
16	1 = Operator can change the time for flutter suppression at the `In4` input
17	1 = Operator can change the time for flutter suppression at the `In5` input
18	1 = Operator can change the time for flutter suppression at the `In6` input
19	1 = Operator can change the time for flutter suppression at the `In7` input
20	1 = Operator can change the time for flutter suppression at the `In8` input
21 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Changing labels on buttons and text

This block provides the standard function Labeling of buttons and text (Page 167).

You can change the label for "Process value" for this block as you please. The change is made with the `FlutXTmIn` parameter.

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

MonDi08 messaging (Page 435)

MonDi08 I/Os (Page 436)

Description of MonDi08 (Page 428)

MonDi08 block diagram (Page 440)

MonDi08 error handling (Page 434)

MonDi08 modes (Page 431)

3.7.4 MonDi08 error handling

Error handling of MonDi08

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Flutter alarm

Overview of error numbers

The `ErrorNum` I/O can be used to output various error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
11	Fluttering time < 0

Flutter alarm

An alarm is output at output `FlutAct` with 1 if signal flutter is detected. Refer to the functions of the block > Monitoring and reporting flutter signals (Page 431).

See also

MonDi08 block diagram (Page 440)

MonDi08 I/Os (Page 436)

MonDi08 messaging (Page 435)

MonDi08 modes (Page 431)

Description of MonDi08 (Page 428)

3.7.5 MonDi08 messaging

Messaging

The following messages can be generated for this block:

- Process messages
- Instance-specific messages

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ Signal change Signal 1 has occurred
	SIG 2	Alarm - high	$$BlockComment$$ Signal change Signal 2 has occurred
	SIG 3	Alarm - high	$$BlockComment$$ Signal change Signal 3 has occurred
	SIG 4	Alarm - high	$$BlockComment$$ Signal change Signal 4 has occurred
	SIG 5	Alarm - high	$$BlockComment$$ Signal change Signal 5 has occurred
	SIG 6	Alarm - high	$$BlockComment$$ Signal change Signal 6 has occurred
	SIG 7	Alarm - high	$$BlockComment$$ Signal change Signal 7 has occurred
	SIG 8	Alarm - high	$$BlockComment$$ Signal change Signal 8 has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	`Out1.ST`
2	`Out2.ST`
3	`Out3.ST`
4	`Out4.ST`
5	`Out5.ST`
6	`Out6.ST`
7	`Out7.ST`
8	`Out8.ST`

See also

Description of MonDi08 (Page 428)
MonDi08 functions (Page 431)
MonDi08 I/Os (Page 436)
MonDi08 block diagram (Page 440)
MonDi08 error handling (Page 434)
MonDi08 modes (Page 431)
Time stamp (Page 163)

3.7.6 MonDi08 I/Os

I/Os of MonDi08

Input parameters

Parameter	Description	Type	Default
`Alm1MsgEn`	1 = Activate error message	BOOL	1
`Alm2MsgEn`	1 = Activate error message	BOOL	1
`Alm3MsgEn`	1 = Activate error message	BOOL	1
`Alm4MsgEn`	1 = Activate error message	BOOL	1
`Alm5MsgEn`	1 = Activate error message	BOOL	1
`Alm6MsgEn`	1 = Activate error message	BOOL	1
`Alm7MsgEn`	1 = Activate error message	BOOL	1
`Alm8MsgEn`	1 = Activate error message	BOOL	1
`BatchEn`	1 = Enable allocation	BOOL	0

Parameter	Description	Type	Default
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
EN	1 = Called block will be processed	BOOL	1
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
Feature	I/O for additional functions (Page 431)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
Flut1TmIn	Flutter time [s]	REAL	0.0
Flut2TmIn	Flutter time [s]	REAL	0.0
Flut3TmIn	Flutter time [s]	REAL	0.0
Flut4TmIn	Flutter time [s]	REAL	0.0
Flut5TmIn	Flutter time [s]	REAL	0.0
Flut6TmIn	Flutter time [s]	REAL	0.0
Flut7TmIn	Flutter time [s]	REAL	0.0
Flut8TmIn	Flutter time [s]	REAL	0.0
In1	Binary input In1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In2	Binary input In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In3	Binary input In3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In4	Binary input In4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF

Parameter	Description	Type	Default
In5	Binary input In5	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In6	Binary input In6	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In7	Binary input In7	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In8	Binary input In8	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = Occupied by batch control	BOOL	0
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 431)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
StepNo	Batch step number	DWORD	16#00000000
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MonDi08 error handling (Page 434)	INT	-1
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	1 = Alarm error 1 (output ERROR of the first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
Out1	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out2	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out3	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out4	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Out5	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out6	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out7	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out8	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 428)	DWORD	16#00000000
Status2	Status word 2 (Page 428)	DWORD	16#00000000
Status3	Status word 3 (Page 428)	DWORD	16#00000000

See also

MonDi08 messaging (Page 435)
MonDi08 block diagram (Page 440)
MonDi08 modes (Page 431)

3.7.7 MonDi08 block diagram

MonDi08 block diagram

A block diagram is not provided for this block.

See also

MonDi08 I/Os (Page 436)
MonDi08 messaging (Page 435)
MonDi08 error handling (Page 434)
MonDi08 functions (Page 431)
MonDi08 modes (Page 431)
Description of MonDi08 (Page 428)

3.7.8 Operator control and monitoring

3.7.8.1 MonDi08 views

Views of the MonDi08 block

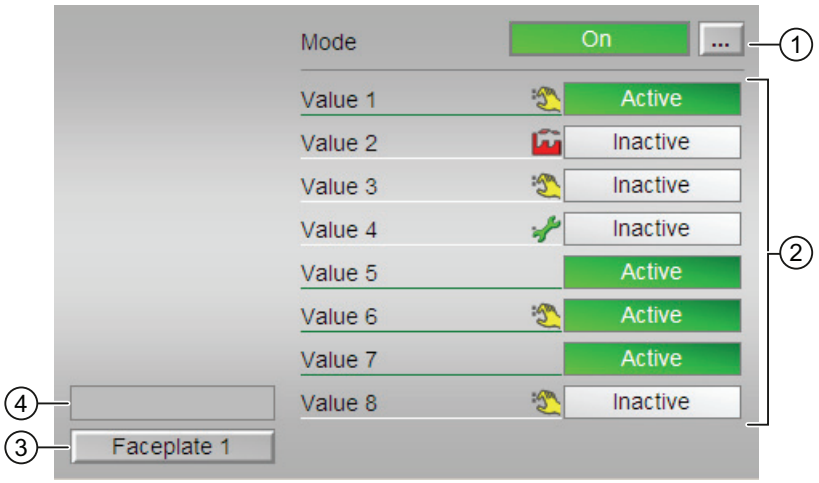
The block MonDi08 provides the following views:

- MonDi08 standard view (Page 441)
- Alarm view (Page 250)
- Trend view (Page 253)
- MonDi08 parameter view (Page 443)
- MonDi08 preview (Page 444)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for MonDi08 (Page 445)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

3.7.8.2 MonDi08 standard view

MonDi08 standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Display of the status for each parameter

This display is only visible when the corresponding block input is connected.

This area shows you the status of the individual parameters available.

You can determine the names for the connected parameters using the `S7_String` attribute at the corresponding input parameter. A default text is displayed if you enter nothing here.

You can change the text for value 1 ... 8 with the `FlutXTmIn` parameter.

Additional information is available in the section Labeling of buttons and text (Page 167).

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

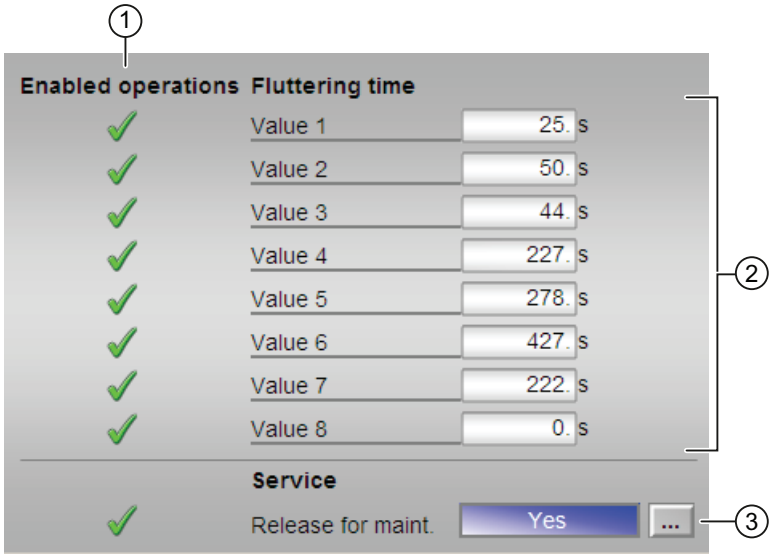
(4) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

3.7.8.3 MonDi08 parameter view

Parameter view of MonDi08



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(2) Area for entering the flutter time

Use this area to set the time period to determine how long a continuous signal should last in order for it to be transferred to the process without flutter.

Refer to the Changing values (Page 210) section for more on this.

You can determine the names for the connected parameters using the `S7_String` attribute at the corresponding input parameter. A default text is displayed if you enter nothing here.

You can change the text for value 1 ... 8 with the `FlutXTmIn` parameter.

Additional information is available in the section Labeling of buttons and text (Page 167).

(3) Service

You can select the following function in this area:

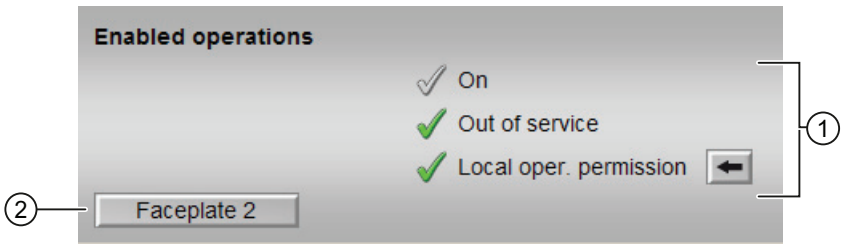
- "Release for maintenance"

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the Release for maintenance (Page 52) section.

3.7.8.4 MonDi08 preview

Preview of MonDi08



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

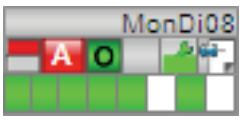
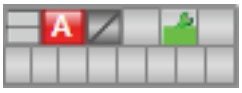
3.7.8.5 Block icon for MonDi08

Block icons for MonDi08

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault `CSF`
- Operating modes
- Signal status, release for maintenance
- Memo display
- Display of the output signal

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

Controller blocks 4

4.1 ConPerMon - monitoring of the control performance of control loops

4.1.1 Description of ConPerMon

Object name (type + number) and family

Type + number: FB 1805

Family: Control

Area of application for ConPerMon

The block is used for the following applications:

- Permanent monitoring of control performance of control loops for early detection of problems as they develop

The block calculates:

- Stochastic characteristics of the control performance with the process in a steady state
  - Mean value, variance and standard deviation of controlled variable
  - Mean value of the manipulated variable and control deviation
  - Control performance index
  - Estimated steady state process gain
- Deterministic characteristics of the control performance with step changes in the setpoint
  - Response time and settling time and the settling ratio
  - Overshoot absolute and relative to the step height

Other statistical and graphic evaluations of the signals in the control loop over longer, freely selectable periods are available in the faceplate of the ConPerMon block.

In an overview representation of a plant or unit, you can obtain a clear picture of the status of all control loops based on ConPerMon block icons (indicator light function).

The aim is to detect problems as they develop and to focus the attention of the user on the control loops in a plant that are no longer operating correctly.

How it works

The ConPerMon block evaluates the setpoint and process value signals and the manipulated variable of the PID controller in a sliding time window. The mode of the controller is also taken into account.

With the process in a steady state, the detected stochastic characteristics are compared with the reference values obtained during commissioning. If there is a step change in the setpoint, the stochastic characteristics are by definition irrelevant and are temporarily frozen. Instead, the monitoring of the deterministic characteristics is automatically activated.

If the control performance falls below a defined limit a message is generated. This is also the case when a defined limit for overshoot is exceeded when there is a step change in the setpoint.

Configuration

Each PID controller has a ConPerMon block assigned to it that is installed in the same CFC chart and interconnected with the controller. This already takes place with the corresponding process tag types.

You can open the standard view for the ConPerMon block from the standard view of a controller (for example PIDConL). Additional information on this topic is available in the section Opening additional faceplates (Page 165).

After successful commissioning and optimization of the PID controller to be monitored, the ConPerMon block is initialized while the process is in a steady state and it stores the corresponding characteristic values as reference values.

Follow the steps outlined below:

- Change the PID controller you want to monitor to automatic mode and set the setpoint to the typical operating point. This operating status is intended to represent the normal operation of the process; in other words, the entire plant/unit should be running under production conditions. Monitor the process with a trend writer (CFC trend in the Engineering-System or WinCC Online-Trend-Control on the Operator Station) and wait until the process has settled
- To specify the length `TimeWindow` of the sliding time window, monitor the `PV_Variance` block output of the ConPerMonblock in a trend. The time window should be long enough to keep the variance fairly constant in the relevant decimal places. If the selected time window is too short in relation to the time constants in the control loop and the disturbance signal spectrum, the variance will have too much noise and no useful information.

  If the selected time window is too long, it takes longer before any deterioration of the control performance is detected by the ConPerMon block. It also takes longer following a step change in the setpoint before the monitoring of the stochastic characteristics can be resumed. A good starting value for the `TimeWindow` parameter is 10 times as long as the longest process time constant or 20 times as long as the reset time of the PID controller.

- If the controller
  - is set perfectly,
  - has achieved a steady state,
  - the time window has been defined and filled with values from the steady state,

  the ConPerMon block can be initialized. You do this by clicking the "Initialize" button in the parameter view of the ConPerMon faceplate or by setting the `InitRefVar` = 1 parameter in the CFC block. This saves the `PV_Variance` parameter in the current time window as a reference value for calculating the control performance in the block along with reference values for manipulated variable and process variable.

The **C**ontrol **P**erformance **I**ndex CPI should now be approximately at 100% and therefore indicate that the control loop is operating correctly. Due to stochastic fluctuations, the CPI can also temporarily exceed the 100% mark. If, however, the CPI drops by a significant amount over a longer period, this indicates deterioration of the control performance.

For more detailed information on interpreting the calculation results of the block, refer to the section ConPerMon functions (Page 452).

Note

If the length of the time window is changed during runtime, the CPI will temporarily deviate considerably from its old value and then gradually settle to the new steady value. It is advisable to reinitialize the ConPerMon block after the CPI value has settled to a constant level.

The ConPerMon faceplate is opened from the faceplate of the assigned PID controller so that the ConPerMonicon pictures do not need to be installed separately in each OS picture. It is, in fact, advisable to group all ConPerMon block icons of a plant or unit in one overview picture at the appropriate hierarchy level.

You can expand this overview picture with the trend display of the control performance of all control loops over a longer time to allow you to recognize gradual deterioration (for example reflecting wear and tear). You can also display a further view of the message archive (WinCC AlarmLogging Control) as a hit list sorted according to the frequency in which they occur. In this list, the control loops that caused the most alarms will be shown at the top.

For the ConPerMon block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)
- PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800)
- PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799)
- PIDConR with safety logic and control loop monitoring (PIDConR_ConPerMon) (Page 1800)
- Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)
- Ratio control with PIDConR (RatioR) (Page 1809)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)
- Step controller with direct access to the actuator and without position feedback (StepControlDirect) (Page 1805)

Startup characteristics

When the CPU starts up, the block is reinitialized but the stored reference values are retained. The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section ConPerMon I/Os (Page 466)

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	`PID_AutAct.Value`
6	`OnAct.Value`
7 - 14	Not used
15	`CPI_Suppress`
16 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	MsgLock
1	OvsAH_Act.Value
2	OvsWH_Act.Value
3 - 4	Not used
5	CPI_WL_Act.Value
6	CPI_AL_Act.Value
7	OvsAH_En
8	OvsWH_En
9 - 10	Not used
11	CPI_WL_En
12	CPI_AL_En
13	OvsAH_MsgEn
14	OvsWH_MsgEn
15 - 16	Not used
17	CPI_WL_MsgEn
18	CPI_AL_MsgEn
19 - 31	Not used

See also

ConPerMon messaging (Page 464)
ConPerMon block diagram (Page 471)
ConPerMon error handling (Page 463)
ConPerMon modes (Page 451)

4.1.2 ConPerMon modes

ConPerMon operating modes

The block can be operated using the following modes

- On (Page 58)
- Out of service (Page 58)

"On"

You can find general information about the "On" mode in the On (Page 58) section.

"Out of service"

You can find general information about the "Out of service" mode in the Out of service (Page 58) section.

See also

ConPerMon block diagram (Page 471)

ConPerMon I/Os (Page 466)

ConPerMon messaging (Page 464)

ConPerMon error handling (Page 463)

ConPerMon functions (Page 452)

Description of ConPerMon (Page 447)

4.1.3 ConPerMon functions

Functions of ConPerMon

The functions for this block are listed below.

Monitoring of stochastic characteristics of the control performance

The mean value of a variable relating to an ergodic stochastic process (Page 1840) can be determined from a sliding time window with the length n = `TimeWindow` / `SampleTime` for example the controlled variable y = `PV`:

$$\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y(i)$$

A recursive formulation of this calculation is included in the MeanTime block that is called by the ConPerMonblock. Most steady-state time series can be considered as being ergodic so that the expected value can be estimated by averaging over a window of finite length.

The mean control deviation is `ER_Mean` = `SP` - `PV_Mean`. A mean steady-state control deviation ≠ 0 at a constant setpoint is an indication of problems in the control loop if the controller has I action. You should then check the following potential causes:

- The actuator does not have sufficient capacity. As a result, the controller's manipulated signal constantly approaches its limit. This can be caused by unsuitably dimensioned actuators or may simply by wear and tear.
- The manipulated variable demanded by the controller does not take effect in the process, for example because the actuator is defective.

If a steady-state reference operating point (MV_Ref, PV_Ref) is known, this can be used to estimate the current mean steady state gain of a linear process model if it is assumed that only disturbances with zero mean have an effect:

$$\text{StatGain} = \frac{\text{PV}_{\text{Mean}} - \text{PV}_{\text{Ref}}}{\text{MV}_{\text{Mean}} - \text{MV}_{\text{Ref}}}$$

Normally the reference operating point is obtained during the initialization of the ConPerMon block. Estimation of the steady state gain is then, however, impossible precisely at this operating point. As an alternative, you can also enter the reference values PV_Ref and MV_Ref manually at the appropriate block inputs. Typical steady-state operating points are often known in advance, for example

- Flow control: PV = 0 for MV = 0, in other words, valve closed,
- Temperature control: PV = PV_Ambient for MV = 0, in other words, ambient temperature

If the steady state gain changes gradually as time progresses, this is an indication of wear phenomena in the process, such as deposits on heat exchangers, valves or shutters, failing efficiency of process plant, etc.

If, for example, a temperature regulation circuit is closed by a heat exchanger and a deposit forms on the exchanger surfaces, the heat transfer coefficient, and consequently the process gain, is reduced. Within certain limits, this can be compensated by a closed control loop (so that the controller initially disregards the problem). Although the original control loop dynamics can be restored (to a certain extent) by suitable increase of the controller gain as the pollution increases, it is advisable to eliminate the cause of the problem; in other words, to clean the heat exchanger.

If the estimated steady state gain changes suddenly and temporarily, this tends to point to an external disturbance. This may be a normal occurrence in the operation of the process. If, however, these occurrences become more frequent, it is worth finding out the cause.

Due to the approach, the variance PV_Variance as second moment requires the calculation of differences of each current measured value from (constant !) mean value:

$$\sigma_y^2 = \frac{1}{n-1}\sum_{i=1}^{n}\left(y(i) - \bar{y}\right)^2 = \frac{1}{n}\left(\sum_{i=1}^{n} y^2(i)\right) - \bar{y}^2$$

Within the function block, however, a variant of the calculation is used that saves computing time. The standard deviation

$$\text{PV\_StdDev} = \sigma_y = \sqrt{\sigma_y^2}$$

as the square root of the variance is easier to interpret because it has the same physical unit as the measured value.

The control performance index CPI (**C**ontrol **P**erformance **I**ndex) in the unit [%] describes the current variance of the controlled variable relative to a reference variance (benchmark). It is defined as

$$\varsigma = \frac{\sigma_{\text{ref}}^2}{\sigma_y^2} 100\%$$

The CPI moves in the 0 < ς ≤ 100% range. If the current variance corresponds to the benchmark, the index reaches the value 100. If, by contrast, the current variance becomes larger, the control performance index decreases accordingly. Ideally, the benchmark is obtained in a defined good state of the control loop and stored when the ConPerMon block is initialized. It does not matter if the CPI temporarily reaches values somewhat higher than 100%. A CPI > 100% only means that the variance of the controlled variable is currently somewhat lower than in the reference state. Other alternatives for determining the benchmark will be explained in a separate section.

If you consider that the calculated CPI signal is too strongly affected by noise, you can smooth it using the integrated level pass filter (parameter `CPI_FiltFactor`) with the filter time constant `TimeWindow` · `CPI_FiltFactor`.

The disadvantage of these stochastic characteristics is that they assume an ergodic (Page 1840) or steady state in the process - at least in a statistical sense. Each step change in the standpoint in a controller is an elementary violation of this requirement and leads temporarily to incorrect statements of the stochastic characteristics, for example variances increasing too much. The basic principle of the combined approach implemented in the ConPerMonblock is to use both stochastic and deterministic characteristics for the control performance and to select the suitable characteristics automatically depending on the operating state.

If a step change in the setpoint is detected in a control loop, the ConPerMon block freezes the CPIvalue and automatically suppresses all messages relating to this. As the user, you can also force the suppression of the messages manually via the `ManSupprCPI` = 1 binary input. This setting is useful to avoid false alarms when known disturbances occur, for example at a load change in a Conti process (Page 1840) or a dosing procedure in a Batch process (Page 1839). In such cases the variance of the controlled variable usually rises momentarily. This should not be interpreted as a worsening of the control performance.

Monitoring of deterministic characteristics of the control performance

Assessment of the control performance based on the response to a step change in the setpoint is relatively simple. In the sense of automatic monitoring, the ConPerMon block is capable of determining the essential characteristics of the control performance directly from the signal changes so that when necessary a message or an alarm can be generated automatically by the system.

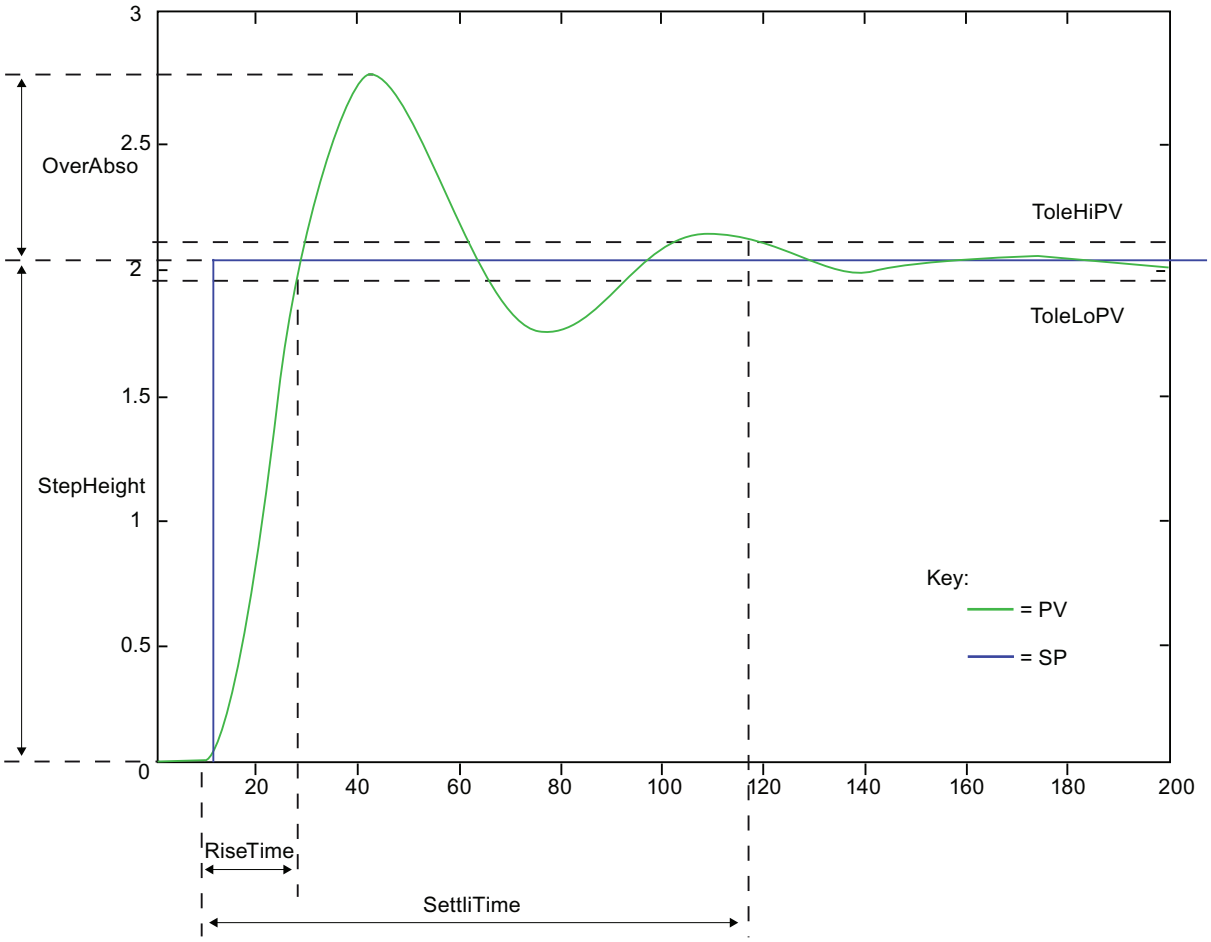
The first thing to look for is always the overshoot if it is present and clearly distinct from the noise level. For a positive step response,

`OverAbso` = max(`PV`) - `SP` > 0

is output where is for a negative step response (step response down), and negative values

`OverAbso` = min(`PV`) - `SP` < 0

are also output. For normalization, the absolute overshoot is related to the height of the step change in the setpoint and is therefore always positive. The relative overshoot (`Overshoot`) as a percentage is a measure of the damping of the control loop. If this is more than 20 or 30%, the loop gain (gain of the controller multiplied by the gain of the control system) is generally too high either because the controller was badly set from the beginning or because the properties of the control system have changed over the course of time. If overshoot is significantly too high, the control loop is generating weakly damped oscillations in the plant. The block sends a message to this effect if the relative overshoot is above a specified limit.



In every control loop, there is a general correlation between overshoot and phase reserve: The higher the overshoot, the lower the phase reserve. If the response of the closed control loop can be described approximately by a 2nd order transfer function

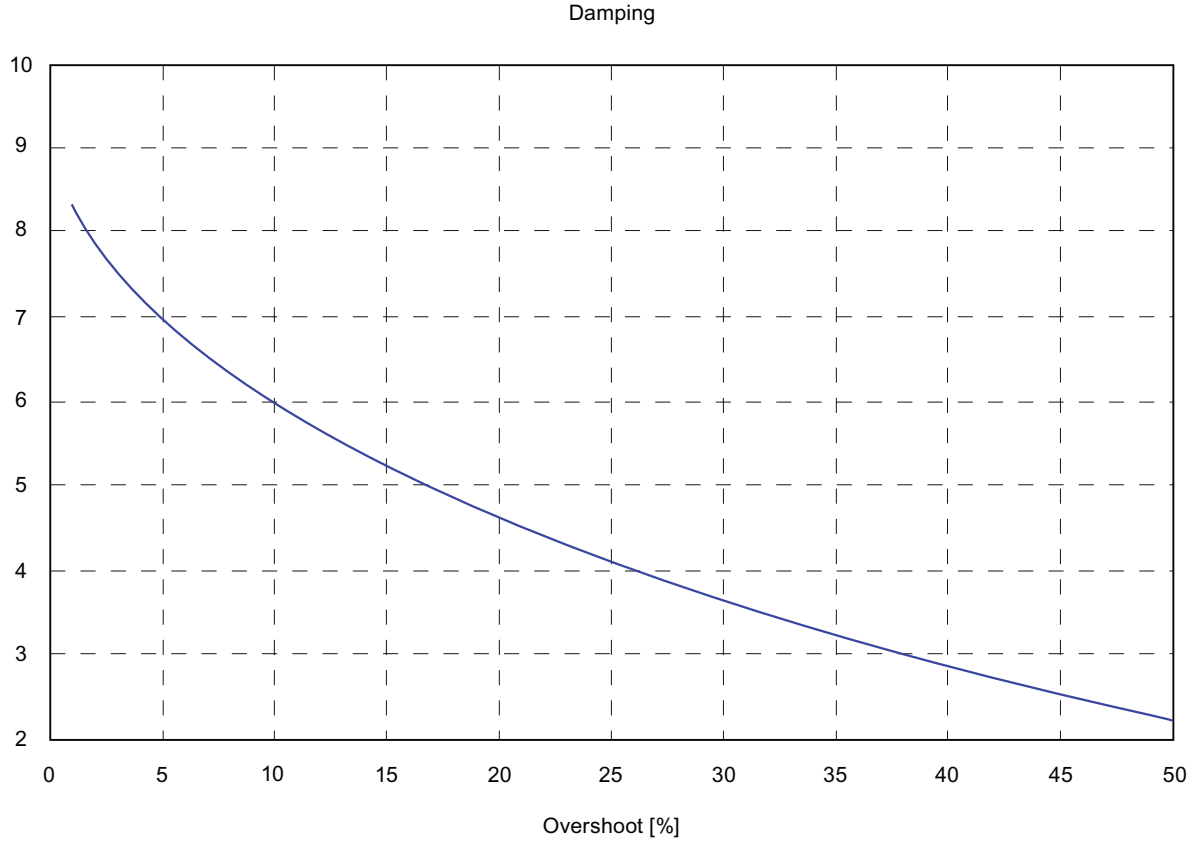
$$g_{cl}(s) = \frac{PV(s)}{SP(s)} = \frac{1}{\frac{1}{\omega_0^2}s^2 + 2\frac{\delta}{\omega_0}s + 1}$$

the following relationships are known:

- If δ ≥ 1 , the overshoot is equal to zero and the settling response is asymptotic.
- If δ < 1 , overshoot and oscillations occur.

The damping of the closed loop can be determined approximately from the overshoot:

$$\delta = \frac{-\ln\left(\frac{\text{Overshoot}}{100\%}\right)}{\sqrt{\ln^2\left(\frac{\text{Overshoot}}{100\%}\right)+\pi^2}}$$



An optimum controller setting typically aims for overshoot between 5 and 25%, which means damping between 0.7 and 0.4.

If overshoot is too high, it is often helpful to reduce the gain of the controller.

While overshoot primarily serves to check controller gain, there is a further characteristic that provides information on the setting of the I action: If the setting of the reset time is unsuitable, the process value will creep towards the new setpoint following a step change in the setpoint. The ratio to the `RiseTime` is relevant, and not the absolute value of the `SettliTime`. If the settling ratio, in other words the quotient of the rise time and settling time, is less than approximately 25%, it can generally be assumed that the reset time of the controller is too slow. To determine the rise time and settling time, a 3σ tolerance band is placed around the setpoint and is also displayed in the faceplate of the ConPerMon block. The absolute values of the settling time and rise time can be assessed in terms of the concrete requirements of the process control for a specific application.

During a step change in the setpoint, larger mathematical variances of the controlled variable are bound to occur compared with the steady state so that generating alarms due to the variance limits being exceeded needs to be suppressed until the settling process has neared completion following the step change in the setpoint. The calculated deterministic characteristics are output and the stochastic evaluation is activated again.

Alternatives for determining the benchmark

During planned commissioning of a plant with integrated ConPerMon, following controller optimization, the ConPerMon block is initialized for every control loop and the calculated variance stored as the benchmark for calculating the CPI.

As an alternative, a benchmark can set via the `RefVarExt` input parameter by setting `RefVarExtOn` = 1 . There are various ways of obtaining numeric values for the benchmark:

- Take the lowest variance that was ever measured in this control loop since the initialization of the ConPerMon block. This is displayed at the `PV_VarMin` output parameter. This value is only useful when the control loop has been in a stable and desirable operating state for a longer period of time at least once since the initialization of the ConPerMon block.
- Take the variance of the control loop with a theoretical minimum variance controller as can be obtained based on archived data using another supplier's CPM application. This depends only on the process dead time and the disturbance model. This form of CPI is known as the Harris index and represents a lower barrier that can generally not be reached by a PID controller which is why CPI seldom reaches the value 100% even by well tuned controllers. Low CPI values provide the first indication that the controller settings could be improved. You should, however, bear in mind that the minimum variance is only a theoretically achievable value and that the minimum variance controller has characteristics that are not desired in the real application, for example extremely high manipulated variable amplitudes. With minimum variance-based CPI, therefore, it is not worth making every effort to bring this as close as possible to 100%

Cascade control

In a cascade control, you should only use the ConPerMon block for the primary controller and not for the secondary controller. The ConPerMon block cannot make any useful statements about the control performance of the secondary controller because

- the variance of the process value in the secondary control loop depends directly on the variance of the setpoint that is set as the manipulated variable by the primary controller,
- there are neither operating phases with a constant setpoint nor defined step changes in the setpoint.

Apart from this, from the perspective of process control, the primary control loop is, of course, the one whose control performance should be monitored while the control performance of the secondary loop is of secondary importance. It is nevertheless advisable to set the secondary controller carefully before optimization and monitoring of the primary controller is started because a poor response by the secondary controller cannot be compensated by the primary controller.

For additional information read about the process tag template Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810).

Split-range control

The split-range function block contains two separate (static) characteristics for both actuators. Any significant difference between the two actuators in terms of performance (in other words, different steady state gains for heating and cooling) can be compensated by setting different gradients for the characteristics, so that the controller is presented with a linear process response (regardless of the sign) as far as possible. It this does not work, the control performance will differ slightly in the two areas. The initialization of the ConPerMon block should then be performed in the worse area to avoid error alarms.

For additional information read about the process tag template Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806).

PID controller with gain scheduler

The aim of gain scheduling is to achieve consistent control performance over the entire operating range. If this does not work perfectly, the initialization of the ConPerMon block should be performed in an operating point with worse control performance to avoid error alarms. We recommend that you expand the alarm limits somewhat at the ConPerMon block: permit lower `CPI`s and higher overshoot.

For additional information read about the process tag template PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800).

Override control

For change-over control, different controllers are active depending on the process state; their control performances differ, of course. We recommend using control loop monitoring only for the primary controller, and to suppress it using the `ManSuprCPI` input parameter if limit controlling is activated.

For additional information read about the process tag template Override control (Page 1814).

Feedforward control

The task of feedforward control is to avoid or at least to reduce degradation of the control performance caused by a measurable disturbance variable. Control loop monitoring therefore can basically be used as it is used for simple control loop. When the disturbance variable is quiet for a time and then acts up for a brief period, the resulting fluctuations of the control performance cannot be ruled out. The reason behind it is that feedforward control represents a model-based intervention, and a model is never a perfect reflection of reality.

For additional information read about the process tag template PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802).

Smith predictor

The Smith predictor enables higher control performance than a simple PI controller in control loops with dead time. Control loop monitoring therefore can basically be used as it is used for simple control loop. If the dead time changes during ongoing operation, control performance will most likely go down.

For additional information read about the process tag template PID controller with Smith predictor (SmithPredictorControl) (Page 1804).

Ratio control

With ratio controlling, the control loop monitoring should only be used in the primary control loop if the setpoints are to be determined for combined components from the actual value of the primary component. In this case, you can expect continuous setpoint changes in the control loops for the combined components - similar to sequential control loop of a cascade. If the setpoints for combined components are to be determined from the setpoint of the primary component, the lower-level control loops can be monitored as well.

For additional information read about the process tag template Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808).

Multivariable controller

The mathematical concept of the ConPerMon block is intended for monovariable control loops. If the variance in a control loop is found to be too high, the block cannot determine whether the actual cause is within the control loop or whether influences are being brought in due to interactions from the outside. If, therefore, you notice strong interactions between various control loops in your plant or even use multivariable controllers, the information provided by the ConPerMon block should be treated with caution.

It can nevertheless make sense to equip a multivariable controller such as the ModPreCon block with control loop monitoring to establish whether the control performance achieved during commissioning of the controller is also retained in runtime. In this case, each controller channel of the multivariable controller has a separate ConPerMon block. Several additional logic functions need to be configured upstream from the `ManSuprCPI` input parameter as shown in the corresponding specimen project Predictive control of a 2x2 multi-variable controlled system (Page 1836):

- If one or more other channels for the multivariable controller is in a non steady state (for example step change in the setpoint) indicated by the `CPI_SupRoot` = 1 output parameter, the temporarily increased variance cannot be avoided in this controller channel and should not cause a CPI message.
- If one or more other channels of the multivariable controller have higher variances (poor control performance) indicated by the appropriate output `CPI_WrnAct` = 1, due to the interaction, these variances cause a higher variance in this controller channel as well that cannot be avoided and should not lead to a CPI warning. It is possible to find the actual cause of a disturbance in a multivariable system as follows: The channel that first detects higher variances, set the alarm while subsequent alarms in adjacent channels are suppressed.

Note

In the case of multivariables, the estimated steady state gains from the monovariable observation are irrelevant. By setting the input parameter `StGainValid` = 0, this status is also displayed in the faceplate as "Uncertain, process related".

If a PID controllers is remotely controlled in program mode (Page 65), it should be treated similar to a secondary controller for a cascade connection in regard to control performance monitoring, i.e. monitoring is usually impractical in this case.

If program mode is the typical operating mode of the controller involved, the corresponding ConPerMon block can be completely removed. If the controller involved is often used in automatic mode, however, monitoring can be temporarily disabled during program mode by connecting the output parameter `AdvCoAct` of the PIDConL block to the input parameter `ManSupprCPI` of the ConPerMon block.

Selecting a unit of measure

The block provides the standard function Selecting a unit of measure (Page 168).

Forming the signal status for blocks

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status for the block is formed by the following parameters:

- `SP_Mon.ST`
- `PV_Mon.ST`
- `MV_Mon.ST`
- `ER_Mean.ST`
- In addition, the ConPerMon block has the following special functions for determining status values:
- If you use a step controller without position feedback, there is no manipulated variable that you could interconnect with the input parameter `MV_Mon`. Unlike most other input parameters `MV_Mon`does not have the preset signal status "Uncertain, process related" (16#78). If there is no interconnected value, this status is transferred to the calculated output parameters `MV_Mean` and `StatGain`.
- `StGainValid`: Set this input to 0 if you use a multivariable controller or observe strong interactions between neighboring control loops. This gives the calculated output parameter `StatGain` the signal status "Uncertain, process related". If known disturbances affect your process, for example dosing procedures in a batch process, you can also set this input temporarily using the recipe control.
- Under normal circumstances the output parameter `StatGain` accepts the worse signal status of `PV_Mon` and `MV_Mon`. Other possible causes of uncertain status for `StatGain` are:
  - the process is currently very close to the reference operating point, or
  - the process is currently in transition, e.g. step change in the setpoint.

- The signal status of the CPI output parameter is dependent on output parameter CPI_Suppress: If CPI_Suppress = 1, the control performance index CPI is uncertain. Apart from this, the CPI can also become uncertain in occasional situations when there are numeric problems in the calculation of the variance. Under normal circumstances the CPI signal status is the same as the PV_Mon signal status.
- The signal status of the OverAbso output parameter is set to invalid when step changes in the setpoint are evaluated whose step change height is too low in relation to the noise level.

Configurable reactions using the Feature parameter

You can find an overview of all reactions provided by the Feature parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
1	Reaction to the out of service mode (Page 148)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Operator control permissions

The block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the OS_Perm parameter:

Bit	Function
0 - 1	Not used
2	1 = Operator can switch to "Out of service" mode
3 - 27	Not used
28	1 = Operator can initialize the block
29	1 = Operator may input a value for the time window, the reference value for the controlled variable and the reference value of the manipulated variable
30	1 = Operator can abort the evaluation of the step response
31	Not used

The block has the following permissions for the `OS1Perm` parameter:

Bit	Function
0	1 = Operator can change the limit (overshoot) for high alarm
1	1 = Operator can change the limit (process value) for the high warning
2	Not used
3	1 = Operator may change a value for the `CPI` hysteresis.
4	Not used
5	1 = Operator can change the limit (control performance index `CPI`) for the low warning
6	1 = Operator can change the limit (control performance index `CPI`) for the low alarm
7 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Alarm delays with a time value for all limits

The block provides the standard function One time value for all limits (Page 157).

This function is used only for monitoring the control performance index `CPI`.

Limit operation and display in the faceplate

This block provides the standard function Limit operation and display in the faceplate (Page 255).

Generating instance-specific messages

The block provides the standard function Generating instance-specific messages (Page 162) without the time stamp function in the I/O.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of ConPerMon (Page 447)

ConPerMon messaging (Page 464)

ConPerMon I/Os (Page 466)

ConPerMon block diagram (Page 471)

ConPerMon error handling (Page 463)

ConPerMon modes (Page 451)

4.1.4 ConPerMon error handling

Error handling of ConPerMon

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
2	`SampleTime` < 0.001
10	`TimeWindow` < 20 · `SampleTime`

See also

ConPerMon block diagram (Page 471)

ConPerMon I/Os (Page 466)

ConPerMon messaging (Page 464)

ConPerMon functions (Page 452)

ConPerMon modes (Page 451)

Description of ConPerMon (Page 447)

4.1.5 ConPerMon messaging

Messaging

If the control performance falls below a defined limit a message is generated. This is also the case when a defined limit for overshoot is exceeded when there is a step change in the setpoint.

If the CPI temporarily falls below the configured warning and alarm limits, it is not necessary to trigger an alarm immediately. The main aim of the control loop monitoring is to signal the need for maintenance or optimization measures in individual control loops. With the alarm delay, you can make sure that an alarm is triggered only after the cause exists for longer than a configured period `AlmDelay`.

The following messages can be generated for this block:

- Process messages
- Instance-specific messages

Process messages

Message instance	Message identifier	Message class	Event
`MsgEvID`	SIG 1	Alarm - high	$$BlockComment$$ Overshoot - high alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ Overshoot - high warning limit violated
	SIG 3	Warning - low	$$BlockComment$$ `CPI` - low warning limit violated
	SIG 4	Alarm - low	$$BlockComment$$ `CPI` - low alarm limit violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvID	SIG 5	AS process control message - fault	$$BlockComment$$ External message 1 Status 16#@5%x@
	SIG 6	AS process control message - fault	$$BlockComment$$ External message 2 Status 16#@6%x@
	SIG 7	AS process control message - fault	$$BlockComment$$ External message 3 Status 16#@7%x@

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvID

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	CPI(control performance index)
5	ExtMsg1.ST
6	ExtMsg2.ST
7	ExtMsg3.ST
8	ExtVa108
9	ExtVa109
10	Reserved

The associated values 8 ... 9 are allocated to the parameters ExtVa108 ... ExtVa109 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of ConPerMon (Page 447)

ConPerMon functions (Page 452)

ConPerMon I/Os (Page 466)

ConPerMon block diagram (Page 471)

ConPerMon error handling (Page 463)

ConPerMon modes (Page 451)

4.1.6 ConPerMon I/Os

I/Os of ConPerMon

Input parameters

Parameter	Description	Type	Default
AlmDelay	Alarm delay time [s] for monitoring the control performance index CPI 0 = Alarm delay deactivated	REAL	0.0
BatchEn	1 = Enable allocation for batch control	BOOL	0
BatchID	Current batch ID	DWORD	16#00000000
BatchName	Current batch designation	S7-String	
BreakSuppress	1 = Manually cancel suppression of the control performance alarm during a step response	BOOL	0
CPI_AlmHyst	Alarm hysteresis of the control performance index [%]	REAL	5.0
CPI_AL_En	1 = Activate alarm (low) for monitoring of control performance	BOOL	1
CPI_AL_Lim	Low alarm limit for control performance [%]	REAL	30.0
CPI_FiltFactor	Low-pass filter for CPI, filter time constant = TimeWindow · CPI_FiltFactor	REAL	10.0
CPI_WL_En	1 = Activate warning (low) for monitoring of control performance	BOOL	1
CPI_WL_Lim	Low warning limit for control performance [%]	REAL	50.0
CPI_AL_MsgEn	1 = Activate alarm message for: Low limit for control performance	BOOL	0
CPI_WL_MsgEn	1 = Activate warning message for: Low limit for control performance	BOOL	0
EN	1 = Called block will be processed	BOOL	1
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa108	Associated value 8 for messages (MsgEvID)	ANY	
ExtVa109	Associated value 9 for messages (MsgEvID)	ANY	

Parameter	Description	Type	Default
Feature	I/O for additional functions (Page 452)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
InitRefVar	1 = Initialization of the block. The benchmark of the controlled variable variance and the reference values of the controlled variable and manipulated variable are measured in the steady state.	BOOL	0
LoopClosed	1 = Control loop is closed	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManSupprCPI	1 = Manual suppression of the CPI calculation and message, e.g. during known disturbances	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgEvID	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Mon	Manipulated variable of the controller for monitoring	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#78
MV_Ref	Reference value of the manipulated variable	REAL	0.0
MV_Unit	Unit of measure for manipulated variable	INT	1342
Occupied	1 = Occupied by batch control	BOOL	0
OnOp*	1 = "On" mode via operator	BOOL	1
OosLi	1 = Edge transition (0-1) = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- 0 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 452)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1

Parameter	Description	Type	Default
OS1Perm	I/O for operator control permissions (Page 452)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
OvsAH_En	1 = Activate alarm (high) for overshoot	BOOL	1
OvsAH_Lim	Overshoot alarm limit [%]	REAL	25.0
OvsAH_MsgEn	1 = Enable alarm message for overshoot	BOOL	0
OvsWH_En	1 = Activate warning (high) for overshoot	BOOL	1
OvsWH_Lim	Overshoot warning limit [%]	REAL	20.0
OvsWH_MsgEn	1 = Enable warning message for overshoot	BOOL	0
PV_Mon	Controlled variable for monitoring	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_Ref	Reference value for controlled variable	REAL	0.0
PV_Unit	Unit of measure for process value	INT	1001
RefVarExt	Reference value for PV_Variance in control loop "good" status	REAL	0.0
ReVaExOn	1 = Use the external reference value of RefVarExt	BOOL	0
RefVariance	Variance of controlled variable in control loop "good" status	REAL	100.0
RunUpCyc	Number of start cycles in which messages are suppressed	INT	32000
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SP_Mon	Setpoint of the corresponding controller for monitoring	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
StepNo	Batch step number	DWORD	16#00000000
StGainValid	0 = Output parameter StatGain systematically invalid, e.g. for multi-variable processes	BOOL	1
TimeWindow	Width of the sliding time window [s] for statistical evaluations	REAL	120.0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
CPI	Control performance index	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
CPI_AL_Act	1 = Alarm due to control performance is active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CPI_Suppress	1 = Message for the control performance index is suppressed; retain last valid CPI value	BOOL	1
CPI_SuRoot	1= CPI message suppression was triggered in this control loop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CPI_WL_Act	1 = Warning due to control performance is active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ER_Mean	Mean value of the control deviation in the time window [PV_Unit]	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ErrorNum	Output of current error number. For error numbers that can be output by this block, see ConPerMon error handling (Page 463)	INT	-1
MsgAckn	ALARM_8P: Output ACK_STATE message acknowledgment state	WORD	16#0000
MsgErr	1 = Message processing error occurred	BOOL	0
MsgStatus	ALARM_8P: Output STATUS Error information of the ALARM_8P	WORD	16#0000
MV_Mean	Mean value of the manipulated variable in the time window [MV_Unit]	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000

Parameter	Description	Type	Default
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS1PermOut	Display of OS1Perm	DWORD	16#FFFFFFFF
OS1PermLog	Display of OS1Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OverAbso	Absolute overshoot of the step response [PV_Unit]	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Overshoot	Relative overshoot of the step response with respect to the step change height [%]	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
OvsAH_Act	1 = Alarm due to overshoot is active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OvsWH_Act	1 = Warning due to overshoot is active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Mean	Mean value of the controlled variable in the time window [PV_Unit]	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_StdDev	Standard deviation of the controlled variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_ToleHi	Limit (high) of the 3σ band around the setpoint	REAL	0.0
PV_ToleLo	Limit (low) of the 3σ band around the setpoint	REAL	0.0
PV_Variance	Variance of the controlled variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_VarMin	Minimum observed value of the process variance (slave pointer)	REAL	10000.0
RefStdDev	Standard deviation of controlled variable in control loop "good" status	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RiseTime	Rise time of the step response [s]	REAL	0.0
SettlRatio	Ratio = Rise time/settling time · 100%	REAL	0.0
SettliTime	Settling time of the step response [s]	REAL	0.0

Parameter	Description	Type	Default
StatGain	Steady-state process gain [PV_Unit / MV_Unit]	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 447)	DWORD	16#00000000
Status2	Status word 2 (Page 447)	DWORD	16#00000000
StepPhase	Phase of the step response: 0 = Waiting 1 = Rising 2 = Overshoot 3 = Settled	INT	0

See also

ConPerMon messaging (Page 464)

ConPerMon block diagram (Page 471)

ConPerMon modes (Page 451)

4.1.7 ConPerMon block diagram

ConPerMon block diagram

A block diagram is not provided for this block.

See also

ConPerMon I/Os (Page 466)

ConPerMon messaging (Page 464)

ConPerMon error handling (Page 463)

ConPerMon functions (Page 452)

ConPerMon modes (Page 451)

Description of ConPerMon (Page 447)

4.1.8 Operator control and monitoring

4.1.8.1 ConPerMon views

Views of the ConPerMon block

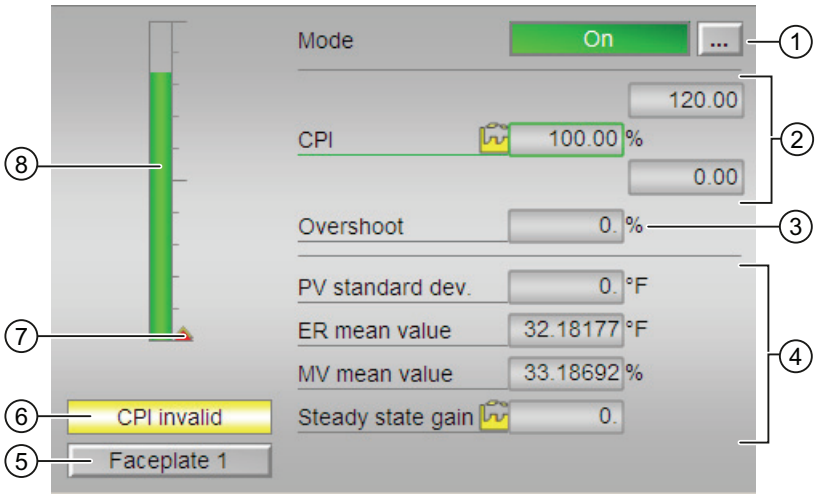
The block ConPerMon provides the following views:

- ConPerMon standard view (Page 472)
- Alarm view (Page 250)
- ConPerMon limit value view (Page 474)
- Trend view (Page 253)
- ConPerMon parameter view (Page 475)
- ConPerMon preview (Page 476)
- Memo view (Page 252)
- Batch view (Page 251)
- ConPerMon's setpoint view (Page 477)
- Block icon for ConPerMon (Page 479)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

4.1.8.2 ConPerMon standard view

ConPerMon standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Display area for control performance

This area shows the current control performance index.

(3) Display area for the overshoot

This area shows you the relative overshoot based on a step change [%].

(4) Display area for the static evaluation of the current time window (`TimeWindow`)

This area shows you the statistical evaluation of the current time window. The following values are evaluated:

- "PV standard dev.": Standard deviation of the controlled variable
- "ER mean value": Mean value of the control deviation
- "MV mean value": Mean value of the manipulated variable
- "Steady state gain": Steady-state process gain

(5) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See also the Opening additional faceplates (Page 165) section for more on this.

(6) Display for CPI valid / CPI invalid

This area shows you if the control performance index is valid or invalid:

- "CPI valid": Control performance is valid
- "CPI invalid": Control performance is invalid

You set the limits for the control performance index in the limits views, depending on the configuration in the engineering system (ES).

(7) Limit display

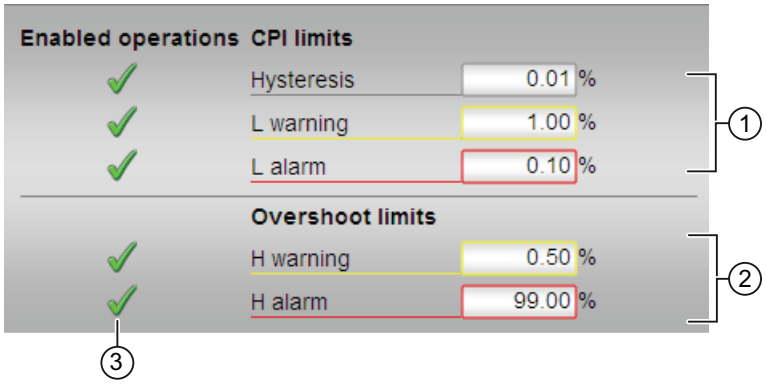
These colored triangles show you the configured limits in the respective bar graph.

(8) Bar graph for control performance index

This area shows you the current CPI control performance index in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

4.1.8.3 ConPerMon limit value view

Limit value view of ConPerMon



(1) CPI limits

In this area, you can enter the limits for the CPI control performance index. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "Hysteresis"
- "L warning": Warning low
- "L alarm": Alarm low

(2) Overshoot limits

In this area, you can enter the limits for the overshoot. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H warning": Warning high
- "H alarm": Alarm high

(3) Enabled operations

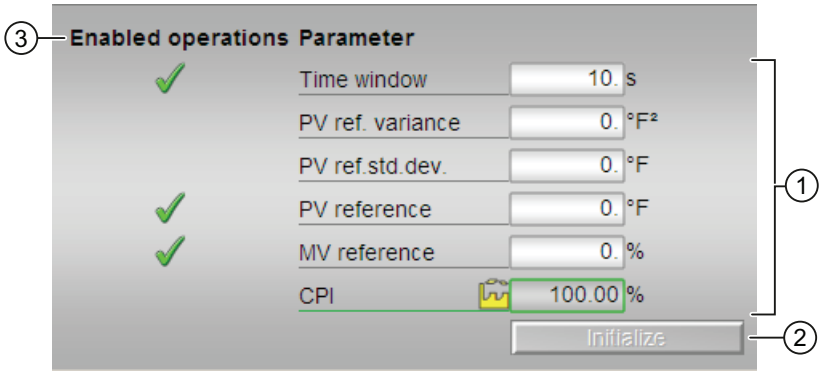
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

4.1.8.4 ConPerMon parameter view

Parameter view of ConPerMon



(1) Parameter

In this area, you change parameters and therefore influence the controller. Refer to the Changing values (Page 210) section for more on this.

You can influence the following parameters:

- "Time window": Set the time window here, in which the statical evaluation for the following values is to be performed:
  - Standard deviation of the controlled variable
  - Mean value of the control deviation
  - Mean value of the manipulated variable
  - Steady-state process gain
- "PV reference": Reference value for controlled variable
- "MV reference": Reference value of the manipulated variable

(2) Initialize button

Clicking this button initializes the block. The benchmark of the controlled variable variance and the reference values of the controlled variable and manipulated variable are measured in the steady state.

(3) Enabled operations

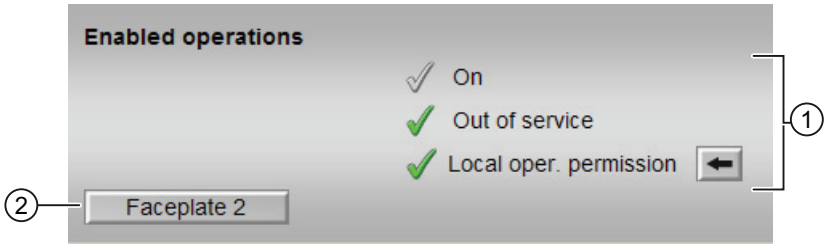
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

4.1.8.5 ConPerMon preview

Preview of ConPerMon



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. You can find more information about this in the section titled: Operator control permissions (Page 205)

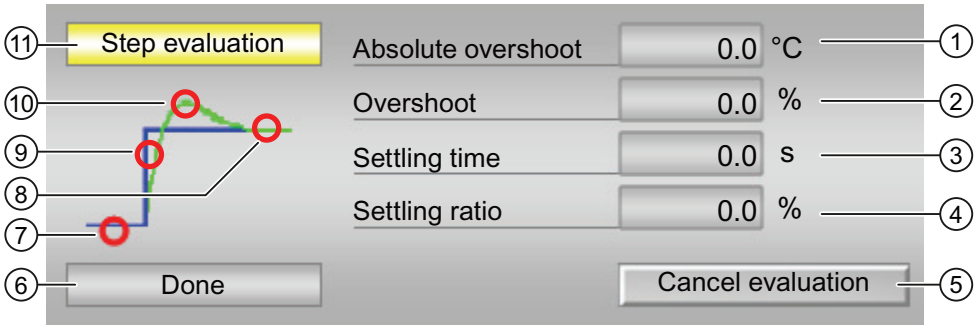
(2) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

4.1.8.6 ConPerMon's setpoint view

Setpoint view of ConPerMon



(1) Absolute overshoot

The absolute overshoot is given in the physical unit of the actual value.

(2) Overshoot

Output of the relative overshoot base on a step change.

(3) Settling time

Settling time of the step response in seconds.

(4) Settling time ratio

The settling time ratio is formed from the ramp time by the settling time.

(5) Cancel evaluation button

You can use the button to show the evaluation of the step response.

Note

The "Cancel evaluation" button is operable when **all** of the following conditions are met:

- Operator permission level = 2 (Higher-level process control)
- Parameter `OS_Perm Bit30` = 1 (Operator can abort the evaluation of the step response)

(6), (7), (8), (9) and (10): Status of the step response

The following states are shown here:

- (6) Textual display of the states
- (7) "Idle": steady state
- (8) "Steady-state": i.e. the actual value is located within the tolerance band of the setpoint
- (9) "Rising phase": from the initial state to the first time the setpoint is reached
- (10) "Overshoot"

(11) Display: Evaluation of the step response in progress:

- "Step evaluation"
- "Constant PV"

See also

ConPerMon standard view (Page 472)
ConPerMon limit value view (Page 474)
ConPerMon parameter view (Page 475)

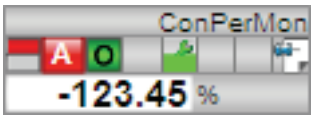
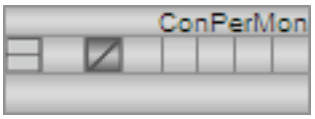
4.1.8.7 Block icon for ConPerMon

Block icons for ConPerMon

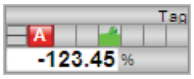
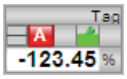
A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits
- Operating modes
- Signal status, release for maintenance
- Memo display
- Process value (black, with and without decimal places)

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

4.2 FmCont - Interface to module FM 355

4.2.1 Description of FmCont

Object name (type + number) and family

Type + number: FB 1818

Family: Control

Area of application for FmCont

The block is used for the following applications:

- Fixed setpoint control
- Cascade control
- Ratio control
- Split-range control

How it works

Block FmCont is used to interface the FM 355 controller modules.

FmCont can be used for the C (continuous controllers) and S (step and pulse controllers) module types. It contains the algorithms of the setpoint ramp, the setpoint rise limitation, and the limit monitoring of the process value, the control deviation, and the position feedback. Limit monitoring is not used on the module. The control function itself (e.g. PID algorithm) is processed on the module.

You can use the FmCont block to monitor all relevant process values and to change all relevant controller parameters.

Application examples of the FM 355 and detailed descriptions of the associated input and output parameters can be found in the manual for the FM 355. controller module.

Process values such as temperatures, levels and flows can be controlled. However, pressure processes which are not excessively fast are also possible.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100). Set the input parameter LogAddr to the module address from HW Config and the input parameter Channel to the desired controller channel (1 ... 4).

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The parameter CoordNo is set
- The in/out parameter Mode is interconnected to the corresponding OMODE_xx output parameter of the MOD block.
- The parameter FM 355 is set in accordance with the module type C/S
- The in/out parameter EnCoord is interconnected to the output EN_CO_x of the FM_CO block of the basic library (x = number of the rack)
- The output parameter EnCoNum is interconnected to the input ENCOx_yy of the FmCont block (x = number of the rack, yy = coordination number).

For the control loop monitoring to work as planned in the trend view of the controller faceplates, the

S7_xarchive:='Value,shortterm;'

attributes in the process tag types for control loops at the controller function block must be set for the following tags:

- Input parameters:
  - CPI_In

- Output parameters
  - MV
  - MV_HiAct
  - MV_LoAct
  - LoopClosed
  - SP
  - PV_Out
  - PV_ToleHi
  - PV_ToleLo

Startup characteristics

Use the Feature startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at RunUpCyc.

Status word allocation for Status1 parameter

For a description of the individual parameters, see the section I/Os of FmCont (Page 501)

Status bit	Parameter
0	Occupied
1	BatchEn
2	SimOn
3	OosAct.Value
4	OosLi.Value
5	AutAct.Value
6	Not used
7	ManAct.Value
8	SP_ExtAct.Value
9	MV_SafeOn.Value AND NOT OosAct.Value
10	MV_TrkOn.Value AND NOT (ManAct.Value OR OosAct.Value OR MV_SafeAct.Value)
11	MV.Value > ManLoLim for continuous or pulse controller NOT FbkClosed.Value for step controller with/without position feedback
12	Open.Value
13	Close.Value
14	Stop.Value
15	FbkOpnOut.Value
16	FbkClsOut.Value
17	SimOn AND ManAct
18	MV_SafeOn.Value

Status bit	Parameter
19	AdvCoAct.Value
20	1 =Input parameter Rbk is not interconnected (RbkOut.ST = 16#FF)
21	NegGain.Value
22	MV_FmTrkAct.Value AND NOT (OosAct.Value OR MV_SafeAct.Value)
23 - 24	Not used
25	MV_TrkOn.Value
26	MV_FmTrkOn.Value
27	AdvCoModSP
28	1 = Analog controller (FM 355 = 1)
29	1 = Pulse controller (FM 355 = 0 AND StepCon = 0)
30	1 =Step controller with position feedback (FM 355 = 0 AND StepCon = 1 AND WithRbk = 1)
31	1=Step controller without position feedback (FM 355 = 0 AND StepCon = 1 AND WithRbk = 0)

Status word allocation for Status2 parameter

Status bit	Parameter
0	MsgLock
1	PV_AH_Act.Value
2	PV_WH_Act.Value
3	PV_TH_Act.Value
4	PV_TL_Act.Value
5	PV_WL_Act.Value
6	PV_AL_Act.Value
7	PV_AH_En
8	PV_WH_En
9	PV_TH_En
10	PV_TL_En
11	PV_WL_En
12	PV_AL_En
13	PV_AH_MsgEn
14	PV_WH_MsgEn
15	PV_TH_MsgEn
16	PV_TL_MsgEn
17	PV_WL_MsgEn
18	PV_AL_MsgEn
19	ER_AH_Act.Value
20	ER_AL_Act.Value
21	ER_AH_En
22	ER_AL_En

Status bit	Parameter
23	ER_AH_MsgEn
24	ER_AL_MsgEn
25	RbkWH_Act.Value
26	RbkWL_Act.Value
27	RbkWH_En
28	RbkWL_En
29	RbkWH_MsgEn
30	RbkWL_MsgEn
31	MS_RelOp

Status word allocation for Status3 parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via EventTsIn
1	Effective signal 2 of the message block connected via EventTsIn
2	Effective signal 3 of the message block connected via EventTsIn
3	Effective signal 4 of the message block connected via EventTsIn
4	Effective signal 5 of the message block connected via EventTsIn
5	Effective signal 6 of the message block connected via EventTsIn
6	Effective signal 7 of the message block connected via EventTsIn
7	Effective signal 8 of the message block connected via EventTsIn
8 - 26	Not used
27	SP_UpRaAct, SP_DnRaAct limits enabled for gradient mode (SP_RateOn = 1)
28	GrpErr.Value
29	RdyToStart.Value
30	SimLiOp.Value
31	Not used

See also

FmCont messaging (Page 498)
FmCont block diagram (Page 515)
FmCont modes (Page 485)
FmCont error handling (Page 496)
FmCont functions (Page 486)

4.2.2 FmCont modes

FmCont operating modes

The block can be operated using the following modes:

- Automatic mode (Page 59)
- Manual mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and bumpless switchover in the Manual and automatic mode for control blocks (Page 59) section.

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the Manual and automatic mode for control blocks (Page 59) section.

"Program mode for controllers"

General information on "Program mode for controllers" is available in the section Program mode for controllers (Page 65).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

FmCont block diagram (Page 515)

FmCont I/Os (Page 501)

Description of FmCont (Page 480)

FmCont functions (Page 486)

FmCont error handling (Page 496)

FmCont messaging (Page 498)

4.2.3 FmCont functions

Functions of FmCont

The functions for this block are listed below.

Module types

FmCont can be used for the C (continuous controllers) and S (step controllers with and without position feedback and pulse controllers) module types. You can use the following parameters to identify which module type and controller type has been set:

FM 355	StepCon	WithRbk	Module type, controller type
1 or C	-	-	FM 355 C: Continuous controller
0 or S	1	1	FM 355 S: Step controller with position feedback
0 or S	1	0	FM 355 S: Step controller without position feedback
0 or S	0	-	FM 355 S: Pulse controller

You must set input parameter `StepCon` if you want to set the step controller with/without position feedback as the controller type.

Generating manipulated variables for continuous controllers, step controllers with position feedback, or pulse controllers

The manipulated variable MV and the actuating signals Open, Close and Stop are generated as follows

MV_Safe On	MV_FmTrk On	ManAct	MV_TrkOn	AdvCoAct AND NOT AdvCoModSP	MV =	Manipulated variable limit	State	Open, Close, Stop
1	-	-	-	-	MV_Safe	MV_HiLim MV_LoLim	Tracking to safety value	**Cont. controller:** Open, Close, Stop = 0 **Step controller with position feedback:** Depending on Rbk and MV the output signals Open, Close and Stop are generated using the algorithm of a positioner. **Pulse controller:** Depending on MV the output signals Open and Close are generated using the algorithm of a pulse controller (Stop = 0).
0	1	-	-	-	Prepared FM analog input	MV_HiLim MV_LoLim	Tracking to an FM analog input	
0	0	1	-	-	Man	ManHiLim ManLoLim	Manual mode, set by the operator	
0	0	0	1	-	MV_Trk	MV_HiLim MV_LoLim	Tracking to block input MV_Trk	
0	0	0	0	1	AdvCoMV	MV_HiLim MV_LoLim	Higher-level program mode	
0	0	0	0	0	P_Part + I_Part + D_Part + FFwd	MV_HiLim MV_LoLim	Automatic mode (PID algorithm)	

Generating actuating signals for step controllers without position feedback (WithRbk = 0)

The manipulated variable signals `Open`, `Close` and `Stop` can be generated as follows:

ManAct	Open, Close, Stop	State
1	The output signals are generated using input signals `OpenOp`/`Li`, `CloseOp`/`Li` or `StopOp`/`Li`	Manual mode, set by the operator
0	The output signals are generated using PID output parameters `P_Part`, `I_Part`, `D_Part` and `FFwd`	Automatic mode (PID algorithm)

Tracking and limiting a manipulated variable (cont. controller, step controller with position feedback and pulse controller)

The block provides the standard function Tracking and limiting a manipulated variable (Page 153).

Neutral position

The controller modules have their own mechanism for feedforwarding a safety value (see manual for Temperature Controller FM 355-2 or manual for Controller Module FM 355).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `ModErr`
- `ParFM_Err`
- `PerACCErr`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

"Actuator active" information

For continuous and pulse controllers: If the manipulated variable `MV` is greater than the minimum manual limit `ManLoLim`, this is recognized as actuator active.

For step controllers: If the parameter is `FbkClosed` = 0 , this is known as "Actuator active".

This status can be used to indicate, for example, a customized icon in the process image and is saved in the status word (see Status word section in Description of FmCont (Page 480)).

Limit monitoring of position feedback (cont. controller, step controller with position feedback and pulse controller)

The block provides the standard function Limit monitoring of the feedback (Page 80).

External/internal setpoint specification

The block provides the standard function Setpoint specification - internal/external (Page 112).

Setpoint limiting for external setpoints

The block provides the standard function Setpoint limiting for external setpoints (Page 153).

Gradient limit of the setpoint

The block provides the standard function Gradient limit of the setpoint (Page 109).

Using setpoint ramp

The block provides the standard function Using setpoint ramp (Page 108).

Tracking setpoint in manual mode

The block provides the standard function Tracking setpoint in manual mode (Page 153).

Simulating signals

The block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Process value (`SimPV`, `SimPV_Li`)
- Position feedback (`SimRbk`, `SimRbkLi`)

Note

The simulated process value `SimPV` only affects alarm processing and not the PID algorithm in the control module.

Limit monitoring of the process value

The block provides the standard function Limit monitoring of the process value (Page 72).

Control deviation generation and dead band

The block provides the standard function Control deviation generation and dead band (Page 151).

Limit monitoring of control deviation

The block provides the standard function Limit monitoring of setpoint, manipulated variable and control deviation (Page 81).

Inverting control direction

The block provides the standard function Inverting control direction (Page 151).

Physical standardization of setpoint, manipulated variable and process value

Controller gain `Gain` is entered either using a physical variable or as standardized value.

- `Gain` as a physical variable:

  The standardized variables retain their default values:

  – `NormPV.High` = 100 and `NormPV.Low` = 0

  – `NormMV.High` = 100 and `NormMV.Low` = 0

  For step controllers with/without position feedback and pulse controllers, the values of `NormMV.High` and `NormMV.Low` are not taken into account. The algorithm uses default values 0 and 100 for internal calculations.

  The effective gain is: `GainEff` = `Gain`

- Entering a standardized `Gain` (dimensionless):

  Change the standardized variables to the actual range of the process values and manipulated variables.

  – Internal and external setpoints; the process value and corresponding parameters are entered according to the physical measuring range of the process value.

  Continuous controller, pulse controller:

  – The manual value, the tracking value of the manipulated variable, feedforward control and the corresponding parameters are set according to the physical measuring range of the manipulated variable.

  Step controller with position feedback:

  – The manual parameter, the tracking value of the manipulated variable, feedforward control and the corresponding parameters are entered as a percentage 0 ... 100.

  Step controller without position feedback:

  – No physical measuring range available.

  The effective gain is:

  – Step controller with/without position feedback:

    `GainEff` = 100.0 / (`NormPV.High` - `NormPV.Low`) · `Gain`

  – Continuous controller, pulse controller:

    `GainEff` = (`NormMV.High` - `NormMV.Low`) / (`NormPV.High` - `NormPV.Low`) · `Gain`

Selecting a unit of measure

The block provides the standard function Selecting a unit of measure (Page 168).

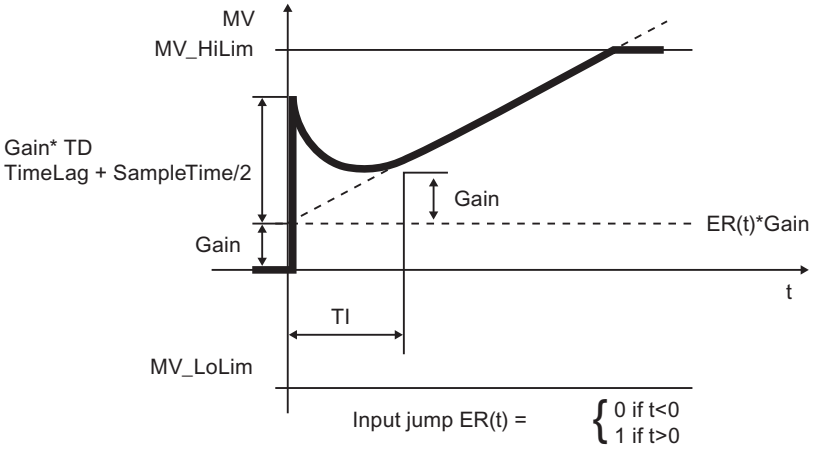
PID algorithm

The manipulated variable is generated in automatic mode according to the following algorithm:

$MV = Gain \cdot (1 + 1 / TI \cdot s) + (TD \cdot s) / (1 + TD / DiffGain \cdot s)) \cdot ER$

Where: s = Complex number

The following step response occurs:



Note

This formula describes a standard application where the P, I and D actions are activated and the P and D actions are not in the feedback circuit (`PropSel` = 1, `TI` ≠ 0, `D_InSel` = 0 and `P_FbkSel` = 0).

The D action delay is derived from `TD` / `DiffGain`.

- The P action can be shut down by `PropSel` = 0 .
- The I action can be shut down by `TI` = 0 .
- The D action can be shut down by `TD` = 0 .

Structure segmentation at controllers

The PID controller algorithm of FM 355 features structure segmentation. It is activated via the `P_FbkSel` and `D_InSel` parameters. The precise functionality is described in the FM 355 manual.

Anti-windup

The PID control algorithm of FM 355 has an anti-windup function. The I action is frozen or tracked after the manipulated variable has reached its limits (`MV_HiLim` or `MV_LoLim`).

Feedforwarding and limiting disturbance variables

The block provides a function for activating the disturbance variable. The precise functionality is described in the FM 355 manual.

Forming the signal status for blocks

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

- Signal status for the setpoint value `SP`:

  The signal status of the SP output parameter is always equivalent to the signal status of input parameter `SP_Ext` or `SP_Int` , depending on how the setpoint is specified. If the internal setpoint `SP_Int` is used, the signal status is always output as `16#80`.

- Signal status for `PV_Out`, `RbkOut`, `Open`, `Close`, `Stop`:

  The signal status is always `16#60` when simulation is activated.

  When the `ModErr.Value, ChFM_Err, ParFM_Err` module error occurs, the signal status of `PV_Out` is always `16#0`. `RbkOut` is always `16#0` for step controllers with position feedback

  Otherwise, the following applies:

  ```
  PV_Out.ST: 16#80

  Step controller: RbkOut.ST: = 16#80

  Continuous controller or pulse controller: RbkOut.ST: = Rbk.ST

  Open.ST := 16#80;

  Close.ST := 16#80;

  Stop.ST := 16#80;
  ```

- Signal status of the control deviation `ER`:

  The signal status of output parameter `ER` is obtained from the worst signal status of the two output parameters `PV_Out` and `SP` and is output. The signal status `16#60` (external simulation) is suppressed because the block acts as a sink with external simulation.

  Signal status for `FbkOpnOut, FbkClsOut:`

  ```
  FbkOpnOut.ST := FbkOpened.ST;

  FbkClsOut.ST := FbkClosed.ST;
  ```

- Signal status for the manipulated variable MV:

  The status signal from the output parameter MV is always set to 16#80 in "manual mode" and for step controllers without position feedback.

  In "automatic mode", the signal status for continuous controllers or pulse controllers is formed from the following parameters:

  RbkOut.STFFwdOut.STER.STWith step controllers, the

  FbkOpnOut.STFbkClsOut.STparameters are also included. The signal status 16#60 (external simulation) is suppressed because the block acts as a sink with external simulation.

- Worst signal status:

  The worst signal status ST_Worst for the block is formed from:

  – PV_Out.ST;
  – SP:ST;
  – FFwdOut.ST;
  – RbkOut.ST;

  With step controllers (FM355 = 0, StepCon = 1), the following are also included:

  – FbkOpnOut.ST;
  – FbkClsOut.ST;

Configurable reactions using the Feature parameter

You can find an overview of all reactions provided by the Feature parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
4	Setting switch or button mode (Page 140)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
25	Suppression of all messages (Page 146)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Operator control permissions

The block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode" `AutModOp`
1	1 = Operator can switch to "manual mode" `ManModOp`
2	1 = Operator can switch to "Out of service" mode `OosOp`
3	1 = Operator can switch to "program mode" `AdvCoEn`
4	1 = Operator can switch the setpoint to "external" `SP_ExtOp`
5	1 = Operator can switch the setpoint to "internal" `SP_IntOp`
6	1 = Operator can change the internal setpoint `SP_Int`
7	Continuous controllers, pulse controllers or step controllers with position feedback: 1 = Operator can change the manual parameter `Man` Step controller without position feedback: 1 = Operator can change the manual operation signals `OpenOp`, `StopOp`, `CloseOp`
8	1 = Operator can change operation high limit of the setpoint `SP_InHiLim`
9	1 = Operator can change operation low limit of the setpoint `SP_InLoLim`
10	1 = Operator can change the operation high limit of the manipulated variable `ManHiLim`
11	1 = Operator can change the operation low limit of the manipulated variable `ManLiLim`
12	1 = Operator can enable the setpoint's gradient limitation function `SP_RateOn`
13	1 = Operator can change the setpoint's high limit for the ramp `SP_UpRaLim`
14	1 = Operator can change the setpoint's low limit for the ramp `SP_DnRaLim`
15	1 = Operator can switch between the time value or the value for the ramp `SP_RmpModTime`
16	1 = Operator can change the ramp time `SP_RmpTime`
17	1 = Operator can change the target setpoint `SP_RmpTarget` for the setpoint ramp
18	1 = Operator can enable the setpoint ramp function `SP_RmpOn`
19	Not used
20	1 = Operator can enable the track setpoint in manual mode function `SP_TrkPV`
21	1 = Operator can enable the bumpless switchover from external to internal `SP_TrkExt`
22	1 = Operator can change the gain parameter `Gain`
23	1 = Operator can change the integral time parameter `TI`
24	1 = Operator can change the derivative time parameter `TD`
25	1 = Operator can change the derivative gain parameter `DiffGain`
26	1 = Operator can change the dead band parameter `DeadBand`
27	Not used
28	1 = Operator can change the integral time parameter `MotorTime`
29	1 = Operator can change the integral time parameter `PulseTime`
30	1 = Operator can change the integral time parameter `BreakTime`
31	Not used

The block has the following permissions for the `OS1Perm` parameter:

Bit	Function
0	1 = Operator can change the limit (process value) PV_AH_Lim for the high alarm
1	1 = Operator can change the limit (process value) PV_WH_Lim for the high warning
2	1 = Operator can change the limit (process value) PV_TH_Lim for the high tolerance
3	1 = Operator can change the hysteresis (process value) PV_Hyst
4	1 = Operator can change the limit (process value) PV_TL_Lim for the low tolerance
5	1 = Operator can change the limit (process value) PV_WL_Lim for the low warning
6	1 = Operator can change the limit (process value) PV_AL_Lim for the low alarm
7	1 = Operator can change the limit (control deviation) ER_AH_Lim for the high alarm
8	1 = Operator can change the hysteresis (control deviation) ER_Hyst
9	1 = Operator can change the limit (control deviation) ER_AL_Lim for the low alarm
10	1 = Operator can change the limit (position feedback) RbkWH_Lim for the high warning
11	1 = Operator can change the hysteresis (position feedback) RbkHyst
12	1 = Operator can change the limit (position feedback) RbkWL_Lim for the low warning
13	1 = Operator can open the valve
14	1 = Operator can close the valve
15	1 = Operator can stop the valve
16	1 = Operator can activate the Simulation function SimOn
17	1 = Operator can activate the Release for maintenance function MS_RelOp
18	1 = Operator can change the simulation value SimPV
19 - 31	Not used

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Release for maintenance

The block provides the standard function Release for maintenance (Page 52).

Generating instance-specific messages

The block provides the standard function Generating instance-specific messages (Page 162) without the time stamp function in the I/O.

Suppressing messages using the MsgLock parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Specifying the display area for process and setpoint values as well as operations

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `OpenOp`
- `StopOp`
- `CloseOp`

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

See also

FmCont messaging (Page 498)

FmCont I/Os (Page 501)

FmCont block diagram (Page 515)

FmCont modes (Page 485)

FmCont error handling (Page 496)

4.2.4 FmCont error handling

Error handling of FmCont

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The ErrorNum I/O can be used to output various error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of PV can no longer be displayed in the REAL number field.
31	The value of SP_Ext can no longer be displayed in the REAL number field.
33	The value of MV_Trk can no longer be displayed in the REAL number field.
35	The value of Rbk can no longer be displayed in the REAL number field.
36	The value of MV can no longer be displayed in the REAL number field.
50	The controller cannot be switched to program mode, because program mode with default setpoint (AdvCoModSP = 0) is not possible with step controllers without position feedback (WithRbk = 0).
60	|TI| < SampleTime / 2
61	|TD| < SampleTime
62	DiffGain < 1 or DiffGain > 10
63	TD / DiffGain < SampleTime / 2
64	PropFacSP < 0 or PropFacSP > 1
66	NormPV_High = NormPV_Low
67	MotorTime < SampleTime
68	PulseTime < SampleTime
69	BreakTime < SampleTime
70	Channel < 1 or Channel > 4
71	(D_InSel < 0 or D_InSel > 4) and D_InSel ≠ 17

See also

FmCont block diagram (Page 515)
FmCont I/Os (Page 501)
Description of FmCont (Page 480)
FmCont modes (Page 485)
FmCont functions (Page 486)
FmCont messaging (Page 498)
Setting switch or button mode (Page 140)

4.2.5 FmCont messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 6	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId2, SIG 6).

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ PV - high alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ PV - high warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ PV - high tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ PV - low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ PV - low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ PV - low alarm limit violated
	SIG 7	Alarm - high	$$BlockComment$$ ER - high alarm limit violated
	SIG 8	Alarm - low	$$BlockComment$$ ER - low alarm limit violated

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 7	Warning - high	$$BlockComment$$ Rbk - high warning limit violated
	SIG 8	Warning - low	$$BlockComment$$ Rbk - low warning limit violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You can use up to four instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 1	AS process control message - fault	$$BlockComment$$ External message 1 Status 16#@5%x@
	SIG 2	AS process control message - fault	$$BlockComment$$ External message 2 Status 16#@6%x@
	SIG 3	AS process control message - fault	$$BlockComment$$ External message 3 Status 16#@7%x@
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 4 Status 16#@8%x@

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	Process value `PV_Out`
5	Control deviation `ER`
6	`ExtVa106`
7	`ExtVa107`
8	Not allocated
9	Not allocated
10	Not allocated

The associated values 6 ... 7 are allocated to the parameters `ExtVa106` ... `ExtVa107` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

Associated values for message instance `MsgEvId2`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	Position feedback `Rbk`
5	Signal status `ExtMsg1`
6	Signal status `ExtMsg2`
7	Signal status `ExtMsg3`
8	Signal status `ExtMsg4`
9	`ExtVa209`
10	`ExtVa210`

The associated values 9 ... 10 are allocated to the parameters `ExtVa209` ... `ExtVa210` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

FmCont block diagram (Page 515)

FmCont modes (Page 485)

FmCont error handling (Page 496)

4.2.6 FmCont I/Os

I/Os of FmCont

Input parameters

Parameter	Description	Type	Default
AccMode*	1 = Transfer of operating parameters SubN1_ID, SubN2_ID, RackNo, SlotNo and Channel to internal processing	BOOL	1
AdvCoEn	1 = Enable "program mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoModSP	Type of "program mode": 1 = Setpoint specification 0 = Manipulated variable specification	BOOL	1
AdvCoMstrOn	Activate (0-1) or deactivate (1-0) "program mode" via edge transition	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoMV	Specified value from the external program	REAL	0.0
AdvCoOn*	1 = Enable "program mode" via faceplate	BOOL	0
AutModLi*	1 = "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
BatchEn	1 = Enable allocation for batch control	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BreakTime*	Minimum break duration [s]	REAL	1.0
Channel	Controller channel number (1..4)	INT	1
CloseLi*	1 = Close via interconnection or CFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseOp*	1 = Close via operator	BOOL	0
CoordNo	Coordination number	INT	0
CPI_In	Input for control performance index, which is calculated by the assigned ConPerMon block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78

Parameter	Description	Type	Default
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
D_InSel*	Input for differentiator: 0 = Control deviation 1..4 = Channel 1..4 17 = Actual value to feedback	INT	0
DeadBand*	Width of dead band	REAL	0.0
DiffGain*	Gain of differentiator [1...10] DiffGain = TD/(delay time of D action)	STRUCT • Value: REAL • ST: BYTE	- • 5.0 • 16#80
EN	1 = Called block will be processed	BOOL	1
ER_A_DC*	Delay for incoming alarms during control deviation monitoring	REAL	0.0
ER_A_DG*	Delay for outgoing alarms during control deviation monitoring	REAL	0.0
ER_AH_En	1 = Activate alarm (high) for control deviation monitoring	BOOL	1
ER_AH_Lim	Alarm limit (high) for control deviation monitoring	REAL	100.0
ER_AH_MsgEn	1 = Activate messages for alarm (high) for control deviation monitoring	BOOL	1
ER_AL_En	1 = Activate alarm (low) for control deviation monitoring	BOOL	1
ER_AL_Lim	Alarm limit (low) for control deviation monitoring	REAL	-100.0
ER_AL_MsgEn	1 = Activate messages for alarm (low) for control deviation monitoring	BOOL	1
ER_Hyst	Alarm hysteresis for control deviation	REAL	1.0
EventTsIn	Evaluation of the signal status of the EventTs message block. EventTsIn serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ExtMsg4	Binary input for freely selectable message 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa209	Associated value 9 for messages (MsgEvID2)	ANY	
ExtVa210	Associated value 10 for messages (MsgEvID2)	ANY	
FbkClosed	Low limit stop signal of position feedback	STRUCT • Value: BOOL • ST: BYTE	- 0 16#80
FbkOpened	High limit stop signal of position feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Feature	I/O for additional functions (Page 486)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
FM355	Module type: 0: FM 355 S; 1: FM 355 C	BOOL	0
FuzOptOn*	Fuzzy optimization	BOOL	0
Gain*	Proportional gain Gain.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#FF
LogAddr	Logical address FM 355	INT	0
Man	Manual specification for the manipulated variable	REAL	0.0
ManHiLim*	Limit (high) for manual parameter Man	REAL	100.0
ManLoLim*	Limit (low) for manual parameter Man	REAL	0.0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
Mode	Operating mode	DWORD	16#00000000
ModLiOp	Operating mode switchover between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MotorTime*	Motor actuating time [s]	REAL	30.0
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvID1	Message number (assigned automatically)	DWORD	16#00000000

Parameter	Description	Type	Default
MsgEvID2	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_FmTrkOn	1 = Manipulated variable tracking in the FM	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_HiLim*	Limit (high) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
MV_LoLim*	Limit (low) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_OpScale	OS display range for manipulated variable MV	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
MV_Safe*	Neutral position manipulated variable	REAL	0.0
MV_SafeOn	1 = Neutral position manipulated variable MV_Safe at output MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Trk*	Tracking value for the manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_TrkOn	1 = Tracking of manipulated variable MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Unit	Unit of measure for manipulated variable	INT	1342
NegGain*	0 = Positive controller gain: ER = Gain · (SP - PV) 1 = Negative controller gain: ER = Gain · (PV - SP)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NormMV	Manipulated variable range (MV) for standardizing the proportional gain (GAIN)	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
NormPV	Process value range (PV) for standardizing the proportional gain (GAIN)	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
Occupied	Occupied by batch control	BOOL	0

Parameter	Description	Type	Default
OosLi	Edge transition (0-1) = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OP_Sel*	Operation via OP 0 = "Off" (P bus) 1 = "On" (K bus)	BOOL	0
OpenLi*	1 = Open via interconnection or CFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenOp*	1 = Open via operator	BOOL	0
OptimEn	1 = Enable optimization of PID parameters by PID tuner	BOOL	0
OptimOcc	1 = Optimization running	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 486)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
OS1Perm	I/O for operator control permissions (Page 486)	STRUCT • Bit 0: BOOL • Bit 18: BOOL • Bit 19: BOOL • Bit 31: BOOL	- • 1 • 1 • 1 • 1
P_FbkSel*	1 = P action in feedback	BOOL	0
PropSel*	1 = Activate P action	BOOL	1
PulseTime*	Minimum pulse duration [s]	REAL	1.0
PV_A_DC*	Delay time for incoming PV alarms [s]	REAL	0.0
PV_A_DG*	Delay time for outgoing PV alarms [s]	REAL	0.0
PV_AH_En	1 = Enable PV alarm limit (high)	BOOL	1
PV_AH_Lim	Limit PV alarm (high)	REAL	95.0
PV_AH_MsgEn	1 = Enable PV alarm (high) message	BOOL	1
PV_AL_En	1 = Enable PV alarm limit (low)	BOOL	1
PV_AL_Lim	PV alarm limit (low)	REAL	5.0
PV_AL_MsgEn	1 = Enable PV alarm (low) message	BOOL	1
PV_Hyst	Hysteresis for PV alarm, warning and tolerance limits	REAL	1.0
PV_OpScale	Limit for scale in PV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0

Parameter	Description	Type	Default
PV_T_DC*	Delay time for incoming PV tolerance messages [s]	REAL	0.0
PV_T_DG*	Delay time for outgoing PV tolerance messages [s]	REAL	0.0
PV_TH_En	1 = Enable PV tolerance limit (high)	BOOL	0
PV_TH_Lim	Limit PV tolerance message (high)	REAL	85.0
PV_TH_MsgEn	1 = Enable message for PV tolerance message (high)	BOOL	1
PV_TL_En	1 = Enable PV tolerance limit (low)	BOOL	0
PV_TL_Lim	Limit PV tolerance message (low)	REAL	15.0
PV_TL_MsgEn	1 = Activate message for PV tolerance message (low)	BOOL	1
PV_Unit	Unit of measure for process value	INT	1001
PV_W_DC*	Delay time for incoming PV warnings [s]	REAL	0.0
PV_W_DG*	Delay time for outgoing PV warnings [s]	REAL	0.0
PV_WH_En	1 = Enable PV warning limit (high)	BOOL	1
PV_WH_Lim	Limit PV warning (high)	REAL	90.0
PV_WH_MsgEn	1 = Enable PV warning (high) message	BOOL	1
PV_WL_En	1 = Enable PV warning limit (low)	BOOL	1
PV_WL_Lim	Limit PV warning (low)	REAL	10.0
PV_WL_MsgEn	1 = Enable PV warning (low) message	BOOL	1
RackNo	Rack number	BYTE	16#FF
Rbk*	Position feedback for display on OS	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
RbkHyst	Alarm hysteresis for position feedback	REAL	1.0
RbkWH_En	1 = Enable warning (high) for position feedback	BOOL	1
RbkWH_Lim	Limit for position feedback of warning (high)	REAL	100.0
RbkWH_MsgEn	1 = Enable messages for warning (high) for position feedback	BOOL	1
RbkWL_En	1 = Enable warning (low) for position feedback	BOOL	1
RbkWL_Lim	Limit for position feedback of warning (low)	REAL	0.0
RbkWL_MsgEn	1 = Enable messages for warning (low) for position feedback	BOOL	1
RefStdDevIn	Reference value of PV standard deviation (sigma) in defined "good" state of control loop	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
S_RbkOnPIDTun	Simulation of position feedback on; For PCS 7 PID tuner only	BOOL	0
S_RbkPIDTun	Simulated position feedback	REAL	50.0
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-

Parameter	Description	Type	Default
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimPV*	Process value used for SimOn = 1	REAL	0.0
SimPV_Li	Process value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SimRbk*	Position feedback used for SimOn = 1	REAL	0.0
SimRbkLi	Position feedback used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SlotNo	Slot number	BYTE	16#FF
SP_DnRaLim	Limit (low) for the gradient of the setpoint [SP_Unit/s]	REAL	100.0
SP_ExHiLim*	Limit (high) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP_ExLoLim*	Limit (low) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_Ext*	External setpoint of - (to interconnection)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_ExtLi*	1 = Select external setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOp*	1 = Select external setpoint (via operator)	BOOL	0
SP_InHiLim*	Limit (high) of internal setpoint	REAL	100.0
SP_InLoLim*	Limit (low) of internal setpoint	REAL	0.0
SP_Int*	Internal setpoint for operation	REAL	0.0
SP_IntLi*	1 = Select internal setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_IntOp*	1 = Select internal setpoint (via operator)	BOOL	0

Parameter	Description	Type	Default
SP_LiOp	Select setpoint source (internal/external): 1 = Via interconnection 0 = Via operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_RateOn*	1 = Activate limitation of setpoint gradients	BOOL	0
SP_RmpModTime	1 = Use time (SP_RmpTime) for setpoint ramp, 0 = Use gradient	BOOL	0
SP_RmpOn*	1 = Activate setpoint ramp to target setpoint SP_RmpTarget	BOOL	0
SP_RmpTarget	Target setpoint for setpoint ramp	REAL	0.0
SP_RmpTime*	Time for setpoint ramp [s] from current SP up to SP_RmpTarget	REAL	0.0
SP_TrkExt	1 = Bumpless switchover from external to internal setpoint active	BOOL	1
SP_TrkPV	1 = Setpoint follows PV in "manual mode" and with tracking	BOOL	0
SP_UpRaLim	Gradient limit (high) for the setpoint [SP_Unit/s]	REAL	100.0
StepCon	Controller type in the FM 355 S: 0 = Pulse controller 1 = Step controller	BOOL	0
StepNo	Batch step number	DWORD	16#00000000
StopLi*	1 = Stop via interconnection or CFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopOp*	1 = Stop via operator	BOOL	0
SubN1_ID	ID of the primary DP master system	BYTE	16#FF
SubN2_ID	ID of the redundant DP master system	BYTE	16#FF
TD*	Derivative action time [s] TD.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
TI*	Integral action time [s] TI.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#FF
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
EnCoord	Current coordination number	STRUCT • CO_ACT : INT	- • 0

Output parameters

Parameter	Description	Type	Default
AdvCoAct	1 = "Program mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoRdy	1 = "Program mode" available	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutAct	1 = "Automatic mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ChFM_Err	1 = Channel error on the module	BOOL	0
Close	Control output: 1 = Closed is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EnCoNum	Coordination number	BYTE	16#00
ENO	1 = Block algorithm completed without errors	BOOL	0
ER	Control deviation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ER_AH_Act	1 = Alarm limit (high) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ER_AL_Act	1 = Alarm limit (low) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ErrorNum	Output of present error number, for error numbers that can be output by this block, see FmCont error handling (Page 496)	INT	-1

Parameter	Description	Type	Default
FbkClsOut	1 = Low limit stop of the position feedback reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkOpnOut	1 = High limit stop of the position feedback reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FFwdOut	Disturbance variable generated in the FM	STRUCT Value: REAL ST: BYTE	- 0.0 16#80
FuzCon	Controller type: 0 = PID controller 1 = Fuzzy controller	BOOL	0
FuzOptAct	1 = Optimization of fuzzy controller active	BOOL	0
FuzSP_PV_Act	Fuzzy controller display: Setpoint < actual value	BOOL	0
GainEff	Effective proportional gain, depends on Gain and NormPV	REAL	1.0
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LoopClosed	1 = Control loop closed 0 = Control loop open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
ManARW_Act	1 = Tracking mode or anti-reset windup by secondary controller	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManHiOut	Limit (high) for "manual mode", corresponds to input parameter ManHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
ManLoOut	Limit (low) for "manual mode", corresponds to input parameter ManLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ModErr	1 = Module error	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgAckn2	Alarm acknowledgement status 2 (output STATUS of second ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgErr2	Alarm error 2 (output ERROR of second ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
MsgStat2	Alarm status 2 (output ERROR of second ALARM_8P)	WORD	16#0000
MV	Manipulated variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_FmTrkAct	1 = Track manipulated variable in the FM enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_HiAct	1 = Limit (high) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_LoAct	1 = Limit (low) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_SafeAct	1 = Neutral position manipulated variable of the FM enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_SpliA	Manipulated variable A of split-range function	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_SpliB	Manipulated variable B of split-range function	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_UnitOut	Unit of measure for manipulated variable, for interconnecting to the MV_Unit input parameter of the ConPerMon block	INT	0
MV_Visible	1 = MV display visible Evaluated by block icon	BOOL	0
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Open	Control output: 1 = Open is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS1PermOut	Display of OS_Perm1	DWORD	16#FFFFFFFF
OS1PermLog	Display of OS1Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
ParFM_Err	1 = Direct parameter-assignment error of the FM or input Channel configured incorrectly	BOOL	0
PerAccErr	1 = I/O access error	BOOL	0
PV	Process value of the module	STRUCT • Value: REAL • ST:BYTE	- • 0.0 • 16#80
PV_AH_Act	1 = PV alarm (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_AL_Act	1 = PV alarm (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Out	Output for process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_TH_Act	1 = PV tolerance message (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_TL_Act	1 = PV tolerance message (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_ToleHi	Limit (high) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
PV_ToleLo	Limit (low) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_UnitOut	Unit of measure for process value, for interconnecting with PV_Unit input parameter of the ConPerMon block	INT	0
PV_WH_Act	1 = PV warning (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_WL_Act	1 = PV warning (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkOut	Output for position feedback	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RbkVisible	1 = Rbk display visible Evaluated by block icon	BOOL	0
RbkWH_Act	1 = Warning (high) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkWL_Act	1 = Warning (low) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RetValue	Return value of WRREC / RDREC	WORD	16#0000
SP	Setpoint used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_DnRaAct	1 = Negative gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExHiAct	1 = Limit (high) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

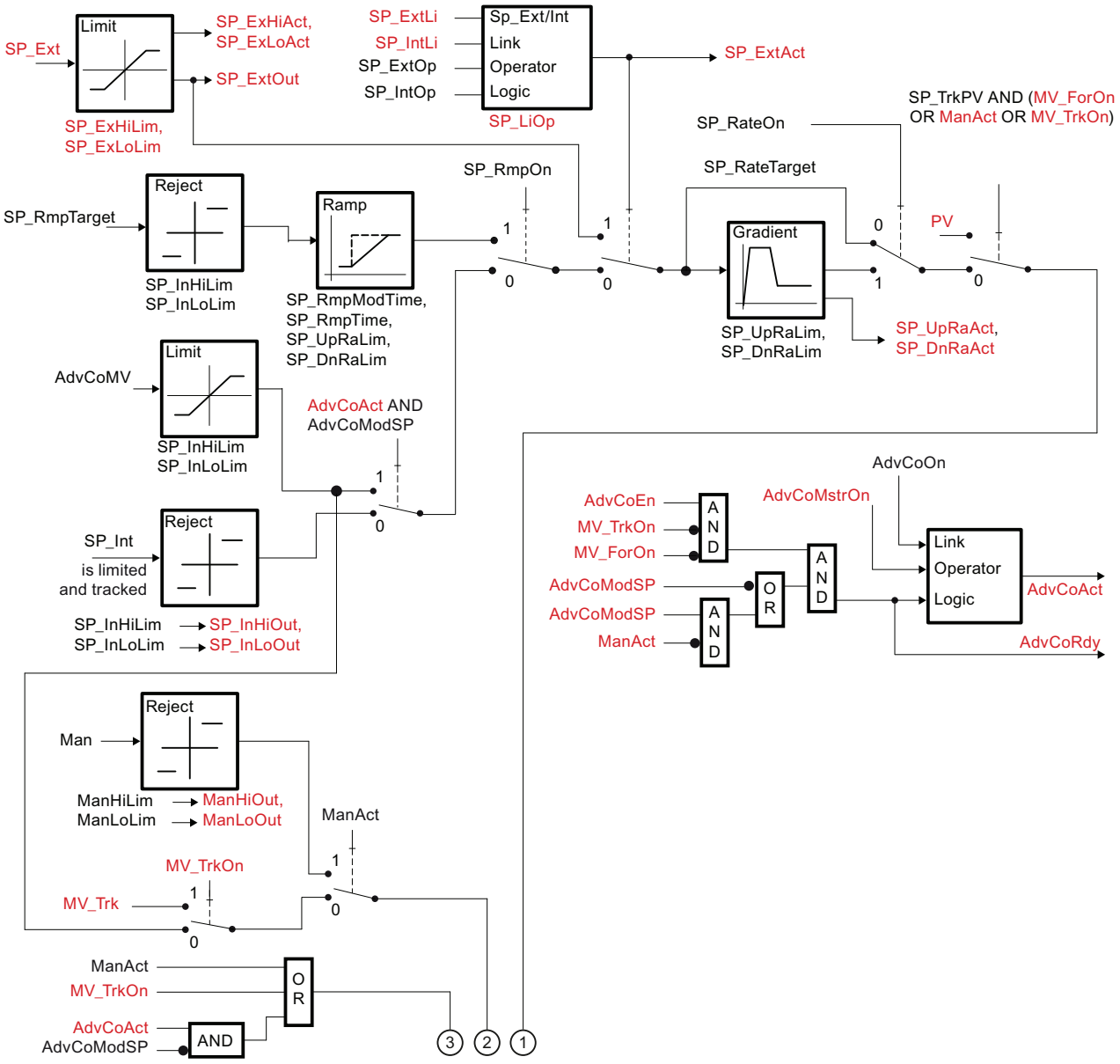
Parameter	Description	Type	Default
SP_ExLoAct	1 = Limit (low) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtAct	1 = External setpoint is active 0 = Internal setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOut	External setpoint, corresponds to input parameter SP_Ext	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_InHiOut	Limit (high) for SP_Int corresponds to input parameter SP_InHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP_InLoOut	Limit (low) for SP_Int corresponds to input parameter SP_InLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_RateTarget	Target setpoint for the gradient limitation	REAL	0.0
SP_UpRaAct	Positive gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
SplitRange	1 = Split-range function has been activated	BOOL	0
Status1	Status word 1 (Page 480)	DWORD	16#00000000
Status2	Status word 2 (Page 480)	DWORD	16#00000000
Status3	Status word 2 (Page 480)	DWORD	16#00000000
Stop	Control output: 1 =Stopped is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SumMsgAct	1 = Active process alarm	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
WithRbk	Controller type: 0 = Step controller without position feedback 1 = Step controller with position feedback	BOOL	0

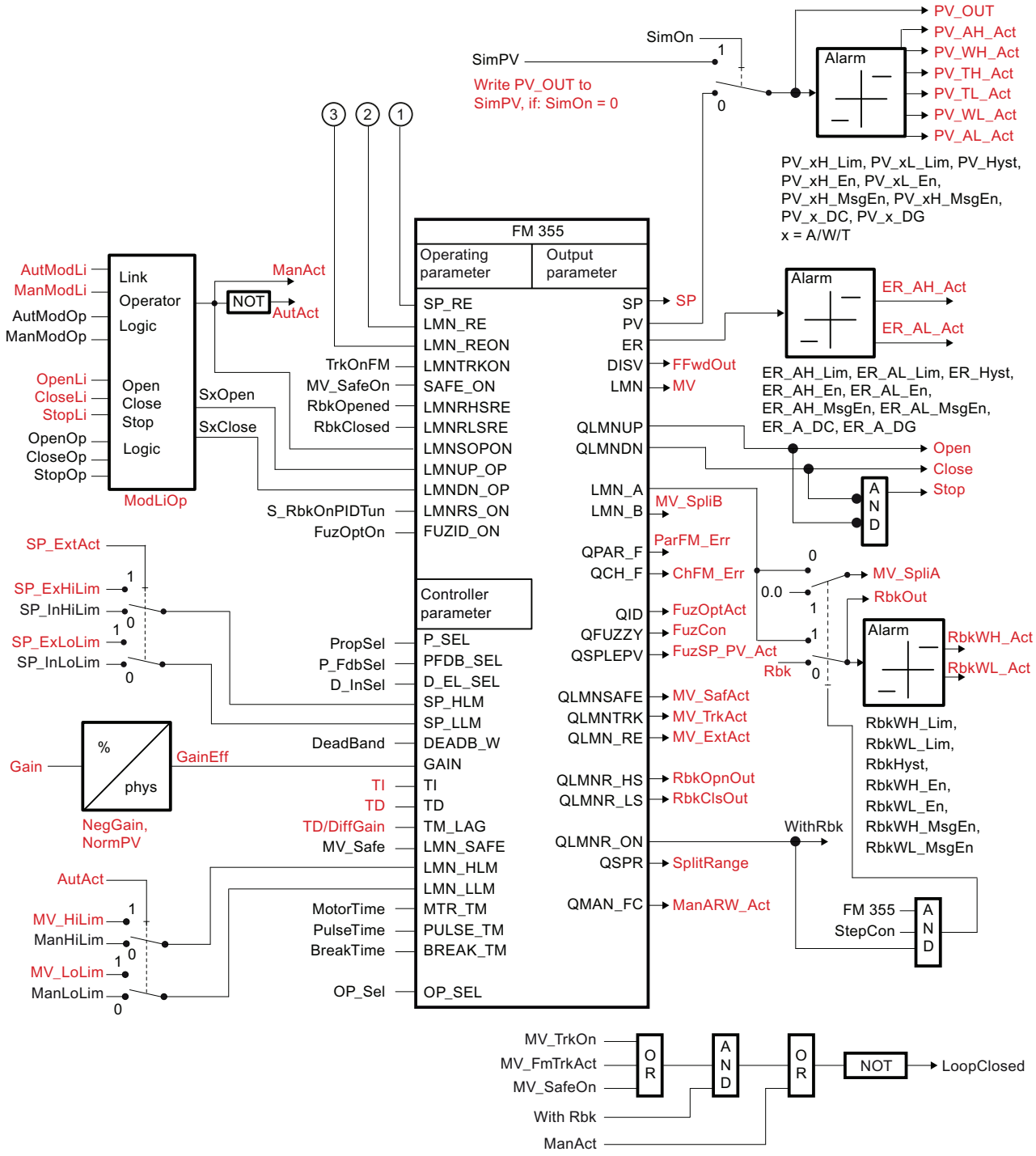
See also

FmCont messaging (Page 498)
FmCont block diagram (Page 515)
FmCont modes (Page 485)
Neutral position for motors, valves and controllers (Page 37)

4.2.7 FmCont block diagram

FmCont block diagram




SimOn
SimPV
Write PV_OUT to SimPV, if: SimOn = 0
Alarm
PV_OUT
PV_AH_Act
PV_WH_Act
PV_TH_Act
PV_TL_Act
PV_WL_Act
PV_AL_Act
PV_xH_Lim, PV_xL_Lim, PV_Hyst, PV_xH_En, PV_xL_En, PV_xH_MsgEn, PV_xH_MsgEn, PV_x_DC, PV_x_DG
x = A/W/T
FM 355
Operating parameter
Output parameter
SP_RE
LMN_RE
LMN_REON
LMNTRKON
SAFE_ON
LMNRHSRE
LMNRLSRE
LMNSOPON
LMNUP_OP
LMNDN_OP
LMNRS_ON
FUZID_ON
SP
PV
ER
DISV
LMN
QLMNUP
QLMNDN
LMN_A
LMN_B
QPAR_F
QCH_F
QID
QFUZZY
QSPLEPV
QLMNSAFE
QLMNTRK
QLMN_RE
QLMNR_HS
QLMNR_LS
QLMNR_ON
QSPR
QMAN_FC
Controller parameter
P_SEL
PFDB_SEL
D_EL_SEL
SP_HLM
SP_LLM
DEADB_W
GAIN
TI
TD
TM_LAG
LMN_SAFE
LMN_HLM
LMN_LLM
MTR_TM
PULSE_TM
BREAK_TM
OP_SEL
TrkOnFM
MV_SafeOn
RbkOpened
RbkClosed
S_RbkOnPIDTun
FuzOptOn
PropSel
P_FdbSel
D_InSel
DeadBand
TI
TD
TD/DiffGain
MV_Safe
MotorTime
PulseTime
BreakTime
OP_Sel
SP
FFwdOut
MV
MV_SpliB
ParFM_Err
ChFM_Err
FuzOptAct
FuzCon
FuzSP_PV_Act
MV_SafAct
MV_TrkAct
MV_ExtAct
RbkOpnOut
RbkClsOut
SplitRange
ManARW_Act
Alarm
ER_AH_Act
ER_AL_Act
ER_AH_Lim, ER_AL_Lim, ER_Hyst, ER_AH_En, ER_AL_En, ER_AH_MsgEn, ER_AL_MsgEn, ER_A_DC, ER_A_DG
Open
Close
Stop
AND
MV_SpliA
RbkOut
Alarm
RbkWH_Act
RbkWL_Act
Rbk
WithRbk
RbkWH_Lim, RbkWL_Lim, RbkHyst, RbkWH_En, RbkWL_En, RbkWH_MsgEn, RbkWL_MsgEn
FM 355
StepCon
AND
AutModLi
ManModLi
AutModOp
ManModOp
OpenLi
CloseLi
StopLi
OpenOp
CloseOp
StopOp
Link
Operator
Logic
Open
Close
Stop
Logic
ModLiOp
NOT
ManAct
AutAct
SxOpen
SxClose
SP_ExtAct
SP_ExHiLim
SP_InHiLim
SP_ExLoLim
SP_InLoLim
Gain
%
phys
GainEff
NegGain, NormPV
AutAct
MV_HiLim
ManHiLim
MV_LoLim
ManLoLim
MV_TrkOn
MV_FmTrkAct
MV_SafeOn
With Rbk
ManAct
OR
AND
OR
NOT
LoopClosed

See also

FmCont I/Os (Page 501)
FmCont messaging (Page 498)
FmCont error handling (Page 496)
FmCont functions (Page 486)
FmCont modes (Page 485)
Description of FmCont (Page 480)

4.2.8 Operator control and monitoring

4.2.8.1 FmCont views

Views of the FmCont block

The block FmCont provides the following views:

- FM controllers standard view (analog) (Page 212)
- FM controllers standard view (pulse controller) (Page 216)
- FM controllers standard view (step controller with position feedback) (Page 220)
- FM controllers standard view (step controller without position feedback) (Page 224)
- Alarm view (Page 250)
- Limit value view of FM controllers (Page 238)
- Trend view (Page 253)
- Ramp view (Page 248)
- Parameter view of FM controllers (Page 234)
- Preview of FM controllers (Page 245)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icons for PID and FM controller (Page 193)

Refer to the Structure of the faceplate (Page 200) and Block icon structure (Page 185) sections for general information about the faceplate and block icon.

4.3 FmTemp - Interface to temperature controller modules FM 355-2

4.3.1 Description of FmTemp

Object name (type + number) and family

Type + number: FB 1819

Family: Control

Area of application for FmTemp

The block is used for the following applications:

- Fixed setpoint control
- Cascade control
- Ratio control
- Split-range control

How it works

Block FmTemp is used to interface the FM 355-2 temperature controller modules.

FmTemp can be used for the C (continuous controllers) and S (step and pulse controllers) module types. It contains the algorithms of the setpoint ramp, the setpoint rise limitation, and the limit monitoring of the process value, the control deviation, and the position feedback. Limit monitoring is not used on the module.

The control function itself (e.g. PID algorithm) is processed on the module. You can use the FmTemp block to monitor all relevant process values and to change all relevant controller parameters.

Application examples of the FM 355-2 and detailed descriptions of the associated input and output parameters can be found in the manual of the FM 355-2. temperature controller.

It is primarily used for controlling temperature processes, but can also control level and flow processes which are not excessively fast, for example.

Module FM 355-2 features online optimization of the PID parameters. You can set the corresponding parameters for performing online optimization in the CFC chart at block FmTemp .

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100). Set the input `LogAddr` to the module address from HW config and the input `Channel` to the desired controller channel (0 ... 3)..

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The parameter `CoordNo` is set
- The in/out parameter `Mode` is interconnected to the corresponding `OMODE_xx` output parameter of the MOD block.
- The parameter `FM 355_2` is set in accordance with the module type C/S
- The in/out parameter `EnCoord` is interconnected to the output `EN_CO_x` of the FM_CO block of the basic library (x = number of the rack)
- The output `EnCoNum` is interconnected to the input `ENCOx_yy` of the FM_CO block (x = number of the rack, yy = coordination number).

For the control loop monitoring to work as planned in the trend view of the controller faceplates, the

`S7_xarchive:='Value, shortterm;'`

attributes in the process tag types for control loops at the controller function block must be set for the following tags:

- Input parameters:
  - `CPI_In`
- Output parameters
  - `MV`
  - `MV_HiAct`
  - `MV_LoAct`
  - `LoopClosed`
  - `SP`
  - `PV_Out`
  - `PV_ToleHi`
  - `PV_ToleLo`

Startup characteristics

Use the `Feature` Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section FmTemp I/Os (Page 539).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutAct.Value`
6	Not used
7	`ManAct.Value`
8	`SP_ExtAct.Value`
9	`MV_SafeOn.Value`
10	`MV_TrkOn.Value`
11	`MV.Value > ManLoLim` for continuous or pulse controller `NOT FbkClosed.Value` for step controller with/without position feedback
12	`Open.Value`
13	`Close.Value`
14	`Stop.Value`
15	`FbkOpened.Value`
16	`FbkClosed.Value`
17	`SimOn` AND `ManAct`
18	`SimOn` AND `ManAct`
19	`AdvCoAct`
20	1 = Input parameter `Rbk` is not interconnected (`RbkOut.ST` = 16#FF)
21	`NegGain`
22 - 27	Not used
28	1 = Analog controller (`FM 355_2` = 1)
29	1 = Pulse controller (`FM 355_2` = 0 AND `StepCon` = 0)
30	1 = Step controller with position feedback (`FM 355_2` = 0 AND `StepCon` = 1 AND `WithRbk` = 1)
31	1 = Step controller without position feedback (`FM 355_2` = 0 AND `StepCon` = 1 AND `WithRbk` = 0)

Status word allocation for `Status2` parameter

Status bit	Parameter
0	MsgLock
1	PV_AH_Act.Value
2	PV_WH_Act.Value
3	PV_TH_Act.Value
4	PV_TL_Act.Value
5	PV_WL_Act.Value
6	PV_AL_Act.Value
7	PV_AH_En
8	PV_WH_En
9	PV_TH_En
10	PV_TL_En
11	PV_WL_En
12	PV_AL_En
13	PV_AH_MsgEn
14	PV_WH_MsgEn
15	PV_TH_MsgEn
16	PV_TL_MsgEn
17	PV_WL_MsgEn
18	PV_AL_MsgEn
19	ER_AH_Act.Value
20	ER_AL_Act.Value
21	ER_AH_En
22	ER_AL_En
23	ER_AH_MsgEn
24	ER_AL_MsgEn
25	RbkWH_Act.Value
26	RbkWL_Act.Value
27	RbkWH_En
28	RbkWL_En
29	RbkWH_MsgEn
30	RbkWL_MsgEn
31	MS_RelOp

Status word allocation for `Status3` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8 - 26	Not used
27	`SP_UpRaAct`, `SP_DnRaAct` limits enabled for gradient mode (`SP_RateOn = 1`)
28	`GrpErr.Value`
29	`RdyToStart.Value`
30	`SimLiOp.Value`
31	Not used

See also

FmTemp functions (Page 524)
FmTemp messaging (Page 536)
FmTemp modes (Page 522)
FmTemp error handling (Page 535)
FmTemp block diagram (Page 554)

4.3.2 FmTemp modes

FmTemp operating modes

The block can be operated using the following modes:

- Automatic mode (Page 59)
- Manual mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and bumpless switchover in the Manual and automatic mode for control blocks (Page 59) section.

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the Manual and automatic mode for control blocks (Page 59) section.

"Program mode for controllers"

General information on "Program mode for controllers" is available in the section Program mode for controllers (Page 65).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of FmTemp (Page 518)

FmTemp functions (Page 524)

FmTemp error handling (Page 535)

FmTemp messaging (Page 536)

FmTemp I/Os (Page 539)

FmTemp block diagram (Page 554)

4.3.3 FmTemp functions

Functions of FmTemp

The functions for this block are listed below.

Module types

FmTemp can be used for the C (continuous controllers) and S (step controllers with and without position feedback and pulse controllers) module types. You can use the following parameters to identify which module type and controller type has been set:

FM 355	StepCon	WithRbk	Module type, controller type
1 or C	-	-	FM 355-2 C: Continuous controller
0 or S	1	1	FM 355-2 S: Step controller with position feedback
0 or S	1	0	FM 355-2 S: Step controller without position feedback
0 or S	0	-	FM 355-2 S: Pulse controller

Generating manipulated variables for continuous controllers, step controllers with position feedback, or pulse controllers

The manipulated variable MV and the actuating signals Open, Close and Stop are generated as follows:

MV_SafeOn	MV_FMTrkOn	ManAct	MV_TrkOn	AdvCoAct AND NOT AdvCoModSP	MV =	Manipulated variable limit	State	Open, Close, Stop
1	-	-	-	-	MV_Safe	MV_HiLim MV_LoLim	Tracking to safety value	**Cont. controller:** Open, Close, Stop = 0 **Step controller with position feedback:** Depending on Rbk and MV the output signals Open, Close and Stop are generated using the algorithm of a positioner. **Pulse controller:** Depending on MV the output signals Open and Close are generated using the algorithm of a pulse controller (Stop = 0).
0	1	-	-	-	Prepared FM analog input	MV_HiLim MV_LoLim	Tracking to an FM analog input	
0	0	1	-	-	Man	ManHiLim ManLoLim	Manual mode, set by the operator	
0	0	0	1	-	MV_Trk	MV_HiLim MV_LoLim	Tracking to block input MV_Trk	
0	0	0	0	1	AdvCoMV	MV_HiLim MV_LoLim	Higher-level program mode	
0	0	0	0	0	P_Part + I_Part + D_Part + FFwd	MV_HiLim MV_LoLim	Automatic mode (PID algorithm)	

Generating actuating signals for step controllers without position feedback (WithRbk = 0)

The manipulated variable signals `Open`, `Close` and `Stop` can be generated as follows:

ManAct	Open, Close, Stop	State	ManAct
1	The output signals are generated using input signals `OpenOp`/`Li`, CloseOp/`Li` or `StopOp`/`Li`	Manual mode, set by the operator	1
0	The output signals are generated using PID output variables `P_Part`, `I_Part`, `D_Part` and `FFwd`	Automatic mode (PID algorithm)	0

Tracking and limiting a manipulated variable (cont. controller, step controller with position feedback and pulse controller)

The block provides the standard function Tracking and limiting a manipulated variable (Page 153).

Neutral position

The controller modules have their own mechanism for feedforwarding a safety value (see manual for Temperature Controller FM 355-2).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `ModErr`
- `ParFM_Err`
- `PerAccErr`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

"Actuator active" information

For continuous and pulse controllers: If the manipulated variable `MV` is greater than the minimum manual limit `ManLoLim`, this is recognized as actuator active.

For step controllers: If the parameter is `FbkClosed` = 0 , this is known as "Actuator active".

This status can be used to indicate, for example, a customized icon in the process image and is saved in the status word (see Status word section in Description of FmTemp (Page 518)).

Limit monitoring of position feedback (cont. controller, step controller with position feedback and pulse controller)

The block provides the standard function Limit monitoring of the feedback (Page 80).

External/internal setpoint specification

The block provides the standard function Setpoint specification - internal/external (Page 112).

Setpoint limiting for external setpoints

The block provides the standard function Setpoint limiting for external setpoints (Page 153).

Limitation of rate of change of setpoint

The block provides the standard function Gradient limit of the setpoint (Page 109).

Using setpoint ramp

The block provides the standard function Using setpoint ramp (Page 108).

Tracking setpoint in manual mode

The block provides the standard function Tracking setpoint in manual mode (Page 153).

Simulating signals

The block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Process value (`SimPV`, `SimPV_Li`)
- Position feedback (`SimRbk`, `SimRbkLi`)

Note

The simulated process value `SimPV` only affects alarm processing and not the PID algorithm in the control module.

Limit monitoring of the process value

The block provides the standard function Limit monitoring of the process value (Page 72).

Control deviation generation and dead band

The block provides the standard function Control deviation generation and dead band (Page 151).

Limit monitoring of control deviation

The block provides the standard function Limit monitoring of setpoint, manipulated variable and control deviation (Page 81).

Inverting control direction

The block provides the standard function Inverting control direction (Page 151).

Physical standardization of setpoint, manipulated variable and process value

Controller gain `Gain` is entered either using a physical variable or as standardized value.

- `Gain` as a physical variable:

  The standardized variables retain their default values:

  – `NormPV.High` = 100 and `NormPV.Low` = 0

  – `NormMV.High` = 100 and `NormMV.Low` = 0

  For step controllers with/without position feedback and pulse controllers, the values of `NormMV.High` and `NormMV.Low` are not taken into account. The algorithm uses default values 0 and 100 for internal calculations.

  The effective gain is: `GainEff` = `Gain`

- Entering a standardized `Gain` (dimensionless):

  Change the standardized variables to the actual range of the process values and manipulated variables.

  – Internal and external setpoints; the process value and corresponding parameters are entered according to the physical measuring range of the process value.

  Continuous controller, pulse controller:

  – The manual value, the tracking value of the manipulated variable, feedforward control and the corresponding parameters are set according to the physical measuring range of the manipulated variable.

  Step controller with position feedback:

  – The manual parameter, the tracking value of the manipulated variable, feedforward control and the corresponding parameters are entered as a percentage 0 ... 100.

  Step controller without position feedback:

  – No physical measuring range available.

  The effective gain is:

  – Step controller with/without position feedback:

    `GainEff` = 100.0 / (`NormPV.High` - `NormPV.Low`) · `Gain`

  – Continuous controller, pulse controller:

    `GainEff` = (`NormMV.High` - `NormMV.Low`) / (`NormPV.High` - `NormPV.Low`) · `Gain`

Selecting a unit of measure

The block provides the standard function Selecting a unit of measure (Page 168).

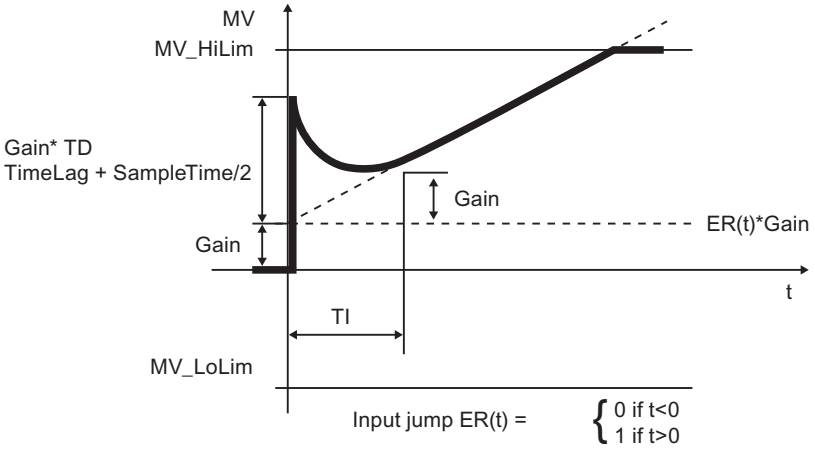
PID algorithm

The manipulated variable is generated in automatic mode according to the following algorithm:

$MV = Gain \cdot (1 + 1 / TI \cdot s) + (TD \cdot s) / (1 + TD / DiffGain \cdot s)) \cdot ER$

Where: s = Complex number

The following step response occurs:



Note

This formula describes a standard application where P, I and D actions are activated and the P and D actions are not in the feedback circuit (`PropSel` = 1, `TI` ≠ 0, `D_InSel` = 0 and `PropFacSP` = 1).

The D action delay is derived from `TD` / `DiffGain`.

- The P action can be shut down by `PropSel` = 0 .
- The I action can be shut down by `TI` = 0 .
- The D action can be shut down by `TD` = 0 .

Structure segmentation at controllers

The PID controller algorithm of FM 355 features structure segmentation. It is activated via the `PropFacSel` and `D_InSel` parameters. The precise functionality is described in the FM 355 manual.

Online optimization of the PID controller parameters

- Optimization sequence

  The optimization sequence is as follows:

  – Create a stationary state

  – Set `PID_On` = 1 (if PID parameters are required)

  – Set `TunD_MV` / `TunC_MVLMN`

  – Set `TunOn` = 1 (phase 1, ready for optimization)

  – Start the optimization using a step change in the setpoint or by setting `TunStart`

  If you have not made any configuration errors, the controller optimization is now in phase 2 and `StatusH` is 0.

  – When the point of inflection has been reached (PHASE ≥ 3) evaluate the diagnostics display at the `StatusH` parameter. Phase 0 is reached in a few cycles for process type I and the optimization is completed in full. For process types II and III, the optimization goes to phase 7 (checking the process type). If `StatusH` > 20000 , a valuation error has occurred or the point of inflection has not been reached. In this case, repeat the procedure.

- Result

  – Once optimization is completed, the parameters `PropFacSP`, `GAIN`, `TI`, `TD`, `DiffGain`, and `ConZone` are updated (for both the module and at FmTemp). Furthermore, the PI or PID parameter sets are saved on the FM 355-2.

  – The precise procedure is described in the FM 355-2 manual of the temperature controller module.

- Permanent backup of optimized controller parameters

  – Save, compile and download the hardware configuration; the optimized controller parameters are now in the system data block (SDB).

  – Transfer the modified parameters to the offline data management of the CFC via Chart > Readback.

Anti-windup

The PID control algorithm of FM 355 has an anti-windup function. The I action is frozen or tracked after the manipulated variable has reached its limits (`MV_HiLim` or `MV_LoLim`).

Feedforwarding and limiting disturbance variables

The block provides a function for activating the disturbance variable. The precise functionality is described in the FM 355-2 manual.

Control zone

The block provides the standard function Using control zones (Page 152).

Forming the signal status for blocks

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

- Signal status for the setpoint value SP:

  The signal status of the SP output parameter is always equivalent to the signal status of input parameter SP_Ext or SP_Int , depending on how the setpoint is specified. If the internal setpoint SP_Int is used, the signal status is always output as 16#80.

- Signal status for PV_Out, RbkOut, Open, Close, Stop:

  The signal status is always 16#60 when simulation is activated.

  When the ModErr.Value, ChFM_Err, ParFM_Err module error occurs, the signal status of PV_Out is always 16#0. RbkOut is always 16#0 for step controllers with position feedback

  Otherwise, the following applies:

  ```
  PV_Out.ST: 16#80

  Step controller: RbkOut.ST: = 16#80

  Continuous controller or pulse controller: RbkOut.ST: = Rbk.ST

  Open.ST := 16#80;

  Close.ST := 16#80;

  Stop.ST := 16#80;
  ```

- Signal status of the control deviation ER:

  The signal status of output parameter ER is obtained from the worst signal status of the two output parameters PV_Out and SP and is output. The signal status 16#60 (external simulation) is suppressed because the block acts as a sink with external simulation.

  Signal status for FbkOpnOut, FbkClsOut:

  ```
  FbkOpnOut.ST := FbkOpened.ST;

  FbkClsOut.ST := FbkClosed.ST;
  ```

- Signal status for the manipulated variable MV:

  The status signal from the output parameter MV is always set to 16#80 in "manual mode" and for step controllers without position feedback.

  In "automatic mode", the signal status for continuous controllers or pulse controllers is formed from the following parameters:

  RbkOut.STFFwdOut.STER.STWith step controllers, the

  FbkOpnOut.STFbkClsOut.STparameters are also included. The signal status 16#60 (external simulation) is suppressed because the block acts as a sink with external simulation.

- Worst signal status:

  The worst signal status `ST_Worst` for the block is formed from:

  - `PV_Out.ST`;
  - `SP:ST`;
  - `FFwdOut.ST`;
  - `RbkOut.ST`;

  With step controllers (FM355-2 = 0, StepCon = 1), the following are also included:

  - `FbkOpnOut.ST`;
  - `FbkClsOut.ST`;

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
4	Setting switch or button mode (Page 140)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Operator control permissions

The block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode" `AutModOp`
1	1 = Operator can switch to "manual mode" `ManModOp`
2	1 = Operator can switch to "Out of service" mode `OosOp`
3	1 = Operator can switch to "program mode" `AdvCoEn`
4	1 = Operator can switch the setpoint to "external" `SP_ExtOp`
5	1 = Operator can switch the setpoint to "internal" `SP_IntOp`
6	1 = Operator can change the internal setpoint `SP_Int`

Bit	Function
7	Continuous controllers, pulse controllers or step controllers with position feedback: 1 = Operator can change the manual parameter `Man` Step controller without position feedback: 1 = Operator can change the manual operation signals `OpenOp`, `StopOp`, `CloseOp`
8	1 = Operator can change operation high limit of the setpoint `SP_InHiLim`
9	1 = Operator can change operation low limit of the setpoint `SP_InLoLim`
10	1 = Operator can change the operation high limit of the manipulated variable `ManHiLim`
11	1 = Operator can change the operation low limit of the manipulated variable `ManLiLim`
12	1 = Operator can enable the setpoint's gradient limitation function `SP_RateOn`
13	1 = Operator can change the setpoint's high limit for the ramp `SP_UpRaLim`
14	1 = Operator can change the setpoint's low limit for the ramp `SP_DnRaLim`
15	1 = Operator can switch between the time value or the value for the ramp `SP_RmpModTime`
16	1 = Operator can change the ramp time `SP_RmpTime`
17	1 = Operator can change the target setpoint `SP_RmpTarget` for the setpoint ramp
18	1 = Operator can enable the setpoint ramp function `SP_RmpOn`
19	Not used
20	1 = Operator can enable the track setpoint in manual mode function `SP_TrkPV`
21	1 = Operator can enable the bumpless switchover from external to internal `SP_TrkExt`
22	1 = Operator can change the gain parameter `Gain`
23	1 = Operator can change the integral time parameter `TI`
24	1 = Operator can change the derivative time parameter `TD`
25	1 = Operator can change the derivative gain parameter `DiffGain`
26	1 = Operator can change the dead band parameter `DeadBand`
27	1 = Operator can change the control zone parameter `ConZone`
28	1 = Operator can change the integral time parameter `MotorTime`
29	1 = Operator can change the integral time parameter `PulseTime`
30	1 = Operator can change the integral time parameter `BreakTime`
31	Not used

The block has the following permissions for the `OS1Perm` parameter:

Bit	Function
0	1 = Operator can change the limit (process value) `PV_AH_Lim` for the high alarm
1	1 = Operator can change the limit (process value) `PV_WH_Lim` for the high warning
2	1 = Operator can change the limit (process value) `PV_TH_Lim` for the high tolerance
3	1 = Operator can change the hysteresis (process value) `PV_Hyst`
4	1 = Operator can change the limit (process value) `PV_TL_Lim` for the low tolerance
5	1 = Operator can change the limit (process value) `PV_WL_Lim` for the low warning
6	1 = Operator can change the limit (process value) `PV_AL_Lim` for the low alarm
7	1 = Operator can change the limit (control deviation) `ER_AH_Lim` for the high alarm
8	1 = Operator can change the hysteresis (control deviation) `ER_Hyst`
9	1 = Operator can change the limit (control deviation) `ER_AL_Lim` for the low alarm

Bit	Function
10	1 = Operator can change the limit (position feedback) `RbkWH_Lim` for the high warning
11	1 = Operator can change the hysteresis (position feedback) `RbkHyst`
12	1 = Operator can change the limit (position feedback) `RbkWL_Lim` for the low warning
13	1 = Operator can open the valve
14	1 = Operator can close the valve
15	1 = Operator can stop the valve
16	1 = Operator can activate the Simulation function `SimOn`
17	1 = Operator can activate the Release for maintenance function `MS_RelOp`
18	1 = Operator can change the simulation value SimPV
19 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Release for maintenance

The block provides the standard function Release for maintenance (Page 52).

Generating instance-specific messages

The block provides the standard function Generating instance-specific messages (Page 162) without the time stamp function in the I/O.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Specifying the display area for process and setpoint values as well as operations

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `OpenOp`
- `StopOp`
- `CloseOp`

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

See also

FmTemp messaging (Page 536)

FmTemp I/Os (Page 539)

FmTemp modes (Page 522)

FmTemp block diagram (Page 554)

FmTemp error handling (Page 535)

4.3.4 FmTemp error handling

Error handling of FmTemp

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output various error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of `PV` can no longer be displayed in the REAL number field.
31	The value of `SP_Ext` can no longer be displayed in the REAL number field.
33	The value of `MV_Trk` can no longer be displayed in the REAL number field.
35	The value of `Rbk` can no longer be displayed in the REAL number field.

Error number	Meaning of the error number
36	The value of MV can no longer be displayed in the REAL number field.
50	The controller cannot be switched to program mode, because program mode with default setpoint (AdvCoModSP = 0) is not possible with step controllers without position feedback (WithRbk = 0).
60	|TI| < SampleTime / 2
61	|TD| < SampleTime
62	DiffGain < 1 or DiffGain > 10
63	TD / DiffGain < SampleTime / 2
64	PropFacSP < 0 or PropFacSP > 1
66	NormPV_High = NormPV_Low
67	MotorTime < SampleTime
68	PulseTime < SampleTime
69	BreakTime < SampleTime
70	Channel < 0 or Channel > 3
71	(D_InSel < 0 or D_InSel > 4) and D_InSel ≠ 17

See also

Description of FmTemp (Page 518)

FmTemp modes (Page 522)

FmTemp functions (Page 524)

FmTemp messaging (Page 536)

FmTemp I/Os (Page 539)

FmTemp block diagram (Page 554)

Setting switch or button mode (Page 140)

4.3.5 FmTemp messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 6	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId2, SIG 6).

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ PV - high alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ PV - high warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ PV - high tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ PV - low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ PV - low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ PV - low alarm limit violated
	SIG 7	Alarm - high	$$BlockComment$$ ER - high alarm limit violated
	SIG 8	Alarm - low	$$BlockComment$$ ER - low alarm limit violated
MsgEvId2	SIG 7	Warning - high	$$BlockComment$$ Rbk - high warning limit violated
	SIG 8	Warning - low	$$BlockComment$$ Rbk - low warning limit violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You can use up to four instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 1	AS process control message - fault	$$BlockComment$$ External message 1 Status 16#@5%x@
	SIG 2	AS process control message - fault	$$BlockComment$$ External message 2 Status 16#@6%x@
	SIG 3	AS process control message - fault	$$BlockComment$$ External message 3 Status 16#@7%x@
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 4 Status 16#@8%x@

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	Process value PV_Out
5	Control deviation ER
6	ExtVa106
7	ExtVa107
8	Not allocated
9	Not allocated
10	Not allocated

The associated values 6 ... 7 are allocated to the parameters ExtVa106 ... ExtVa107 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

Associated values for message instance MsgEvId2

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	Position feedback Rbk
5	Signal status ExtMsg1
6	Signal status ExtMsg2
7	Signal status ExtMsg3
8	Signal status ExtMsg4
9	ExtVa209
10	ExtVa210

The associated values 9 ... 10 are allocated to the parameters ExtVa209 ... ExtVa210 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of FmTemp (Page 518)
FmTemp functions (Page 524)
FmTemp I/Os (Page 539)
FmTemp modes (Page 522)
FmTemp error handling (Page 535)
FmTemp block diagram (Page 554)

4.3.6 FmTemp I/Os

I/Os of FmTemp

Input parameters

Parameter	Description	Type	Default
AccMode*	1 = Transfer of operating parameters SubN1_ID, SubN2_ID, RackNo, SlotNo and Channel to internal processing	BOOL	1
AdvCoEn	1 = Enable "program mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
AdvCoModSP	Type of "program mode": 1 = Setpoint specification 0 = Manipulated variable specification	BOOL	1
AdvCoMstrOn	Activate (0-1) or deactivate (1-0) "program mode" via edge transition	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoMV	Specified value from the external program	REAL	0.0
AdvCoOn*	1 = Enable "program mode" via faceplate	BOOL	0
AutModLi*	1 = "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
BatchEn	1 = Enable allocation for batch control	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BreakTime*	Minimum break duration [s]	REAL	1.0
Channel	Controller channel number (0..3)	INT	0
CloseLi*	1 = Close via interconnection or CFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseOp*	1 = Close via operator	BOOL	0
ConZone*	Control zone	REAL	0.0
CoordNo	Coordination number	INT	0
CPI_In	Input for control performance index, which is calculated by the assigned ConPerMon block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
D_InSel*	Input for differentiator: 0 = Control deviation 1..4 = Channel 0..3 17 = Actual value to feedback	INT	0
DeadBand*	Width of dead band	REAL	0.0
DiffGain*	Gain of differentiator [1..10] DiffGain = TD / (delay time of D action)	STRUCT • Value: REAL • ST: BYTE	- • 5.0 • 16#80
EN	1 = Called block will be processed	BOOL	1
ER_A_DC*	Delay for incoming alarms during control deviation monitoring	REAL	0.0
ER_A_DG*	Delay for outgoing alarms during control deviation monitoring	REAL	0.0

Parameter	Description	Type	Default
ER_AH_En	1 = Activate alarm (high) for control deviation monitoring	BOOL	1
ER_AH_Lim	Alarm limit (high) for control deviation monitoring	REAL	100.0
ER_AH_MsgEn	1 = Activate messages for alarm (high) for control deviation monitoring	BOOL	1
ER_AL_En	1 = Activate alarm (low) for control deviation monitoring	BOOL	1
ER_AL_Lim	Alarm limit (low) for control deviation monitoring	REAL	-100.0
ER_AL_MsgEn	1 = Activate messages for alarm (low) for control deviation monitoring	BOOL	1
ER_Hyst	Alarm hysteresis for control deviation	REAL	1.0
EventTsIn	Evaluation of the signal status of the EventTs message block. EventTsIn serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg4	Binary input for freely selectable message 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa209	Associated value 9 for messages (MsgEvID2)	ANY	
ExtVa210	Associated value 10 for messages (MsgEvID2)	ANY	
FbkClosed	Low limit stop signal of position feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkOpened	High limit stop signal of position feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Feature	I/O for additional functions (Page 524)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0

Parameter	Description	Type	Default
FM355_2	Module type: 0: FM 355-2 S; 1: FM 355-2 C	BOOL	0
Gain*	Proportional gain Gain.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#FF
LoadPID*	Load optimized PI/PID parameters	BOOL	0
LogAddr	Logical address FM 355	INT	0
Man*	Manual specification for the manipulated variable	REAL	0.0
ManHiLim*	Limit (high) for manual parameter Man	REAL	100.0
ManLoLim*	Limit (low) for manual parameter Man	REAL	0.0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
Mode	Operating mode	DWORD	16#00000000
ModLiOp	Operating mode switchover between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MotorTime*	Motor actuating time [s]	REAL	30.0
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvID1	Message number (assigned automatically)	DWORD	16#00000000
MsgEvID2	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_FmTrkOn	1 = Manipulated variable tracking in the FM	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_HiLim*	Limit (high) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
MV_LoLim*	Limit (low) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_OpScale	OS display range for manipulated variable MV	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
MV_Safe*	Neutral position manipulated variable	REAL	0.0

Parameter	Description	Type	Default
MV_SafeOn	1 = Neutral position manipulated variable MV_Safe at output MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Trk*	Tracking value for the manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_TrkOn	1 = Tracking of manipulated variable MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Unit	Unit of measure for manipulated variable	INT	1342
NegGain*	0 = Positive controller gain: ER = Gain · (SP - PV) 1 = Negative controller gain: ER = Gain · (PV - SP)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NormMV	Manipulated variable range (MV) for standardizing the proportional gain (GAIN)	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
NormPV	Process value range (PV) for standardizing the proportional gain (GAIN)	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
Occupied	Occupied by batch control	BOOL	0
OosLi	Edge transition (0-1) = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpenLi*	1 = Open via interconnection or CFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenOp*	1 = Open via operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 524)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1

Parameter	Description	Type	Default
OS1Perm	I/O for operator control permissions (Page 524)	STRUCT	-
		• Bit 0: BOOL	• 1
		• Bit 18: BOOL	• 1
		• Bit 19: BOOL	• 1
		• Bit 31: BOOL	• 1
PID_On*	1 = PID mode on	BOOL	0
PropFacSP*	Applying the P action to the feedback [0..1]. 0 = P action fully in feedback	REAL	1.0
PropSel*	1 = Activate P action	BOOL	1
PulseTime*	Minimum pulse duration [s]	REAL	1.0
PV_A_DC*	Delay time for incoming PV alarms [s]	REAL	0.0
PV_A_DG*	Delay time for outgoing PV alarms [s]	REAL	0.0
PV_AH_En	1 = Enable PV alarm limit (high)	BOOL	1
PV_AH_Lim	Limit PV alarm (high)	REAL	95.0
PV_AH_MsgEn	1 = Enable PV alarm (high) message	BOOL	1
PV_AL_En	1 = Enable PV alarm limit (low)	BOOL	1
PV_AL_Lim	PV alarm limit (low)	REAL	5.0
PV_AL_MsgEn	1 = Enable PV alarm (low) message	BOOL	1
PV_Hyst	Hysteresis for PV alarm, warning and tolerance limits	REAL	1.0
PV_OpScale	Limit for scale in PV bar graph of faceplate	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0
PV_T_DC*	Delay time for incoming PV tolerance messages [s]	REAL	0.0
PV_T_DG*	Delay time for outgoing PV tolerance messages [s]	REAL	0.0
PV_TH_En	1 = Enable PV tolerance limit (high)	BOOL	0
PV_TH_Lim	Limit PV tolerance message (high)	REAL	85.0
PV_TH_MsgEn	1 = Enable message for PV tolerance message (high)	BOOL	1
PV_TL_En	1 = Enable PV tolerance limit (low)	BOOL	0
PV_TL_Lim	Limit PV tolerance message (low)	REAL	15.0
PV_TL_MsgEn	1 = Activate message for PV tolerance message (low)	BOOL	1
PV_Unit	Unit of measure for process value	INT	1001
PV_W_DC*	Delay time for incoming PV warnings [s]	REAL	0.0
PV_W_DG*	Delay time for outgoing PV warnings [s]	REAL	0.0
PV_WH_En	1 = Enable PV warning limit (high)	BOOL	1
PV_WH_Lim	Limit PV warning (high)	REAL	90.0
PV_WH_MsgEn	1 = Enable PV warning (high) message	BOOL	1
PV_WL_En	1 = Enable PV warning limit (low)	BOOL	1
PV_WL_Lim	Limit PV warning (low)	REAL	10.0
PV_WL_MsgEn	1 = Enable PV warning (low) message	BOOL	1
RackNo	Rack number	BYTE	16#FF

Parameter	Description	Type	Default
RatioFac*	Ratio factor	REAL	0.0
Rbk*	Position feedback for display on OS	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
RbkHyst	Alarm hysteresis for position feedback	REAL	1.0
RbkWH_En	1 = Enable warning (high) for position feedback	BOOL	1
RbkWH_Lim	Limit for position feedback of warning (high)	REAL	100.0
RbkWH_MsgEn	1 = Enable messages for warning (high) for position feedback	BOOL	1
RbkWL_En	1 = Enable warning (low) for position feedback	BOOL	1
RbkWL_Lim	Limit for position feedback of warning (low)	REAL	0.0
RbkWL_MsgEn	1 = Enable messages for warning (low) for position feedback	BOOL	1
RefStdDevIn	Reference value of PV standard deviation (sigma) in defined "good" state of control loop	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SavePar*	1 = Save PID controller parameters	BOOL	0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimPV*	Process value used for SimOn = 1	REAL	0.0
SimPV_Li	Process value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SimRbk*	Position feedback used for SimOn = 1	REAL	0.0
SimRbkLi	Position feedback used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SlotNo	Slot number	BYTE	16#FF
SP_DnRaLim	Limit (low) for the gradient of the setpoint [SP_Unit/s]	REAL	100.0

Parameter	Description	Type	Default
SP_ExHiLim*	Limit (high) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP_ExLoLim*	Limit (low) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_Ext*	External setpoint of - (to interconnection)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_ExtLi*	1 = Select external setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOp*	1 = Select external setpoint (via operator)	BOOL	0
SP_InHiLim*	Limit (high) of internal setpoint	REAL	100.0
SP_InLoLim*	Limit (low) of internal setpoint	REAL	0.0
SP_Int*	Internal setpoint for operation	REAL	0.0
SP_IntLi*	1 = Select internal setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_IntOp*	1 = Select internal setpoint (via operator)	BOOL	0
SP_LiOp	Select setpoint source (internal/external): 1 = Via interconnection 0 = Via operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_RateOn*	1 = Activate limitation of setpoint gradients	BOOL	0
SP_RmpModTime	1 = Use time (SP_RmpTime) for setpoint ramp, 0 = Use gradient	BOOL	0
SP_RmpOn*	1 = Activate setpoint ramp to target setpoint SP_RmpTarget	BOOL	0
SP_RmpTarget	Target setpoint for setpoint ramp	REAL	0.0
SP_RmpTime*	Time for setpoint ramp [s] from current SP up to SP_RmpTarget	REAL	0.0
SP_TrkExt	1 = Bumpless switchover from external to internal setpoint active	BOOL	1
SP_TrkPV	1 = Setpoint follows PV in "manual mode" and with tracking	BOOL	0
SP_UpRaLim	Gradient limit (high) for the setpoint [SP_Unit/s]	REAL	100.0
StepNo	Batch step number	DWORD	16#00000000
StopLi*	1 = Stop via interconnection or CFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopOp*	1 = Stop via operator	BOOL	0
SubN1_ID	ID of the primary DP master system	BYTE	16#FF

Parameter	Description	Type	Default
SubN2_ID	ID of the redundant DP master system	BYTE	16#FF
TD*	Derivative action time [s] TD.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
TI*	Integral action time [s] TI.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#FF
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
TunC_MV*	Delta manipulated variable for cooling optimization	REAL	-20.0
TunC_Start*	Start cooling optimization	BOOL	0
TunD_MV*	Delta manipulated variable for process excitation	REAL	20.0
TunOn*	Enable controller optimization	BOOL	0
TunStart*	Start controller optimization	BOOL	0
UndoPar*	Undo controller parameter changes	BOOL	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
EnCoord	Current coordination number	STRUCT • CO_ACT : INT	- • 0

Output parameters

Parameter	Description	Type	Default
AdvCoAct	1 = "Program mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoRdy	1 = "Program mode" available	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ChFM_Err	1 = Channel error on the module	BOOL	0
Close	Control output: 1 = Closed is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EnCoNum	Coordination number	BYTE	16#00
ENO	1 = Block algorithm completed without errors	BOOL	0
ER	Control deviation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ER_AH_Act	1 = Alarm limit (high) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ER_AL_Act	1 = Alarm limit (low) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ErrorNum	Output of present error number, for error numbers that can be output by this block, see FmTemp error handling (Page 535)	INT	-1
FFwdOut	Disturbance variable generated in the FM	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
FbkClsOut	1 = Low limit stop of the position feedback reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkOpnOut	1 = High limit stop of the position feedback reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GainEff	Effective proportional gain, depends on Gain and NormPV	REAL	1.0
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LoopClosed	1 = Control loop closed 0 = Control loop open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
ManARW_Act	1 = Tracking mode or anti-reset windup by secondary controller	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManHiOut	Limit (high) for "manual mode", corresponds to input parameter ManHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
ManLoOut	Limit (low) for "manual mode", corresponds to input parameter ManLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ModErr	1 = Module error	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgAckn2	Alarm acknowledgement status 2 (output STATUS of second ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgErr2	Alarm error 2 (output ERROR of second ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
MsgStat2	Alarm status 2 (output ERROR of second ALARM_8P)	WORD	16#0000
MV	Manipulated variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_FmTrkAct	1 = Track manipulated variable in the FM enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_HiAct	1 = Limit (high) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_LoAct	1 = Limit (low) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
MV_SafeAct	1 = Neutral position manipulated variable of the FM enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_SpliA	Manipulated variable A of split-range function	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_SpliB	Manipulated variable B of split-range function	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_UnitOut	Unit of measure for manipulated variable, for interconnecting to the MV_Unit input parameter of the ConPerMon block	INT	0
MV_Visible	1 = MV display visible Is evaluated by the block icon	BOOL	0
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Open	Control output 1 = Open is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS1PermLog	Display of OS1Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS1PermOut	Display of OS_Perm1	DWORD	16#FFFFFFFF
ParFM_Err	1 = Direct parameter-assignment error of the FM or input Channel configured incorrectly	BOOL	0
PerAccErr	1 = I/O access error	BOOL	0
Phase	Phase of auto-tuning [0..7]	INT	0
PV	Process value of the module	STRUCT • Value: REAL • ST: BYTE	- 0.0 16#80
PV_AH_Act	1 = PV alarm (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- 0 16#80
PV_AL_Act	1 = PV alarm (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
PV_Out	Output for process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_TH_Act	1 = PV tolerance message (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_TL_Act	1 = PV tolerance message (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_ToleHi	Limit (high) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_ToleLo	Limit (low) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_UnitOut	Unit of measure for process value, for interconnecting with PV_Unit input parameter of the ConPerMon block	INT	0
PV_WH_Act	1 = PV warning (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_WL_Act	1 = PV warning (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkOut	Output for position feedback	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RbkWH_Act	1 = Warning (high) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkWL_Act	1 = Warning (low) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RetValue	Return value of WRREC / RDREC	WORD	16#0000
RbkVisible	1 = Rbk display visible Is evaluated by the block icon	BOOL	0

Parameter	Description	Type	Default
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP	Setpoint used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_DnRaAct	1 = Negative gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExHiAct	1 = Limit (high) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExLoAct	1 = Limit (low) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtAct	1 = External setpoint is active 0 = Internal setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOut	External setpoint, corresponds to input parameter SP_Ext	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_InHiOut	Limit (high) for SP_Int corresponds to input parameter SP_InHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP_InLoOut	Limit (low) for SP_Int corresponds to input parameter SP_InLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_RateTarget	Target setpoint for the gradient limitation	REAL	0.0
SP_UpRaAct	Positive gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SplitRange	1 = Split-range function has been activated	BOOL	0
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 518)	DWORD	16#00000000
Status2	Status word 2 (Page 518)	DWORD	16#00000000
Status3	Status word 2 (Page 518)	DWORD	16#00000000
StatusC	Status of cooling optimization	INT	0
StatusD	Status of controller design	INT	0

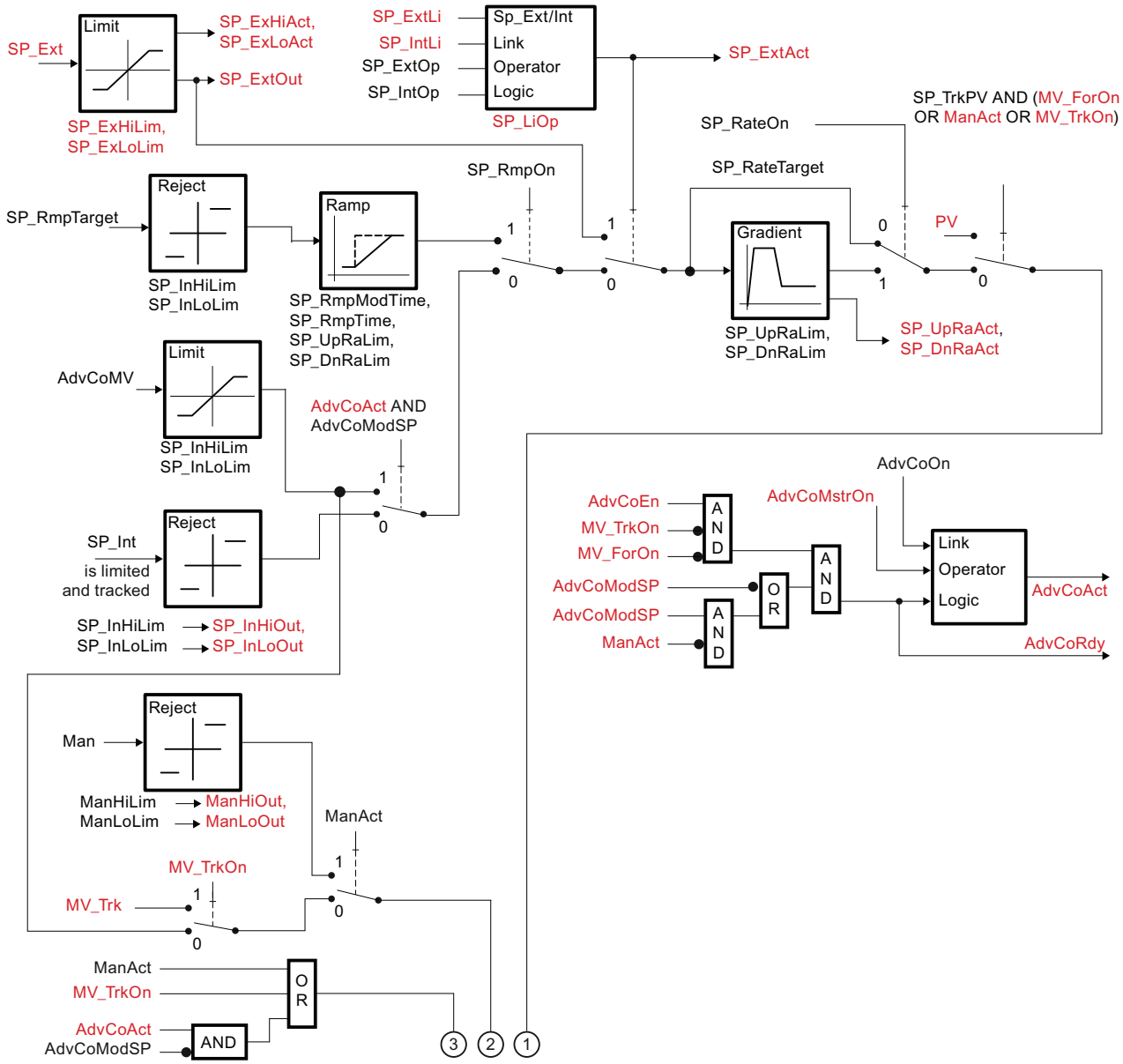
Parameter	Description	Type	Default
StatusH	Status of heating optimization	INT	0
StepCon	1 = Step controller	BOOL	0
Stop	Control output: 1 =Stopped is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SumMsgAct	1 = Active process alarm	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
TunAct	1 = Optimization running	BOOL	0
WithRbk	Controller type: 0 = Step controller without position feedback 1 = Step controller with position feedback	BOOL	0
ZoneTun	Controller channels grouped in one zone for parallel optimization	WORD	16#0000

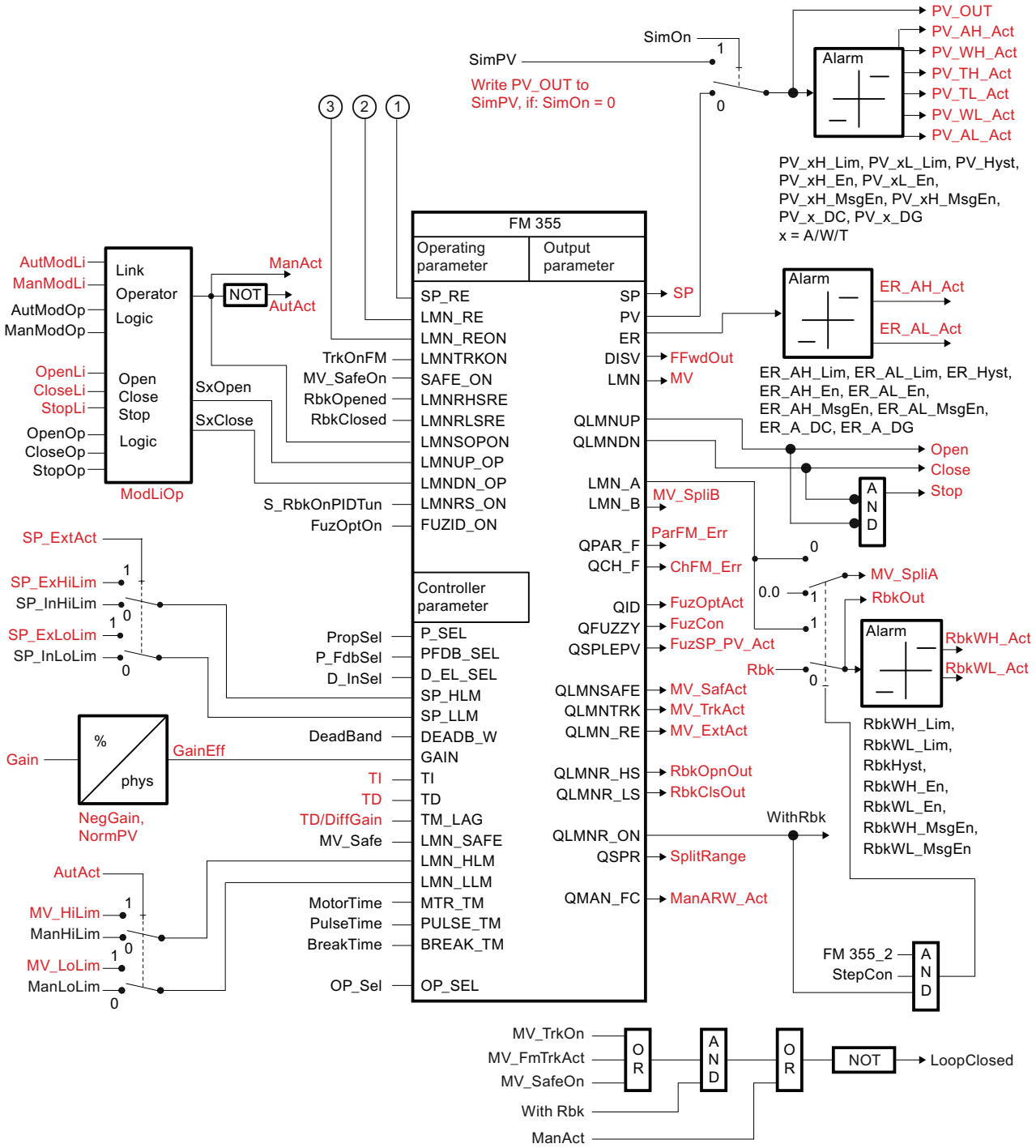
See also

FmTemp messaging (Page 536)
FmTemp modes (Page 522)
FmTemp block diagram (Page 554)

4.3.7 FmTemp block diagram

FmTemp block diagram




PV_OUT
PV_AH_Act
PV_WH_Act
PV_TH_Act
PV_TL_Act
PV_WL_Act
PV_AL_Act
Alarm
SimOn
SimPV
Write PV_OUT to SimPV, if: SimOn = 0
PV_xH_Lim, PV_xL_Lim, PV_Hyst, PV_xH_En, PV_xL_En, PV_xH_MsgEn, PV_xH_MsgEn, PV_x_DC, PV_x_DG x = A/W/T
FM 355
Operating parameter
Output parameter
Controller parameter
AutModLi
ManModLi
AutModOp
ManModOp
OpenLi
CloseLi
StopLi
OpenOp
CloseOp
StopOp
Link Operator Logic
Open Close Stop Logic
ModLiOp
NOT
ManAct
AutAct
SxOpen
SxClose
TrkOnFM
MV_SafeOn
RbkOpened
RbkClosed
S_RbkOnPIDTun
FuzOptOn
SP_RE
LMN_RE
LMN_REON
LMNTRKON
SAFE_ON
LMNRHSRE
LMNRLSRE
LMNSOPON
LMNUP_OP
LMNDN_OP
LMNRS_ON
FUZID_ON
SP
PV
ER
DISV
LMN
QLMNUP
QLMNDN
LMN_A
LMN_B
QPAR_F
QCH_F
QID
QFUZZY
QSPLEPV
QLMNSAFE
QLMNTRK
QLMN_RE
QLMNR_HS
QLMNR_LS
QLMNR_ON
QSPR
QMAN_FC
Alarm
ER_AH_Act
ER_AL_Act
ER_AH_Lim, ER_AL_Lim, ER_Hyst, ER_AH_En, ER_AL_En, ER_AH_MsgEn, ER_AL_MsgEn, ER_A_DC, ER_A_DG
Open
Close
Stop
AND
MV_SpliB
ParFM_Err
ChFM_Err
FuzOptAct
FuzCon
FuzSP_PV_Act
MV_SafAct
MV_TrkAct
MV_ExtAct
RbkOpnOut
RbkClsOut
WithRbk
SplitRange
ManARW_Act
MV_SpliA
RbkOut
Alarm
RbkWH_Act
RbkWL_Act
Rbk
RbkWH_Lim, RbkWL_Lim, RbkHyst, RbkWH_En, RbkWL_En, RbkWH_MsgEn, RbkWL_MsgEn
SP_ExtAct
SP_ExHiLim
SP_InHiLim
SP_ExLoLim
SP_InLoLim
PropSel
P_FdbSel
D_InSel
P_SEL
PFDB_SEL
D_EL_SEL
SP_HLM
SP_LLM
DeadBand
DEADB_W
Gain
%
phys
GainEff
NegGain, NormPV
GAIN
TI
TD
TM_LAG
LMN_SAFE
LMN_HLM
LMN_LLM
MotorTime
PulseTime
BreakTime
MTR_TM
PULSE_TM
BREAK_TM
OP_Sel
OP_SEL
AutAct
MV_HiLim
ManHiLim
MV_LoLim
ManLoLim
FM 355_2
StepCon
MV_TrkOn
MV_FmTrkAct
MV_SafeOn
With Rbk
ManAct
OR
AND
OR
NOT
LoopClosed

See also

Description of FmTemp (Page 518)

FmTemp modes (Page 522)

FmTemp functions (Page 524)

FmTemp error handling (Page 535)

FmTemp messaging (Page 536)

FmTemp I/Os (Page 539)

4.3.8 Operator control and monitoring

4.3.8.1 FmTemp views

Views of the FmTemp block

The block FmTemp provides the following views:

- FM controllers standard view (analog) (Page 212)
- FM controllers standard view (pulse controller) (Page 216)
- FM controllers standard view (step controller with position feedback) (Page 220)
- FM controllers standard view (step controller without position feedback) (Page 224)
- Alarm view (Page 250)
- Limit value view of FM controllers (Page 238)
- Trend view (Page 253)
- Parameter view of FM controllers (Page 234)
- Preview of FM controllers (Page 245)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icons for PID and FM controller (Page 193)

Refer to the Structure of the faceplate (Page 200) and Block icon structure (Page 185) sections for general information about the faceplate and block icon.

4.4 GainSched - Adapting parameter values for a PID controller

4.4.1 Description of GainSched

Object name (type + number) and family

Type + number: FB 1820

Family: Control

Area of application for GainSched

The block is used for the following applications:

- Continuous adaptation of the parameter values of a PID controller to the current operating point of a non-linear process
- Controller gain
- Integral action time
- Derivative action time

How it works

If your process requires different PID controller parameters due to its non-linear response at different operating points, you can store optimum parameter sets for up to three different operating points in theGainSched block in the form of a table ("timetable"). The current operating point is represented by a continuously measurable variable X, typically by the actual value of the controller itself. The block ensures that the suitable optimum parameters `Gain`(j), `TI`(j) and `TD`(j) are made available to the controller for each operating point X(j).

If the process is between two operating points, the parameters are calculated by linear interpolation between the optimum values of the two nearest operating points. This allows a bumpless, continuous adaptation of the controller parameters while the process moves from one operating point to another.

The block should be considered a supplementary function for a PID controller to improve the control performance of the PID controller in non-linear processes. The GainSched faceplate is called from the parameter view of the corresponding PID controller using the "Gain scheduler" button.

In contrast to all other function blocks, the GainSched block is implemented as a CFC chart and is generated with the "Compile chart as block type" function. The source chart "`FbGainSchedLim`" is supplied with the library so that you have more options open to you:

- You can use the precompiled function block GainSched from the library if the standard functionality is adequate for your needs.

- If you require special additional functions for gain scheduling in your application (for example more than three operating points, additional logic functions for selecting the parameters), you will need to modify the CFC source chart and compile it as a block type with a different FB number.

If the current value of input parameter X is below the lowest value X1 in the table or above the highest value X3, precisely the controller parameters which are specified at the relevant boundary point X1 or X3 in the table are output.

Configuration

The GainSched block is placed in the same CFC chart as the assigned controller and interconnected with it as shown in the corresponding template: The output parameters Link2Gain, Link2TI and Link2TD are connected to the inputs Gain, TI and TD of the PID controller. The input X of GainSched is supplied with the measured value for the operating point, typically with the same value as PV of the controller.

You can open the standard view for the GainSched block from the parameter view of a controller (for example PIDConL). Additional information on this topic is available in the section Opening additional faceplates (Page 165).

To specify the parameters for gain scheduling, run separate controller optimizations at each of the intended operating points, for example with a tool such as the PID tuner. Use amplitudes as small as possible to excite the process to capture the approximately linear response in the area of the operating point under investigation. The optimum parameter values calculated by the PID tuner are entered in the relevant row belonging to the operating point in the table of the GainSched block. The table is clearly displayed in the standard view of the faceplate. Make sure that the numeric values are also permanently stored in the data management of the engineering system by reading back the numeric values of the parameters from AS to the ES or entering them manually at the inputs of the CFC block.

For the GainSched block, the Advanced Process Library contains a template for process tag types as an example with an application scenario for this block.

Example of process tag types:

- PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800)

Gain scheduling for batch processes

A typical area of application for gain scheduling is in batch processes that, in contrast to continuous processes, cannot be linearized around a fixed operating point because they need to be moved backwards and forwards between different operating points during the course of the batch. Here, there are three application scenarios:

- The controller parameters depend on a single continuously measurable variable that is representative of the operating point, for example, the reactor temperature. This is the normal use case for the GainSched block: The management of the controller parameters is handled in the block and is independent of batch recipes.
- The controller parameters depend on a continuously measurable variable that is representative of the operating point, but there is also a dependency on the materials used in the reaction. Suitable parameter sets for gain scheduling can then be anchored in the recipe and transferred by SIMATIC BATCH to the GainSched block.

- The controller parameters depend only the current phase of the batch. They can then be written directly from the Batch package to the PID controller and no gain scheduling block is necessary. The disadvantage of this is that there is bump in the controller parameters at the transfer from one phase to the next. The controller should be put into manual mode temporarily at the time of the transfer to avoid a bump in the manipulated variable.
- The recipe only specifies which of the controller parameter sets 1 ... 3 is currently required from the GainSched block. The numerical values of the parameter, however, are not anchored in the recipe. In this case input variable `X` of the GainSched block can then be used as the number of the required data record and assigned by the recipe instead of being linked with a measurable process variable. In this case, there are only three discrete values for `X` and the precautions against a change of controller parameters with bump outlined above must be taken because the interpolation abilities of the GainSched block are not used.

In general, it is not necessary to manage the batch parameters (batch number, batch name, etc.) in the GainSched block because the block does not generate any separate messages and there is always a 1-to-1 relationship with a controller block that knows the batch parameters.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

GainSched functions (Page 560)

GainSched messaging (Page 562)

GainSched I/Os (Page 562)

GainSched block diagram (Page 565)

GainSched error handling (Page 561)

GainSched modes (Page 559)

4.4.2 GainSched modes

GainSched modes

The block can be operated using the following modes:

- Automatic mode (Page 59)
- Manual mode (Page 59)

"Automatic mode"

In "automatic mode" (`ManParOn` = 0) the controller parameters are determined through a polygon in accordance with the settings in the "automatic" area of the parameter view.

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for control blocks (Page 59) section.

"Manual mode"

In "manual mode" (`ManParOn` = 1) the controller parameters correspond to the settings in the "manual" area.

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for control blocks (Page 59).

See also

GainSched block diagram (Page 565)

GainSched I/Os (Page 562)

GainSched messaging (Page 562)

GainSched error handling (Page 561)

GainSched functions (Page 560)

Description of GainSched (Page 557)

4.4.3 GainSched functions

Functions of GainSched

The functions for this block are listed below.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
24	Activating local operating permission (Page 130)

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

See also

Description of GainSched (Page 557)
GainSched messaging (Page 562)
GainSched I/Os (Page 562)
GainSched block diagram (Page 565)
GainSched error handling (Page 561)
GainSched modes (Page 559)
GainSched standard view (Page 566)

4.4.4 GainSched error handling

GainSched error handling

The block does not report any errors.

See also

GainSched block diagram (Page 565)
GainSched I/Os (Page 562)
GainSched messaging (Page 562)
GainSched functions (Page 560)
GainSched modes (Page 559)
Description of GainSched (Page 557)

4.4.5 GainSched messaging

Messaging

This block does not offer messaging.

See also

Description of GainSched (Page 557)
GainSched functions (Page 560)
GainSched I/Os (Page 562)
GainSched block diagram (Page 565)
GainSched error handling (Page 561)
GainSched modes (Page 559)

4.4.6 GainSched I/Os

GainSched I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Gain1	PID gain for operating point 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Gain2	PID gain for operating point 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Gain3	PID gain for operating point 3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
GainOp	PID gain: Input for "manual mode"	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
Feature	I/O for additional functions (Page 560)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
ManParOn	1 = input of PID parameters in "manual mode" 0 = use the planned controller parameters from the table	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
TD_Op	PID derivative action time [s]: Manual input for the operator	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
TD1	PID derivative action time [s] for operating point 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
TD2	PID derivative action time [s] for operating point 2	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
TD3	PID derivative action time [s] for operating point 3	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
TI_Op	PID integral action time [s]: Manual input for the operator	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
TI1	PID integral action time [s] for operating point 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
TI2	PID integral action time [s] for operating point 2	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
TI3	PID integral action time [s] for operating point 3	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
X	Process value that defines the operating point	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

Parameter	Description	Type	Default
X1	Operating point 1 (support point) for X	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
X2	Operating point 2 (support point) for X	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
X3	Operating point 3 (support point) for X	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
X_Unit	Unit of measure for the operating point	INT	1001

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Link2Gain	Calculated controller gain	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Link2TD	Calculated integral action time	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Link2TI	Calculated derivative action time	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Parameter used to hide operator controls in the faceplate	DWORD	16#00000000

See also

Description of GainSched (Page 557)
GainSched messaging (Page 562)
GainSched block diagram (Page 565)
GainSched modes (Page 559)

4.4.7 GainSched block diagram

GainSched block diagram

A block diagram is not provided for this block.

See also

GainSched I/Os (Page 562)

GainSched messaging (Page 562)

GainSched error handling (Page 561)

GainSched functions (Page 560)

GainSched modes (Page 559)

Description of GainSched (Page 557)

4.4.8 Operator control and monitoring

4.4.8.1 GainSched views

Views of the GainSched block

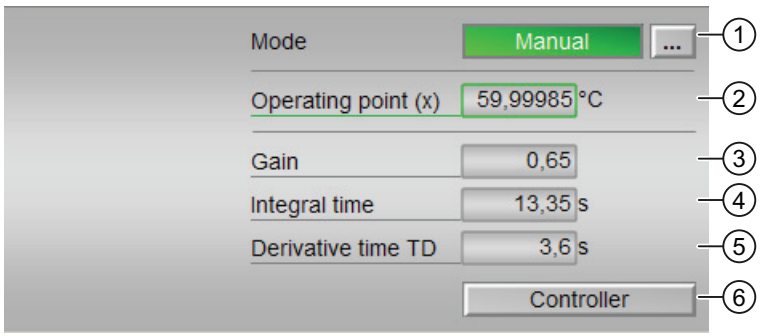
The GainSched block provides the following views:

- GainSched standard view (Page 566)
- GainSched parameter view (Page 567)
- GainSched preview (Page 568)
- Memo view (Page 252)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

4.4.8.2 GainSched standard view

GainSched standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 59)
- Automatic mode (Page 59)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

In "manual mode", you can specify the values on the OS in the parameter view of this block; they are then output directly via the corresponding output parameters.

In "automatic mode", an interpolation is performed through the interpolation points, which can also be specified in the parameter view.

(2) Displaying the operating point (X)

Currently used operating point.

(3) Displaying the gain

The controller gain currently output at the `Link2Gain` output parameter.

(4) Displaying the integration time `TI`

Integration time currently output at the `Link2TI` output parameter.

(5) Displaying and changing the derivative time `TD`

Derivative time currently output at the `Link2TD` output parameter.

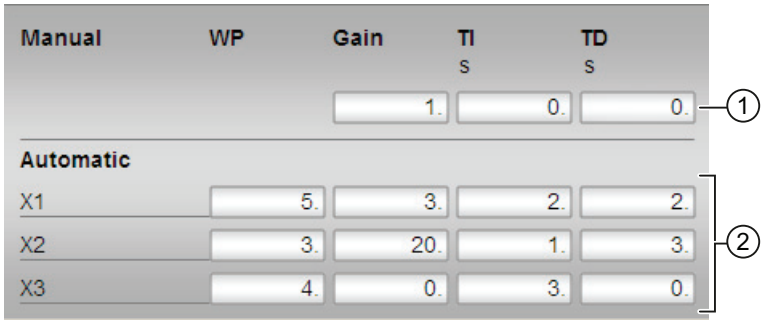
(6) Navigation button to GainSched block

Use this navigation button to reach the standard view of a controller block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

4.4.8.3 GainSched parameter view

Parameter view of GainSched



(1) Displaying and changing the values for the controller parameters in "manual mode"

This is where you enter the values for the parameters to be used in "manual mode" at the corresponding output parameters of the block:

- "Gain": Input parameter `GainOp`
- "TI": Integration time, input parameter `TI_Op`
- "TD": Derivative time, input parameter `TD_Op`

Refer to the section titled Changing values (Page 210) for information on changing the values.

(2) Displaying and changing the values for the controller parameters in "automatic mode"

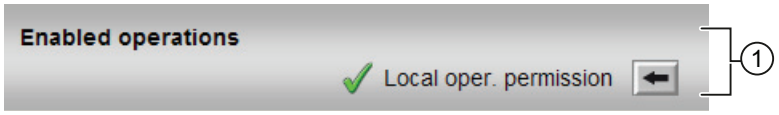
This is where you enter the values for the parameters to be used in "automatic mode" for the interpolation (max. 3 values):

- "X1": Operating point 1, input parameter `X1`
- "X2": Operating point 2, input parameter `X2`
- "X3": Operating point 3, input parameter `X3`
- "Gain": Input parameter `Gain1` ... `Gain3`
- "TI": Integration time, input parameter `TI1` ... `TI3`
- "TD": Derivative time, input parameter `TD1` ... `TD3`

Refer to the section titled Changing values (Page 210) for information on changing the values.

4.4.8.4 GainSched preview

Preview of GainSched



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

The following enabled operations are shown here:

- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

4.5 ModPreCon - Model predictive controller

4.5.1 Description of ModPreCon

?Object name (type + number) and family

Type + number: FB 1843

Family: Control

Area of application for ModPreCon

The block is used in much the same way as a PIDConL block for the following applications:

- Fixed setpoint control
- Cascade control
- Ratio control
- Split-range control

In contrast to the PID controllers, this is a multivariable controller.

Compared to Advanced Process Library V7.1.4, the new version provides the following functional enhancements:

- Integrated static operating point optimization,
- Prediction without control action and display of the prediction of the free motion,
- Automatic process trigger for model identification,
- Verification of the sampling time.

Method of operation and area of application

The block is used for multivariable control (Page 1841) of dynamic processes. It can handle up to four dependent manipulated and controlled variables as well as a measurable disturbance.

In special situations, the ModPreCon block can also be used for particularly difficult dynamic, single-variable controls. It is better than a PID controller, for example, in systems with non-minimum phase (Page 1841) or a strongly oscillating response.

The ModPreCon algorithm only works for stable processes with a step response that settles to a fixed value in a finite time. If the process is unstable on one of the main links or includes an integrator (fill level control, for example), the corresponding partial transfer function must be stabilized with a secondary controller.

A simple P controller (proportional component only) is sufficient as a subordinate controller for integrating processes. It is inserted between the manipulated variable output from ModPreCon and the input of the unstable process section, and receives the output of the integrating process section as a manipulated variable. (Unstable data links are stabilized with this approach.)

You can find an explanation of "multivariable controls" and "non-phase-minimum response" in the Help on the Advanced Process Library > Definitions.

Note on the area of application of the controller: Longer run times

Due to the principle on which they work, the runtime for multivariable controllers is significantly longer than that for PID controllers, because the matrix calculations in the algorithm are much more complex. The runtime is also determined by the number of the process and manipulated variables in the control algorithm. This is why the multivariable controller is unsuited for rapid control and is usually used for slow, complex control tasks.

The computation time required on the CPU is compensated for by the fact that very slow sample times of > 20s are used for the typical ModPreCon applications (see Advanced control templates). The ModPreCon is then typically in OB30 and can be interrupted by faster OBs.

Optimization is called within the ModPreCon block in the program section in which OB1 is executed. In cyclic operation (OB3x), this avoids the additional computing time required by the optimizer, the acyclic time, i.e. which is only relevant for changes to the optimizer inputs. The calculation time load caused by the ModPreCon block is hardy more with optimization than it is for ModPreCon without optimization.

Operating principle

The ModPreCon block is a model-based predictive multivariable controller. It uses a mathematical model of the process dynamics including all interactions as part of the controller. This model allows the process response to be predicted over a defined period in the future, also known as the prediction horizon.

Based on this prediction, a criterion for a fit (quality)

$$J = (\vec{w} - \vec{y})^T \cdot R \cdot (\vec{w}-\vec{y}) + \Delta\vec{u}^T \cdot Q \, \Delta\vec{u}$$

is optimized (minimized) where the following applies:

- w contains the time series of the future setpoints,
- y contains the vector of the controlled variables in the future,
- Δu contains the future changes to the manipulated variable.

If you increase the weighting in the Q diagonal matrix, the controller moves its manipulated variables more cautiously resulting in a slower but more robust control action. Using the weighting factors in the R diagonal matrix, you specify the relative significance of the individual controlled variables. A higher weighting (priority) for a controlled variable means that this moves more quickly towards the setpoint and remains more accurately at the setpoint in steady state if it is not possible to achieve all setpoints precisely.

The algorithm is a variant of the DMC procedure (**D**ynamic **M**atrix **C**ontrol) in which the optimization problem is solved in the design phase ignoring the constraints. The function block itself contains the analytical solution of the optimization problem. Manipulated variable limitations, both absolute and relating to the gradients, are treated in the algorithm of the function block as hard limits that must not be violated. This means that precise setpoints or target zones for the controlled variables are taken into account as well as possible in the optimization. The target zones for the controller variables are therefore soft limits, which are maintained as well as possible although they cannot be guaranteed. Using a reference variable filter for future setpoint settings, the control action of the controller can be finely adjusted during operation.

You can achieve significant improvements in control performance when individual disturbances can be measured, for example variations in throughput. In this case, it is a good idea to take into account a model of the influence of this disturbance on the controlled variables when predicting the controlled variables so that the controller can react preemptively to such disturbances.

Operating point optimization

The integrated static operating point optimization can be used when at least one controlled variable provides certain degrees of freedom. No exact setpoint is specified for such controlled variables. Instead there is a tolerance band, e.g.

SP2OptHiLim…SP2OptLoLim

within which the process value, CV2, must remain. These areas can be defined for any subset of the relevant controlled variables. From an economic perspective, different values within the tolerance range can be more or less favorable. With the help of the optimization function, the optimal economic point can be found within the tolerance range. This is done by defining a target function (performance criterion), which depends on the manipulated variable and controlled variable of the predictive controller. This can be, for example, the economic yield of plant operation per time unit, or it may involve specific costs or energy consumption.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

After installation in CFC, follow the steps outlined below:

1. Excite the process with the controller in manual mode by applying a series of manipulated variable step changes.
2. Record the measured data with the CFC trend display and export it to an archive file.
3. Enter the number of the data block at the DB_No input parameter of the ModPreCon block. The values are adopted in the controller by restarting the block using the Restart input parameter.
4. Select the ModPreCon instance in the CFC. Start the MPC Configurator with the command Edit > MPC Configurator.
5. Using the Configurator, create an SCL source code for the user data block (DB). It contains the models and matrices required for a ModPreConinstance.
6. Compile the SCL source code in the engineering system and download it to the AS.

Note

You can find a detailed description of this procedure in the MPC Configurator help.

During controller design in the MPC Configurator, a controller cycle time and an OB sampling time are calculated, displayed, and stored in the user data block. You yourself are responsible for the ModPreCon block being called in the cyclic interrupt level suitable for the OB sampling time. This is checked in the current ModPreCon versions during initialization. If the SampleTime sampling time of the function block does not match the OB_SampleTime parameter of the user data block, a parameter assignment error (ErrorNum=3) is displayed. For controller cycle times greater than 5s, specify the ModPreCon block in the OB30 and specify the appropriate cycle time for the OB30 in the hardware configuration of the Simatic CPU. Controller cycle times slower than 20 s cannot be set in the hardware configuration. The block would then be called every 20s and the slower sampling time automatically realized by an internal pulse reduction ratio in the block.

For the ModPreCon block, the Advanced Process Library contains a template for a process tag type as examples and there is an example project (where APL_Example_xx, xx designates the language variant) containing various application cases for this block. Several application cases are simulated in the example project and serve to explain how the block works.

Example of a process tag type:

- Model-based predictive control (you can find additional information on this in the Help on Advanced Process Library > PCS 7 Advanced Process Control Templates > Process tag types > Model-based predictive control (ModPreCon))

Application cases in example project:

- Predictive control of a 2x2 multi-variable controlled system (you can find additional information on this in the Help on Advanced Process Library > PCS 7 Advanced Process Control Templates > Example project APL_Example_xx > Predictive control of a 2x2 multi-variable controlled system)
- Predictive control of a non-linear process (you can find additional information on this in the Help on Advanced Process Library > PCS 7 Advanced Process Control Templates > Example project APL_Example_xx > Predictive control of a non-linear process)

Startup characteristics

When the CPU starts up, the block always starts in manual mode. It is only possible to change to automatic mode when a user data block is loaded and the internal measured value memory in ModPreCon is filled with data.

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

You can find additional information on the feature bit "Set startup characteristics" in the Help on Advanced Process Library > Basics of APL > Selectable block response> Setting the startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section ModPreCon I/Os (Page 590)

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutAct.Value`
6	Not used
7	`ManAct.Value`
8 - 9	Not used
10	`MV1TrkOn.Value` AND NOT (`ManAct.Value` OR `OosAct.Value`)
11	`MV2TrkOn.Value` AND NOT (`ManAct.Value` OR `OosAct.Value`)
12	`MV3TrkOn.Value` AND NOT (`ManAct.Value` OR `OosAct.Value`)
13	`MV4TrkOn.Value` AND NOT (`ManAct.Value` OR `OosAct.Value`)
14	Not used
15	`DB_Loaded`
16	`DV_Model Available`
17	OptimAct
18	`NOT(OptimAct)`
19	`SimOn AND ManAct`
20	J_Mini
21	NOT(J_Mini)
22	ExciteOn AND ManAct.Value
23-30	Not allocated
31	Feature.Bit31: Display of the predictions in the faceplate

Status word allocation for `Status2` parameter

Status bit	Parameter
0 - 30	Not used
31	`MS_RelOp`

See also

ModPreCon functions (Page 575)

ModPreCon messaging (Page 590)

ModPreCon block diagram (Page 601)

ModPreCon error handling (Page 588)

ModPreCon modes (Page 574)

Model-based predictive control (ModPreCon) (Page 1816)

Predictive control of a 2x2 multi-variable controlled system (Page 1836)

Predictive control of a non-linear process (Page 1837)

4.5.2 ModPreCon modes

Operating modes of ModPreCon

The block can be operated using the following modes:

- Automatic mode (Page 59)
- Manual mode (Page 59)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

The aforementioned operating modes are valid for the block with all control channels (`MV1` ... `MV4`). Moreover, individual control channels can be tracked; see chapter ModPreCon functions (Page 575) for more information.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and bumpless switchover in the Manual and automatic mode for control blocks (Page 59) section.

Note

In contrast to PID controllers, it is permitted to run the ModPreCon block in "automatic mode" without its actuating signals affecting the process because there is no risk of integrator windup.

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the Manual and automatic mode for control blocks (Page 59) section.

"Out of service"

You can find general information about the "Out of service" mode in the Out of service (Page 58) section.

See also

ModPreCon block diagram (Page 601)

ModPreCon I/Os (Page 590)

ModPreCon messaging (Page 590)

ModPreCon error handling (Page 588)

Description of ModPreCon (Page 568)

4.5.3 ModPreCon functions

Functions of ModPreCon

The functions for this block are listed below.

Generating and limiting the manipulated variable

The manipulated variable MV1 ... MV4 (hereinafter referred to as MVx, x = 1 ... 4) can be generated as follows:

ManAct	MVxTrkOn	MVx	Limit monitoring	State
1	-	Manx	ManxHiLim ManxLoLim	"Manual mode", set by the operator
0	1	MVxTrk	MVxHiLim MVxLoLim	Tracking with limitation
0	0	Automatic manipulated variable	MVxHiLim MVxLoLim	"Automatic mode": Predictive controller algorithm

Remark

If the controller is in "Out of service" mode, the output parameters MV1 ... MV4, depending on the Feature Bit (Neutral position manipulated variable takes effect at startup (Page 139)) are set to the last valid value in manual mode or the corresponding neutral position manipulated variable (SafePos1 ... SafePos4). Refer to the Out of service (Page 58) section for more on this.

The limited operating range (between MVxHiLim and MVxLoLim) is typically smaller in automatic mode than in manual mode. With regard to the limited range of validity of a linear process model for approximating a non-linear process response, this allows the stability of the closed control loop to be guaranteed within the setting range in automatic mode.

The gradients of the manipulated variable (changes per second) are limited to MV1RaLim to MV4RaLim in "automatic mode". Gradient limitation applies both to the positive and negative directions.

Tracking and limiting a manipulated variable

The block provides the standard function Tracking and limiting a manipulated variable (Page 153).

In contrast to PID controllers, tracking the manipulated variables (`MV1` ... `MV4`) channel by channel is enabled via one of the input parameters `MV1TrkOn` ... `MV4TrkOn`. The corresponding manipulated variable is then tracked by the interconnectable input parameters `MV1Trk` ... `MV4Trk`.

Setting the setpoint internally

With this block, the setpoint must always be set internally at the I/Os `SP1` ... `SP4`. These are normally set in the faceplate. In special situations, you can interconnect the setpoints but they can then no longer be changed using the faceplate.

Setpoint tracking in manual mode

In this situation (`SP_TrackCV` = 1), the internal setpoints `SP1` ... `SP4` are tracked to the assigned process values `CV1` ... `CV4` in "manual mode". This function allows a bumpless transfer to "automatic mode". After the transfer, the setpoints can be changed by the operator again.

Setpoint filters

The setpoint filter is the only way of changing the action of the predictive controller without having to create a new user data block with the MPC Configurator and reinitialize the controller. The specified time constant `PreFilt1` ... `PreFilt4` of the setpoint filter can be interpreted as the required settling time of this `CV` channel following a setpoint step change. As the time constant setting increases, the controller works more slowly and less aggressively. In particular, this reduces the influence of a setpoint step change in one control channel on neighboring control channels.

Internally, the ModPreCon block works with sets of future setpoints that are compared with the predicted movements of the controlled variables. Without the setpoint filter, it is assumed that the current setpoint will continue to remain valid in the future within the prediction horizon. If there is a setpoint step change, this means that the full value of the new setpoint will be required in the near future although the process cannot achieve this (according to the prediction). With the setpoint filter, an asymptotic setpoint trajectory (first order) is calculated from the current process value to the required setpoint so that the required setpoint is reached in the specified time.

Note

The setpoint filter also comes into effect without a setpoint step change if the process value deviates significantly from the setpoint due to disturbances. This means that the filter not only slows down the control action but indirectly also the response to disturbances.

The control action can only be slowed down by the setpoint filter and not accelerated; when the value is 0, the prefilter is deactivated. It is therefore advisable to set the basic controller action in the MPC Configurator with the "Manipulated variable change penalty" parameter and then to optimize this in the software using the function for simulation of the closed control loop. The software filter should then only be used for fine modification of the action in the operational system.

Simulating signals

The block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Controlled variable (`SimCVx` , `SimCVxLi`)

Selecting a unit of measure

The block provides the standard function Selecting a unit of measure (Page 168).

Control deviation generation and dead band

The block provides the standard function Control deviation generation and dead band (Page 151).

In the predictive controller, the control deviation as the deviation between the predicted movement of the process (starting at the current process value `CV1` ... `CV4`) and future setpoint settings (ending at `SP1` ... `SP4`) is generated over the entire prediction horizon for each control channel and used to calculate the manipulated variable.

In principle, the effect of the dead bands `SP1DeadBand` to `SP4Deadband` is the same as in a PID controller but extends over the entire future prediction horizon. In other words, if, for example, the predicted controlled variable `CV1` in the entire prediction horizon is within the band `SP1` ± `SP1DeadBand`, the controller sees no reason whatsoever to change any manipulated variable. These are therefore also known as `CV` bands. In contrast to the manipulated variable limits, these are not hard constraints that need to be adhered to at all costs.

In multivariable controllers, it is advisable to make use of the fact that from the perspective of the application only some of the controlled variables need to move to a specified setpoint exactly while others only need to remain within a defined range.

A typical example would be quality characteristics for which a tolerance band is specified. While a dead band in a PID controller tends to put stability at risk, `CV` bands in individual controller channels generally relieve the multivariable controller overall.

Using `CV` bands, the action of a soft override control can be achieved.

Use case for control deviation generation with dead band

As long as the pressure in a reactor remains within the set safety limits, the controller is interested only in product quality. However, as soon as the pressure threatens to leave the permitted range (in other words, in the prediction it moves towards an illegal value in the future), the pressure control cuts in. By weighting the controlled variables in the fit criterion (see MPC Configurator), the user can specify that threatened violations of the pressure limits are given a particularly high weighting.

Predictive controller algorithm

The ModPreCon block is derived from the familiar DMC algorithm (**D**ynamic **M**atrix **C**ontrol) . Future changes to the manipulated variable within the control horizon are calculated according to the formula:

$$\Delta\vec{\underline{u}} = \underline{C} \cdot (\vec{\underline{w}} - \vec{\underline{f}})$$

Where:

- w contains the time series of the future setpoints
- f contains the predicted free movement of the controlled variables (with constant manipulated variables) in the future
- C is the constant controller matrix calculated by the MPC Configurator. C includes both the process model and the weighting of the manipulated variable changes and the controlled variables from the fit criterion of the optimization.

Based on the principle of the receding horizon, only the first value is taken from the vector of the optimum manipulated variable changes over the entire control horizon and applied to the process. In the next step, the newly arrived process values are taken into account and the calculation repeated over the entire prediction horizon.

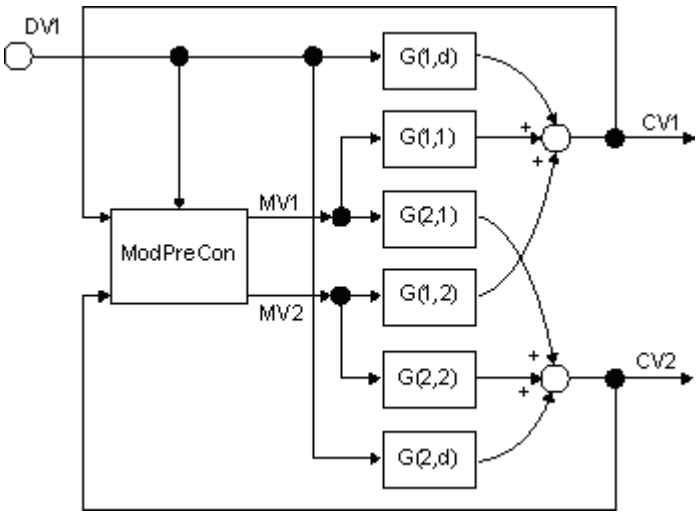
With predictive controllers, the manipulated variable changes are based on the control deviations predicted in the future, while with a PID controller, they are based on control deviation of the past (possibly also integrated). This can be interpreted as a "looking ahead" strategy.

Anti-windup

When manipulated variable limits are active, anti-windup measures are taken automatically within the controller. The prediction equations use the real limited values of the manipulated variable instead of theoretically calculated values.

Model-based disturbance compensation

Model-based disturbance compensation can and should be used when a known disturbance has a strong influence on the process and its cause can be measured.



The effects of a measurable disturbance (DV1 I/O) on all controlled variables CV1 ... CV4 can be estimated when the controller is put into manual mode. This means that no movements of the controlled variables whatsoever result from changes to the manipulated variable and all movements result from the disturbance. If the disturbance can be measured but cannot be actively adjusted, it may be necessary to search through a data archive to find the time segments in which the disturbance changed.

The identification of the transfer functions from the disturbance DV1 to all controlled variables CV1 ... CV4 (disturbance model, in the graphic above G(1,d) and G(2,d)) is performed with the MPC Configurator and is analogous to the identification of the main transfer functions (G(1,1) to G(2,2)). The measured disturbance is then switched to the DV1 input of the ModPreCon block and disturbance compensation is activated with DV_On = 1. As a result, the effect of the measurable disturbance is taken into account in the prediction and the controller can start countermeasures in advance before the disturbance can have a massive influence on the controlled variables.

Such disturbance compensation is especially effective when the disturbance is constant in sections and changes from time to time. If a disturbance changes constantly or oscillates on the other hand, the feedforward control is not enabled during operation of the controller in order to avoid constant oscillation of the manipulated variables, although it should be taken into account in the MPC Configurator when creating the process model.

If there is no disturbance model in the user data block, the DV1 input is ignored.

Typical examples of measurable disturbances are inlet volumes in distillation columns or throughput of continuous reactors.

Predictive controller with more than one measurable disturbance

If you want to plan for more than one measurable disturbance in an application, but do not need all four disturbances from the ModPreCon block, you can dedicate the first of the previously unused control channels for disturbance feedforwarding.

Example: You only have two control actions available, so only use MV1 and MV2. Then connect the additional measurable disturbance DV2 to the MV3Trk input parameter and set MV3TrkOn = 1. For recording training data for the predictive controller, declare MV3Trk as the third disturbance and also use the CFC trend recorder to record the effect of changes to DV2 on all manipulated variables.

Use the MPC Configurator to then determine a process model that describes the effects of DV2. However, if the DV2 in "automatic mode" of the controller changes due to external influences, the effect of such change is taken into consideration for predicting future process reactions through MV3Trk, and predictive methods can be used to compensate. The performance of the disturbance compensation is the exact same level as that for regular feedforward control via the input parameters DV and DV_On = 1.

If you want to disable this disturbance compensation in runtime with the unused MV3 manipulated variable, you need to insert a MV3Trk a selector block in front of the SelA02In input. This allows you to set a constant zero for MV3Trk instead of the measured value DV2, which stops the effect of MV3 on prediction. (Due to this reassignment, MV3TrkOn must always remain 1 to prevent the controller from changing the value of MV3.)

This way, up to four measurable disturbances can be selected. However, the sum of the manipulated variables and disturbances may not exceed a total number of five.

Control of square and non-square systems

In multivariable controllers, the number of manipulated variables should ideally be the same as the number of controlled variables. This is known as a "square system". As long as constraints to not influence operation, the controller can, in principle, control to the selected setpoints.

If there are less manipulated variables than controlled variables, or individual manipulated variables have reached their limits, there is no freedom in the control problem. This means that it is not possible for all setpoints to be reached exactly.

The ModPreCon algorithm then finds a compromise that can be influenced by the selection of controlled value weights (priorities) in the MPC Configurator: Controlled variables with higher priority will have lower control deviations.

Note

Since the ModPreCon block is a lean predictive controller algorithm without online optimization, there can be no general guarantee that the compromise found is optimum in a mathematical sense; in other words, it is the minimum of the fit function taking into account the manipulated variable limits. In most practical situations, however, the controller finds sensible compromises.

The static operating point optimization it not a dynamic online optimization in this sense, i.e. it does not change anything in the above-mentioned restriction.

If there are more manipulated variables than controlled variables or if some of the controlled variables are already within their setpoint bands, there is surplus freedom in the control problem. A lean predictive controller algorithm, however, cannot recognize this situation explicitly and use the free manipulated variables for optimization. The ModPreCon block therefore moves all manipulated variables to values that meet the aims in terms of controlled variables and then leaves them there. In some situations, however, it can be useful to provide the controller with more manipulated variables than controlled variables, for example when the effect of individual manipulated variables is too restricted.

Another approach is to define the excess manipulated variables as pseudo controlled variables at the same time. You do this by assigning a setpoint with low priority to the pseudo controlled variables. The controller then attempts to achieve the important control aims as first priority and, at the same time, attempts to reach certain ideal values for the individual manipulated variables.

Control of linear and non-linear systems

The ModPreCon algorithm is based on a linear, time invariant process model. As a result, in much the same way as a PID controller, it is suitable above all for controlling non-linear systems around a fixed operating point.

Again analogous to the PID controller, there are, however, several possibilities with which the area of application can be extended with non-linear systems:

Compensation functions between controller and controlled system:

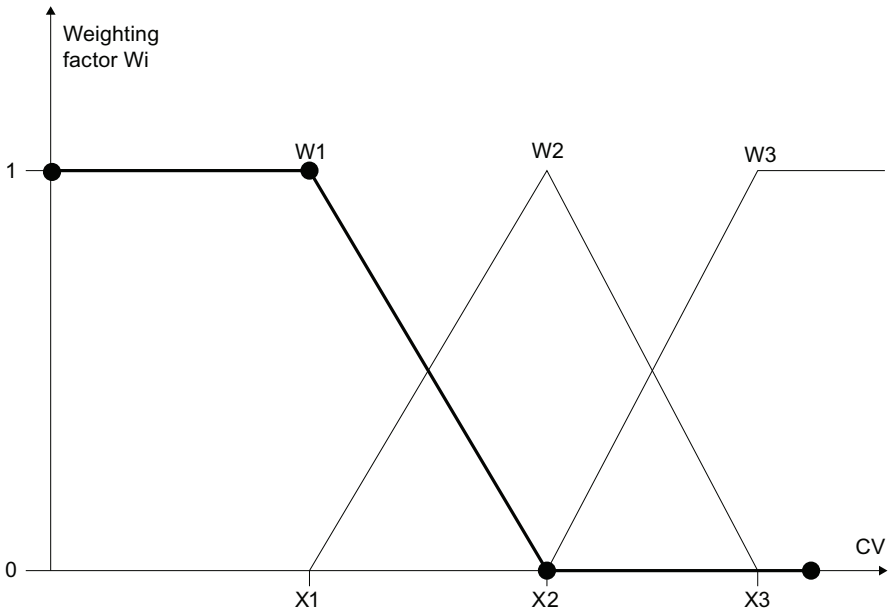
It is, for example, possible to compensate the effect of a non-linear valve characteristic curve using a polygon block between the MV output and the control input of the valve block. Care must be taken when implementing the manipulated variable limits. In the same way, the effect of a non-linearity at the output of the controlled system (for example a sensor characteristic curve) can be compensated by a polygon block before the CV input of the controller. Remember that the corresponding SP must also be transformed accordingly. In both cases, the compensation functions become part of the controlled system from the perspective of the controller. The aim is always to keep the overall response of the controlled system consisting of process and compensation elements as linear as possible.

Multimodel control:

This approach is related to the basic idea of operating-point-based parameter control with PID controllers. Since the model parameter of the ModPreCon block cannot be modified in runtime, however, the control strategy for selecting the suitable parameter set becomes a control strategy for selecting the suitable model.

Several ModPreCon instances with different models for different operating points run at the same time. The local optimal models are determined by starting the process at the various operating points with small amplitudes, so that only the reaction of the non-linear process in the ambience of this operating point is registered.

The final manipulated variable for each manipulated variable is formed as a weighted mean value of the manipulated variables proposed by the controller instances. (It is recommended that experiments for starting the process for the MPC Configurator are only performed after implementing the functions for adding the manipulated variables, in order to ensure that the same conditions applicable when the model is in operation actually take effect.)



The weighting factors 0 ... 1 are formed in the same way as the membership functions known from fuzzy logic so that the sum of all weights is always one and each controller has the highest weighting at its own operating point. A polygon with 4 or 5 interpolation points is used to calculate each individual weighting factor. The weighting factors are calculated based on a specific measurable PV variable of the process, which is representative for the operating point of the process. This can be one of the CVx controlled variables, although it does not have to be. The abscissa of the interpolation points of all polygons is selected in such a way that they cover the entire value range of PV in order to avoid extrapolation errors.

One should note in this regard that the only non-linear effects in the full multi-variable control loop that can be modeled are those that correlate exactly to a representative PV variable. This approach is therefore not suitable for cases in which individual partial transfer functions demonstrate non-linear effects that depend on various, totally independent variables.

To ensure the stability of the overall control loop, all subcontrollers must be at least stable at all operating points. In contrast to PID controllers however, an MPC is not affected by windup problems if it temporarily runs in "automatic mode" but cannot intervene in the real process (weighting factor zero).

One of the controller instances is defined as the main controller and shown in the operator faceplate on the OS. All others are connected in such a way that they adopt the operating mode ("manual"/"automatic mode") and the setpoints from the main controller. The manual manipulated variables are passed to the secondary controller via the tracking inputs. This means that no operator intervention is required on secondary controllers.

Note

The manipulated variables of the main controller can be used when switching from automatic to manual mode. If the process was in the operating range of a secondary controller beforehand, the current manipulated variables in the process can deviate significantly. In this case, you should apply the actual manipulated values in effect by manual input in the faceplate of the primary controller.

You can find an example for multi-model controlling in the example project of Advanced Process Library under Predictive control of a non-linear process (Page 1837).

Trajectory control:

This approach neatly combines the advantages of an open loop controller (Feedforward Control) with those of a closed loop controller with process value feedback (Closed Loop Control). The controller follows a previously optimized trajectory of setpoints and manipulated variables; in other words, it only needs to compensate small deviations between the stored trajectory and the current plant state. A trajectory is an optimum series of manipulated variables over time and the process values that match them. The required manipulated variables are read via the inputs `MV1Traj` ... `MV4Traj` into the ModPreCon block and added to the values of the manipulated variable calculated by the algorithm (in automatic mode only). Among other things, the advantage of this is that the effective manipulated variable acting on the process can be configured and is limited to the sum of the trajectory and controller action. The actual values from the trajectory are switched to the corresponding setpoint inputs `SP1` ... `SP4` of the controller. As long as the process reacts exactly as planned in the trajectory, it will respond to the series of manipulated variables from the trajectory with the corresponding series of process values and the control deviation is zero. It is generally known that a non-linear dynamic process can linearized around a fixed operating point or a steady state of the system. It is also possible to linearize it around a trajectory.

Forming the signal status for blocks

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `DV1.ST`
- `CV1.ST`
- `CV2.ST`
- `CV3.ST`
- `CV4.ST`

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions which are provided by the `Feature` parameter in chapter Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
4	Setting switch or button mode (Page 140)
15	Neutral position manipulated variable takes effect with "out of service" operating mode (Page 139)
16	Neutral position manipulated variable takes effect at startup (Page 139)
24	Activating local operating permission (Page 130)

Operator control permissions

The block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	Not used
2	1 = Operator can switch to "Out of service" mode
3	Not used
4	Not used
5	1 = Operator can change the setpoint 1
6	1 = Operator can change the manipulated variables of all channels
7	1 = Operator can change operating high limits of the setpoints for all channels
8	1 = Operator can change operating low limits of the setpoints for all channels
9	1 = Operator can change the setpoint 2
10	1 = Operator can change the setpoint 3
11	1 = Operator can change the setpoint 4
12	1 = Operator can change the setpoint filter of all channels
13 - 16	Not used
17	1 = Operator can enable the track setpoint in "manual mode" function
18	1 = Operator can activate the model-based disturbance compensation function
19 - 22	Not used
23	1 = Operator can change the dead band parameter of all channels
24 - 25	Not used
26	1 = Operator can activate the Simulation function
27	1 = Operator can activate the Release for maintenance function
28	1 = Operator can change the manipulated variable limits of all channels
29	1 = Operator can change the gradient limits of manipulated variables of all channels
30 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Release for maintenance

The block provides the standard function Release for maintenance (Page 52).

Specifying the display area for process and setpoint values as well as operations

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

In contrast to PID controllers, there are no separate parameters for bar limits. The setpoints limits are used for all setpoint and actual value bars; manual limits are used as bar limits for all manipulated variable bars.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Integrated static operating point optimization

The integrated static operating point optimization can be used if no exact SPi setpoint is specified for at least one controlled variable (index i =1...4), but rather the CVi process value must remain within a tolerance range SPiOptHiLim…SPiOptLoLim. The tolerance range must, of course, be within the valid setpoint limits SPiHiLim…SPiLoLim for this control channel. The tolerance range SPiOptHiLim…SPiOptLoLim is not coupled to the operator-controlled setpoint SPi. If the setpoint is changed, the tolerance range is not automatically shifted. If you want to do this nevertheless, interconnect the SPiOpOut output parameters via two adders to the width of the tolerance range at the inputs SPiOptHiLim and SPiOptLoLim.

From an economic perspective, different values within the tolerance range can be more or less favorable. With the help of the optimization function, the optimal economic point can be found within the tolerance range.

This is done by defining a target function (performance criterion), which depends on the manipulated variable and controlled variable of the predictive controller. This can be, for example, the economic yield of plant operation per time unit, or it may involve specific costs or energy consumption.

J= GradMV1*MV1 +GradMV2*MV2 +GradMV3*MV3 +GradMV4*MV4

+GradCV1*CV1 +GradCV2*CV2 +GradCV3*CV3 +GradCV4*CV4

+J0

You specify the individual GradXVi coefficients of the gradient vector as input variables at the ModPreCon function block in the CFC or in the parameter view of the faceplate. If individual coefficients vary with time, e.g. they are dependent on current market prices, you can also interconnect these input variables. If individual manipulated or controlled variables have no influence on the performance criterion, leave the corresponding coefficients at the default value, zero.

You can use the binary J_Mini input parameter to specify whether the target function is to be maximized or minimized, based on whether this involves yields or costs (J_Mini = 1 : minimization).

The term J0 combines all contributions to the target function that do not depend on manipulated variables and controlled variables. These contributions have no effect on the optimum values in the decision variables, but are applied for calculating the current value of employed performance criterion similar to the above-mentioned formula.

Within the controller, the terms of the target function that depend on manipulated variables are converted to make their dependence on the controlled variables visible. To do this, the inverse stationary process model from the MPC Configurator is used. This requires that the number of manipulated variables matches the number of controlled variables. If the number of manipulated variables does not match the number of controlled variables, the largest possible square submodel in the matrix of the transfer functions is truncated from the top left. If there are more manipulated variables than controlled variables, for example, only the first manipulated variables are used, in accordance with the number of controlled variables.

Constraints for the controlled variables take the form of the above-mentioned tolerance ranges for setpoints. The controller takes care of adhering to the manipulated variable limits, in any case; they do not have to separately specified as constraints for the optimization.

Enable the optimization using the binary input variable OptimizeOn in the controller faceplate. The optimizer then returns setpoints within the tolerance ranges that are optimal for the performance criterion. These setpoints are then sent to the control algorithm, which handles them in the same way as conventionally specified setpoints (with or without dead band). The operable SP1...SP4 setpoints are not tracked to the optimized setpoints; when optimization is disabled, the old setpoints from the faceplate take effect once again. When selection of tags for archiving and graphic plotter, ensure you use the SP1Out...SP4Out setpoint actually in effect and not the SP1...SP4. input variables.

The current value of the performance criterion is displayed at the J_Actual output variables.

You can find additional information about the topic of static operating point optimization in the online help for the MPC configuration editor.

Display of the prediction of free movement

The prediction of free motion is a forecast for the future behavior of the process within the overall prediction horizon, under the assumption that all manipulated variables are frozen at their current values. The time length of the prediction horizon is indicated in the output parameter PrediHorizon in the[s] unit.

The prediction of free motion is recalculated in each sampling step within the control algorithm. If the manipulated variables is to a constant value in manual mode, the prediction of the free movement is actually a realistic prediction for the future process response. It can therefore be represented graphically in the faceplate at least in terms of quality. For this purpose, five equidistant interpolation values are copied from the prediction horizon, and displayed in the standard view of the faceplate as a vertical bar next to the current process value.

Example: The prediction horizon is 1800s=30min and the current time is labeled with the index k. The prediction for k+6min, and next to it k+12min, up to k+30min then appears on the right next to the bar of the current process value. If the upper border of the bar is conceptually connected with a line (red in the picture red), you can imaging the curve created by the future course of the process value over the next half hour.

In automatic mode, the value of the manipulated variables changes with each sampling step. The prediction of free movement is then only a fictional mathematical formulation within the algorithm, and not a realistic prediction for the future process response. This is why the prediction is only displayed in manual mode. The display can be generally suppressed using Feature.Bit31.

Prediction without control action

In this special "operating mode" (comparable to the block-internal simulation), the controller only monitors the process and indicates what it would like to do in the next sampling step without actively intervening in the process. This allows you as the user to build trust before "switching off the safety" of the controller the first time, i.e. intervening in the process.

Prediction Mode is activated via the binary input variable PredictMode or in "Parameters" in the faceplate view. Setpoints and process values are read as in normal automatic mode. The prediction of the free movement and manipulated variable change for the next sampling step are calculated as in normal automatic mode. The starting point for the prediction of the manipulated variable for the next sampling step, however, is the current process value of the follow-up control loop at the MV1Trk…MV4Trk tracking inputs. The predicted manipulated variables are not output at the normal outputs MV1...4, but rather at the MV1Pred...MV4Pred outputs, which were especially introduced for this purpose, and are displayed in the standard view of the faceplate on the left next to MV1...4, as long as "Prediction Mode" is active.

- When the controller is in automatic mode, in "Prediction Mode" all MVi (i=1..4) are set to match the assigned MViTrk input parameters, similar to tracking mode.
- When the controller in manual mode, all MVi are set to the desired manual values regardless of "Prediction Mode".
- When "Prediction Mode" is disabled, all MViPred always equal the assigned MVi.

Automatic process trigger for model identification

In order to determine the process model for the model predictive controller, the process must be artificially triggered in order to observe its dynamic response and record it in the form of training data. This trigger can be specified manually in manual mode of the controller.

Alternatively, a suitable trigger signal can be generated automatically in the form a defined, symmetrical sequence of manipulated variable jumps. The trigger signals are calculated by an auxiliary function block, "AutoExcitation", which is built into the process tag type and interconnected with ModPreCon .

Additional MV1Excite…MV4Excite input variables are required for this on the controller. Process triggering performed in manual mode of the controller, because automatic mode cannot be activated before modeling. The new process trigger "operating mode" can only be controlled via the ExciteOn input bit on the engineering system , and not on the operator station, since the CFC is needed for data recording in any case. However, process triggering must be displayed on the OS in standard view at the lower left.

Manual intervention per faceplate remains possible even during the triggering. The values of the MV1Excite...MV4Excite input parameters are therefore only written to the MV1Man...MV4Man manual values event-based, but only if they change.

You can find additional details on automatic process triggering in the online help for the MPC configuration editor.

See also

Description of ModPreCon (Page 568)

ModPreCon messaging (Page 590)

ModPreCon I/Os (Page 590)

ModPreCon block diagram (Page 601)

ModPreCon error handling (Page 588)

ModPreCon modes (Page 574)

4.5.4 ModPreCon error handling

Error handling of ModPreCon

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The ErrorNum output parameter can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Default value when the block is installed; this message is irrelevant.
0	There is no error.
2	SampleTime < 0.001 [s]
32	The value of CV1 can no longer be displayed in the real number field or is not a number.
33	The value of CV2 can no longer be displayed in the real number field or is not a number.
34	The value of CV3 can no longer be displayed in the real number field or is not a number.
35	The value of CV4 can no longer be displayed in the real number field or is not a number.
36	The MV_Trk1 value can no longer be displayed in the real number field or is not a number.
37	The MV_Trk2 value can no longer be displayed in the real number field or is not a number.
38	The MV_Trk3 value can no longer be displayed in the real number field or is not a number.
39	The MV_Trk4 value can no longer be displayed in the real number field or is not a number.
90	The controller matrix could not be loaded from the user data block.

The ErrorOpt output parameter is used to output the status of the lower-level LPOptim block. See ModPreCon I/Os (Page 590) for more

See also

ModPreCon block diagram (Page 601)

ModPreCon messaging (Page 590)

ModPreCon functions (Page 575)

ModPreCon modes (Page 574)

Description of ModPreCon (Page 568)

Description of LPOptim (Page 771)

4.5.5 ModPreCon messaging

Messaging

This block does not offer messaging.

See also

Description of ModPreCon (Page 568)
ModPreCon functions (Page 575)
ModPreCon I/Os (Page 590)
ModPreCon block diagram (Page 601)
ModPreCon error handling (Page 588)
ModPreCon modes (Page 574)

4.5.6 ModPreCon I/Os

I/Os of ModPreCon

Input parameters

Parameter	Description	Type	Default
AutModLi*	1 = Automatic mode via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = Automatic mode via operator (controlled by ModLiOp = 0)	BOOL	0
BatchEn	1 = Enabled for allocation by batch control	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	STRING[32]	''
CV1	Control variable 1 (process value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
CV1_Unit	Unit of measure for control variable 1 (process value)	INT	1001
CV2	Manipulated variable 2 (process value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
CV2_Unit	Unit of measure for manipulated variable 2 (process value)	INT	1001

Parameter	Description	Type	Default
CV3	Manipulated variable 3 (process value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
CV3_Unit	Unit of measure for manipulated variable 3 (process value)	INT	1001
CV4	manipulated variable 4 (process value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
CV4_Unit	Unit of measure for manipulated variable 4 (process value)	INT	1001
DB_No	Number of the data block in which the controller variable is saved.	INT	0
DV_On	1 = Activate the feedforward control from DV1	BOOL	1
DV1	Disturbance variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
EN	1 = Called block will be processed	BOOL	1
ExciteOn	1 = Automatic process trigger; MViExcite input parameters are written to the MVi outputs	BOOL	0
Feature	I/O for additional ModPreCon functions (Page 575)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
GradCV1	Gradient vector for performance criterion, element (factor) for CV1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
GradCV2	Gradient vector for performance criterion, element (factor) for CV2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
GradCV3	Gradient vector for performance criterion, element (factor) for CV3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
GradCV3	Gradient vector for performance criterion, element (factor) for CV3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
GradCV4	Gradient vector for performance criterion, element (factor) for CV4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
GradMV1	Gradient vector for performance criterion, element (factor) for MV1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
GradMV2	Gradient vector for performance criterion, element (factor) for MV2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
GradMV3	Gradient vector for performance criterion, element (factor) for MV3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
GradMV4	Gradient vector for performance criterion, element (factor) for MV4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
J_Actual_Unit	Physical unit of performance J_Actual	INT	0
J_Mini	1 = Minimize, 0 = maximize	BOOL	0
J0	Value of the performance criterion in the operating point	REAL	0
ManModLi*	1 = Manual mode via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = Manual mode via OS operator (controlled by ModLiOp = 0)	BOOL	0
ModLiOp	Operating mode switchover by: • 0 = Operator • 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MV1_Unit	Unit of measure for manipulated variable 1	INT	1342
MV1Excite	MV1 for automatic process trigger	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV1HiLim	High limit of manipulated variable MV1	REAL	100.0
MV1LoLim	Low limit of manipulated variable MV1	REAL	• 0.0
MV1Man*	Manual value: Operator input for setting the manipulated variable MV1 in manual mode	REAL	0.0
MV1ManHiLim	High limit of manipulated variable MV1 in manual mode	REAL	100.0
MV1ManLoLim	Low limit of manipulated variable MV1 in manual mode	REAL	0.0
MV1RaLim	Gradient limit of the manipulated variable MV1 per sampling step	REAL	100.0
MV1Traj	Trajectory value that is added to the manipulated variable MV1	REAL	0.0
MV1Trk	Tracking value for the manipulated variable MV1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
MV1TrkOn	1 = Tracking of manipulated variable MV1	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
MV2_Unit	Unit of measure for manipulated variable 2	INT	1342
MV2Excite	MV2 for automatic process trigger	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
MV2HiLim	High limit of manipulated variable MV2	REAL	100.0
MV2LoLim	Low limit of manipulated variable MV2	REAL	0.0
MV2Man*	Manual value: Operator input for setting the manipulated variable MV2 in manual mode	REAL	0.0
MV2ManHiLim	High limit of manipulated variable MV2 in manual mode	REAL	100.0
MV2ManLoLim	Low limit of manipulated variable MV2 in manual mode	REAL	0.0
MV2RaLim	Gradient limit of the manipulated variable MV2 per sampling step	REAL	100.0
MV2Traj	Trajectory value that is added to the manipulated variable MV2	REAL	0.0
MV2Trk	Tracking value for the manipulated variable MV2	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
MV2TrkOn	1 = Tracking of manipulated variable MV2	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
MV3_Unit	Unit of measure for manipulated variable 3	INT	1342
MV3Excite	MV3 for automatic process trigger	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
MV3HiLim	High limit of manipulated variable MV3	REAL	100.0
MV3LoLim	Low limit of manipulated variable MV3	REAL	0.0
MV3Man*	Manual value: Operator input for setting the manipulated variable MV3 in manual mode	REAL	0.0
MV3ManHiLim	High limit of manipulated variable MV3 in manual mode	REAL	100.0
MV3ManLoLim	Low limit of manipulated variable MV3 in manual mode	REAL	0.0
MV3RaLim	Gradient limit of the manipulated variable MV3 per sampling step	REAL	100.0
MV3Traj	Trajectory value that is added to the manipulated variable MV3	REAL	0.0
MV3Trk	Tracking value for the manipulated variable MV3	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

Parameter	Description	Type	Default
MV3TrkOn	1 = Tracking of manipulated variable MV3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV4_Unit	Unit of measure for manipulated variable 4	INT	1342
MV4Excite	MV4 for automatic process trigger	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV4HiLim	High limit of manipulated variable MV4	REAL	100.0
MV4LoLim	Low limit of manipulated variable MV4	REAL	0.0
MV4Man*	Manual value: Operator input for setting the manipulated variable MV4 in manual mode	REAL	0.0
MV4ManHiLim	High limit of manipulated variable MV4 in manual mode	REAL	100.0
MV4ManLoLim	Low limit of manipulated variable MV4 in manual mode	REAL	0.0
MV4RaLim	Gradient limit of the manipulated variable MV4 per sampling step	REAL	100.0
MV4Traj	Trajectory value that is added to the manipulated variable MV4	REAL	0.0
MV4Trk	Tracking value for the manipulated variable MV4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV4TrkOn	1 = Tracking of manipulated variable MV4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = Allocated by SIMATIC BATCH	BOOL	0
OosLi	1 = Out of service, via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = Out of service, via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations	DWORD	16#00000000
OptimOffOp	1 = Disable optimization, normal setpoints SP1...SP4 in effect	BOOL	0
OptimOnOp	1 = Enable optimization, optimized setpoints SP1Out ... SP4Out in effect	BOOL	0
OS_Perm	I/O for operator control permissions	STRUCT • Bit 0: BOOL • Bit 25: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
PredictMode	1 = "Prediction mode" enabled, prediction only, no intervention in the process	BOOL	0
PreFilt1	Time constant [s] of the setpoint filter for setpoint SP1	REAL	0.0

Parameter	Description	Type	Default
PreFilt2	Time constant [s] of the setpoint filter for setpoint SP2	REAL	0.0
PreFilt3	Time constant [s] of the setpoint filter for setpoint SP3	REAL	0.0
PreFilt4	Time constant [s] of the setpoint filter for setpoint SP4	REAL	0.0
Restart*	1 = Restart of the block and adoption of the data from the user block that is entered at the input parameter DB_No	BOOL	1
SafePos1	Neutral position for MV1	BOOL	0
SafePos2	Neutral position for MV2	BOOL	0
SafePos3	Neutral position for MV3	BOOL	0
SafePos4	Neutral position for MV4	BOOL	0
SampleTime	Sampling time [s] (assigned automatically)	REAL	1.0
SelFp1	1 = Call a block saved in this parameter as an additional faceplate in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate in the preview	ANY	-
SimCV1*	Controlled variable CV1 (process value) which is used with SimOn = 1	REAL	0.0
SimCV2*	Controlled variable CV2 (process value) which is used with SimOn = 1	REAL	0.0
SimCV3*	Controlled variable CV3 (process value) which is used with SimOn = 1	REAL	0.0
SimCV4	Controlled variable CV4 (process value) which is used with SimOn = 1	REAL	0.0
SimCV1Li	Controlled variable CV1 (process value) that is used for SimOnLi.Value = 1 (SimLiOp.Value =1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
SimCV2Li	Controlled variable CV2 (process value) that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
SimCV3Li	Controlled variable CV3 (process value) that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
SimCV4Li	Controlled variable CV4 (process value) that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SP_TrkCV	1 = Setpoints follow the CVs in manual mode and in tracking	BOOL	0

Parameter	Description	Type	Default
SP1*	Setpoint 1 SP1.ST=FF: Operable in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
SP1DeadBand	Width of the dead band control of CV1	REAL	0.0
SP1HiLim	High limit for setpoint 1	REAL	100.0
SP1LoLim	Low limit for setpoint 1	REAL	0.0
SP1OptHiLim	High limit for optimization of setpoint 1	REAL	100.0
SP1OptLoLim	Low limit for optimization of setpoint 1	REAL	0.0
SP2*	Setpoint 2 SP2.ST=FF: Operable in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
SP2DeadBand	Width of the dead band control of CV2	REAL	0.0
SP2HiLim	High limit for setpoint 2	REAL	100.0
SP2LoLim	Low limit for setpoint 2	REAL	0.0
SP2OptHiLim	High limit for optimization of setpoint 2	REAL	100.0
SP2OptLoLim	Low limit for optimization of setpoint 2	REAL	0.0
SP3*	Setpoint 3 SP3.ST=FF: Operable in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
SP3DeadBand	Width of the dead band control of CV3	REAL	0.0
SP3HiLim	High limit for setpoint 3	REAL	100.0
SP3LoLim	Low limit for setpoint 3	REAL	0.0
SP3OptHiLim	High limit for optimization of setpoint 3	REAL	100.0
SP3OptLoLim	Low limit for optimization of setpoint 3	REAL	0.0
SP4*	Setpoint 4 SP4.ST=FF: Operable in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
SP4DeadBand	Width of the dead band control of CV4	REAL	0.0
SP4HiLim	High limit for setpoint 4	REAL	100.0
SP4LoLim	Low limit for setpoint 4	REAL	0.0
SP4OptHiLim	High limit for optimization of setpoint 4	REAL	100.0
SP4OptLoLim	Low limit for optimization of setpoint 4	REAL	0.0
StepNo	Batch step number	DWORD	16#00000000
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ActInOuts	Status word displays active inputs and outputs in the faceplate	WORD	16#C0C0
AutAct	1 = Automatic mode is active 0 = Manual mode is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CV1Out	Output of manipulated variable 1 (process value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
CV2Out	Output of manipulated variable 2 (process value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
CV3Out	Output of manipulated variable 3 (process value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
CV4Out	Output of manipulated variable 4 (process value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. You can find information via the error numbers that are output by this block at ModPreCon error handling (Page 588)	INT	-1
ErrorOpt	Error number of the integrated optimization function, see the description of function block LPOptim	INT	0
Fut1_y1... Fut1_y5	Prediction of free movement of CV1 for five future points in time within the prediction horizon	REAL	0
Fut2_y1... Fut2_y5	Prediction of free movement of CV2 for five future points in time within the prediction horizon	REAL	0
Fut3_y1... Fut3_y5	Prediction of free movement of CV3 for five future points in time within the prediction horizon	REAL	0
Fut4_y1... Fut4_y5	Prediction of free movement of CV4 for five future points in time within the prediction horizon	REAL	0
J_Actual	Current value of the performance criterion	REAL	0
Loop1Closed	1 = Control loop for CV1 closed 0 = Control loop for CV1 open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Loop2Closed	1 = Control loop for CV2 closed 0 = Control loop for CV2 open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Loop3Closed	1 = Control loop for CV3 closed 0 = Control loop for CV3 open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Loop4Closed	1 = Control loop for CV4 closed 0 = Control loop for CV4 open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = Manual mode active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release by OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV1	Manipulated variable 1 (control signal)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV1HiAct	1 = High limit of manipulated variable 1 reached or exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV1LoAct	1 = Low limit of manipulated variable 1 reached or exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV1AutAct	1 = MV1 is set automatically by the algorithm, i.e. AutAct = 1 and MV1TrkOn = 0	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV1Pred	One-step prediction for MV1 in the "Prediction without control action" mode	REAL	0
MV2	Manipulated variable 2 (control signal)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV2HiAct	1 = High limit of manipulated variable 2 reached or exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV2LoAct	1 = Low limit of manipulated variable 2 reached or exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV2AutAct	1 = MV2 is set automatically by the algorithm, i.e. AutAct = 1 and MV2TrkOn = 0	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
MV2Pred	One-step prediction for MV2 in the "Prediction without control action" mode	REAL	0
MV3	Manipulated variable 3 (control signal)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV3HiAct	1 = High limit of manipulated variable 3 reached or exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV3LoAct	1 = Low limit of manipulated variable 3 reached or exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV3AutAct	1 = MV3 is set automatically by the algorithm, i.e. AutAct = 1 and MV3TrkOn = 0	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV3Pred	One-step prediction for MV3 in the "Prediction without control action" mode	REAL	0
MV4	Manipulated variable 4 (control signal)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV4HiAct	1 = High limit of manipulated variable 4 reached or exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV4LoAct	1 = Low limit of manipulated variable 4 reached or exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV4AutAct	1 = MV4 is set automatically by the algorithm, i.e. AutAct = 1 and MV4TrkOn = 0	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV4Pred	One-step prediction for MV4 in the "Prediction without control action" mode	REAL	0
NumberCVs	Number of controlled variables (process values) used	INT	0
NumberDVs	Number of disturbances used	INT	0
NumberMVs	Number of manipulated variables used	INT	0
OosAct	1 = Block is "out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000

Parameter	Description	Type	Default
OptimAct	1 = Optimization is active	BOOL	0
OptimAvailable	1 = Optimization available, 0 = Optimization not available, because old user data block is loaded	BOOL	0
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
PrediHorizon	Prediction horizon [s]	REAL	0
SP1OpOut	Copy of the operable setpoint 1 for step-enabling	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP2OpOut	Copy of the operable setpoint 2 for step-enabling	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP3OpOut	Copy of the operable setpoint 3 for step-enabling	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP4OpOut	Copy of the operable setpoint 4 for step-enabling	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP1Out	Setpoint 1 used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP2Out	Setpoint 2 used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP3Out	Setpoint 3 used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP4Out	Setpoint 4 used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1	DWORD	16#00
Status2	Status word 2	DWORD	16#00

See also

Description of ModPreCon (Page 568)
ModPreCon messaging (Page 590)
ModPreCon block diagram (Page 601)
ModPreCon modes (Page 574)
Neutral position for motors, valves and controllers (Page 37)
Opening additional faceplates (Page 165)
Description of OpStations (Page 304)

4.5.7 ModPreCon block diagram

ModPreCon block diagram

A block diagram is not provided for this block.

See also

ModPreCon I/Os (Page 590)
ModPreCon messaging (Page 590)
ModPreCon error handling (Page 588)
ModPreCon functions (Page 575)
ModPreCon modes (Page 574)
Description of ModPreCon (Page 568)

4.5.8 Operator control and monitoring

4.5.8.1 ModPreCon views

Views of the ModPreCon block

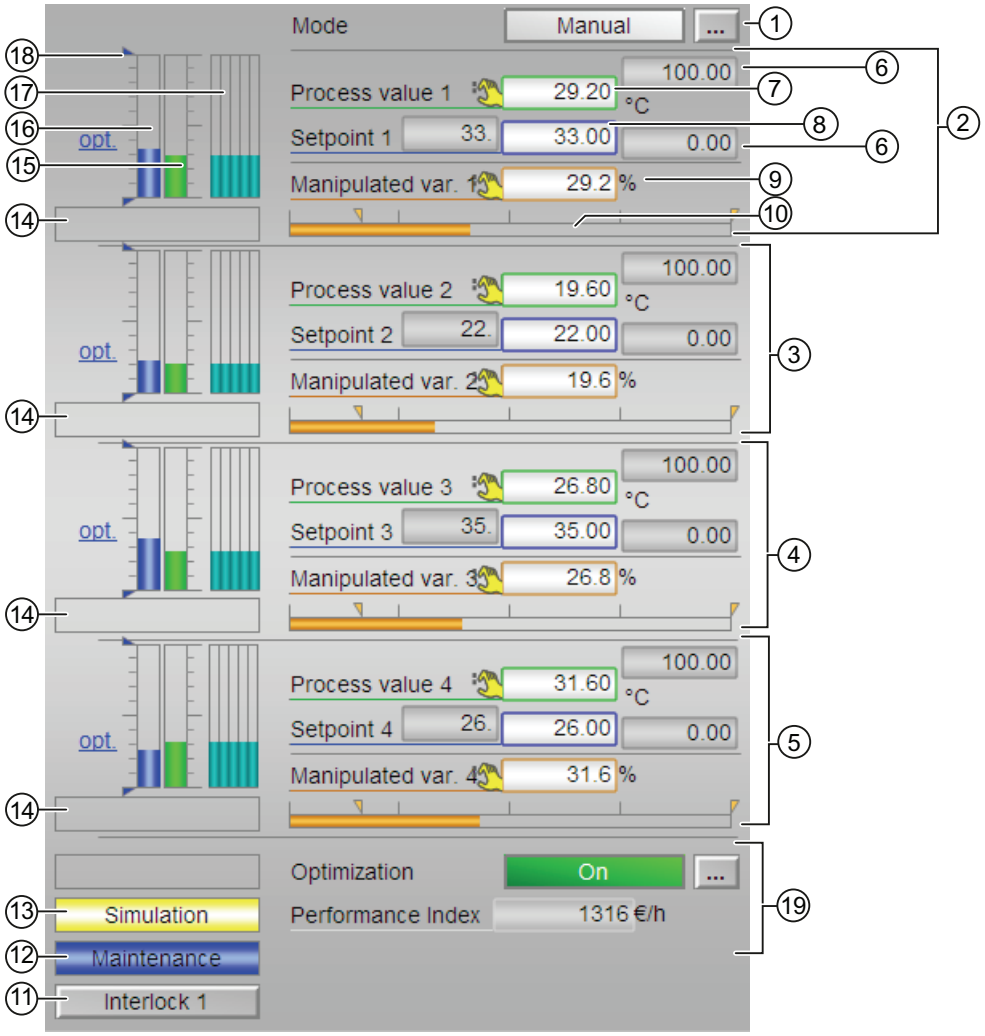
The block ModPreCon provides the following views:

- ModPreCon standard view (Page 603)
- Trend view (Page 253)
- ModPreCon parameter view (Page 606)
- Parameter view channel 1 to 4 of ModPreCon (Page 608)
- ModPreCon preview (Page 610)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for ModPreCon (Page 612)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

4.5.8.2 ModPreCon standard view

ModPreCon standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 59)
- Automatic mode (Page 59)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2), (3), (4) and (5) Displaying and switching for values for channels 1 to 4

This area always has the same layout for channels 1 to 4:

(6) High and low scale range for the process value

These values provide information on the display range for the bar graph of the process value. The scale range is defined in the engineering system.

(7) Displaying and changing the process value including signal status

This area shows the current process value with the corresponding signal status.

(8) Displaying and changing the setpoint including signal status

This area shows the current setpoint with the corresponding signal status. Refer to the Changing values (Page 210) section for information on changing the setpoint.

(9) Displaying and changing the manipulated variable including signal status

This area shows the current manipulated variable with the corresponding signal status. Refer to the Changing values (Page 210) section for information on changing the manipulated variable. You can only make a change in manual mode.

(10) Bar graph for the manipulated variable with limit display

This area shows the current manipulated variable in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES):

- Limits: `MVxHiLim` and `MVxLoLim`
- Display area: `MVxManHiLim` and `MVxManLoLim`

(11) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(12) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

- "Process excitation"

  The automatic process excitation is fed forward using the upstream block AutoExcitation for recording learning data for the MPC configurator. The manipulated variable step changes are added to the manipulated values 1 to 4 according to schedule. Avoid external disturbances to the process while the process excitation is running. The manipulated variables can be changed manually while the process excitation is running.

(13) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

You can find additional information on this in the Simulating signals (Page 47) section.

(14) Display for block states

There is a display for the states of the block for every channel 1 to 4:

- "Tracking"

(15) Bar graph for the process value 1

There is a bar graph for the process value for every channel 1 to 4.

This area shows the current process value in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(16) Bar graph for the setpoint 1

There is a bar graph for the setpoint for every channel 1 to 4.

This area shows the current setpoint in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(17) Prediction of free movement

This area shows you the prediction of free movement in the form of a bar graph. For each channel from 1 to 4, there is a bar graph for the prediction of free movement, that is, for the future behavior of the process within the overall prediction horizon, under the assumption that all manipulated variables are frozen at their current values.

This is why the prediction of free movement is only displayed in manual mode.

The value range of the bar graph matches the value range of the assigned setpoint and current value bar.

ModPreCon functions (Page 575)

(18) Displaying the limits

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the Engineering System (ES).

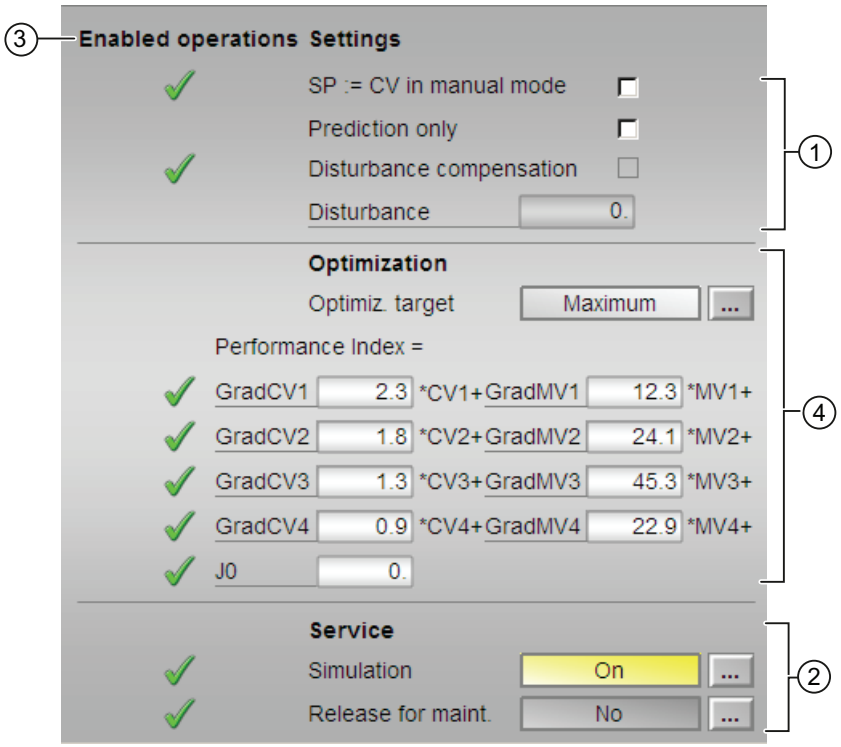
(19) Static operating point optimization

Activate the optimization using the button at bottom right. Activation means that the optimized setpoints SP1Out...SP4Out are actually used instead of the SP1...SP4 setpoints specified in the faceplate for the closed-loop control. (The actual calculation of the optimum setpoints depends on this, and is only performed if one of the input variables for the optimization has changed.) The current value the economic performance criterion J appears in the display field below.

When optimization is enabled, the optimum setpoints are displayed on the setpoint bar as small, horizontal lines and highlighted with the abbreviation "opt.". The numerical values of the optimum setpoints are then displayed left of the input fields for the setpoints.

4.5.8.3 ModPreCon parameter view

Parameter view of ModPreCon



(1) Settings

You can activate the following functions for the controller in this area:

- "SP := PV in manual mode": ☑ Bumpless switchover from "manual mode" to "automatic mode"
- "Prediction only" activate this special "operating mode" by selecting the check box. The controller then only listens in on the process and indicates what it would like to do in the next sampling step without actively intervening in the process
- "Disturbance compensation": ☑ Select disturbance feedforward
- "Disturbance variable"

You cannot change the disturbance variable, it can only be displayed.

(2) Service

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance"

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

(3) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(4) Optimization

Direction of the optimization (minimize or maximize)

By default, the optimizer seeks to maximize the performance function, in the assumption that it is dealing with economic yield. If you want to search a minimum, however, because you are dealing with costs or consumption values, click this button.

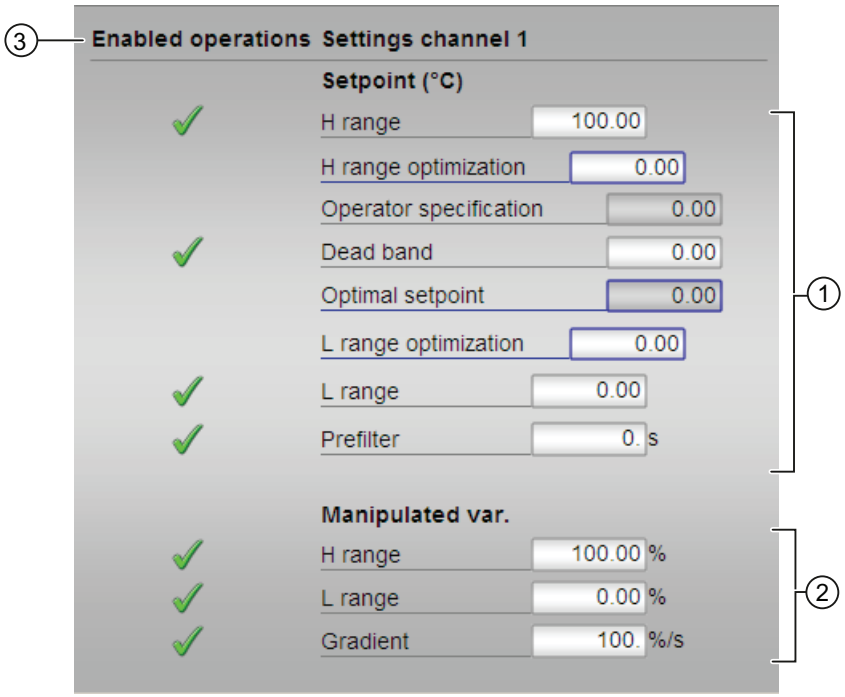
Specification of performance criterion for the operating point optimization

The performance criterion consists of a weighted sum of all manipulated and controlled variables. For each manipulated variable and controlled variable, enter the appropriate weighting factor, i.e. the coefficient of the gradient vector. Zero means that the value of the corresponding manipulated variable or controlled variable no direct influence on the economic yield. If the controller has less than four manipulated variables or controlled variables, the irrelevant variables are hidden automatically.

4.5.8.4 Parameter view channel 1 to 4 of ModPreCon

Parameter view channel 1 to 4 for ModPreCon

The layout of the parameter view for channels 1 to 4 is always identical:



(1) Displaying and changing the limit parameters for the setpoint

You can change the following parameters for the setpoint in this area:

- "H range": High limit for setpoint operation
- "H range optimization": High limit for optimizing the setpoint
- "Operator input": Display of the setpoint entered in the standard view, cannot be operated here.
- "Dead band": Dead band (Page 52), error signal generation and dead band section
- "Optimal setpoint": Calculated by the optimization, cannot be operated
- "L range optimization": Low limit for optimizing the setpoint
- "L range": Low limit for setpoint operation
- "Prefilter": ModPreCon functions (Page 575), setpoint filter section

You can find additional information on this in the Changing values (Page 210) section.

(2) Displaying and changing the limit parameters for the manipulated variable

You can change the following parameters for the manipulated variable in this area:

- "H range": Upper limit of the manipulated variable for automatic mode
- "L range": Low limit of manipulated variable for automatic mode
- "Gradient limit": Maximum (absolute) change in the manipulated variable per sampling step

(3) Enabled operations

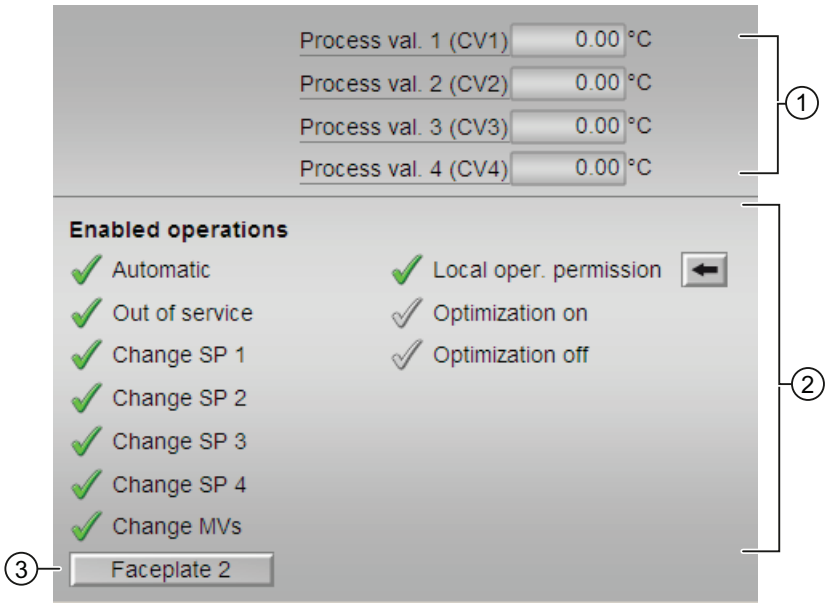
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

4.5.8.5 ModPreCon preview

Preview for ModPreCon



(1) Process value

This area displays the real process values (`PVx`).

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Rotes Kreuz**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

The following enabled operations for parameters are shown here:

- "Automatic": You can switch to "automatic mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Auto-Hotspot.
- "Change SP1": You can change the setpoint 1
- "Change SP2": You can change the setpoint 2
- "Change SP3": You can change the setpoint 3
- "Change SP4": You can change the setpoint 4
- "Change MVs": You can change the manipulated variables

Note

The OS operator must always be able to switch to "manual mode". That is why the switch to "manual mode" is not shown here in the faceplate.

-

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(6) Prediction horizon

The prediction horizon specifies how far the controller looks into the future in its calculations. The value is set in the MPC Configurator and displayed in the faceplate for informational purposes.

See also

Operator control permissions (Page 205)

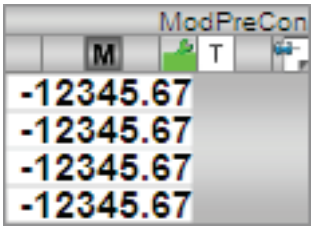
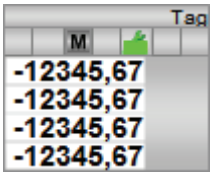
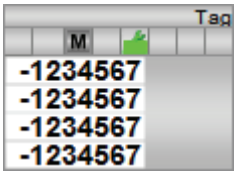
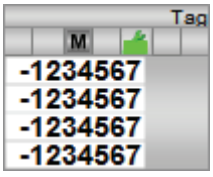
4.5.8.6 Block icon for ModPreCon

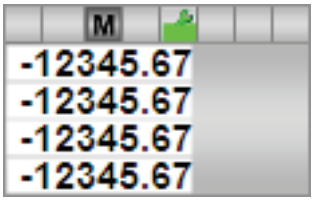
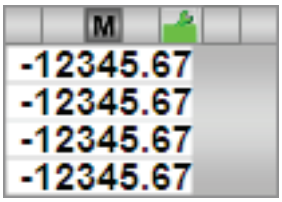
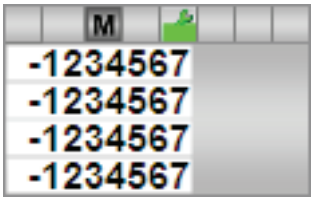
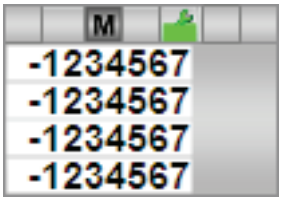
Block icons for ModPreCon

A variety of block icons are available with the following functions:

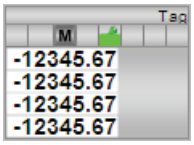
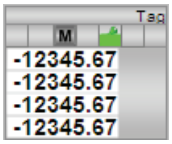
- Process tag type
- Operating modes
- Signal status, release for maintenance
- Tracking
- Memo display
- Process value (black, with and without decimal places)

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	

Icons	Selection of the block icon in CFC	Special features
	5	
	6	
	7	
	8	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

4.6 PIDConL - Continuous PID controller

4.6.1 Description of PIDConL

Object name (type + number) and family

Type and number: FB 1874

Family: Control

Area of application for PIDConL

The block is used for the following applications:

- Fixed setpoint control
- Cascade control
- Ratio control
- Split-range control
- Smith predictor closed-loop control
- Override control (override)

How it works

The block is a PID controller with continuous output signal (manipulated variable). It is used to activate a final controlling element with continuous action input.

The block functions following the PID algorithm with a delayed D action and an integrator with double precision.

The block is suitable for controlling sluggish control loops, for example, for temperatures and filling levels, and high-speed control loops, for example, for flow rates and speed. For a given CPU, a compromise has to be made between the number of controllers and the frequency with which the individual controllers have to be processed. The faster the modulated control loops are, i.e. the more frequently the manipulated variables have to be calculated per time unit, the lower the number of controllers that can be installed.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the control loop monitoring to work as planned in the trend view of the controller faceplates, the

```
S7_xarchive:='Value, shortterm;'
```

attributes in the process tag types for control loops at the controller function block must be set for the following tags:

- Input parameters:
  - `CPI_In`
- Output parameters
  - `MV`
  - `MV_HiAct`
  - `MV_LoAct`
  - `LoopClosed`
  - `SP`
  - `PV_Out`
  - `PV_ToleHi`
  - `PV_ToleLo`

For the PIDConL block, the Advanced Process Library contains templates for process tag types as examples and there is a example project (APL_Example_xx, xx designates the language variant) containing different application cases for this block. Several application cases are simulated in the example project and serve to explain how the block works.

Examples of process tag types:

- PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799)
- Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806)
- Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)
- Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810)
- PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800)
- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)
- Override control (Page 1814)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)
- PID controller for PA/FF devices (PIDControlLean_Fb) (Page 1799)

Application cases in example project:

- Process simulation including noise generator (Page 1828)
- Cascade control of a temperature by using the heat flow (Page 1829)
- Control loop monitoring with simulation of colored noise (Page 1831)
- Feedforward control to compensate a measurable disturbance variable (Page 1832)
- Operating point-oriented adaptation of parameters (gain scheduling) for non-linear processes (Page 1833)
- Override control on a pipeline (Page 1834)
- Smith predicator for a dead time system (Page 1834)
- Filtering of noisy measured values in a control loop (Page 1835)

Startup characteristics

Use the Feature bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section PIDConL I/Os (Page 632).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutAct.Value`
6	Not used
7	`ManAct.Value`
8	`SP_ExtAct.Value`
9	`MV_ForOn.Value`
10	`MV_TrkOn.Value` AND NOT (`ManAct.Value` OR `OosAct.Value` OR `MV_ForOn.Value`)
11	`MV.Value` > `ManLoLim`
12	`SimLiOp.Value`
13 - 17	Not used
18	`SimOn` AND `ManAct`
19	`AdvCoAct`
20	1 = Input parameter `Rbk` is not interconnected (`RbkOut.ST` = 16#FF)
21	`NegGain`
22	Not used
23	`OptimEn`
24	`OptimOcc`
25 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock`
1	`PV_AH_Act.Value`
2	`PV_WH_Act.Value`
3	`PV_TH_Act.Value`
4	`PV_TL_Act.Value`
5	`PV_WL_Act.Value`
6	`PV_AL_Act.Value`
7	`PV_AH_En`
8	`PV_WH_En`
9	`PV_TH_En`
10	`PV_TL_En`

Status bit	Parameter
11	PV_WL_En
12	PV_AL_En
13	PV_AH_MsgEn
14	PV_WH_MsgEn
15	PV_TH_MsgEn
16	PV_TL_MsgEn
17	PV_WL_MsgEn
18	PV_AL_MsgEn
19	ER_AH_Act.Value
20	ER_AL_Act.Value
21	ER_AH_En
22	ER_AL_En
23	ER_AH_MsgEn
24	ER_AL_MsgEn
25	RbkWH_Act.Value
26	RbkWL_Act.Value
27	RbkWH_En
28	RbkWL_En
29	RbkWH_MsgEn
30	RbkWL_MsgEn
31	MS_RelOp

Status word allocation for `Status3` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via EventTsIn
1	Effective signal 2 of the message block connected via EventTsIn
2	Effective signal 3 of the message block connected via EventTsIn
3	Effective signal 4 of the message block connected via EventTsIn
4	Effective signal 5 of the message block connected via EventTsIn
5	Effective signal 6 of the message block connected via EventTsIn
6	Effective signal 7 of the message block connected via EventTsIn
7	Effective signal 8 of the message block connected via EventTsIn
8 - 26	Not used
27	SP_UpRaAct, SP_DnRaAct limits enabled for gradient mode (SP_RateOn = 1)
28	GrpErr.Value
29	RdyToStart.Value
30 - 31	Not used

See also

PIDConL functions (Page 620)

PIDConL messaging (Page 629)

PIDConL block diagram (Page 646)

PIDConL error handling (Page 628)

PIDConL modes (Page 619)

4.6.2 PIDConL modes

PIDConL operating modes

The block can be operated using the following modes:

- Automatic mode (Page 59)
- Manual mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and bumpless switchover in the Manual and automatic mode for control blocks (Page 59) section.

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the Manual and automatic mode for control blocks (Page 59) section.

"Program mode for controllers"

General information on "Program mode for controllers" is available in the section Program mode for controllers (Page 65).

"Out of service"

You can find general information about the "Out of service" mode in the Out of service (Page 58) section.

See also

PIDConL block diagram (Page 646)

PIDConL I/Os (Page 632)

PIDConL messaging (Page 629)

PIDConL error handling (Page 628)

PIDConL functions (Page 620)

Description of PIDConL (Page 614)

4.6.3 PIDConL functions

Functions of PIDConL

The functions for this block are listed below.

Generation of manipulated variables

The manipulated variable `MV` can be generated as follows:

MV_ForOn	ManAct	MV_TrkOn	AdvCoAct AND NOT AdvCoModSP	MV =	Limit monitoring	State
1	-	-	-	`MV_Forced`	none	Forced tracking through constraint without limitation
0	1	-	-	`Man`	`ManHiLim` `ManLoLim`	Manual mode, set by the operator
0	0	1	-	`MV_Trk`	`MV_HiLim` `MV_LoLim`	Tracking with limitation
0	0	0	1	`AdvCoMV`	`MV_HiLim` `MV_LoLim`	Higher-level program mode
0	0	0	0	`P_Part` + `I_Part` + `D_Part` + `FFwd`	`MV_HiLim` `MV_LoLim`	Automatic mode (PID algorithm)

If the controller is in "out of service" mode, the output parameter `MV` is set to the last valid value in manual mode or the neutral position manipulated variable depending on the `Feature` Bit (Neutral position manipulated variable takes effect at startup (Page 139)). Refer to the Out of service (Page 58) section for more on this.

Tracking and limiting a manipulated variable

The block provides the standard function Tracking and limiting a manipulated variable (Page 153).

Neutral position

The block provides the standard function Neutral position for motors, valves and controllers (Page 37).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

"Actuator active" information

If the manipulated variable `MV` is greater than the minimum manual limit `ManLoLim`, this is recognized as actuator active. This status can be used to indicate, for example, a customized icon in the process image and is saved in the status word (see Status word section in Description of PIDConL (Page 614)).

Limit monitoring of position feedback

The block provides the standard function Limit monitoring of the feedback (Page 80).

External/internal setpoint specification

The block provides the standard function Setpoint specification - internal/external (Page 112).

Setpoint limiting for external setpoints

The block provides the standard function Setpoint limiting for external setpoints (Page 153).

Gradient limit of the setpoint

The block provides the standard function Gradient limit of the setpoint (Page 109).

Using setpoint ramp

The block provides the standard function Using setpoint ramp (Page 108).

Tracking setpoint in manual mode

The block provides the standard function Tracking setpoint in manual mode (Page 153).

Simulating signals

The block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Process value (`SimPV, SimPV_Li`)
- Position feedback (`SimRbk, SimRbkLi`)

Limit monitoring of the process value

The block provides the standard function Limit monitoring of the process value (Page 72).

Control deviation generation and dead band

The block provides the standard function Control deviation generation and dead band (Page 151).

The `Feature` Bit 14 can be used to feedforward an external control deviation `ER_Ext`. When the external error signal is activated, `ER_Ext` affects both the dead band and the control deviation alarm generation.

Delay alarm for control deviation at setpoint step changes (Page 150)

Limit monitoring of control deviation

The block provides the standard function Limit monitoring of setpoint, manipulated variable and control deviation (Page 81).

Inverting control direction

The block provides the standard function Inverting control direction (Page 151).

Physical standardization of setpoint, manipulated variable and process value

Controller gain `Gain` is entered either using a physical variable or as standardized value.

`Gain` as a physical variable:

The standardized variables retain their default values:

- `NormPV.High` = 100 and `NormPV.Low` = 0
- `NormMV.High` = 100 and `NormMV.Low` = 0

The effective gain is:

`GainEff` = `Gain`

Entering a standardized `Gain` (dimensionless):

Change the standardized variables to the actual range of the process values and manipulated variables.

- Internal and external setpoints; the process value and corresponding parameters are entered according to the physical measuring range of the process value.
- The manual value, the tracking value of the manipulated variable, feedforward control and the corresponding parameters are set according to the physical measuring range of the manipulated variable.

The effective gain is:

`GainEff` = (`NormMV.High` - `NormMV.Low`) / (`NormPV.High` - `NormPV.Low`) · `Gain`

Selecting a unit of measure

The block provides the standard function Selecting a unit of measure (Page 168).

PID algorithm

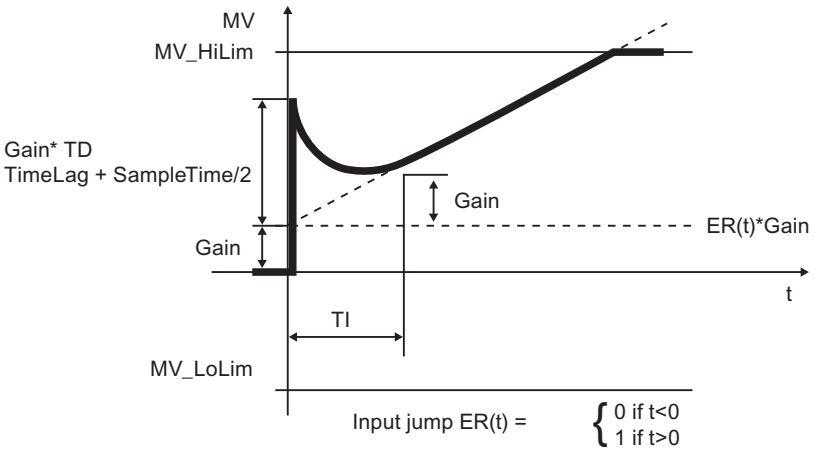
The manipulated variable is generated in automatic mode according to the following algorithm:

`MV` = `Gain` · (1 + 1 / (`TI` · s) + (`TD` · s) / (1 + `TD` / `DiffGain` · s)) · `ER`

Where:

s = Complex number

The following step response occurs:



Note

This formula describes a standard application where P, I and D actions are activated and the P and D actions are not in the feedback circuit (PropSel = 1, TI <> 0, DiffToFbk = 0 and PropFacSP = 1).

The D action delay is derived from TD / DiffGain.

- The P action is displayed after P_Part and can be deactivated using PropSel = 0 .
- The I action is displayed after I_Part and can be deactivated using TI = 0 .
- The D action is displayed after D_Part and can be deactivated using TD = 0 .

Structure segmentation at controllers

The block provides the standard function Structure segmentation at controllers (Page 155).

Anti-windup

The controller has an anti-windup function. The I action is frozen after the manipulated variable has reached limits (MV_HiLim or MV_LoLim).

Feedforwarding and limiting disturbance variables

The block provides the standard function Feedforwarding and limiting disturbance variables (Page 155).

Control zone

The block provides the standard function Using control zones (Page 152).

Forming the signal status for blocks

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

- Signal status for the process value PV_Out:

  The signal status of the output parameter PV_Out always corresponds to the signal status of input parameter PV or, if the block is in simulation mode, 16#60.

- Signal status for the setpoint value SP:

  The signal status of the SP output parameter is always equivalent to the signal status of input parameter SP_Ext or SP_Int, depending on how the setpoint is specified. If the internal setpoint SP_Int is used, the signal status is always output as 16#80 .

- Signal status of the control deviation ER:

  The signal status of output parameter ER is obtained from the worst signal status of the two output parameters PV_Out and SP and is output.

  The signal status 16#60 (external simulation) is suppressed because the block acts as a sink with external simulation.

  If the external control deviation is activated (feature bit14 = 1), the signal status of ER_Ext.ST is applied.

- Signal status for the manipulated variable MV:

  The signal status of output parameter MV is obtained in "automatic mode" or in "program mode" with default setpoint from the worst signal status of the two parameters FFwd and ER and is output. In "manual mode", the signal status is output as good. The signal status 16#60 (external simulation) is suppressed because the block acts as a sink with external simulation. In "manual mode", the signal status is output as good.

- Signal status for position feedback RbkOut:

  The signal status of RbkOut always corresponds to the signal status of input parameter Rbk or, if the block is in simulation mode, 16#60.

- Worst signal status:

  The worst signal status ST_Worst for the block corresponds to the signal status of MV, but without suppression of external simulation.

Configurable reactions using the Feature parameter

You can find an overview of all reactions provided by the Feature parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
4	Setting switch or button mode (Page 140)
14	External control deviation (Page 125)
15	Neutral position manipulated variable takes effect with "out of service" operating mode (Page 139)
16	Neutral position manipulated variable takes effect at startup (Page 139)
18	Disabling bumpless switchover to automatic mode for controllers (Page 145)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Operator control permissions

The block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode" `AutModOp`
1	1 = Operator can switch to "manual mode" `ManModOp`
2	1 = Operator can switch to "Out of service" mode `OosOp`
3	1 = Operator can switch to "program mode" `AdvCoEn`
4	1 = Operator can switch the setpoint to "external" `SP_ExtOp`
5	1 = Operator can switch the setpoint to "internal" `SP_IntOp`
6	1 = Operator can change the internal setpoint `SP_Int`
7	1 = Operator can change the manual parameter `Man`
8	1 = Operator can change operation high limit of the setpoint `SP_InHiLim`
9	1 = Operator can change operation low limit of the setpoint `SP_InLoLim`
10	1 = Operator can change the operation high limit of the manipulated variable `ManHiLim`
11	1 = Operator can change the operation low limit of the manipulated variable `ManLiLim`
12	1 = Operator can enable the setpoint's gradient limitation function `SP_RateOn`
13	1 = Operator can change the setpoint's high limit for the ramp `SP_UpRaLim`
14	1 = Operator can change the setpoint's low limit for the ramp `SP_DnRaLim`
15	1 = Operator can switch between the time value or the value for the ramp `SP_RmpModTime`
16	1 = Operator can change the ramp time `SP_RmpTime`
17	1 = Operator can change the target setpoint `SP_RmpTarget` for the setpoint ramp
18	1 = Operator can enable the setpoint ramp function `SP_RmpOn`
19	1 = Operator can permit the PID optimization function `OptimEn`
20	1 = Operator can enable the track setpoint in "manual mode" function `SP_TrkPV`
21	1 = Operator can enable the bumpless switchover from external to internal `SP_TrkExt`
22	1 = Operator can change the gain parameter `Gain`
23	1 = Operator can change the integral time parameter `TI`
24	1 = Operator can change the derivative time parameter `TD`
25	1 = Operator can change the derivative gain parameter `DiffGain`
26	1 = Operator can change the dead band parameter `DeadBand`
27	1 = Operator can change the control zone parameter `ConZone`
28 - 31	Not used

The block has the following permissions for the OS1Perm parameter:

Bit	Function
0	1 = Operator can change the limit (process value) PV_AH_Lim for the high alarm
1	1 = Operator can change the limit (process value) PV_WH_Lim for the high warning
2	1 = Operator can change the limit (process value) PV_TH_Lim for the high tolerance
3	1 = Operator can change the hysteresis (process value) PV_Hyst
4	1 = Operator can change the limit (process value) PV_TL_Lim for the low tolerance
5	1 = Operator can change the limit (process value) PV_WL_Lim for the low warning
6	1 = Operator can change the limit (process value) PV_AL_Lim for the low alarm
7	1 = Operator can change the limit (control deviation) ER_AH_Lim for the high alarm
8	1 = Operator can change the hysteresis (control deviation) ER_Hyst
9	1 = Operator can change the limit (control deviation) ER_AL_Lim for the low alarm
10	1 = Operator can change the limit (position feedback) RbkWH_Lim for the high warning
11	1 = Operator can change the hysteresis (position feedback) RbkHyst
12	1 = Operator can change the limit (position feedback) RbkWL_Lim for the low warning
13 - 15	Not used
16	1 = Operator can activate the Simulation function SimOn
17	1 = Operator can activate the Release for maintenance function MS_RelOp
18	1 = Operator can change the simulation value SimPV
19 - 31	Not used

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Release for maintenance

The block provides the standard function Release for maintenance (Page 52)

Generating instance-specific messages

The block provides the standard function Generating instance-specific messages (Page 162) without the time stamp function in the I/O.

Suppressing messages using the MsgLock parameter

This block provides the standard function Labeling of buttons and text (Page 167).

Specifying the display area for process and setpoint values as well as operations

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

See also

PIDConL I/Os (Page 632)

PIDConL block diagram (Page 646)

PIDConL error handling (Page 628)

PIDConL modes (Page 619)

4.6.4 PIDConL error handling

Error handling of PIDConL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The ErrorNum output parameter can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of PV can no longer be displayed in the REAL number field.
31	The value of SP_Ext can no longer be displayed in the REAL number field.
32	The value of FFwd can no longer be displayed in the REAL number field.
33	The value of MV_Trk can no longer be displayed in the REAL number field.
34	The value of MV_Forced can no longer be displayed in the REAL number field.
35	The value of Rbk can no longer be displayed in the REAL number field.
36	The value of MV can no longer be displayed in the REAL number field.
60	|TI| < SampleTime / 2
61	|TD| < SampleTime
62	DiffGain < 1 or DiffGain > 10
63	TD / DiffGain < SampleTime / 2
64	PropFacSP < 0 or PropFacSP > 1
66	NormPV_High = NormPV_Low

See also

PIDConL block diagram (Page 646)

PIDConL I/Os (Page 632)

PIDConL messaging (Page 629)

PIDConL functions (Page 620)

PIDConL modes (Page 619)

Description of PIDConL (Page 614)

Setting switch or button mode (Page 140)

4.6.5 PIDConL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 6	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId2, SIG 6).

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ PV - high alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ PV - high warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ PV - high tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ PV - low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ PV - low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ PV - low alarm limit violated
	SIG 7	Alarm - high	$$BlockComment$$ ER - high alarm limit violated
	SIG 8	Alarm - low	$$BlockComment$$ ER - low alarm limit violated
MsgEvId2	SIG 7	Warning - high	$$BlockComment$$ Rbk - high warning limit violated
	SIG 8	Warning - low	$$BlockComment$$ Rbk - low warning limit violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You can use up to four instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 1	AS process control message - fault	$$BlockComment$$ External message 1 Status 16#@5%x@
	SIG 2	AS process control message - fault	$$BlockComment$$ External message 2 Status 16#@6%x@
	SIG 3	AS process control message - fault	$$BlockComment$$ External message 3 Status 16#@7%x@
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 4 Status 16#@8%x@

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	Process value PV_Out
5	Control deviation ER
6	ExtVa106
7	ExtVa107
8	Not allocated
9	Not allocated
10	Not allocated

The associated values 6 ... 7 are allocated to the parameters ExtVa106 ... ExtVa107 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

Associated values for message instance MsgEvId2

Associated value	Block parameters
1	BatchName
2	StepNo

Associated value	Block parameters
3	BatchID
4	Position feedback Rbk
5	Signal status ExtMsg1
6	Signal status ExtMsg2
7	Signal status ExtMsg3
8	Signal status ExtMsg4
9	ExtVa209
10	ExtVa210

The associated values 9 ... 10 are allocated to the parameters ExtVa209 ... ExtVa210 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of PIDConL (Page 614)
PIDConL functions (Page 620)
PIDConL I/Os (Page 632)
PIDConL block diagram (Page 646)
PIDConL error handling (Page 628)
PIDConL modes (Page 619)

4.6.6 PIDConL I/Os

I/Os of PIDConL

Input parameters

Parameter	Description	Type	Default
AdvCoEn	1 = Enable "program mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoOn*	1 = Enable "program mode" via faceplate	BOOL	0
AdvCoModSP	Type of "program mode": 1 = Setpoint specification 0 = Manipulated variable specification	BOOL	1
AdvCoMstrOn	Activate (0-1) or deactivate (1-0) "program mode" via edge transition	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
AdvCoMV	Specified value from the external program	REAL	0.0
AutModLi*	1 = "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
BatchEn	1 = Enable allocation for batch control	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
ConZone	Width of control zone	REAL	0.0
CPI_In	Input for control performance index, which is calculated by the assigned ConPerMon block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DeadBand	Width of dead band	REAL	0.0
DiffGain	Gain of differentiator [1..10] DiffGain = TD / (delay time of D action)	STRUCT • Value: REAL • ST: BYTE	- • 5.0 • 16#80
DiffToFbk	1 = D action is placed in the feedback	BOOL	0
EN	1 = Called block will be processed	BOOL	1
ER_A_DC*	Delay for incoming alarms during control deviation monitoring	REAL	0.0
ER_A_DG*	Delay for outgoing alarms during control deviation monitoring	REAL	0.0
ER_AH_En	1 = Activate alarm (high) for control deviation monitoring	BOOL	1
ER_AH_DFac*	Delay factor at positive setpoint step changes for incoming alarms at the control deviation monitoring ER_AH_Lim	REAL	0.0
ER_AH_Lim	Alarm limit (high) for control deviation monitoring	REAL	100.0
ER_AH_MsgEn	1 = Activate messages for alarm (high) for control deviation monitoring	BOOL	1
ER_AL_DFac*	Delay factor at negative setpoint step changes for incoming alarms at the control deviation monitoring ER_AL_Lim	REAL	0.0
ER_AL_En	1 = Activate alarm (low) for control deviation monitoring	BOOL	1
ER_AL_Lim	Alarm limit (low) for control deviation monitoring	REAL	-100.0
ER_AL_MsgEn	1 = Activate messages for alarm (low) for control deviation monitoring	BOOL	1
ER_Ext	External control deviation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
ER_Hyst	Alarm hysteresis for control deviation	REAL	1.0
EventTsIn	Evaluation of the signal status of the EventTs message block. EventTsIn serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#80
ExtMsg1	1 = Binary input for freely selectable message 1 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	1 = Binary input for freely selectable message 2 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	1 = Binary input for freely selectable message 3 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg4	1 = Binary input for freely selectable message 4 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa209	Associated value 9 for messages (MsgEvID2)	ANY	
ExtVa210	Associated value 10 for messages (MsgEvID2)	ANY	
Feature	I/O for additional functions (Page 620)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
FFwd*	Input for additive disturbance variable activation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
FFwdHiLim	Limit (high) for additive disturbance variable activation	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
FFwdLoLim	Limit (low) for additive disturbance variable activation	STRUCT • Value: REAL • ST: BYTE	- • -100.0 • 16#80
Gain	Proportional gain Gain.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#FF

Parameter	Description	Type	Default
IntHoldNeg	1 = Integrator cannot run in negative direction	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
IntHoldPos	1 = Integrator cannot run in positive direction	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Man*	Manual specification for the manipulated variable	REAL	0.0
ManHiLim	Limit (high) for manual parameter Man	REAL	100.0
ManLoLim	Limit (low) for manual parameter Man	REAL	0.0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
ModLiOp	Operating mode switchover between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvID1	Message number (assigned automatically)	DWORD	16#00000000
MsgEvID2	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Forced*	Forced manipulated variable that is not limited and assumes top priority	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_ForOn	1 = Forced manipulated variable MV_Forced output unlimited at output MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_HiLim	Limit (high) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
MV_LoLim	Limit (low) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_Offset	Manipulated variable for ER=0, operating point for controller with deactivated I action	REAL	0.0

Parameter	Description	Type	Default
MV_OpScale	OS display range for manipulated variable MV	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0
MV_Trk*	Tracking value for the manipulated variable MV	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
MV_TrkOn	1 = Tracking of manipulated variable MV	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
MV_Unit	Unit of measure for manipulated variable	INT	1342
NegGain	0 = Positive controller gain: ER = Gain · (SP - PV) 1 = Negative controller gain: ER = Gain · (PV - SP)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
NormMV	Manipulated variable range (MV) for standardizing the proportional gain (GAIN)	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0
NormPV	Process value range (PV) for standardizing the proportional gain (GAIN)	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0
Occupied	1 = Occupied by batch control	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OptimEn*	1 = Enable optimization of PID parameters by PID tuner	BOOL	0
OptimOcc*	1 = Optimization running	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 620)	STRUCT	-
		• Bit 0: BOOL	• 1
		• ...	• 1
		• Bit 31: BOOL	• 1
OS1Perm	I/O for operator control permissions (Page 620)	STRUCT	-
		• Bit 0: BOOL	• 1
		• Bit 18: BOOL	• 1
		• Bit 19: BOOL	• 1
		• Bit 31: BOOL	• 1

Parameter	Description	Type	Default
PropFacSP	Applying the P action to the feedback [0..1]. 0 = P action fully in feedback	REAL	1.0
PropSel	1 = Activate P action	BOOL	1
PV*	Process value (controlled variable)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_A_DC*	Delay time for incoming PV alarms [s]	REAL	0.0
PV_A_DG*	Delay time for outgoing PV alarms [s]	REAL	0.0
PV_AH_En	1 = Enable PV alarm limit (high)	BOOL	1
PV_AH_Lim	Limit PV alarm (high)	REAL	95.0
PV_AH_MsgEn	1 = Enable PV alarm (high) message	BOOL	1
PV_AL_En	1 = Enable PV alarm limit (low)	BOOL	1
PV_AL_Lim	PV alarm limit (low)	REAL	5.0
PV_AL_MsgEn	1 = Enable PV alarm (low) message	BOOL	1
PV_Hyst	Hysteresis for PV alarm, warning and tolerance limits	REAL	1.0
PV_OpScale	Limit for scale in PV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
PV_T_DC*	Delay time for incoming PV tolerance messages [s]	REAL	0.0
PV_T_DG*	Delay time for outgoing PV tolerance messages [s]	REAL	0.0
PV_TH_En	1 = Enable PV tolerance limit (high)	BOOL	0
PV_TH_Lim	Limit PV tolerance message (high)	REAL	85.0
PV_TH_MsgEn	1 = Enable message for PV tolerance message (high)	BOOL	1
PV_TL_En	1 = Enable PV tolerance limit (low)	BOOL	0
PV_TL_Lim	Limit PV tolerance message (low)	REAL	15.0
PV_TL_MsgEn	1 = Enable message for tolerance message (low)	BOOL	1
PV_Unit	Unit of measure for process value	INT	1001
PV_W_DC*	Delay time for incoming PV warnings [s]	REAL	0.0
PV_W_DG*	Delay time for outgoing PV warnings [s]	REAL	0.0
PV_WH_En	1 = Enable PV warning limit (high)	BOOL	1
PV_WH_Lim	Limit PV warning (high)	REAL	90.0
PV_WH_MsgEn	1 = Enable PV warning (high) message	BOOL	1
PV_WL_En	1 = Enable PV warning limit (low)	BOOL	1
PV_WL_Lim	Limit PV warning (low)	REAL	10.0
PV_WL_MsgEn	1 = Enable PV warning (low) message	BOOL	1
Rbk*	Position feedback for display on OS	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
RbkHyst	Alarm hysteresis for position feedback	REAL	1.0
RbkWH_En	1 = Enable warning (high) for position feedback	BOOL	1

Parameter	Description	Type	Default
RbkWH_Lim	Limit for position feedback of warning (high)	REAL	100.0
RbkWH_MsgEn	1 = Enable messages for warning (high) for position feedback	BOOL	1
RbkWL_En	1 = Enable warning (low) for position feedback	BOOL	1
RbkWL_Lim	Limit for position feedback of warning (low)	REAL	0.0
RbkWL_MsgEn	1 = Enable messages for warning (low) for position feedback	BOOL	1
RefStdDevIn	Reference value of PV standard deviation (sigma) in defined "good" state of control loop	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SafePos	1 = Neutral position (Page 37) for controller manipulated variable is ManHiLim 0 = Neutral position for controller manipulated variable is ManLoLim	BOOL	0
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimPV*	Process value used for SimOn = 1	REAL	0.0
SimPV_Li	Process value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SimRbk*	Position feedback used for SimOn = 1	REAL	0.0
SimRbkLi	Position feedback used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_DnRaLim	Limit (low) for the gradient of the setpoint [SP_Unit/s]	REAL	100.0
SP_ExHiLim	Limit (high) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80

Parameter	Description	Type	Default
SP_ExLoLim	Limit (low) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_Ext*	external setpoint - (to interconnection)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_ExtLi*	1 = Select external setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOp*	1 = Select external setpoint (via operator)	BOOL	0
SP_InHiLim	Limit (high) of internal setpoint	REAL	100.0
SP_InLoLim	Limit (low) of internal setpoint	REAL	0.0
SP_Int*	Internal setpoint for operation	REAL	0.0
SP_IntLi*	1 = Select internal setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_IntOp*	1 = Select internal setpoint (via operator)	BOOL	0
SP_LiOp	Select setpoint source (internal/external): 1 = Via interconnection 0 = Via operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_RateOn*	1 = Activate limitation of setpoint gradients	BOOL	0
SP_RmpModTime	1 = Use time (SP_RmpTime) for setpoint ramp 0 = Use gradient	BOOL	0
SP_RmpOn*	1 = Activate setpoint ramp to target setpoint SP_RmpTarget	BOOL	0
SP_RmpTarget	Target setpoint for setpoint ramp	REAL	0.0
SP_RmpTime*	Time for setpoint ramp [s] from current SP up to SP_RmpTarget	REAL	0.0
SP_TrkExt	1 = Bumpless switchover from external to internal setpoint active	BOOL	1
SP_TrkPV	1 = Setpoint follows PV in "manual mode" and with tracking	BOOL	0
SP_UpRaLim	Gradient limit (high) for the setpoint [SP_Unit/s]	REAL	100.0
StepNo	Batch step number	DWORD	16#00000000
TD	Derivative action time [s] TD.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
TI	Integral action time [s] TI.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#FF

Parameter	Description	Type	Default
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AdvCoAct	1 = "Program mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoRdy	1 = "Program mode" available	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutAct	1 = "Automatic mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CascaCut	Cascade connection: 1 = Control chain from primary to secondary controller is interrupted	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
D_Part	D action of PID algorithm	REAL	0.0
ENO	1 = Block algorithm completed without errors	BOOL	0
ER	Control deviation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ER_A_DCOut	Effective delay time [s] for incoming alarms at the control deviation monitoring	REAL	0.0
ER_AH_Act	1 = Alarm limit (high) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ER_AL_Act	1 = Alarm limit (low) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ErrorNum	Output of current error number. For error numbers that can be output by this block, see PIDConL error handling (Page 628)	INT	-1

Parameter	Description	Type	Default
FFwdHiAct	1 = Limit (high) for additive disturbance variable activation violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FFwdLoAct	1 = Limit (low) for additive disturbance variable activation violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GainEff	Effective proportional gain, depends on Gain, NormPV, and NormMV	REAL	1.0
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
I_Part	I action of PID algorithm	REAL	0.0
LoopClosed	1 = Control loop closed 0 = Control loop open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
ManHiOut	Limit (high) for "manual mode", corresponds to input parameter ManHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
ManLoOut	Limit (low) for "manual mode", corresponds to input parameter ManLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgAckn2	Alarm acknowledgement status 2 (output STATUS of second ALARM_8P)	WORD	16#0000
MsgErr1	1 = Alarm error 1 (output ERROR of the first ALARM_8P)	BOOL	0
MsgErr2	1 = Alarm error 2 (output ERROR of the second ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
MsgStat2	Alarm status 2 (output ERROR of second ALARM_8P)	WORD	16#0000
MV	Manipulated variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
MV_HiAct	1 = Limit (high) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_LoAct	1 = Limit (low) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_UnitOut	Unit of measure for manipulated variable, for interconnecting to the MV_Unit input parameter of the ConPerMon block	INT	0
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS1PermOut	Display of OS1Perm	DWORD	16#FFFFFFFF
OS1PermLog	Display of OS1Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
P_Part	P action of PID algorithm	REAL	0.0
PV_AH_Act	1 = PV alarm (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_AL_Act	1 = PV alarm (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Out	Output for process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_TH_Act	1 = PV tolerance message (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_TL_Act	1 = PV tolerance message (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
PV_ToleHi	Limit (high) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_ToleLo	Limit (low) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_WH_Act	1 = PV warning (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_WL_Act	1 = PV warning (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_UnitOut	Unit of measure for process value, for interconnecting with PV_Unit input parameter of the ConPerMon block	INT	0
RbkOut	Output for position feedback	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RbkWH_Act	1 = Warning (high) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkWL_Act	1 = Warning (low) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP	Setpoint used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_DnRaAct	1 = Negative gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExHiAct	1 = Limit (high) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExLoAct	1 = Limit (low) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
SP_ExtAct	1 = External setpoint is active 0 = Internal setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOut	External setpoint, corresponds to input parameter SP_Ext	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_InHiOut	Limit (high) for SP_Int corresponds to input parameter SP_InHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP_InLoOut	Limit (low) for SP_Int corresponds to input parameter SP_InLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_RateTarget	Target setpoint for the gradient limitation	REAL	0.0
SP_UpRaAct	1 = Positive gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 614)	DWORD	16#00000000
Status2	Status word 2 (Page 614)	DWORD	16#00000000
Status3	Status word 2 (Page 614)	DWORD	16#00000000
SumMsgAct	1 = Active process alarm	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Calculation of the output parameter ER_A_DCOut

ER_A_DC is assigned by default to the output before a setpoint change.

ER_A_DCOut = ER_A_DC

In the case of a setpoint change in the positive direction during automatic mode, the output is calculated as follows:

ER_A_DCOut = Maximum (ER_A_DC, ER_AH_DFac * Setpoint difference)

In the case of a setpoint change in the negative direction during automatic mode, the output is calculated as follows:

ER_A_DCOut = Maximum (ER_A_DC, -1*ER_AH_DFac * Setpoint difference)

When the control circuit has stabilized again, meaning

(ER_AL_Lim + ER_Hyst) <= ER <= (ER_AH_Lim – ER_Hyst)

and the delay time for outgoing alarms ER_A_DG has expired, the output is reset again to ER_A_DC: ER_A_DCOut = ER_A_DC

Activating and deactivating the function:

The function is deactivated (default) when the following applies: ER_AH_DFac = 0.0 and ER_AL_DFac = 0.0

See also

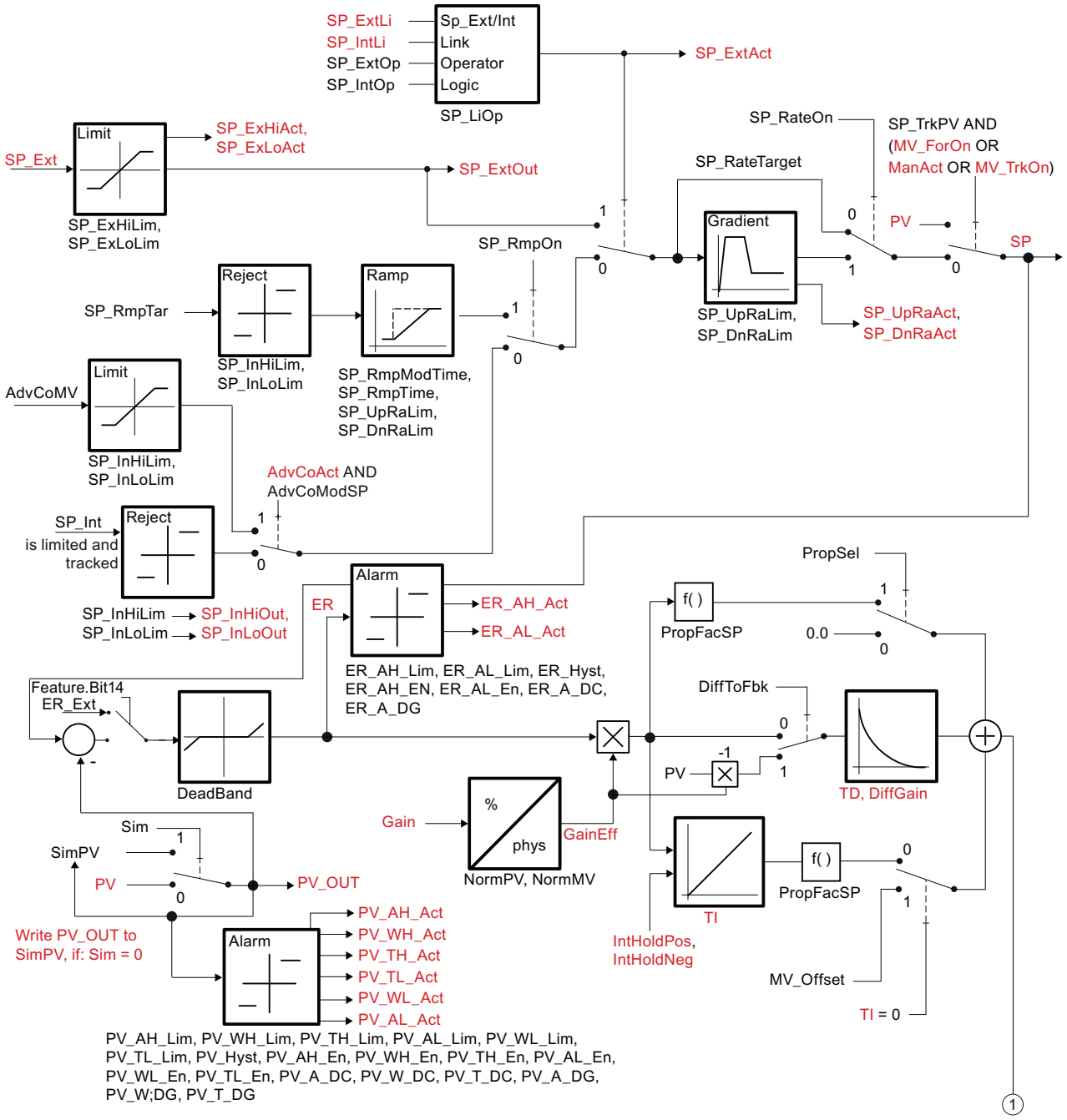
PIDConL messaging (Page 629)

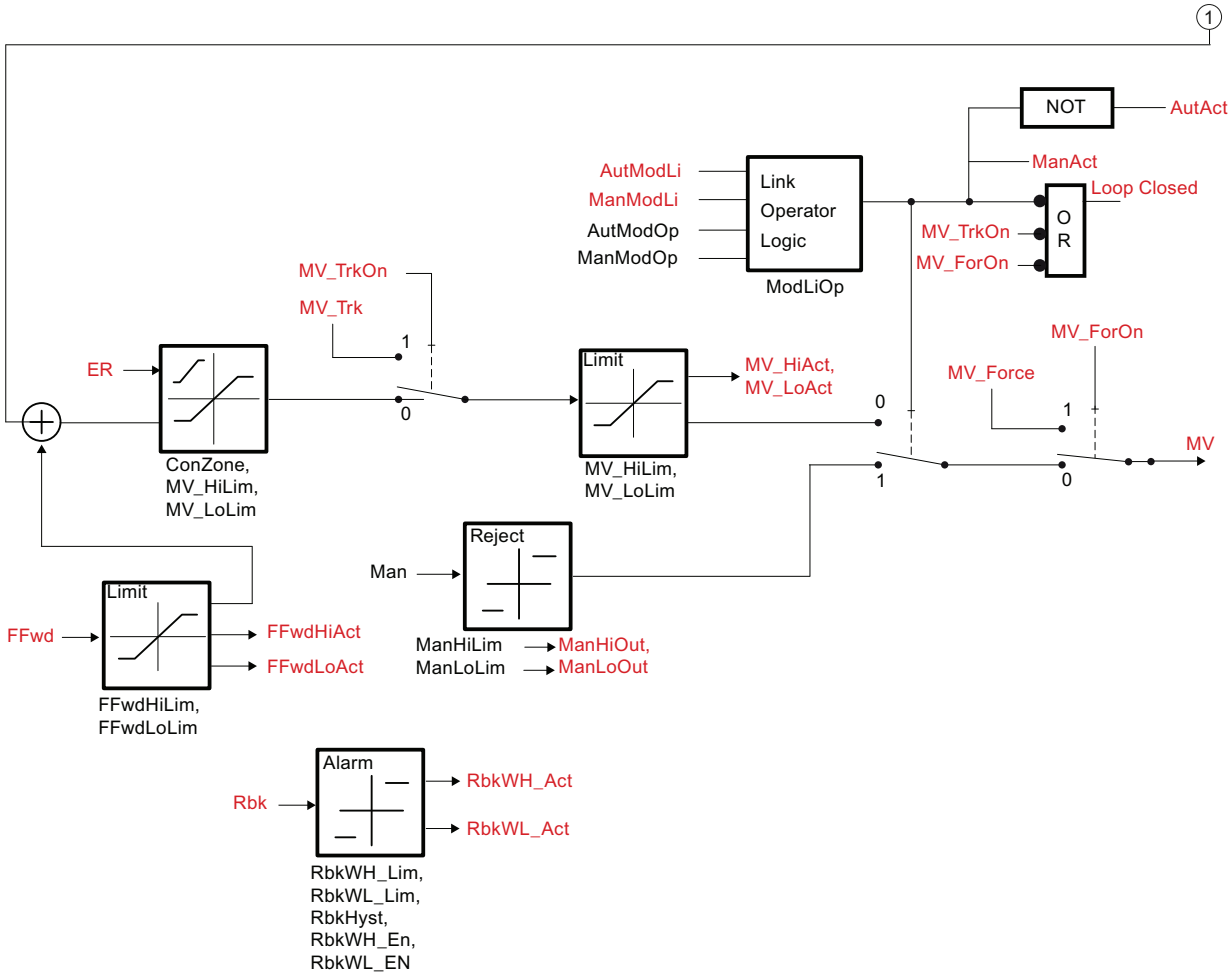
PIDConL block diagram (Page 646)

PIDConL modes (Page 619)

4.6.7 PIDConL block diagram

PIDConL block diagram





See also

PIDConL I/Os (Page 632)

PIDConL messaging (Page 629)

PIDConL error handling (Page 628)

PIDConL functions (Page 620)

PIDConL modes (Page 619)

Description of PIDConL (Page 614)

4.6.8 Operator control and monitoring

4.6.8.1 PIDConL views

Views of the PIDConL block

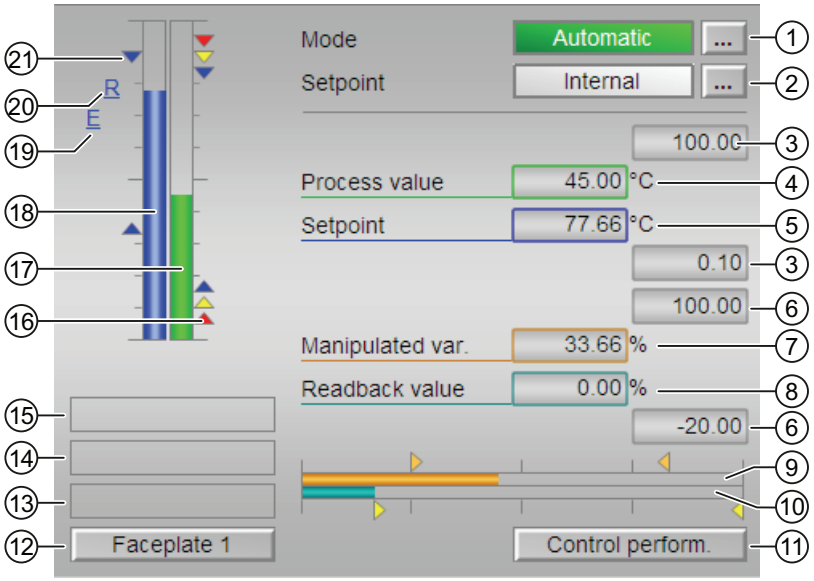
The block PIDConL provides the following views:

- PIDConL and PIDConR standard views (Page 648)
- Alarm view (Page 250)
- Limit value view of PID controllers (Page 240)
- Trend view (Page 253)
- Ramp view (Page 248)
- Parameter view of PID controllers (Page 232)
- Preview of PIDConL and PIDConR (Page 652)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icons for PID and FM controller (Page 193)

Refer to the Structure of the faceplate (Page 200) and Block icon structure (Page 185) sections for general information about the faceplate and block icon.

4.6.8.2 PIDConL and PIDConR standard views

PIDConL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 59)
- Automatic mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Displaying and switching the setpoint

This area shows how to specify the setpoint. The setpoint can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

You can find additional information on this in the Setpoint specification - internal/external (Page 112) section.

Note

With the PIDConR block, this area is only visible if you have set the `Feature` Bit Switching operator controls for external setpoint to visible (Page 120) to 1.

(3) High and low scale range for the process value

These values provide information on the display range for the bar graph of the process value. The scale range is defined in the engineering system.

(4) Display of the process value including signal status

This area shows the current process value with the corresponding signal status.

(5) Displaying and changing the setpoint including signal status

This area shows the current setpoint with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the setpoint. The setpoint specification also needs to be set to "Internal" for this block.

(6) High and low scale range for the setpoint

This area is already set and cannot be changed.

(7) Displaying and changing the manipulated variable including signal status

This area shows the current manipulated variable with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the manipulated variable. You can only make a change in manual mode.

(8) Display of the position feedback including signal status

This display is only visible when the corresponding block input is connected.

This area shows the current feedback of the manipulated variable with the corresponding signal status.

(9) Bar graph for the manipulated variable

This area shows the current manipulated variable in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(10) Bar graph for position feedback

This display is only visible when the corresponding block input is connected.

This area shows the current position feedback in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(11) Navigation button for switching to the standard view of the ConPerMon block

Use this navigation button to reach the standard view of the ConPerMon block. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See also the Opening additional faceplates (Page 165) section for more on this.

(12) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

See also the Opening additional faceplates (Page 165) section for more on this.

(13) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(14) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

You can find additional information on this in the Simulating signals (Page 47) section.

(15) Display area for block states

This area provides additional information on the operating state of the block (from high to low according to priority):

- "Optimizing"
- "Tracking"
- "Forced tracking"

(16) Limit display

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning
- Blue: Tolerance

(17) Bar graph for the process value

This area shows the current process value in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(18) Bar graph for the setpoint

This area shows the current setpoint in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(19) Display of external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(20) Display for the target setpoint of the setpoint ramp

This display [R] shows you the target setpoint and is only visible if you have enabled ramp generation in the Ramp view (Page 248).

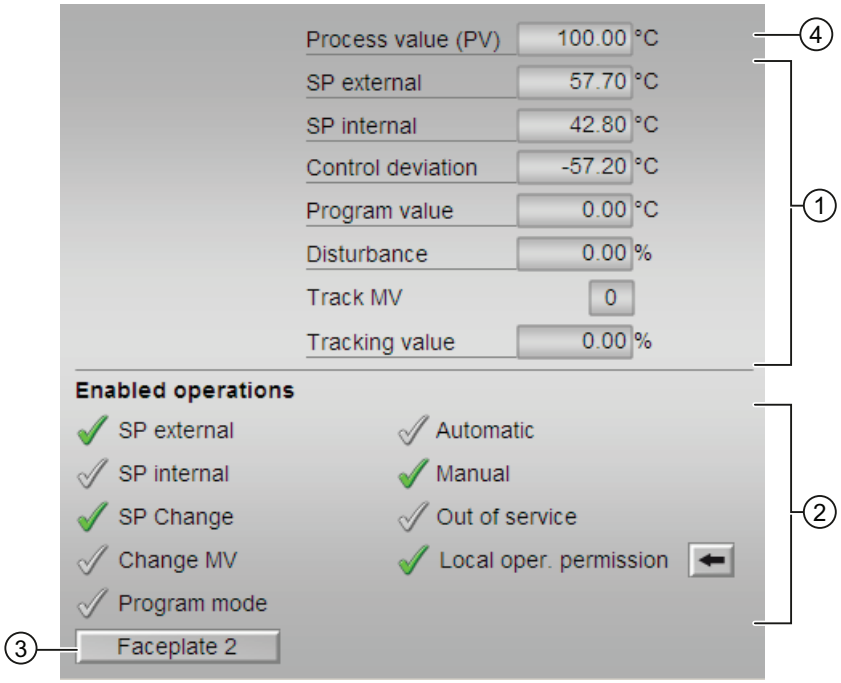
(21) Limit display for the setpoint

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the Engineering System (ES).

4.6.8.3 Preview of PIDConL and PIDConR

Preview of PIDConL

The preview shows you the parameters that you, as an OS operator, can control. You cannot control anything in this view, however.



(1) Preview area

This area shows you a preview for the following values:

- "SP external": currently applicable external setpoint
  - With the PIDConR block, this area is only visible if you have set the `Feature` Bit Switching operator controls for external setpoint to visible (Page 120) to 1
- "SP internal": currently applicable internal setpoint
- "Control deviation": Current control deviation
- "Program value": specified value for program mode
- "Disturbance variable": additive value for feedforward control
- "Track MV": Track manipulated variable (value is 1)
- "Tracking value": effective manipulated variable for "Track manipulated variable"

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: The OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

The following enabled operations are shown here:

- "SP external": You can feedforward the external setpoint.
- "SP internal": You can feedforward the internal setpoint.
- "Change SP": You can change the setpoint.
- "Change MV": You can change the manipulated variable.
- "Program mode": You can switch to "program mode".
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section titled Operator control permissions (Page 205).

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See also the Opening additional faceplates (Page 165) section for more on this.

(4) Process value

This area displays the real process value (`PV`).

4.7 PIDConR - Continuous PID controller with external reset

4.7.1 Description of PIDConR

Object name (type + number) and family

Type + number: FB 1875

Family: Control

Area of application for PIDConR

The block is used for the following applications:

- Fixed setpoint control
- Cascade control
- Ratio control
- Split-range control
- Smith predictor closed-loop control
- Override control (override)

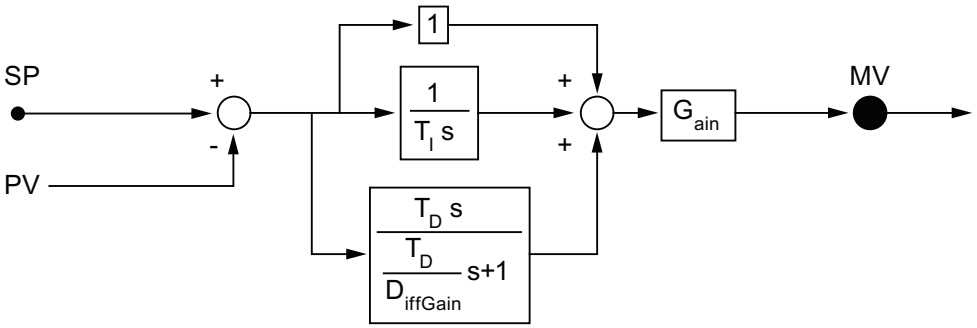
Unlike PIDConL, the PIDConR permits an external reset and satisfies the special requirements of the US market.

How it works

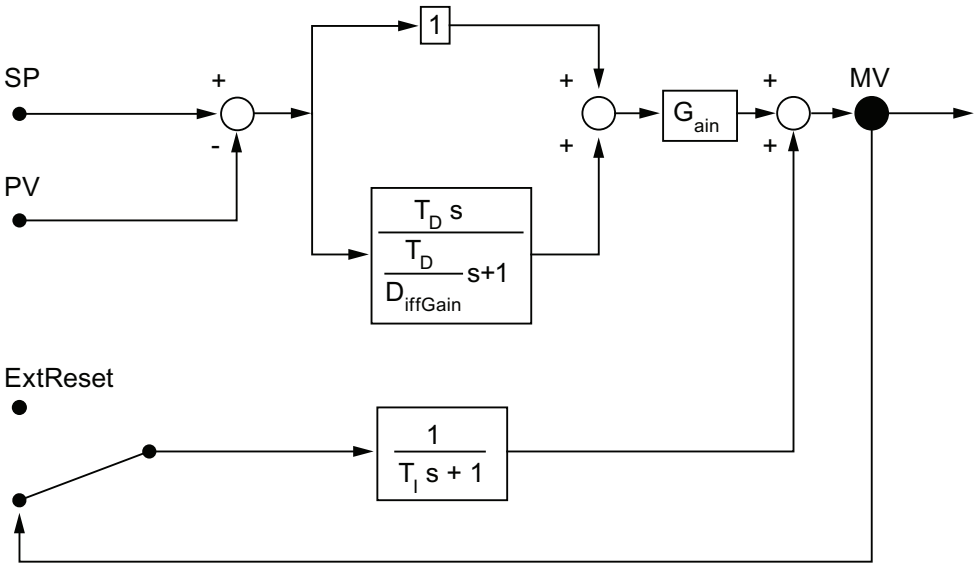
The block is a PID controller with continuous output signal (manipulated variable). It is used to activate a final controlling element with continuous action input.

The block functions following the PID algorithm with a delayed D action and an integrator with double precision. Its particular feature is that it is an incremental control algorithm with a serial-interactive structure. Incremental means that the current manipulated variable is calculated from the old manipulated variable of the last sampling step. In place of the old manipulated variable, an output point for the manipulated variable calculation (external reset) can be specified externally by interconnection. The difference between the parallel controller structure of the PIDConL and the serial-interactive structure of the PIDConR is shown in the next two diagrams.

PIDConL



PIDConR



The block is suitable for controlling sluggish control loops, for example, for temperatures and filling levels, and high-speed control loops, for example, for flow rates and speed. For a given CPU, a compromise has to be made between the number of controllers and the frequency with which the individual controllers have to be processed. The faster the modulated control loops are, i.e. the more frequently the manipulated variables have to be calculated per time unit, the lower the number of controllers that can be installed.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the control loop monitoring to work as planned in the trend view of the controller faceplates, the

`S7_xarchive:='Value, shortterm;'`

attributes in the process tag types for control loops at the controller function block must be set for the following tags:

- Input parameters:
  - `CPI_In`
- Output parameters
  - `MV`
  - `MV_HiAct`
  - `MV_LoAct`
  - `LoopClosed`
  - `SP`
  - `PV_Out`
  - `PV_ToleHi`
  - `PV_ToleLo`

For the PIDConR block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Cascade control with PIDConR (CascadeR) (Page 1812)
- Override control with PIDConR (OverrideR) (Page 1816)
- PIDConR with safety logic and control loop monitoring (PIDConR_ConPerMon) (Page 1800)
- Ratio control with PIDConR (RatioR) (Page 1809)

Note

The meaning of the controller parameters of both structures is different for all controller parameter settings with a D action. If you want to transfer parameter values from one structure to another, they have to be converted according to the formula in the PIDConR function section.

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section PIDConR I/Os (Page 678).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutAct.Value`
6	Not used
7	`ManAct.Value`
8	`SP_ExtAct.Value`
9	`MV_ForOn.Value`
10	`MV_TrkOn.Value` AND NOT (`ManAct.Value` OR `OosAct.Value` OR `MV_ForOn.Value`)
11	`MV.Value` > `ManLoLim`
12	`SimLiOp.Value`
13 - 14	Not used
15	`SP_LoadOn.Value`
16	`SP_LoadOn.Value` AND NOT (`MV_TrkOn.Value` OR `OosAct.Value` OR `MV_ForOn.Value`)
17	`Feature` Bit 19
18	`Feature` Bit 21
19	`AdvCoAct`
20	1 = Input parameter `Rbk` is not interconnected (`RbkOut.ST` = 16#FF)
21	`NegGain`
22	Not used
23	`OptimEn`
24	`OptimOcc`
25 - 27	Not used
28	`SimOn` AND `ManAct`
29 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	MsgLock
1	PV_AH_Act.Value
2	PV_WH_Act.Value
3	PV_TH_Act.Value
4	PV_TL_Act.Value
5	PV_WL_Act.Value
6	PV_AL_Act.Value
7	PV_AH_En
8	PV_WH_En
9	PV_TH_En
10	PV_TL_En
11	PV_WL_En
12	PV_AL_En
13	PV_AH_MsgEn
14	PV_WH_MsgEn
15	PV_TH_MsgEn
16	PV_TL_MsgEn
17	PV_WL_MsgEn
18	PV_AL_MsgEn
19	ER_AH_Act.Value
20	ER_AL_Act.Value
21	ER_AH_En
22	ER_AL_En
23	ER_AH_MsgEn
24	ER_AL_MsgEn
25	RbkWH_Act.Value
26	RbkWL_Act.Value
27	RbkWH_En
28	RbkWL_En
29	RbkWH_MsgEn
30	RbkWL_MsgEn
31	MS_RelOp

Status word allocation for `Status3` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8 - 26	Not used
27	`SP_UpRaAct`, `SP_DnRaAct` limits enabled for gradient mode (`SP_RateOn = 1`)
28	`GrpErr.Value`
29	`RdyToStart.Value`
30 - 31	Not used

See also

PIDConR block diagram (Page 691)

PIDConR messaging (Page 674)

PIDConR error handling (Page 673)

PIDConR functions (Page 662)

PIDConR modes (Page 659)

4.7.2 PIDConR modes

Operating modes of PIDConR

The block can be operated using the following modes:

- Automatic mode (Page 59)
- Manual mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

In "manual mode", the control settings for the device are made manually by the operator. The operator decides how to change the block's manipulated variable (output signal).

In "automatic mode", the controller's manipulated variable is calculated automatically by the block algorithm.

Changing between operating modes

The switchover between manual and automatic modes takes place as shown in the following schematic:

Switchover by using faceplates: The switchover between operating modes is carried out in the standard view of the faceplate. In the function block, the parameters `ManModOp` for "manual mode" and `AutModOp` for "automatic mode" are used.

Switchover via interconnection (CFC or SFC instance): The switchover between the operating modes is carried out by means of interconnection on the function block.

Note

You can access the variable parameters `AutModOp` and `ManModOp` from a normal SFC (in contrast to the instance of an SFC type). The SFC can thus change the operating mode without revoking the access rights of the operator.

Points to note for this block

With PIDConR the switchover between operating modes via interconnectable input parameters follows a different logic than that used for other controller blocks. This logic is oriented towards the special requirements of the US market. The basic approach is to issue the controller with certain commands by interconnection using an individual input parameter. The commands issued by interconnection take priority over the entries in the faceplate, i.e. if such a command input is made, the associated operator controls are locked in the faceplate:

- If the interconnectable `AutExtSet` = 1 input parameter is set, the controller goes into "automatic mode" with an external setpoint. This is also known as the "cascade" operating mode.
- If the interconnectable `AutIntSet` = 1 input parameter is set, the controller goes into "automatic" mode with internal setpoint. `AutIntSet` has higher priority than`AutExtSet`. For more information about the internal and external setpoint, refer to section PIDConR functions (Page 662).
- If the interconnectable input parameter `ManSet` = 1 is set, the controller goes into "manual" mode. This command has higher priority than `AutIntSet` and `AutExtSet`.
- If one of the interconnectable input parameters `MV_Close` or `MV_Open` is set, the controller also goes into "manual" operating mode and performs the corresponding command.

The `ModLiOp`, `ManModLi` and `AutModLi` input parameters are not therefore present in PIDConR.

Switchover from automatic mode to manual mode

When changing over from "automatic mode" to "manual mode", the last valid control settings (**M**anipiulated **V**alue `MV`)for the controller set in "automatic mode" remain valid until you change the control settings manually.

Switchover from automatic mode to manual mode

The switchover from manual to automatic mode can take place with or without the internal setpoint tracking the process value. You specify this behavior on the SP_TrkPV I/O, which can also be operated from the faceplate in the parameter view (Option "SP : = PV in Manual").

Switchover with tracked internal setpoint

(SP_TrkPV = 1) means that in "manual" mode the setpoint (SP) tracks the process variable (PV) (bumpless switchover). After switching back to "Automatic" mode, the manipulated variable remains constant until the setpoint value (SP) is changed or the process value (PV) changes.

Switchover without tracked internal setpoint

(SP_TrkPV = 0) means that the block immediately recalculates the value of the manipulated variable based on the setpoint and process value (PV) when the mode is changed. PIDConR only offers **switchover without P step**: During switchover, the I action of the controller is set in such a way that the switchover is carried out without a P step (virtually bumpless referring to the manipulated variable). A control deviation is only regulated via the I action.

Reaction of signals when operating mode is changed

Using the Feature Bit Resetting the commands for changing the mode (Page 135), you can specify whether the block automatically resets the signal for changing the operating mode.

"Program mode for controllers"

You can find general information about the "Program mode for controller" in the section Program mode for controllers (Page 65).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

PIDConR block diagram (Page 691)

PIDConR I/Os (Page 678)

PIDConR messaging (Page 674)

PIDConR error handling (Page 673)

Description of PIDConR (Page 654)

Disabling bumpless switchover to automatic mode for controllers (Page 145)

4.7.3 PIDConR functions

Functions of PIDConR

The functions for this block are listed below.

Generation of manipulated variables

The manipulated variable MV can be generated as follows:

MV_ForOn	MV_Close	MV_Open	ManAct	MV_TrkOn	AdvCoAct AND NOT AdvCoModSP	MV =	Limit monitoring	State
1	-	-	-	-	-	MV_Forced	none	Forced tracking through constraint without limitation
0	1	-	-	-	-	ManLoLim	ManHiLim ManLoLim	Close by interconnection
0	0	1	-	-	-	ManHiLim	ManHiLim ManLoLim	Open by interconnection
0	0	0	1	-	-	Man	ManHiLim ManLoLim	Manual mode, set by the OS operator or via the ManSet = 1 command
0	0	0	0	1	-	MV_Trk	MV_HiLim MV_LoLim	Tracking with limitation
0	0	0	0	0	1	AdvCoMV	MV_HiLim MV_LoLim	Higher-level program mode
0	0	0	0	0	0	PID.OUT + FFwd	MV_HiLim MV_LoLim	Automatic mode (PID algorithm)

If the controller is in "out of service" mode, the output parameter MV is set to the last valid value in manual mode or the neutral position manipulated variable depending on the Feature Bit Neutral position manipulated variable takes effect at startup (Page 139). Refer to the Out of service (Page 58) section for more on this.

The PIDConR offers the following special ways of influencing the generation of manipulated variables via interconnectable input parameters. The commands issued by interconnection take priority over the entries in the faceplate, i.e. if such a command input is made, the associated operator controls are locked in the faceplate.

MV_BumpOn is used for sudden manipulation of the manipulated variable and has a similar effect to MV_ForOn, the difference being that the appropriate limits are applied. If MV_BumpOn = 1 is set in "automatic mode", the MV_Bump manipulated variable is written in a limited manner between MV_HiLim and MV_LoLim to output MV. If MV_BumpOn = 1 is set in "manual mode", the MV_Bump manipulated variable is written in a limited manner between ManHiLim and ManLoLim to output MV. If MV_BumpOn is reset to 0, the controller returns to its previous mode.

MV_Close is used to close the adjustment valve. MV_Close = 1 switches the controller to "manual mode" with manipulated variable MV = ManLoLim. If MV_Close is reset to 0, the controller remains in "manual mode".

MV_Open is used to open the adjustment valve. MV_Open = 1 switches the controller to "manual mode" with manipulated variable MV = ManHiLim. If MV_Open is reset to 0, the controller remains in "manual mode".

These commands have higher priority than "automatic mode", but lower priority than forced tracking by MV_ForOn.

For meshed controller structures, such as a cascade control and closed-loop control with the PIDConR block, the ExtReset input parameter is used with ExtRstOn = 1 rather than MV_Trk with MV_TrkOn = 1 (also refer to the process tag types Cascade control with PIDConR (CascadeR) (Page 1812) and Override control with PIDConR (OverrideR) (Page 1816)).

Displaying additional information relating to the manipulated variable on the output

The manual manipulated variable limitations ManLoLim and ManHiLim are copied to the ManLoOut and ManHiOut output parameters so that they can be further interconnected to the secondary controller as setpoint limits SP_ExtLoLim and SP_ExtHiLim. If you want to use the same limit pairs for "manual" and "automatic" mode, you can interconnect output parameters ManLoOut and ManHiOut to input parameters MV_LoLim and MV_HiLim of the same block and thereby control the limits for manipulated variable limitation in the faceplate. In most cases, a valve's complete adjustment range can be passed through in "manual" mode. You can then further interconnect the ManLoOut and ManHiOut output parameters to the LoScale and HiScale input parameters of the assigned analog output channel block. Caution: If the valves have an open neutral position (SafePos = 1), this interconnection must be crossed over: LoScale = ManHiOut and HiScale = ManLoOut. On the controller, 0% is always interpreted as the valve being closed and 100% as the valve being open, but the channel block then issues a control signal of 0% for a 100% controller manipulated variable.

Tracking and limiting a manipulated variable

The block provides the standard function Tracking and limiting a manipulated variable (Page 153).

Neutral position

The block provides the standard function Neutral position for motors, valves and controllers (Page 37).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- CSF

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

"Actuator active" information

If the manipulated variable `MV` is greater than the minimum manual limit `ManLoLim`, this is recognized as actuator active. This status can be used to display a custom icon in the process image, for example, and is stored in the status word (you can find additional information under "Status word" in the Description of PIDConR (Page 654) section).

Limit monitoring of position feedback

The block provides the standard function Limit monitoring of the feedback (Page 80).

External/internal setpoint specification

This input of setpoints is carried out either using a CFC/SFC program or using the faceplate (operator). The operator can specify an internal setpoint value (`SP_Int`) or a higher-level open-loop control will specify an external setpoint value (`SP_Ext`).

Setpoint input internally and externally using faceplate

With PIDConR, the setpoint signal source is selected via the faceplate at the SP_IntOp = 1 parameter for the internal setpoint specification SP_ExtOp = 1 for external setpoint specification, just as it is with other controllers.

Note

In contrast to the other controllers, with PIDConR you can only switch to external setpoint specification via SP_ExtOp = 1 in automatic mode or in the program SP mode.

Setpoint input internally and externally using interconnection

With PIDConR the switchover between internal and external setpoint via interconnectable input parameters follows a different logic than that used for other controller blocks. This logic is oriented towards the special requirements of the US market.

The setpoint signal source (internal/external) can be selected by interconnection along with selection of the operating mode using the `AutIntSet` input parameter for automatic with an internal setpoint and `AutExtSet` for automatic with an external setpoint (additional information is available in the PIDConR modes (Page 659) section). The commands issued by interconnection take priority over the entries in the faceplate, i.e. if such a command input is made, the associated operator controls are locked in the faceplate. Input parameters `SP_LiOp`, `SP_ExtLi` and `SP_IntLi` on PIDConR are not therefore needed.

The PIDConR also offers a special way of influencing the setpoint input via interconnectable input parameters. Loading setpoints. If the SP_LoadOn = 1 input parameter is set, the controller goes into "automatic" mode. The value of the SP_Load input parameter is limited according to an internal setpoint and used for control purposes. If the parameter SP_LoadOn changes back from 1 to 0, the controller remains in "automatic" mode and sets the default setpoint back to the internal setpoint.

Loading a setpoint via SP_LoadOn takes priority over all other forms of setpoint input.

Bumpless switchover from external to internal setpoint

The parameter SP_TrkExt = 1 is used so that the internal setpoint tracks the external setpoint to achieve a Bumpless switchover from the external to the internal setpoint. This allows unwanted jumps at the output parameter to be avoided.

Setpoint limiting for external setpoints

The block provides the standard function Setpoint limiting for external setpoints (Page 153).

Gradient limit of the setpoint

The block provides the standard function Gradient limit of the setpoint (Page 109).

Using setpoint ramp

The block provides the standard function Using setpoint ramp (Page 108).

Tracking setpoint in manual mode

The block provides the standard function Tracking setpoint in manual mode (Page 153).

Simulating signals

The block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Process value (SimPV, SimPV_Li)
- Position feedback (SimRbk, SimRbkLi)

Limit monitoring of the process value

The block provides the standard function Limit monitoring of the process value (Page 72).

The PIDConR is the only block to have separate input parameters for the alarm delay at the high and low limits. Delay alarm for control deviation at setpoint step changes (Page 150)

Control deviation generation and dead band

The block provides the standard function Control deviation generation and dead band (Page 151).

Limit monitoring of control deviation

The block provides the standard function Limit monitoring of setpoint, manipulated variable and control deviation (Page 81).

Inverting control direction

The block provides the standard function Inverting control direction (Page 151).

Physical standardization of setpoint, manipulated variable and process value

Controller gain `Gain` is entered either using a physical variable or as standardized value.

`Gain` as a physical variable [`MV_Unit` / `PV_Unit`]:

The standardized variables retain their default values:

- `NormPV.High` = 100 and`NormPV.Low` = 0
- `NormMV.High` = 100 and `NormMV.Low` = 0

The effective gain is:

`GainEff` = `Gain`

Entering a standardized `Gain` (dimensionless):

Change the standardized variables to the actual range of the process values and manipulated variables.

- Internal and external setpoints; the process value and corresponding parameters are entered according to the physical measuring range of the process value.
- The manual value, the tracking value of the manipulated variable, feedforward control and the corresponding parameters are set according to the physical measuring range of the manipulated variable.

The effective gain is:

`GainEff` = (`NormMV.High` - `NormMV.Low`) / (`NormPV.High` - `NormPV.Low`) · `Gain`

Selecting a unit of measure

The block provides the standard function Selecting a unit of measure (Page 168).

PID algorithm

The manipulated variable is generated in automatic mode according to the following algorithm:

$$MV = \quad = G_{ain}\left[1+\frac{T_D s}{\frac{T_D}{D_{iffGain}}s+1}\right](PV-SP)+R_{eset}\left(\frac{1}{T_I s+1}\right)$$

Where:

s = complex number of the Laplace transformation

This formula describes a standard application where P, I and D action is activated

Unlike with PIDConL, the `Gain` gain factor is not applied to the I action.

The D action delay is derived from `TD` / `DiffGain`.

- The P action can be deactivated by `PropSel` = 0 .
- The I action can be deactivated by `IntSel` = 0 . The `MV_Offset` input parameter can then be used to add a constant value to the manipulated variable. Select this value such that the remaining control deviation equals zero at least at the control loop's typical operating point.
- The D action can be deactivated by `TD` = 0 .

Note

This formula describes a standard application where P, I and D action is activated and the P and D actions are not in the feedback circuit, while the P action is formed by the controller deviation (`PropSel = 1, TI <> 0, DiffToFbk = 1` and `PropFacSP = 1`).

If you set the `Feature` Bit Enabling bumpless change to the proportional gain, derivative time and amplification of the differentiator (Page 144) to 1, changes in the proportional gain `Gain` are carried out in a bumpless manner in "automatic" mode by converting the internal reset.

If a GainSched block is linked to the controller, you have to make the parameter settings for the `Feature` Bit Enabling bumpless change to the proportional gain, derivative time and amplification of the differentiator (Page 144) with 0.

The PID core algorithm is implemented in the PIDKernR function block which in turn calls a series of auxiliary functions for the 64-bit arithmetic. Every edge transition on the `InitPid` input parameter forces initialization equations to be carried out by PIDKernR. In so doing, the internal reset is calculated such that the `MV` output does not suffer a P step

Note

The meaning of the controller parameters with PIDConR is different to that with the other PID controllers for all controller parameter settings with a D action. If you want to transfer parameter values from one kind of controller to another, they have to be converted using the following formulas. The calculation is based on a simplified transfer function without a delay in the D action, and all three control channels are applied to the ER = SP - PV control deviation.

Parallel controller structure (e.g. PIDConL):

$$MV = G_{ain}\left(1+\frac{1}{T_I s}+T_D s\right)ER$$

The parameters of the serial-interactive controller structure (PIDConR)

$$MV = G'_{ain}\left(1+\frac{1}{T'_I s}\right)\left(T'_D s+1\right)ER$$

are marked using a speech mark. Both controllers calculate the same manipulated variable if the parameter values of the serial-interactive structure are determined by the following substitution:

$$G'_{ain} = \alpha G_{ain}\ ,\quad T'_I = \alpha T_I\ ,\quad T'_D = \frac{1}{\alpha}T_D$$

using the conversion factor

$$\alpha = \frac{1}{2}+\sqrt{\frac{1}{4}-\frac{T_D}{T_I}}$$

You can immediately see that the conversion factor only equals one if TD = 0 . The conversion is also possible in the other direction with

$$\alpha = \frac{T'_I}{T'_I+T'_D}$$

This conversion is performed automatically in the PID tuner.

Structure segmentation at controllers

The block provides the standard function Structure segmentation at controllers (Page 155).

Use output point for the manipulated variable calculation (external reset)

For the ExtResOn = 0 input parameter (default setting), the starting point for the manipulated variable calculation within the block is taken from manipulated variable MV. In other words, this is the manipulated variable of the last sampling step. If ExtResOn = 1, the ExtReset start parameter is used. This is used in particular for networked control structures, such as cascade or transfer control.

Anti-windup

A controller with incremental algorithm (external reset) inherently has an anti-windup reaction because the starting point for the manipulated variable calculation (external reset value) is limited provided it is taken internally from manipulated variable MV or is taken from another signal source with limitation. If the starting point for the manipulated variable calculation (external reset value) is at the limit (MV_HiLim or MV_LoLim), the I action is automatically frozen.

Feedforwarding and limiting disturbance variables

The block provides the standard function Feedforwarding and limiting disturbance variables (Page 155).

Forming the signal status for blocks

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

- Signal status for the process value PV_Out:

  The signal status of the output parameter PV_Out always corresponds to the signal status of input parameter PV or, if the block is in simulation mode, 16#60.

- Signal status for the setpoint value SP:

  The signal status of the SP output parameter is always equivalent to the signal status of input parameter SP_Ext or SP_Int, depending on how the setpoint is specified. If the internal setpoint SP_Int is used, the signal status is always output as 16#80.

- Signal status of the control deviation ER:

  The signal status of output parameter ER is obtained from the worst signal status of the two output parameters PV_Out and SP and is output. The signal status 16#60 (external simulation) is suppressed because the block acts as a sink with external simulation.

- Signal status for the manipulated variable MV:

  The signal status of output parameter MV is obtained in "automatic mode" or in "program mode" with default setpoint from the worst signal status of the two parameters FFwd and ER and is output. In "manual mode", the signal status is output as good. The signal status 16#60 (external simulation) is suppressed because the block acts as a sink with external simulation. In "manual mode", the signal status is output as good.

- Signal status for position feedback `RbkOut`:

  The signal status of `RbkOut` always corresponds to the signal status of input parameter `Rbk` or, if the block is in simulation mode, `16#60`.

- Worst signal status:

  The worst signal status `ST_Worst` for the block corresponds to the signal status of `MV`, but without suppression of external simulation.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
15	Neutral position manipulated variable takes effect with "out of service" operating mode (Page 139)
16	Neutral position manipulated variable takes effect at startup (Page 139)
17	Neutral position manipulated variable takes effect with "out of service" operating mode (Page 139)
19	Enabling program mode (Page 134)
20	Enabling bumpless change to the proportional gain, derivative time and amplification of the differentiator (Page 144)
21	Switching operator controls for external setpoint to visible (Page 120)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Operator control permissions

The block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode" `AutModOp`
1	1 = Operator can switch to "manual mode" `ManModOp`
2	1 = Operator can switch to "Out of service" mode `OosOp`
3	1 = Operator can switch to "program mode" `AdvCoOn`
4	1 = Operator can switch the setpoint to "external" `SP_ExtOp`
5	1 = Operator can switch the setpoint to "internal" `SP_IntOp`
6	1 = Operator can change the internal setpoint `SP_Int`
7	1 = Operator can change the manual parameter `Man`
8	1 = Operator can change operation high limit of the setpoint `SP_InHiLim`
9	1 = Operator can change operation low limit of the setpoint `SP_InLoLim`
10	1 = Operator can change the operation high limit of the manipulated variable `ManHiLim`
11	1 = Operator can change the operation low limit of the manipulated variable `ManLiLim`
12	1 = Operator can enable the setpoint's gradient limitation function `SP_RateOn`
13	1 = Operator can raise the gradient limit `SP_UpRaLim` of the setpoint
14	1 = Operator can lower the gradient limit `SP_DnRaLim` of the setpoint
15	1 = Operator can switch between the time value or the gradient value for specifying the ramp `SP_RmpModTime`
16	1 = Operator can change the ramp time `SP_RmpTime`
17	1 = Operator can change the target setpoint `SP_RmpTarget` for the setpoint ramp
18	1 = Operator can enable the setpoint ramp function `SP_RmpOn`
19	1 = Operator can permit the PID optimization function `OptimEn`
20	1 = Operator can enable the track setpoint in manual mode function `SP_TrkPV`
21	1 = Operator can enable the bumpless switchover from external to internal `SP_TrkExt`
22	1 = Operator can change the gain parameter `Gain`
23	1 = Operator can change the integral time parameter `TI`
24	1 = Operator can change the derivative time parameter `TD`
25	1 = Operator can change the derivative gain parameter `DiffGain`
26	1 = Operator can change the dead band parameter `DeadBand`
27 - 31	Not used

The block has the following permissions for the OS1Perm parameter:

Bit	Function
0	1 = Operator can change the limit (process value) PV_AH_Lim for the high alarm
1	1 = Operator can change the limit (process value) PV_WH_Lim for the high warning
2	1 = Operator can change the limit (process value) PV_TH_Lim for the high tolerance
3	1 = Operator can change the hysteresis (process value) PV_Hyst
4	1 = Operator can change the limit (process value) PV_TL_Lim for the low tolerance
5	1 = Operator can change the limit (process value) PV_WL_Lim for the low warning
6	1 = Operator can change the limit (process value) PV_AL_Lim for the low alarm
7	1 = Operator can change the limit (control deviation) ER_AH_Lim for the high alarm
8	1 = Operator can change the hysteresis (control deviation) ER_Hyst
9	1 = Operator can change the limit (control deviation) ER_AL_Lim for the low alarm
10	1 = Operator can change the limit (position feedback) RbkWH_Lim for the high warning
11	1 = Operator can change the hysteresis (position feedback) RbkHyst
12	1 = Operator can change the limit (position feedback) RbkWL_Lim for the low warning
13 - 15	Not used
16	1 = Operator can activate the Simulation function SimOn
17	1 = Operator can activate the Release for maintenance function MS_RelOp
18	1 = Operator can change the simulation value SimPV
19 - 31	Not used

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Release for maintenance

The block provides the standard function Release for maintenance (Page 52).

Generating instance-specific messages

The block provides the standard function Generating instance-specific messages (Page 162) without the time stamp function in the I/O.

Suppressing messages using the MsgLock parameter

This block provides the standard function Labeling of buttons and text (Page 167).

Specifying the display area for process and setpoint values as well as operations

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

See also

PIDConR I/Os (Page 678)

PIDConR messaging (Page 674)

PIDConR error handling (Page 673)

Program mode for controllers (Page 65)

4.7.4 PIDConR error handling

Error handling of PIDConR

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The ErrorNum output parameter can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of PV can no longer be displayed in the REAL number field.
31	The value of SP_Ext can no longer be displayed in the REAL number field.
32	The value of FFwd can no longer be displayed in the REAL number field.
33	The value of MV_Trk can no longer be displayed in the REAL number field.
34	The value of MV_Forced can no longer be displayed in the REAL number field.
35	The value of Rbk can no longer be displayed in the REAL number field.
36	The value of MV can no longer be displayed in the REAL number field.
60	|TI| < SampleTime / 2
61	|TD| < SampleTime
62	DiffGain < 1 or DiffGain > 10
63	TD / DiffGain < SampleTime / 2
64	PropFacSP < 0 or PropFacSP > 1
66	NormPV_High = NormPV_Low

See also

PIDConR block diagram (Page 691)
PIDConR I/Os (Page 678)
PIDConR messaging (Page 674)
PIDConR functions (Page 662)
PIDConR modes (Page 659)
Description of PIDConR (Page 654)

4.7.5 PIDConR messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 6	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId2, SIG 6).

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ PV - high alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ PV - high warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ PV - high tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ PV - low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ PV - low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ PV - low alarm limit violated
	SIG 7	Alarm - high	$$BlockComment$$ ER - high alarm limit violated
	SIG 8	Alarm - low	$$BlockComment$$ ER - low alarm limit violated
MsgEvId2	SIG 7	Warning - high	$$BlockComment$$ Rbk - high warning limit violated
	SIG 8	Warning - low	$$BlockComment$$ Rbk - low warning limit violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You can use up to four instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 1	AS process control message - fault	$$BlockComment$$ External message 1 Status 16#@5%x@
	SIG 2	AS process control message - fault	$$BlockComment$$ External message 2 Status 16#@6%x@
	SIG 3	AS process control message - fault	$$BlockComment$$ External message 3 Status 16#@7%x@
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 4 Status 16#@8%x@

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	Process value PV_Out
5	Control deviation ER
6	ExtVa106
7	ExtVa107
8	Not allocated
9	Not allocated
10	Not allocated

The associated values 6 ... 7 are allocated to the parameters ExtVa106 ... ExtVa107 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

Associated values for message instance `MsgEvId2`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	Position feedback `Rbk`
5	Signal status `ExtMsg1`
6	Signal status `ExtMsg2`
7	Signal status `ExtMsg3`
8	Signal status `ExtMsg4`
9	`ExtVa209`
10	`ExtVa210`

The associated values 9 ... 10 are allocated to the parameters `ExtVa209` ... `ExtVa210` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

PIDConR block diagram (Page 691)

PIDConR I/Os (Page 678)

PIDConR error handling (Page 673)

PIDConR functions (Page 662)

PIDConR modes (Page 659)

Description of PIDConR (Page 654)

4.7.6 PIDConR I/Os

I/Os of PIDConR

Input parameters

Parameter	Description	Type	Default
AdvCoEn	1 = Enable "program mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoOn*	1 = Enable "program mode" via faceplate	BOOL	0
AdvCoModSP	Type of "program mode": 1 = Setpoint specification 0 = Manipulated variable specification	BOOL	1
AdvCoMstrOn	1 = Enable (0-1) or disable (1-0) "program mode" via edge transition	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoMV	Specified value from the external program	REAL	0.0
AutExtSet*	1 = Activate "automatic" mode with external setpoint by interconnection (SP = SP_Ext)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutIntSet*	1 = Activate "automatic" mode with internal setpoint by interconnection (SP = SP_Op). AutIntSet has higher priority thanAutExtSet.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic" mode via operator	BOOL	0
BatchEn	1 = Enable allocation for batch control	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
CPI_In	Input for control performance index, which is calculated by the assigned ConPerMon block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DeadBand	Width of dead band	REAL	0.0
DiffGain	Gain of differentiator [1..10] DiffGain = TD / (delay time of D action)	STRUCT • Value: REAL • ST: BYTE	- • 5.0 • 16#80
DiffToFbk*	1 = D action is placed in the feedback	BOOL	1

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
ER_A_DC*	Delay for incoming alarms during control deviation monitoring	REAL	0.0
ER_AH_DFac*	Delay factor at positive setpoint step changes for incoming alarms at the control deviation monitoring ER_AH_Lim	REAL	0.0
ER_A_DG*	Delay for outgoing alarms during control deviation monitoring	REAL	0.0
ER_AH_En	1 = Activate alarm (high) for control deviation monitoring	BOOL	1
ER_AH_Lim	Alarm limit (high) for control deviation monitoring	REAL	100.0
ER_AH_MsgEn	1 = Activate messages for alarm (high) for control deviation monitoring	BOOL	1
ER_AL_DFac*	Delay factor at negative setpoint step changes for incoming alarms at the control deviation monitoring ER_AL_Lim	REAL	0.0
ER_AL_En	1 = Activate alarm (low) for control deviation monitoring	BOOL	1
ER_AL_Lim	Alarm limit (low) for control deviation monitoring	REAL	-100.0
ER_AL_MsgEn	1 = Activate messages for alarm (low) for control deviation monitoring	BOOL	1
ER_Hyst	Alarm hysteresis for control deviation	REAL	1.0
EventTsIn	Evaluation of the signal status of the EventTs message block. EventTsIn serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	1 = Binary input for freely selectable message 1 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	1 = Binary input for freely selectable message 2 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	1 = Binary input for freely selectable message 3 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg4	1 = Binary input for freely selectable message 4 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtReset	Value to which a reset is made if ExtRstOn = 1.	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ExtRstOn	1 = Reset externally	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	

Parameter	Description	Type	Default
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa209	Associated value 9 for messages (MsgEvID2)	ANY	
ExtVa210	Associated value 10 for messages (MsgEvID2)	ANY	
Feature	I/O for additional functions (Page 662)	STRUCT • Bit 0: BOOL • ... • Bit 20: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 1 • 0 • 0
FFwd*	Input for additive disturbance variable activation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
FFwdHiLim	Limit (high) for additive disturbance variable activation	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
FFwdLoLim	Limit (low) for additive disturbance variable activation	STRUCT • Value: REAL • ST: BYTE	- • -100.0 • 16#80
Gain	Proportional gain Gain.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#FF
InitPid*	InitPid edge transitions result in the PID algorithm's initialization equations being carried out. Is used, for example, for SP changes without MV jumps	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
IntSel	1 = I action activated	BOOL	1
Man*	Manual specification for the manipulated variable	REAL	0.0
ManHiLim	Limit (high) for manual parameter Man	REAL	100.0
ManLoLim	Limit (low) for manual parameter Man	REAL	0.0
ManModOp*	1 = "Manual" mode via OS operator	BOOL	1
ManSet*	1 = Activate "manual" mode via interconnection. ManSet has higher priority thanAutIntSet.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvID1	Message number (assigned automatically)	DWORD	16#00000000
MsgEvID2	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
MV_Bump*	Default value for controller output MV if MV_BumpOn = 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_BumpOn	1 = Set controller output MV:= MV_Bump without (!) taking the controller into "manual" mode.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Close	1 = Close adjustment valve by interconnection, i.e. MV:= MV_LoLim MV_Close has higher priority than MV_Open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Forced*	Forced manipulated variable that is not limited and assumes top priority	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_ForOn	1 = Forced manipulated variable MV_Forced output unlimited at output MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_HiLim	Limit (high) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
MV_LoLim	Limit (low) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_Offset	Manipulated variable for ER=0, operating point for controller with deactivated I action	REAL	0.0
MV_Open	1 = Open adjustment valve by interconnection, i.e. MV:= MV_HiLim MV_Open has higher priority than MV_TrkOn	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_OpScale	OS display range for manipulated variable MV	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
MV_Trk*	Tracking value for the manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_TrkOn	1 = Tracking of manipulated variable MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Unit	Unit of measure for manipulated variable	INT	1342

Parameter	Description	Type	Default
NegGain	0 = Positive controller gain: ER = Gain · (SP - PV) 1 = Negative controller gain: ER = Gain · (PV - SP)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NormMV	Manipulated variable range (MV) for standardizing the proportional gain (GAIN)	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
NormPV*	Process value range (PV) for standardizing the proportional gain (GAIN)	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
Occupied	Occupied by batch control	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OptimEn*	1 = Enable optimization of PID parameters by PID tuner	BOOL	0
OptimOcc*	1 = Optimization running	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 662)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
OS1Perm	I/O for operator control permissions (Page 662)	STRUCT • Bit 0: BOOL • Bit 18: BOOL • Bit 19:BOOL • Bit 31: BOOL	- • 1 • 1 • 1 • 1
PropFacSP	Applying the P action to the feedback [0..1]. 0 = P action fully in feedback	REAL	1.0
PropSel*	1 = Activate P action	BOOL	1
PV*	Process value (controlled variable)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_Unit	Unit of measure for process value	INT	1001
PV_AH_DC*	Delay time for incoming PV high alarms [s]	REAL	0.0
PV_AH_DG*	Delay time for outgoing PV high alarms [s]	REAL	0.0
PV_AH_En	1 = Enable PV alarm limit (high)	BOOL	1
PV_AH_Lim	Limit PV alarm (high)	REAL	95.0
PV_AH_MsgEn	1 = Enable PV alarm (high) message	BOOL	1

Parameter	Description	Type	Default
PV_AL_En	1 = Enable PV alarm limit (low)	BOOL	1
PV_AL_Lim	PV alarm limit (low)	REAL	5.0
PV_AL_MsgEn	1 = Enable PV alarm (low) message	BOOL	1
PV_AL_DC*	Delay time for incoming PVlow alarms [s]	REAL	0.0
PV_AL_DG*	Delay time for outgoing PV low alarms [s]	REAL	0.0
PV_Hyst	Hysteresis for PV alarm, warning and tolerance limits	REAL	1.0
PV_OpScale	Limit for scale in PV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
PV_TH_DC*	Delay time for incoming PV high tolerance messages [s]	REAL	0.0
PV_TH_DG*	Delay time for outgoing PV high tolerance messages [s]	REAL	0.0
PV_TH_En	1 = Enable PV tolerance limit (high)	BOOL	0
PV_TH_Lim	Limit PV tolerance message (high)	REAL	85.0
PV_TH_MsgEn	1 = Enable message for PV tolerance message (high)	BOOL	1
PV_TL_DC*	Delay time for incoming PV low tolerance messages [s]	REAL	0.0
PV_TL_DG*	Delay time for outgoing PV low tolerance messages [s]	REAL	0.0
PV_TL_En	1 = Enable PV tolerance limit (low)	BOOL	0
PV_TL_Lim	Limit PV tolerance message (low)	REAL	15.0
PV_TL_MsgEn	1 = Activate message for PV tolerance message (low)	BOOL	1
PV_WH_DC*	Delay time for incoming PV high warnings [s]	REAL	0.0
PV_WH_DG*	Delay time for outgoing PV high warnings [s]	REAL	0.0
PV_WH_En	1 = Enable PV warning limit (high)	BOOL	1
PV_WH_Lim	Limit PV warning (high)	REAL	90.0
PV_WH_MsgEn	1 = Enable PV warning (high) message	BOOL	1
PV_WL_DC*	Delay time for incoming PV low warnings [s]	REAL	0.0
PV_WL_DG*	Delay time for outgoing PV low warnings [s]	REAL	0.0
PV_WL_En	1 = Enable PV warning limit (low)	BOOL	1
PV_WL_Lim	Limit PV warning (low)	REAL	10.0
PV_WL_MsgEn	1 = Enable PV warning (low) message	BOOL	1
Rbk*	Position feedback for display on OS	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
RbkHyst	Alarm hysteresis for position feedback	REAL	1.0
RbkW_DC*	Delay time for incoming Rbk warnings [s]	REAL	0.0
RbkW_DG*	Delay time for outgoing Rbk warnings [s]	REAL	0.0
RbkWH_En	1 = Enable warning (high) for position feedback	BOOL	1
RbkWH_Lim	Limit for position feedback of warning (high)	REAL	100.0
RbkWH_MsgEn	1 = Enable messages for warning (high) for position feedback	BOOL	1
RbkWL_En	1 = Enable warning (low) for position feedback	BOOL	1
RbkWL_Lim	Limit for position feedback of warning (low)	REAL	0.0

Parameter	Description	Type	Default
RbkWL_MsgEn	1 = Enable messages for warning (low) for position feedback	BOOL	1
RefStdDevIn	Reference value of PV standard deviation (sigma) in defined "good" state of control loop	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SafePos	1 = Neutral position (Page 37) for controller manipulated variable is ManHiLim 0 = Neutral position for controller manipulated variable is ManLoLim	BOOL	0
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimPV*	Process value used for SimOn = 1	REAL	0.0
SimPV_Li	Process value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SimRbk*	Position feedback used for SimOn = 1	REAL	0.0
SimRbkLi	Position feedback used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_DnRaLim	Limit (low) for the gradient of the setpoint [SP_Unit/s]	REAL	100.0
SP_ExHiLim	Limit (high) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP_ExLoLim	Limit (low) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_Ext*	external setpoint - (to interconnection)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
SP_ExtOp*	1 = Select external setpoint (via operator)	BOOL	0
SP_InHiLim	Limit (high) of internal setpoint	REAL	100.0
SP_InLoLim	Limit (low) of internal setpoint	REAL	0.0
SP_Int*	Internal setpoint for operation	REAL	0.0
SP_IntOp*	1 = Select internal setpoint (via operator)	BOOL	0
SP_Load*	Defined setpoint, if SP_LoadOn = 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_LoadOn*	1 = Take controller into "automatic mode" with internal setpoint and set setpoint at SP:= SP_Load. This kind of setpoint input has maximum priority.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_RateOn*	1 = Activate limitation of setpoint gradients	BOOL	0
SP_RmpModTime	1 = Use time (SP_RmpTime) for setpoint ramp 0 = Use gradient	BOOL	0
SP_RmpOn*	1 = Activate setpoint ramp to target setpoint SP_RmpTarget	BOOL	0
SP_RmpTarget	Target setpoint for setpoint ramp	REAL	0.0
SP_RmpTime*	Time for setpoint ramp [s] from current SP up to SP_RmpTarget	REAL	0.0
SP_TrkExt	1 = Bumpless switchover from external to internal setpoint active	BOOL	1
SP_TrkPV	1 = Setpoint follows PV in "manual mode" and with tracking	BOOL	0
SP_UpRaLim	Gradient limit (high) for the setpoint [SP_Unit/s]	REAL	100.0
StepNo	Batch step number	DWORD	16#00000000
TD	Derivative action time [s] TD.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
TI	Integral action time [s] TI.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#FF
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AdvCoAct	1 = "Program mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoRdy	1 = "Program mode" available	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutAct	1 = "Automatic mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CascaCut	Cascade connection: 1 = Control chain from primary to secondary controller is interrupted	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ER	Control deviation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ER_A_DCOut	Effective delay time [s] for incoming alarms at the control deviation monitoring	REAL	0.0
ER_AH_Act	1 = Alarm limit (high) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ER_AL_Act	1 = Alarm limit (low) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ErrorNum*	Output of current error number. For error numbers that can be output by this block, see PIDConR error handling (Page 673)	INT	-1
FFwdHiAct	1 = Limit (high) for additive disturbance variable activation violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FFwdLoAct	1 = Limit (low) for additive disturbance variable activation violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GainEff	Effective proportional gain, depends on Gain, NormPV, and NormMV	REAL	1.0

Parameter	Description	Type	Default
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LoopClosed	1 = Control loop closed 0 = Control loop open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
ManHiOut	Limit (high) for "manual mode", corresponds to input parameter ManHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
ManLoOut	Limit (low) for "manual mode", corresponds to input parameter ManLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgAckn2	Alarm acknowledgement status 2 (output STATUS of second ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgErr2	Alarm error 2 (output ERROR of second ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
MsgStat2	Alarm status 2 (output ERROR of second ALARM_8P)	WORD	16#0000
MV	Manipulated variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_HiAct	1 = Limit (high) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_LoAct	1 = Limit (low) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_UnitOut	Unit of measure for manipulated variable, for interconnecting to the MV_Unit input parameter of the ConPerMon block	INT	0

Parameter	Description	Type	Default
OosAct	1 = Block is "out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS1PermOut	Display of OS1Perm	DWORD	16#FFFFFFFF
OS1PermLog	Display of OS1Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
PV_AH_Act	1 = PV alarm (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_AL_Act	1 = PV alarm (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Out	Output for process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_TH_Act	1 = PV tolerance message (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_TL_Act	1 = PV tolerance message (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_ToleHi	Limit (high) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_ToleLo	Limit (low) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_UnitOut	Unit of measure for process value, for interconnecting to the PV_Unit input parameter of the ConPerMon block	INT	0
PV_WH_Act	1 = PV warning (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
PV_WL_Act	1 = PV warning (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkOut	Output for position feedback	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RbkWH_Act	1 = Warning (high) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkWL_Act	1 = Warning (low) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP	Setpoint used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_DnRaAct	1 = Negative gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExHiAct	1 = Limit (high) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExLoAct	1 = Limit (low) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtAct	1 = External setpoint is active 0 = Internal setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOut	External setpoint, corresponds to input parameter SP_Ext	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_InHiOut	Limit (high) for SP_Int corresponds to input parameter SP_InHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80

Parameter	Description	Type	Default
SP_InLoOut	Limit (low) for SP_Int corresponds to input parameter SP_InLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_RateTarget	Target setpoint for the gradient limitation	REAL	0.0
SP_UpRaAct	Positive gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 654)	DWORD	16#00000000
Status2	Status word 2 (Page 654)	DWORD	16#00000000
Status3	Status word 2 (Page 654)	DWORD	16#00000000
SumMsgAct	1 = Active process alarm	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

* Values can be written back to these inputs during processing of the block by the block algorithm.

Calculation of the output parameter ER_A_DCOut

ER_A_DC is assigned by default to the output before a setpoint change.

ER_A_DCOut = ER_A_DC

In the case of a setpoint change in the positive direction during automatic mode, the output is calculated as follows:

ER_A_DCOut = Maximum (ER_A_DC, ER_AH_DFac * Setpoint difference)

In the case of a setpoint change in the negative direction during automatic mode, the output is calculated as follows:

ER_A_DCOut = Maximum (ER_A_DC, -1*ER_AH_DFac * Setpoint difference)

When the control circuit has stabilized again, meaning

(ER_AL_Lim + ER_Hyst) <= ER <= (ER_AH_Lim – ER_Hyst)

and the delay time for outgoing alarms ER_A_DG has expired, the output is reset again to ER_A_DC: ER_A_DCOut = ER_A_DC

Activating and deactivating the function:

The function is deactivated (default) when the following applies: ER_AH_DFac = 0.0 and ER_AL_DFac = 0.0

See also

PIDConR block diagram (Page 691)
PIDConR messaging (Page 674)
PIDConR modes (Page 659)

4.7.7 PIDConR block diagram

PIDConRblock diagram

A block diagram is not provided for this block.

See also

PIDConR I/Os (Page 678)
PIDConR messaging (Page 674)
PIDConR error handling (Page 673)
PIDConR functions (Page 662)
PIDConR modes (Page 659)
Description of PIDConR (Page 654)

4.7.8 Operator control and monitoring

4.7.8.1 PIDConR views

Views of the PIDConR block

This block has the same views as the PIDConL block. Refer to the section Operator control and monitoring (Page 648) of the PIDConL block.

4.8 PIDStepL - step controller

4.8.1 Description of PIDStepL

Object name (type + number) and family

Type + number: FB 1878

Family: Control

Area of application for PIDStepL

The block is used for the following applications:

- Fixed setpoint control
- Cascade control
- Ratio control
- Split-range control
- Smith predictor closed-loop control
- Override control (override)

Note on restricting the area of application: The block is not intended for pulse-duration modulation. Examples of applications: Temperature control with electric heater, which can switched on an off via a (semiconductor) relay. The heating power required by the controller, for example 80%, is output in the form of binary pulses, whereby the duration of the on pulses in this case is four times as long as the pause duration. Such control is built with a combination of a continuous controller (such as PIDConL) and the pulse generator module PULSEGEN from the CFC library ELEM_400.

How it works

The block is a PID step controller with binary output signals (manipulated variable signals). It is used to control integral action actuators (e.g. valves driven by motors).

The block functions following the PID algorithm with a delayed D action and an integrator with double precision.

The step controller can function both with and without a position feedback for the valve position.

The block is suitable for controlling sluggish control loops, for example, for temperatures and filling levels, and high-speed control loops, for example, for flow rates and speed. For a given CPU, a compromise has to be made between the number of controllers and the frequency with which the individual controllers have to be processed. The faster the modulated control loops are, i.e. the more frequently the manipulated variables have to be calculated per time unit, the lower the number of controllers that can be installed.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the control loop monitoring to work as planned in the trend view of the controller faceplates, the

`S7_xarchive:='Value, shortterm;'`

attributes in the process tag types for control loops at the controller function block must be set for the following tags:

- Input parameters:
  - `CPI_In`
- Output parameters
  - `MV`
  - `MV_HiAct`
  - `MV_LoAct`
  - `LoopClosed`
  - `SP`
  - `PV_Out`
  - `PV_ToleHi`
  - `PV_ToleLo`

For the PIDStepL block, the Advanced Process Library contains templates for process tag types as examples and there is a example project (APL_Example_xx, xx designates the language variant) containing different application cases for this block.

Several process tag types are simulated in the example project and serve to explain the block function.

Examples of process tag types:

- Step controller with direct access to the actuator and without position feedback (StepControlDirect) (Page 1805)
- Step controller with assigned actuator block and position feedback (StepControlActor) (Page 1805)

Startup characteristics

Use the Setting the startup characteristics (Page 116) feature to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section PIDStepL I/Os (Page 710).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutAct.Value`
6	Not used
7	`ManAct.Value`
8	`SP_ExtAct.Value`
9	`MV_ForOn.Value`
10	`MV_TrkOn.Value`
11	NOT `RbkClosed.Value`
12	`Open.Value`
13	`Close.Value`
14	`Stop.Value`
15	`FbkOpened.Value`
16	`FbkClosed.Value`
17	`SimLiOp.Value`
18	`SimOn` AND `ManAct`
19	`AdvCoAct`
20	1 = Input parameter `Rbk` is not interconnected (`RbkOut.ST` = 16#FF)
21	`NegGain`
22	Not used
23	`OptimEn`
24	`OptimOcc`
25 - 30	Not used
31	`WithRbk` = 1 (Step controller with position feedback)

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock`
1	`PV_AH_Act.Value`
2	`PV_WH_Act.Value`
3	`PV_TH_Act.Value`
4	`PV_TL_Act.Value`
5	`PV_WL_Act.Value`
6	`PV_AL_Act.Value`

Status bit	Parameter
7	PV_AH_En
8	PV_WH_En
9	PV_TH_En
10	PV_TL_En
11	PV_WL_En
12	PV_AL_En
13	PV_AH_MsgEn
14	PV_WH_MsgEn
15	PV_TH_MsgEn
16	PV_TL_MsgEn
17	PV_WL_MsgEn
18	PV_AL_MsgEn
19	ER_AH_Act.Value
20	ER_AL_Act.Value
21	ER_AH_En
22	ER_AL_En
23	ER_AH_MsgEn
24	ER_AL_MsgEn
25	RbkWH_Act.Value
26	RbkWL_Act.Value
27	RbkWH_En
28	RbkWL_En
29	RbkWH_MsgEn
30	RbkWL_MsgEn
31	MS_RelOp

Status word allocation for Status3 parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via EventTsIn
1	Effective signal 2 of the message block connected via EventTsIn
2	Effective signal 3 of the message block connected via EventTsIn
3	Effective signal 4 of the message block connected via EventTsIn
4	Effective signal 5 of the message block connected via EventTsIn
5	Effective signal 6 of the message block connected via EventTsIn
6	Effective signal 7 of the message block connected via EventTsIn
7	Effective signal 8 of the message block connected via EventTsIn
8 - 26	Not used
27	SP_UpRaAct, SP_DnRaAct limits enabled for gradient mode (SP_RateOn = 1)
28	GrpErr.Value

Status bit	Parameter
29	RdyToStart.Value
30 - 31	Not used

See also

PIDStepL functions (Page 697)

PIDStepL messaging (Page 707)

PIDStepL modes (Page 696)

PIDStepL error handling (Page 706)

PIDStepL block diagram (Page 724)

4.8.2 PIDStepL modes

PIDStepL modes

The block can be operated using the following modes:

- Automatic mode (Page 59)
- Manual mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and bumpless switchover in the section Manual and automatic mode for control blocks (Page 59).

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for control blocks (Page 59).

"Program mode for controllers"

You can find general information about the "Program mode for controller" in the section Program mode for controllers (Page 65).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of PIDStepL (Page 692)

PIDStepL functions (Page 697)

PIDStepL error handling (Page 706)

PIDStepL messaging (Page 707)

PIDStepL I/Os (Page 710)

PIDStepL block diagram (Page 724)

4.8.3 PIDStepL functions

Functions of PIDStepL

The functions for this block are listed below.

Generation of manipulated variables with position feedback (`WithRbk` = 1)

The manipulated variable `MV` and therefore the actuating signals `Open`, `Close` and `Stop` can be generated as follows:

MV_For On	Man Act	MV_Tr kOn	AdvCoA ct AND NOT AdvCoM odSP	MV =	Limit monitoring	State	Open, Close, Stop
1	-	-	-	MV_Forc ed	none	Forced tracking through constraint without limitation	Depending on `Rbk` and `MV`, the output signals `Open`, `Close` and `Stop` are generated using the algorithm of a positioner.
0	1	-	-	Man	ManHiLim ManLoLim	Manual mode, set by the operator	
0	0	1	-	MV_Trk	MV_HiLim MV_LoLim	Tracking with limitation	
0	0	0	1	AdvCoMV	MV_HiLim MV_LoLim	Higher-level program mode	
0	0	0	0	P_Part + I_Part + D_Part + FFwd	MV_HiLim MV_LoLim	Automatic mode (PID algorithm)	

If the controller is in "out of service" mode, the output parameter MV is set to the last valid value in manual mode or the neutral position manipulated variable depending on the Feature Bit (Neutral position manipulated variable takes effect at startup (Page 139)). Refer to the Out of service (Page 58) section for more on this.

Generation of actuating signal without position feedback (WithRbk = 0)

The manipulated variable MV can be generated as follows:

ManAct	Open, Close, Stop	State
1	The output signals are generated using input signals OpenOp/Li, CloseOp/Li or StopOp/Li	Manual mode, set by the operator
0	The output signals are generated using PID output parameters P_Part, I_Part, D_Part and FFwd	Automatic mode (PID algorithm)

If the controller is in "out of service" mode, the output parameter MV is set to the last valid value in manual mode or the neutral position manipulated variable depending on the Feature Bit (Neutral position manipulated variable takes effect at startup (Page 139)). Refer to the Out of service (Page 58) section for more on this.

Tracking and limiting a manipulated variable

The block provides the standard function Tracking and limiting a manipulated variable (Page 153).

Note

This function is only available to you if position feedback is enabled for the controller (WithRbk = 1).

Neutral position

The block provides the standard function Neutral position for motors, valves and controllers (Page 37).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming group errors:

- CSF

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

"Actuator active" information

If the parameter is `FbkClosed` = 0, this is known as "Actuator active". This status can be used to indicate, for example, a customized icon in the process image and is saved in the status word (see Status word section in Description of PIDStepL (Page 692)).

Limit monitoring of position feedback

The block provides the standard function Limit monitoring of the feedback (Page 80).

Note

This function is only available to you if position feedback is enabled for the controller (`WithRbk` = 1).

External/internal setpoint specification

The block provides the standard function Setpoint specification - internal/external (Page 112).

Setpoint limiting for external setpoints

The block provides the standard function Setpoint limiting for external setpoints (Page 153).

Gradient limit of the setpoint

The block provides the standard function Gradient limit of the setpoint (Page 109).

Using setpoint ramp

The block provides the standard function Using setpoint ramp (Page 108).

Tracking setpoint in manual mode

The block provides the standard function Tracking setpoint in manual mode (Page 153).

Simulating signals

The block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Process value (`SimPV, SimPV_Li`)
- Position feedback (`SimRbk, SimRbkLi`)

Limit monitoring of the process value

The block provides the standard function Limit monitoring of the process value (Page 72).

Control deviation generation and dead band

The block provides the standard function Control deviation generation and dead band (Page 151).

Limit monitoring of control deviation

The block provides the standard function Limit monitoring of setpoint, manipulated variable and control deviation (Page 81).

Inverting control direction

The block provides the standard function Inverting control direction (Page 151).

Physical standardization of setpoint, manipulated variable and process value

Controller gain `Gain` is entered either using a physical variable or as standardized value.

`Gain` as a physical variable:

The standardized variables retain their default values:

- `NormPV.High` = 100 and `NormPV.Low` = 0

The effective gain is:

`GainEff` = `Gain`

Entering a standardized `Gain` (dimensionless):

Change the standardized variables to the actual range of the process values and manipulated variables.

- Internal and external setpoints; the process value and corresponding parameters are entered according to the physical measuring range of the process value.
- The manual parameter, the tracking value of the manipulated variable, feedforward control and the corresponding parameters are entered as a percentage 0 ... 100 .

The effective gain is:

`GainEff` = 100.0 / (`NormPV.High` - `NormPV.Low`) · `Gain`

Selecting a unit of measure

The block provides the standard function Selecting a unit of measure (Page 168).

PID algorithm

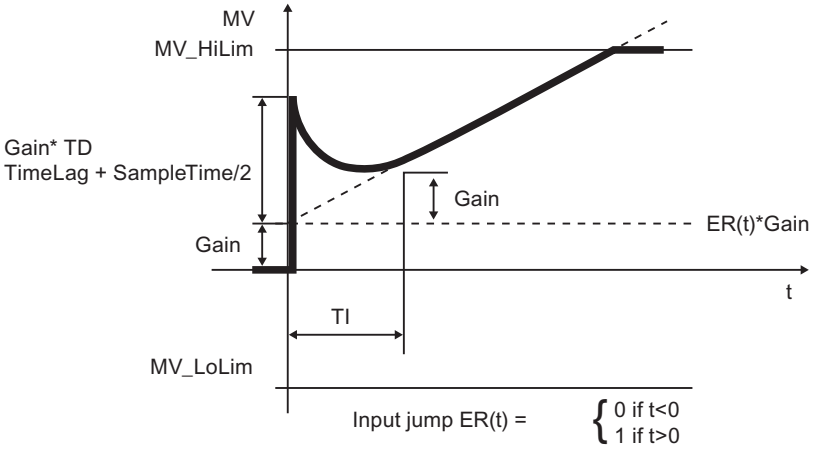
The manipulated variable is generated in automatic mode according to the following algorithm:

`MV` = `Gain` · (1 + 1 / (`TI` · s) + (`TD` · s) / (1 + `TD` / `DiffGain` · s)) · `ER`

Where:

s = Complex number

The following step response occurs:



Note

The formula describes a standard application where P, I and D actions are activated and the P and D actions are not in the feedback circuit (`PropSel` = 1, `TI` <> 0, `DiffToFbk` = 0 and `PropFacSP` = 1).

The D action delay is derived from `TD` / `DiffGain`.

- The P action is displayed after `P_Part` and can be deactivated using `PropSel` = 0 .
- The I action is displayed after `I_Part` and can be deactivated using `TI` = 0 .
- The D action is displayed after `D_Part` and can be deactivated using `TD` = 0 .

Structure segmentation at controllers

The block provides the standard function Structure segmentation at controllers (Page 155).

Anti-windup

The controller has an anti-windup function. The I action is frozen after the manipulated variable has reached limits (`MV_HiLim` or `MV_LoLim`).

Feedforwarding and limiting disturbance variables

The block provides the standard function Feedforwarding and limiting disturbance variables (Page 155).

Forming the signal status for blocks

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

- Signal status for the process value `PV_Out`:

  The signal status from the output parameter `PV_Out` always corresponds to the signal status of input parameter `PV` or, if the block is in simulation mode, 16#60.

- Signal status for the setpoint value `SP`:

  The signal status of output parameter `SP` is always equivalent to the signal status of input parameter `SP_Ext` or `SP_Int`, depending on how the setpoint is specified. If the internal setpoint `SP_Int` is used, the signal status is always output as 16#80 .

- Signal status of the control deviation `ER`:

  The signal status of output parameter `ER` is obtained from the worst signal status of the two output parameters `PV_Out` and `SP` and is output.

  The signal status `16#60` (external simulation) is suppressed because the block acts as a sink with external simulation.

- Signal status for the position feedback `RbkOut`:

  The signal status of `RbkOut` always corresponds to the signal status of input parameter `Rbk` or, if the block is in simulation mode, `16#60`. `RbkOut` is always `16#80` for step controllers without position feedback.

- Signal status for the manipulated variable `MV`:

  The signal status of output parameter `MV` is obtained in "automatic mode" from the worst signal status of the following parameters and is output:

  `ER.STFFwd.STFbkOpened.STFbkClosed.STRbkOut.ST`The signal status `16#60` (external simulation) is suppressed because the block acts as a sink with external simulation. In "manual mode" and for step controllers without position feedback, the signal status is always output as good.

- Signal status for `Open`, `Close`, `Stop`:

  The signal status is `16#60` when simulation is activated; otherwise, it is always `16#80`.

- Worst signal status:

  The worst signal status `ST_Worst` for the block corresponds to the signal status of `MV`, but without suppression of external simulation.

Note

The `RbkOut.ST` parameter is always (`WithFbk` = 0) for a step controller without position feedback 16#80.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
4	Setting switch or button mode (Page 140)
15	Neutral position manipulated variable takes effect with "out of service" operating mode (Page 139)
16	Neutral position manipulated variable takes effect at startup (Page 139)
18	Disabling bumpless switchover to automatic mode for controllers (Page 145)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Operator control permissions

The block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode" `AutModOp`
1	1 = Operator can switch to "manual mode" `ManModOp`
2	1 = Operator can switch to "Out of service" mode `OosOp`
3	1 = Operator can switch to "program mode" `AdvCoEn`
4	1 = Operator can switch the setpoint to "external" `SP_ExtOp`
5	v Operator can switch the setpoint to "internal" `SP_IntOp`
6	1 = Operator can change the internal setpoint `SP_Int`
7	Step controller with position feedback `WithRbk` =1: 1 = Operator can change the manual parameter `Man` Step controller without position feedback `WithRbk` =0: 1 = Operator can change the manual operation signals `OpenOp`, `StopOp`, `CloseOp`
8	1 = Operator can change operation high limit of the setpoint `SP_InHiLim`
9	1 = Operator can change operation low limit of the setpoint `SP_InLoLim`
10	1 = Operator can change the operation high limit of the manipulated variable `ManHiLim`
11	1 = Operator can change the operation low limit of the manipulated variable `ManLiLim`
12	1 = Operator can enable the setpoint's gradient limitation function `SP_RateOn`

Bit	Function
13	1 = Operator can change the setpoint's high limit for the ramp `SP_UpRaLim`
14	1 = Operator can change the setpoint's low limit for the ramp `SP_DnRaLim`
15	1 = Operator can switch between the time value or the value for the ramp `SP_RmpModTime`
16	1 = Operator can change the ramp time `SP_RmpTime`
17	1 = Operator can change the target setpoint `SP_RmpTarget` for the setpoint ramp
18	1 = Operator can enable the setpoint ramp function `SP_RmpOn`
19	1 = Operator can permit the PID optimization function `OptimEn`
20	1 = Operator can enable the track setpoint in "manual mode" function `SP_TrkPV`
21	1 = Operator can enable the bumpless switchover from external to internal `SP_TrkExt`
22	1 = Operator can change the gain parameter `Gain`
23	1 = Operator can change the integral time parameter `TI`
24	1 = Operator can change the derivative time parameter `TD`
25	1 = Operator can change the derivative gain parameter `DiffGain`
26	1 = Operator can change the dead band parameter `DeadBand`
27	Not used
28	1 = Operator can change the integral time parameter `MotorTime`
29	1 = Operator can change the integral time parameter `PulseTime`
30	1 = Operator can change the integral time parameter `BreakTime`
31	Not used

The block has the following permissions for the `OS1Perm` parameter:

Bit	Function
0	1 = Operator can change the limit (process value) `PV_AH_Lim` for the high alarm
1	1 = Operator can change the limit (process value) `PV_WH_Lim` for the high warning
2	1 = Operator can change the limit (process value) `PV_TH_Lim` for the high tolerance
3	1 = Operator can change the hysteresis (process value) `PV_Hyst`
4	1 = Operator can change the limit (process value) `PV_TL_Lim` for the low tolerance
5	1 = Operator can change the limit (process value) `PV_WL_Lim` for the low warning
6	1 = Operator can change the limit (process value) `PV_AL_Lim` for the low alarm
7	1 = Operator can change the limit (control deviation) `ER_AH_Lim` for the high alarm
8	1 = Operator can change the hysteresis (control deviation) `ER_Hyst`
9	1 = Operator can change the limit (control deviation) `ER_AL_Lim` for the low alarm
10	1 = Operator can change the limit (position feedback) `RbkWH_Lim` for the high warning
11	1 = Operator can change the hysteresis (position feedback) `RbkHyst`
12	1 = Operator can change the limit (position feedback) `RbkWL_Lim` for the low warning
13	1 = Operator can open the valve
14	1 = Operator can close the valve
15	1 = Operator can stop the valve
16	1 = Operator can activate the Simulation function `SimOn`
17	1 = Operator can activate the Release for maintenance function `MS_RelOp`

Bit	Function
18	1 = Operator can change the simulation value SimPV
19 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Release for maintenance

The block provides the standard function Release for maintenance (Page 52).

Generating instance-specific messages

The block provides the standard function Generating instance-specific messages (Page 162) without the time stamp function in the I/O.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Specifying the display area for process and setpoint values as well as operations

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `OpenOp`
- `StopOp`
- `CloseOp`

See also

PIDStepL messaging (Page 707)

PIDStepL I/Os (Page 710)

PIDStepL error handling (Page 706)

PIDStepL modes (Page 696)

PIDStepL block diagram (Page 724)

4.8.4 PIDStepL error handling

Error handling of PIDStepL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` output parameter can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of `PV` can no longer be displayed in the REAL number field.
31	The value of `SP_Ext` can no longer be displayed in the REAL number field.
32	The value of `FFwd` can no longer be displayed in the REAL number field.
33	The value of `MV_Trk` can no longer be displayed in the REAL number field.
34	The value of `MV_Forced` can no longer be displayed in the REAL number field.
35	The value of `Rbk` can no longer be displayed in the REAL number field.
36	The value of `MV` can no longer be displayed in the REAL number field.
50	The controller cannot be switched to program mode, because program mode with default setpoint (`AdvCoModSP` = 0) is not possible with step controllers without position feedback (`WithRbk` = 0).
60	|`TI`| < `SampleTime` / 2
61	|`TD`| < `SampleTime`
62	`DiffGain` < 1 or `DiffGain` > 10
63	`TD` / `DiffGain` < `SampleTime` / 2
64	`PropFacSP` < 0 or `PropFacSP` > 1
66	`NormPV_High` = `NormPV_Low`
67	`MotorTime` < `SampleTime`

Error number	Meaning of the error number
68	`PulseTime` < `SampleTime`
69	`BreakTime` < `SampleTime`

See also

PIDStepL functions (Page 697)

Description of PIDStepL (Page 692)

PIDStepL modes (Page 696)

PIDStepL messaging (Page 707)

PIDStepL I/Os (Page 710)

PIDStepL block diagram (Page 724)

Setting switch or button mode (Page 140)

4.8.5 PIDStepL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
`MsgEvId2`	SIG 6	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter `CSF`. If it changes to `CSF` = 1, a process control fault is triggered (`MsgEvId2`, SIG 6).

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ PV - high alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ PV - high warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ PV - high tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ PV - low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ PV - low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ PV - low alarm limit violated
	SIG 7	Alarm - high	$$BlockComment$$ ER - high alarm limit violated
	SIG 8	Alarm - low	$$BlockComment$$ ER - low alarm limit violated
MsgEvId2	SIG 7	Warning - high	$$BlockComment$$ Rbk - high warning limit violated
	SIG 8	Warning - low	$$BlockComment$$ Rbk - low warning limit violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You can use up to four instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 1	AS process control message - fault	$$BlockComment$$ External message 1 Status 16#@5%x@
	SIG 2	AS process control message - fault	$$BlockComment$$ External message 2 Status 16#@6%x@
	SIG 3	AS process control message - fault	$$BlockComment$$ External message 3 Status 16#@7%x@
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 4 Status 16#@8%x@

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	Process value PV_Out
5	Control deviation ER
6	ExtVa106
7	ExtVa107
8	Not allocated
9	Not allocated
10	Not allocated

The associated values 6 ... 7 are allocated to the parameters ExtVa106 ... ExtVa107 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

Associated values for message instance `MsgEvId2`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	Position feedback `Rbk`
5	Signal status `ExtMsg1`
6	Signal status `ExtMsg2`
7	Signal status `ExtMsg3`
8	Signal status `ExtMsg4`
9	`ExtVa209`
10	`ExtVa210`

The associated values 9 ... 10 are allocated to the parameters `ExtVa209` ... `ExtVa210` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of PIDStepL (Page 692)
PIDStepL functions (Page 697)
PIDStepL I/Os (Page 710)
PIDStepL modes (Page 696)
PIDStepL error handling (Page 706)
PIDStepL block diagram (Page 724)

4.8.6 PIDStepL I/Os

I/Os of PIDStepL

Input parameters

Parameter	Description	Type	Default
`AdvCoEn`	1 = Enable "program mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
`AdvCoOn*`	1 = Enable "program mode" via faceplate	BOOL	0

Parameter	Description	Type	Default
AdvCoModSP	Type of "program mode": 1 = Setpoint specification 0 = Manipulated variable specification	BOOL	1
AdvCoMstrOn	Activate (0-1) or deactivate (1-0) "program mode" via edge transition	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoMV	Specified value from the external program	REAL	0.0
AutModLi*	1 = "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
BatchEn	1 = Enable allocation for batch control	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BreakTime	Minimum break duration [s]	REAL	1.0
CloseLi*	1 = Close via interconnection or CFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseOp*	1 = Close via operator	BOOL	0
CPI_In	Input for control performance index, which is calculated by the assigned ConPerMon block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DeadBand	Width of dead band	REAL	0.0
DiffGain	Gain of differentiator [1..10] DiffGain = TD / (delay time of D action)	STRUCT • Value: REAL • ST: BYTE	- • 5.0 • 16#FF
DiffToFbk	1 = D action is placed in the feedback	BOOL	0
EN	1 = Called block will be processed	BOOL	1
ER_A_DC*	Delay for incoming alarms during control deviation monitoring	REAL	0.0
ER_A_DG*	Delay for outgoing alarms during control deviation monitoring	REAL	0.0
ER_AH_En	1 = Activate alarm (high) for control deviation monitoring	BOOL	1
ER_AH_Lim	Alarm limit (high) for control deviation monitoring	REAL	100.0
ER_AH_MsgEn	1 = Activate messages for alarm (high) for control deviation monitoring	BOOL	1

Parameter	Description	Type	Default
ER_AL_En	1 = Activate alarm (low) for control deviation monitoring	BOOL	1
ER_AL_Lim	Alarm limit (low) for control deviation monitoring	REAL	-100.0
ER_AL_MsgEn	1 = Activate messages for alarm (low) for control deviation monitoring	BOOL	1
ER_Hyst	Alarm hysteresis for control deviation	REAL	1.0
EventTsIn	Evaluation of the signal status of the EventTs message block. EventTsIn serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	1 = Binary input for freely selectable message 1 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	1 = Binary input for freely selectable message 2 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	1 = Binary input for freely selectable message 3 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg4	1 = Binary input for freely selectable message 4 is used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa209	Associated value 9 for messages (MsgEvID2)	ANY	
ExtVa210	Associated value 10 for messages (MsgEvID2)	ANY	
FbkClosed	Low limit stop signal of position feedback	STRUCT • Value: BOOL • ST: BYTE	- 0 16#80
FbkOpened	High limit stop signal of position feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Feature	I/O for additional functions (Page 697)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0

Parameter	Description	Type	Default
FFwd*	Input for additive disturbance variable activation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
FFwdHiLim	Limit (high) for additive disturbance variable activation	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
FFwdLoLim	Limit (low) for additive disturbance variable activation	STRUCT • Value: REAL • ST: BYTE	- • -100.0 • 16#80
Gain	Proportional gain Gain.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#FF
IntHoldNeg	1 = Integrator cannot run in negative direction	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
IntHoldPos	1 = Integrator cannot run in positive direction	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Man*	Manual specification for the manipulated variable	REAL	0.0
ManHiLim	Limit (high) for manual parameter Man	REAL	100.0
ManLoLim	Limit (low) for manual parameter Man	REAL	0.0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
ModLiOp	Operating mode switchover between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MotorTime	Motor actuating time [s]	REAL	30.0
MS_RelOp*	1 = Release for maintenance by OS operator	BOOL	0
MsgEvID1	Message number (assigned automatically)	DWORD	16#00000000
MsgEvID2	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_Forced*	Forced manipulated variable that is not limited and assumes top priority	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
MV_ForOn	1 = Forced manipulated variable MV_Forced output unlimited at output MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_HiLim	Limit (high) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
MV_LoLim	Limit (low) for manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_Offset	Manipulated variable for ER = 0, operating point for controller with deactivated I action	REAL	0.0
MV_Trk*	Tracking value for the manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_TrkOn	1 = Tracking of manipulated variable MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NegGain	0 = Positive controller gain: ER = Gain · (SP - PV) 1 = Negative controller gain: ER = Gain · (PV - SP)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NormPV	Process value range (PV) for standardizing the proportional gain (GAIN)	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
Occupied	1 = Occupied by batch control	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpenLi*	1 = Open via interconnection or CFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenOp*	1 = Open via operator	BOOL	0
OptimEn*	1 = Enable optimization of PID parameters by PID tuner	BOOL	0
OptimOcc*	1 = Optimization running	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000

Parameter	Description	Type	Default
OS_Perm	I/O for operator control permissions (Page 697)	STRUCT	-
		• Bit 0: BOOL	• 1
		• ...	• 1
		• Bit 31: BOOL	• 1
OS1Perm	I/O for operator control permissions (Page 697)	STRUCT	-
		• Bit 0: BOOL	• 1
		• Bit 18: BOOL	• 1
		• Bit 19: BOOL	• 1
		• Bit 31: BOOL	• 1
PropFacSP	Applying the P action to the feedback [0..1]. 0 = P action fully in feedback	REAL	1.0
PropSel	1 = Activate P action	BOOL	1
PulseTime	Minimum pulse duration [s]	REAL	1.0
PV*	Process value (controlled variable)	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
PV_Unit	Unit of measure for process value	INT	1001
PV_A_DC*	Delay time for incoming PV alarms [s]	REAL	0.0
PV_A_DG*	Delay time for outgoing PV alarms [s]	REAL	0.0
PV_AH_En	1 = Enable PV alarm limit (high)	BOOL	1
PV_AH_Lim	Limit PV alarm (high)	REAL	95.0
PV_AH_MsgEn	1 = Enable PV alarm (high) message	BOOL	1
PV_AL_En	1 = Enable PV alarm limit (low)	BOOL	1
PV_AL_Lim	PV alarm limit (low)	REAL	5.0
PV_AL_MsgEn	1 = Enable PV alarm (low) message	BOOL	1
PV_Hyst	Hysteresis for PV alarm, warning and tolerance limits	REAL	1.0
PV_OpScale	Limit for scale in PV bar graph of faceplate	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0
PV_T_DC*	Delay time for incoming PV tolerance messages [s]	REAL	0.0
PV_T_DG*	Delay time for outgoing PV tolerance messages [s]	REAL	0.0
PV_TH_En	1 = Enable PV tolerance limit (high)	BOOL	0
PV_TH_Lim	Limit PV tolerance message (high)	REAL	85.0
PV_TH_MsgEn	1 = Enable message for PV tolerance message (high)	BOOL	1
PV_TL_En	1 = Enable PV tolerance limit (low)	BOOL	0
PV_TL_Lim	Limit PV tolerance message (low)	REAL	15.0
PV_TL_MsgEn	1 = Activate message for PV tolerance message (low)	BOOL	1
PV_Unit	Unit of measure for process value	INT	1001; ^{O}C
PV_W_DC*	Delay time for incoming PV warnings [s]	REAL	0.0
PV_W_DG*	Delay time for outgoing PV warnings [s]	REAL	0.0

Parameter	Description	Type	Default
PV_WH_En	1 = Enable PV warning limit (high)	BOOL	1
PV_WH_Lim	Limit PV warning (high)	REAL	90.0
PV_WH_MsgEn	1 = Enable PV warning (high) message	BOOL	1
PV_WL_En	1 = Enable PV warning limit (low)	BOOL	1
PV_WL_Lim	Limit PV warning (low)	REAL	10.0
PV_WL_MsgEn	1 = Enable PV warning (low) message	BOOL	1
Rbk*	Position feedback for display on OS	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
RbkHyst	Alarm hysteresis for position feedback	REAL	1.0
RbkWH_En	1 = Enable warning (high) for position feedback	BOOL	1
RbkWH_Lim	Limit for position feedback of warning (high)	REAL	100.0
RbkWH_MsgEn	1 = Enable messages for warning (high) for position feedback	BOOL	1
RbkWL_En	1 = Enable warning (low) for position feedback	BOOL	1
RbkWL_Lim	Limit for position feedback of warning (low)	REAL	0.0
RbkWL_MsgEn	1 = Enable messages for warning (low) for position feedback	BOOL	1
RefStdDevIn	Reference value of PV standard deviation (sigma) in defined "good" state of control loop	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#78
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
S_RbkOnPIDTun	Simulation of position feedback on; For PCS 7 PID tuner only	BOOL	0
S_RbkPIDTun*	Simulated position feedback	REAL	50.0
SafePos	Neutral position (Page 37) for step controller actuating signals: 0 = Close 1 = Open 2 = Stop	INT	0
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
SimOn*	1 = Simulation on	BOOL	0
SimPV*	Process value used for SimOn = 1	REAL	0.0
SimPV_Li	Process value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SimRbk*	Position feedback used for SimOn = 1	REAL	0.0
SimRbkLi	Position feedback used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_DnRaLim	Limit (low) for the gradient of the setpoint [SP_Unit/s]	REAL	100.0
SP_ExHiLim	Limit (high) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP_ExLoLim	Limit (low) for external setpoint	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_Ext*	External setpoint of - (to interconnection)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_ExtLi*	1 = Select external setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOp*	1 = Select external setpoint (via operator)	BOOL	0
SP_InHiLim	Limit (high) of internal setpoint	REAL	100.0
SP_InLoLim	Limit (low) of internal setpoint	REAL	0.0
SP_Int*	Internal setpoint for operation	REAL	0.0
SP_IntLi*	1 = Select internal setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_IntOp*	1 = Select internal setpoint (via operator)	BOOL	0
SP_LiOp	Select setpoint source (internal/external): 1 = Via interconnection 0 = Via operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_RateOn*	1 = Activate limitation of setpoint gradients	BOOL	0
SP_RmpModTime	1 = Use time (SP_RmpTime) for setpoint ramp 0 = Use gradient	BOOL	0
SP_RmpOn*	1 = Activate setpoint ramp to target setpoint SP_RmpTarget	BOOL	0
SP_RmpTarget	Target setpoint for setpoint ramp	REAL	0.0

Parameter	Description	Type	Default
SP_RmpTime*	Time for setpoint ramp [s] from current SP up to SP_RmpTarget	REAL	0.0
SP_TrkExt	1 = Bumpless switchover from external to internal setpoint active	BOOL	1
SP_TrkPV	1 = Setpoint follows PV in "manual mode" and with tracking	BOOL	0
SP_UpRaLim	Gradient limit (high) for the setpoint [SP_Unit/s]	REAL	100.0
StepNo	Batch step number	DWORD	16#00000000
StopLi*	1 = Stop via interconnection or CFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopOp*	1 = Stop via operator	BOOL	0
TD	Derivative action time in [s] TD.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
ThrAdaOn	Adaptation of threshold 0 = Hold constant	BOOL	1
TI	Integral action time [s] TI.ST = 16#FF: Enabled in faceplate	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#FF
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00
WithRbk	1 = Feedback value available for the manipulated variable	BOOL	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AdvCoAct	1 = "Program mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AdvCoRdy	1 = "Program mode" available	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutAct	1 = "Automatic mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CascaCut	Cascade connection: 1 = Control chain from primary to secondary controller is interrupted	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Close	Control output: 1 = Closed is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
D_Part	D action of PID algorithm	REAL	0.0
ENO	1 = Block algorithm completed without errors	BOOL	0
ER	Control deviation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ER_AH_Act	1 = Alarm limit (high) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ER_AL_Act	1 = Alarm limit (low) for control deviation violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ErrorNum	Output of current error number. For error numbers that can be output by this block, see PIDStepL error handling (Page 706)	INT	-1
FFwdHiAct	1 = Limit (high) for additive disturbance variable activation violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FFwdLoAct	1 = Limit (low) for additive disturbance variable activation violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
GainEff	Effective proportional gain, depends on Gain and NormPV	REAL	1.0
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
I_Part	I action of PID algorithm	REAL	0.0
LoopClosed	1 = Control loop closed 0 = Control loop open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
ManHiOut	Limit (high) for "manual mode", corresponds to input parameter ManHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
ManLoOut	Limit (low) for "manual mode", corresponds to input parameter ManLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgAckn2	Alarm acknowledgement status 2 (output STATUS of second ALARM_8P)	WORD	16#0000
MsgErr1	1 = Alarm error 1 (output ERROR of the first ALARM_8P)	BOOL	0
MsgErr2	1 = Alarm error 2 (output ERROR of the second ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
MsgStat2	Alarm status 2 (output ERROR of second ALARM_8P)	WORD	16#0000
MV	Manipulated variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_HiAct	1 = Limit (high) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_LoAct	1 = Limit (low) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
OosAct	1 = Block is "out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Open	Control output: 1 = Open is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS1PermOut	Display of OS1Perm	DWORD	16#FFFFFFFF
OS1PermLog	Display of OS1Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
P_Part	P action of PID algorithm	REAL	0.0
PV_AH_Act	1 = PV alarm (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_AL_Act	1 = PV alarm (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Out	Output for process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_TH_Act	1 = PV tolerance message (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_TL_Act	1 = PV tolerance message (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_ToleHi	Limit (high) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
PV_ToleLo	Limit (low) of 3-sigma band around the setpoint is calculated when a ConPerMon block is connected	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_UnitOut	Unit of measure for process value, for interconnecting with PV_Unit input parameter of the ConPerMon block	INT	0
PV_WH_Act	1 = PV warning (high) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_WL_Act	1 = PV warning (low) active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkOut	Output for position feedback	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RbkWH_Act	1 = Warning (high) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkWL_Act	1 = Warning (low) for position feedback active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP	Setpoint used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_DnRaAct	1 = Negative gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExHiAct	1 = Limit (high) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExLoAct	1 = Limit (low) for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
SP_ExtAct	1 = External setpoint is active 0 = Internal setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOut	External setpoint, corresponds to input parameter SP_Ext	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_InHiOut	Limit (high) for SP_Int corresponds to input parameter SP_InHiLim	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP_InLoOut	Limit (low) for SP_Int corresponds to input parameter SP_InLoLim	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_RateTarget	Target setpoint for the gradient limitation	REAL	0.0
SP_UpRaAct	Positive gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 692)	DWORD	16#00000000
Status2	Status word 2 (Page 692)	DWORD	16#00000000
Status3	Status word 2 (Page 692)	DWORD	16#00000000
Stop	Control output: 1 =Stopped is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SumMsgAct	1 = Active process alarm	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Threson	Adaptive threshold [%]	REAL	0.0

See also

PIDStepL messaging (Page 707)

PIDStepL modes (Page 696)

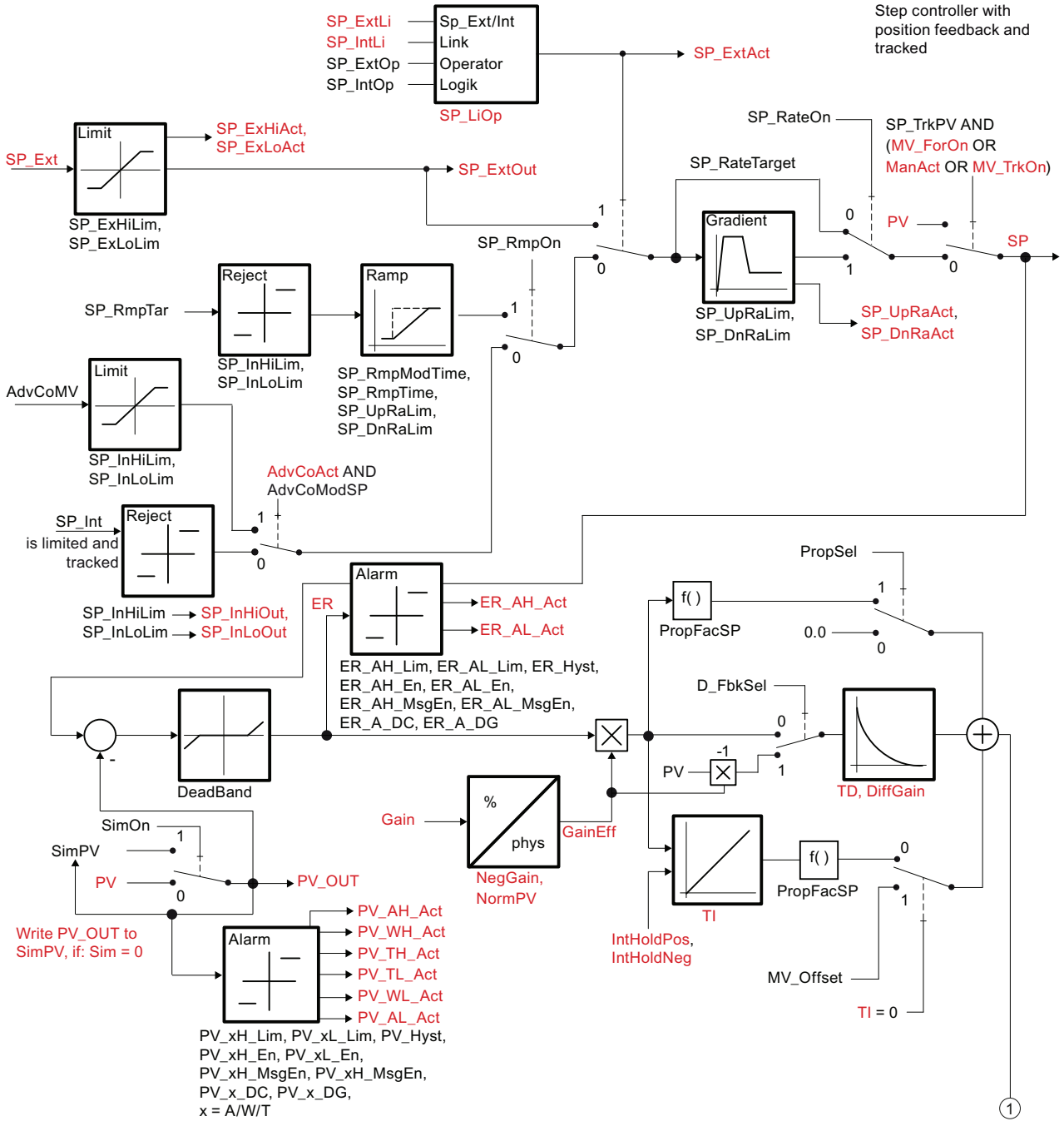
PIDStepL block diagram (Page 724)

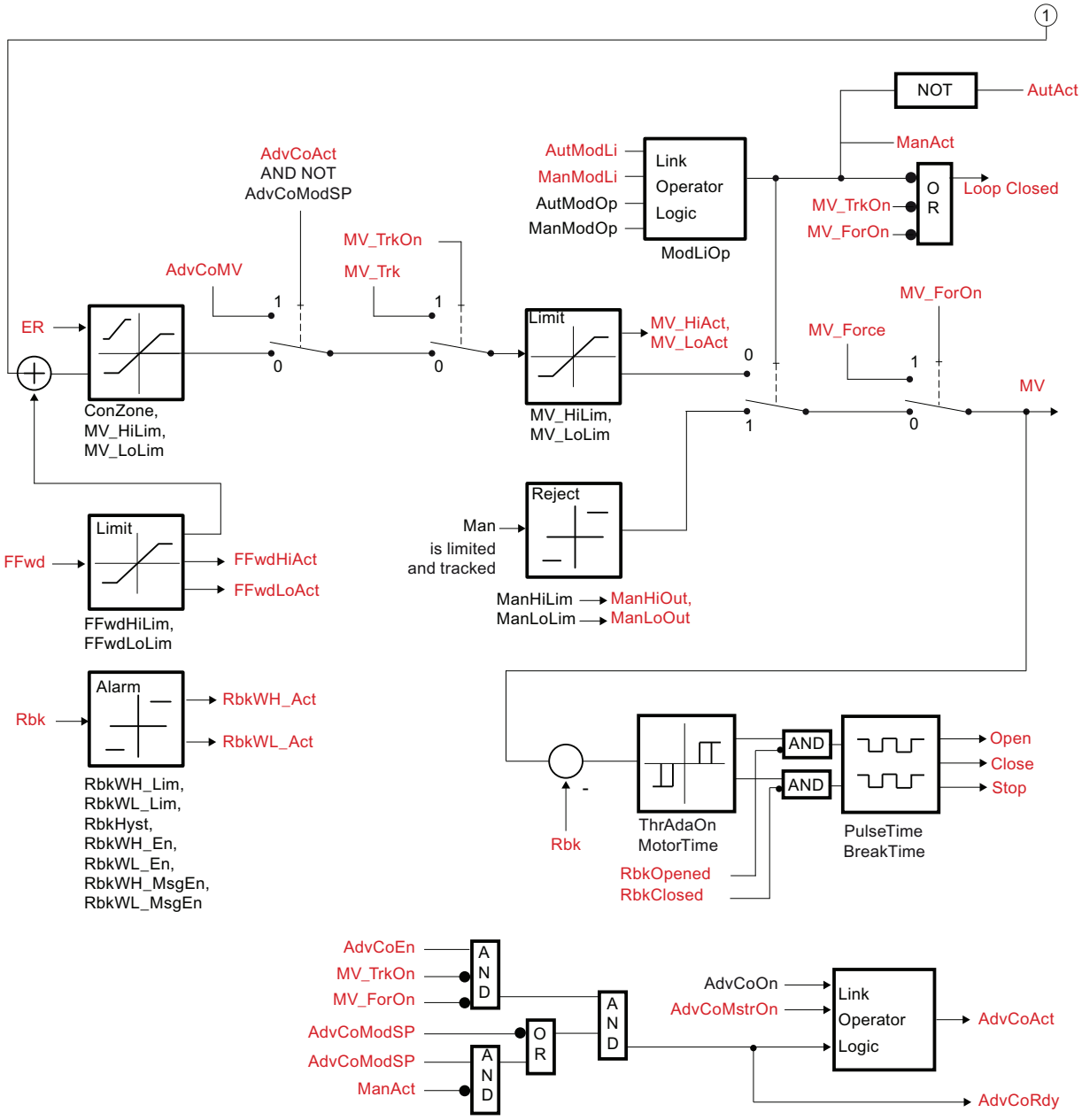
4.8.7 PIDStepL block diagram

PIDStepL block diagram

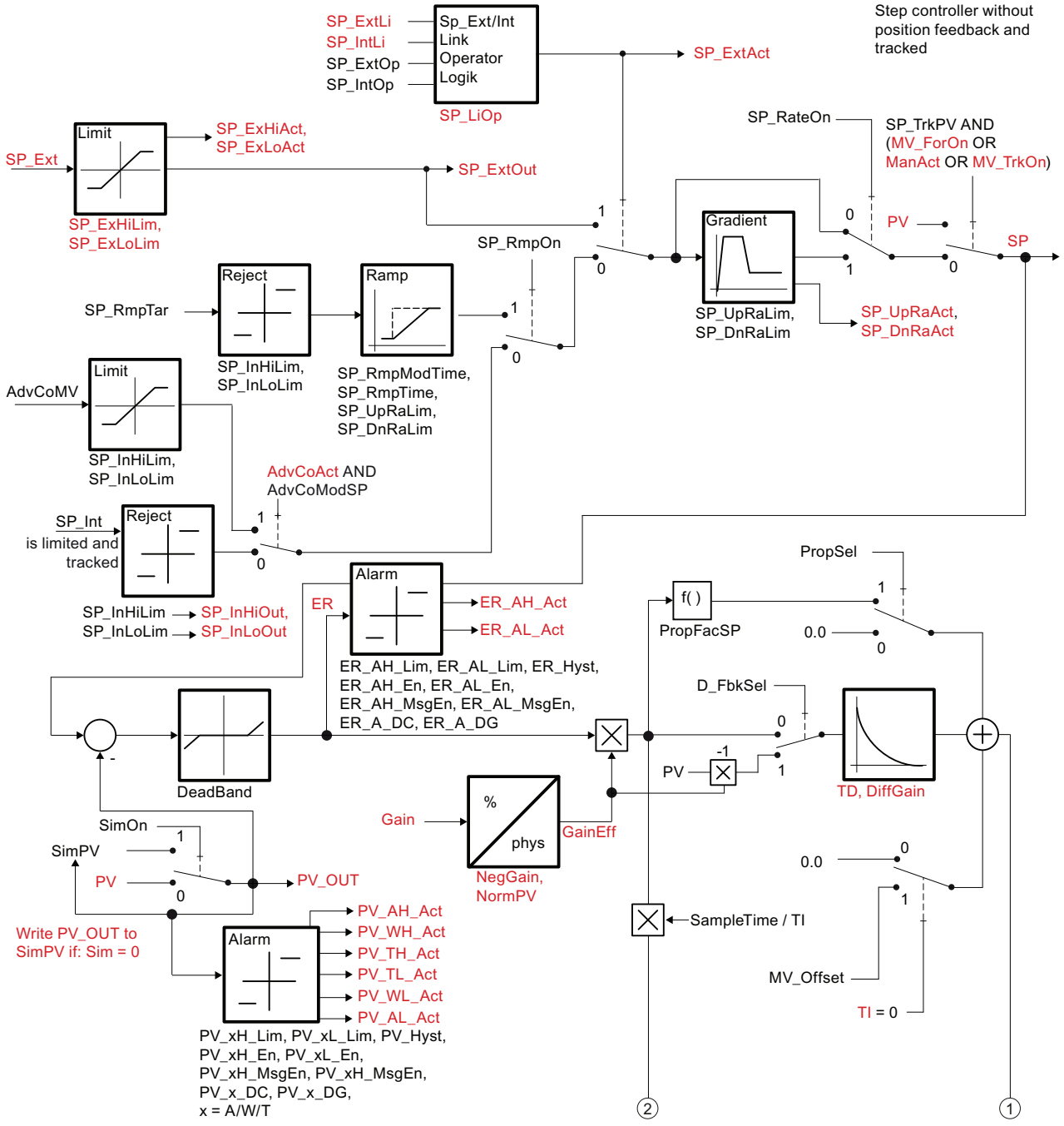
There are two block diagrams for this block: the step controller with and without position feedback.

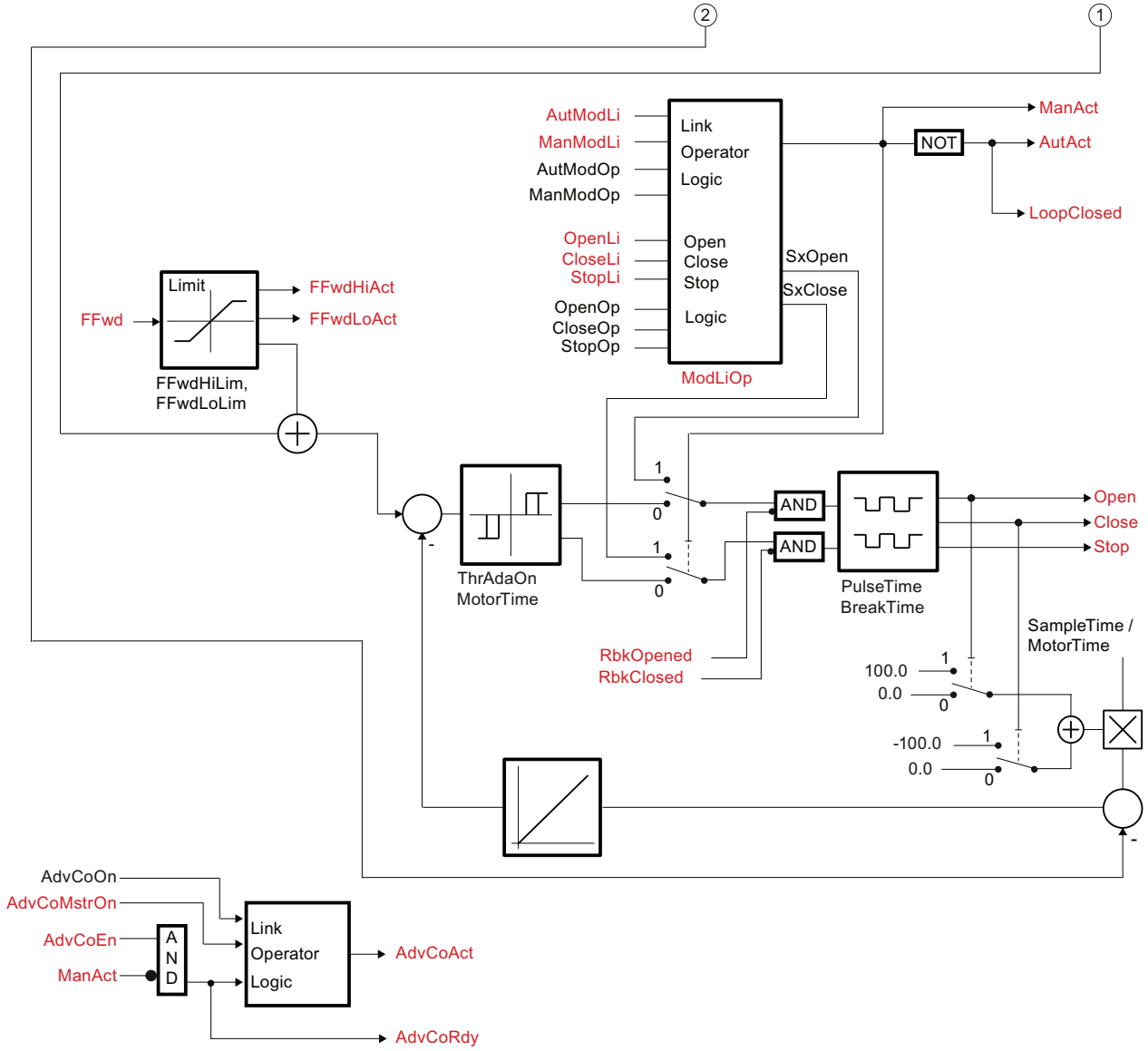
Step controller with position feedback




1
NOT
AutAct
ManAct
AdvCoAct
AND NOT
AdvCoModSP
AutModLi
ManModLi
AutModOp
ManModOp
Link
Operator
Logic
ModLiOp
O
R
Loop Closed
MV_TrkOn
MV_ForOn
AdvCoMV
MV_Trk
MV_TrkOn
ER
1
0
Limit
MV_HiAct,
MV_LoAct
MV_ForOn
MV_Force
MV
ConZone,
MV_HiLim,
MV_LoLim
MV_HiLim,
MV_LoLim
Reject
Man
is limited
and tracked
Limit
FFwd
FFwdHiAct
FFwdLoAct
FFwdHiLim,
FFwdLoLim
ManHiLim
ManLoLim
ManHiOut,
ManLoOut
Alarm
Rbk
RbkWH_Act
RbkWL_Act
RbkWH_Lim,
RbkWL_Lim,
RbkHyst,
RbkWH_En,
RbkWL_En,
RbkWH_MsgEn,
RbkWL_MsgEn
AND
Open
Close
Stop
ThrAdaOn
MotorTime
PulseTime
BreakTime
RbkOpened
RbkClosed
AdvCoEn
MV_TrkOn
MV_ForOn
AdvCoModSP
AdvCoModSP
ManAct
A
N
D
O
R
AdvCoOn
AdvCoMstrOn
AdvCoAct
AdvCoRdy

Step controller without position feedback





See also

Description of PIDStepL (Page 692)

PIDStepL modes (Page 696)

PIDStepL functions (Page 697)

PIDStepL error handling (Page 706)

PIDStepL messaging (Page 707)

PIDStepL I/Os (Page 710)

4.8.8 Operator control and monitoring

4.8.8.1 PIDStepL views

Views of the PIDStepL block

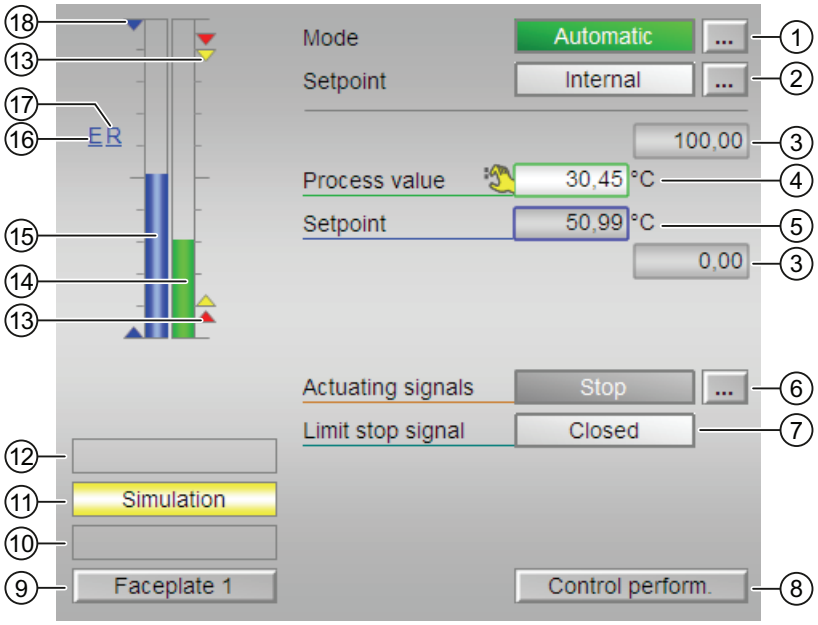
The block PIDStepL provides the following views:

- PIDStepL standard view without position feedback (Page 730)
- PIDStepL standard view with position feedback (Page 733)
- Alarm view (Page 250)
- Limit value view of PID controllers (Page 240)
- Trend view (Page 253)
- Ramp view (Page 248)
- Parameter view of PID controllers (Page 232)
- PIDStepL preview (Page 737)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icons for PID and FM controller (Page 193)

Refer to the Structure of the faceplate (Page 200) and Block icon structure (Page 185) sections for general information about the faceplate and block icon.

4.8.8.2 PIDStepL standard view without position feedback

PIDStepL standard view without position feedback



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 59)
- Automatic mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Displaying and switching the setpoint

This area shows how to specify the setpoint. The setpoint can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

You can find additional information on this in the Setpoint specification - internal/external (Page 112) section.

(3) High and low scale range for the process value

These values provide information on the display range for the bar graph of the process value. The scale range is defined in the Engineering System (ES).

(4) Display of the process value including signal status

This area shows the current process value with the corresponding signal status.

(5) Displaying and changing the setpoint including signal status

This area shows the current setpoint with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the setpoint. The setpoint specification also needs to be set to "Internal" for this block.

(6) Displaying and changing manipulated variables

This area shows you the currently valid manipulated variable. Refer to the Switching operating states and operating modes (Page 208) section for information on changing the manipulated variable.

The following manipulated variables can be selected:

- "Open"
- "Stop"
- "Close"

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167).

(7) Displaying the feedback

The following feedback can be displayed:

- "Open"
- "Closed"

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167).

(8) Navigation button for switching to the standard view of the ConPerMon block

Use this navigation button to reach the standard view of the ConPerMon block. The visibility of this navigation button depends on the configuration in the engineering system (ES).

See also the Opening additional faceplates (Page 165) section for more on this.

(9) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(10) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(11) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

You can find additional information on this in the Simulating signals (Page 47) section.

(12) Display area for block states

This area provides additional information on the operating state of the block (from high to low according to priority):

- "Optimization"
- "Tracking"
- "Forced tracking"

(13) Limit display

These colored triangles show you the configured limits in the respective bar graph.

(14) Bar graph for the process value

This area shows the current process value in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(15) Bar graph for the setpoint

This area shows the current setpoint in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(16) Display of external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(17) Display for the target setpoint of the setpoint ramp

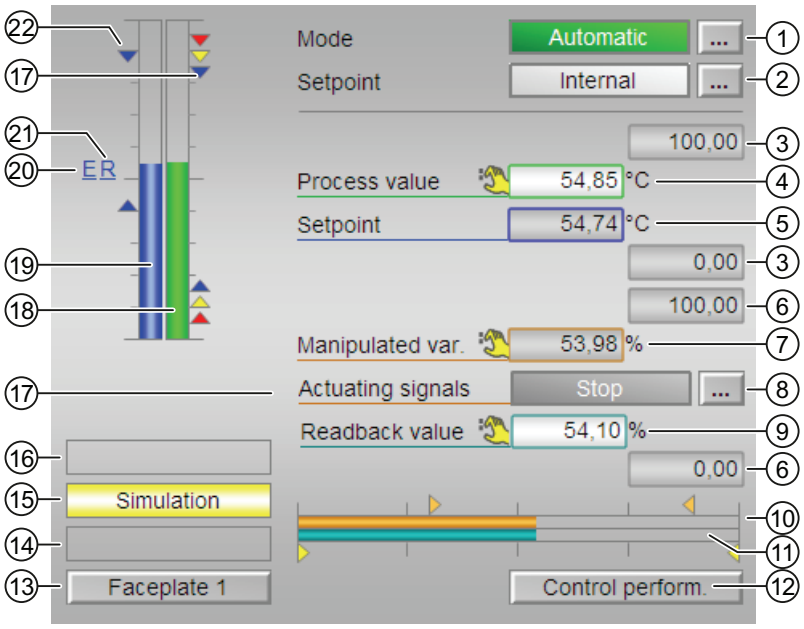
This display [R] shows you the target setpoint and is only visible if you have enabled ramp generation in the Ramp view (Page 248).

(18) Displaying the limits

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the Engineering System (ES).

4.8.8.3 PIDStepL standard view with position feedback

PIDStepL standard view with position feedback



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 59)
- Automatic mode (Page 59)
- Program mode for controllers (Page 65)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Displaying and switching the setpoint

This area shows how to specify the setpoint. The setpoint can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

You can find additional information on this in the Setpoint specification - internal/external (Page 112) section.

(3) High and low scale range for the process value

These values provide information on the display range for the bar graph of the process value. The scale range is defined in the Engineering System (ES).

(4) Display of the process value including signal status

This area shows the current process value with the corresponding signal status.

(5) Displaying and changing the setpoint including signal status

This area shows the current setpoint with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the setpoint. The setpoint specification also needs to be set to "Internal" for this block.

(6) High and low limits of the manipulated variable

You can only display and change a manipulated variable in "manual mode".

(7) Displaying and changing the manipulated variable

You can only display and change a manipulated variable in "manual mode".

(8) Displaying and changing manipulated variables

This area shows you the currently valid manipulated variable. Refer to the Switching operating states and operating modes (Page 208) section for information on changing the manipulated variable.

The following manipulated variables can be selected:

- "Open"
- "Stop"
- "Close"

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167).

(9) Displaying the feedback

This display is only visible when the corresponding block input is connected.

The following feedback can be displayed:

- "Open"
- "Closed"

(10) Bar graph for the manipulated variable

The bar graph for the manipulated variable is only available in manual mode.

(11) Bar graph for the readback value

This display is only visible when the corresponding block input is connected.

The bar graph for the readback value is only available in manual mode.

(12) Navigation button for switching to the standard view of the ConPerMon block

Use this navigation button to reach the standard view of the ConPerMon block. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Refer also to the Opening additional faceplates (Page 165) section for more on this.

(13) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(14) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(15) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

You can find additional information on this in the Simulating signals (Page 47) section.

(16) Display area for block states

This area provides additional information on the operating state of the block (from high to low according to priority):

- "Optimization"
- "Tracking"
- "Forced tracking"

(17) Limit display

These colored triangles show you the configured limits in the respective bar graph.

(18) Bar graph for the process value

This area shows the current process value in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(19) Display of external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(20) Display for the target setpoint of the setpoint ramp

This display [R] shows you the target setpoint and is only visible if you have enabled ramp generation in the Ramp view (Page 248).

(21) Bar graph for the setpoint

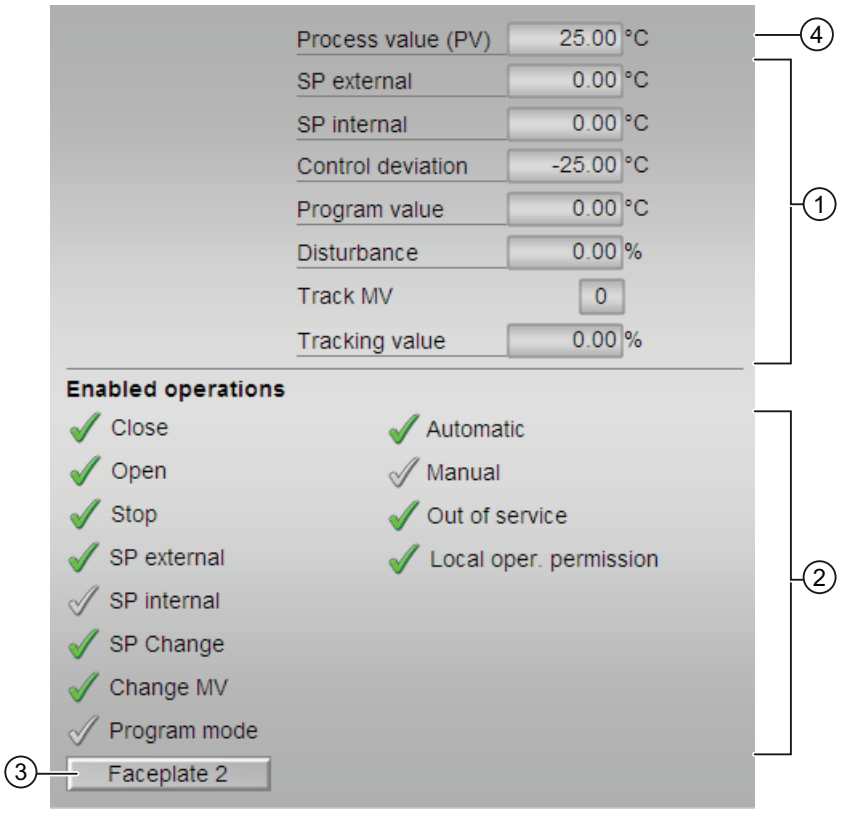
This area shows the current setpoint in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(22) Displaying the limits

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the Engineering System (ES).

4.8.8.4 PIDStepL preview

Preview of PIDStepL



(1) Preview area

This area shows you a preview for the following values:

- "SP external": currently applicable external setpoint
- "SP internal": currently applicable internal setpoint
- "Control deviation": Current control deviation
- "Program value": specified value for program mode
- "Disturbance variable": additive value for feedforward control
- "Track MV": Track manipulated variable (value is 1)
- "Tracking value": effective manipulated variable for "Track manipulated variable"

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Close": You can select the manipulated variable "Close". If text is configured for this command, it is also displayed in brackets. You can find additional information on this in the section Labeling of buttons and text (Page 167).
- "Open": You can select the manipulated variable "Open". If text is configured for this command, it is also displayed in brackets. You can find additional information on this in the section Labeling of buttons and text (Page 167).
- "Stop": You can select the manipulated variable "Stop". If text is configured for this command, it is also displayed in brackets. You can find additional information on this in the section Labeling of buttons and text (Page 167).
- "SP external": You can feedforward the external setpoint.
- "SP internal": You can feedforward the internal setpoint.
- "Change SP": You can change the setpoint.
- "Change MV": You can change the manipulated variable.
- "Program mode": You can switch to "program mode".
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. You can find additional information on this in the section Operator control permissions (Page 205).

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(4) Process value

This area displays the real process value (`PV`).

4.9 Ratio - ratio controlling

4.9.1 Description of Ratio

Object name (type + number) and family

Type + number: FB 1883

Family: Control

Area of application for Ratio

The block is used for the following applications:

- Forming a ratio

How it works

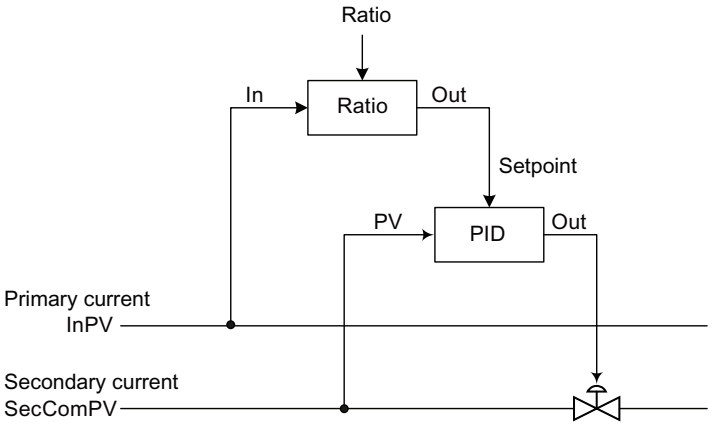
The block is used to create a ratio, for example, in a ratio control. It is also used to set elements (for example, synchronization control loop), or to influence the reference variable of a cascade.

The block operates according to the equation: `Out` = `In` · `RatioOut` + `Offset`

Where:

- `RatioOut` is either the value from `RatioInt` or `RatioExt`
- `Offset` is the offset value that should be added to the output value

`In` is based on the interconnection whereas `RatioOut` is selected based on the internal/external selection.



Also refer to the Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808) section for information on calculating the current ratio.

Configuring OBs

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status` parameter

The description for each parameter can be found in the Ratio I/Os (Page 746) section.

Status bit	Parameter
0 – 1	Not used
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7	Not used
8	`RatExtAct.Value`
9	`RatLoAct.Value`
10	`RatHiAct.Value`
11	`OutLoAct.Value`
12	`OutHiAct.Value`
13	`RatTrkExt`
14	`SimLiOp.Value`
15 - 31	Not used

See also

Ratio functions (Page 742)

Ratio messaging (Page 746)

Ratio block diagram (Page 750)

Ratio error handling (Page 745)

Ratio modes (Page 741)

4.9.2 Ratio modes

Ratio operating modes

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the Out of service (Page 58) section.

The last valid value is provided at the `Out` output in this operating mode. The `OutHiAct`, `OutLoAct`, `RatHiAct`and `RatLoAct`output parameters are reset.

See also

Ratio block diagram (Page 750)

Ratio I/Os (Page 746)

Ratio messaging (Page 746)

Ratio error handling (Page 745)

Ratio functions (Page 742)

Description of Ratio (Page 739)

4.9.3 Ratio functions

Functions of Ratio

The functions for this block are listed below.

Internal or external ratio

You can use the RatLiOp parameter to specify if the ratio should be specified internally or externally:

- RatLiOp = 0: The ratio (RatioInt) is specified by the operator. The operator can decide if the specification should be made internally (RatIntOp = 1) or externally (RatExtOp = 1) .
- RatLiOp = 1: The ratio (RatioExt) is specified by an interconnection. The interconnection is used to determine if the specification should be made internally (RatIntLi = 1) or externally (RatExtLi = 1) .

Bumpless switchover from external to internal ratio

The parameter RatTrkExt = 1 is used so that the internal ratio tracks the external setpoint to achieve a bumpless switchover from the external to the internal ratio. This allows unwanted jumps at the output parameter to be avoided.

Limiting the ratio

The ratio is limited by the RatHiLim parameter (high) or RatLoLim parameter (low).

The external ratio RatioExt is limited to the value you have specified if a limit is violated. This is then also used to form the output value Out. If these limits are reached or exceeded RatioHiAct or RatioLoAct are also set to 1.

The internal ratio RatioInt is checked against the value you have specified. If a value is outside the specified limit, it is reset to the most recent valid value.

Limiting the output value

The output value is limited by the OutHiLim parameter (high) or OutLoLim parameter (low).

The OutHiAct or OutLoAct output parameter is set to 1 as soon as the output value has reached or exceeded the limits

Simulating signals

This block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Analog input value (SimIn, SimInLi)

Display and operator input area for process values and setpoints

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Selecting a unit of measure

The block provides the standard function Selecting a unit of measure (Page 168).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can switch to external
5	1 = Operator can switch to internal
6	1 = Operator can specify the internal ratio
7 - 10	Not used
11	1 = Operator can switch to "Simulation" mode
12	1 = Operator can enable bumpless switchover
13	Not used
14	1 = Operator can change `RatHiLim`
15	1 = Operator can change `RatLoLim`
16	1 = Operator can change `OutHiLim`
17	1 = Operator can change `OutLoLim`
18 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Forming and outputting signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` is formed from the following parameters:

- `Out.ST`
- `SecComPV.ST`
- `InPV.ST`
- `RatioExt.ST`
- `Offset.ST`

The signal status of the `Out` output parameter corresponds to the input parameter `In`.

The signal status of the current ratio calculation corresponds to the status of the input parameter `SecComPV`.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the Feature parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
24	Activating local operating permission (Page 130)

See also

Description of Ratio (Page 739)

Ratio messaging (Page 746)

Ratio I/Os (Page 746)

Ratio block diagram (Page 750)

Ratio error handling (Page 745)

Ratio modes (Page 741)

4.9.4 Ratio error handling

Ratio error handling

Refer to section Error handling (Page 104) for basic instructions on how to troubleshoot all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when implementing the block; block will not be processed.
0	No active fault
30	The input value of `In` can no longer be displayed in the REAL number field.
51	`RatLiOp` = 1 and `RatExtLi` = 1 and `RatInLi` = 1

See also

Ratio block diagram (Page 750)

Ratio I/Os (Page 746)

Ratio messaging (Page 746)

Ratio functions (Page 742)

Ratio modes (Page 741)

Description of Ratio (Page 739)

4.9.5 Ratio messaging

Messaging

This block does not offer messaging.

See also

Description of Ratio (Page 739)
Ratio functions (Page 742)
Ratio I/Os (Page 746)
Ratio block diagram (Page 750)
Ratio error handling (Page 745)
Ratio modes (Page 741)

4.9.6 Ratio I/Os

I/Os of Ratio

Input parameters

Parameter	Description	Type	Default
`EN`	1 = Called block will be processed	BOOL	1
`Feature`	I/O for additional functions (Page 742)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
`In`	Analog input	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
`InPV`	Input for process variable	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
`InUnit`	Unit of measure for input parameter `In`	INT	1001
`Offset`	Offset	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
`OnOp*`	1 = "On" mode via operator	BOOL	0

Parameter	Description	Type	Default
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 742)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
OutHiLim	High limit for output value	REAL	100.0
OutLoLim	Low limit for output value	REAL	0.0
RatExtLi	1 = Select external ratio (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RatExtOp*	1 = Select external ratio (via operator)	BOOL	0
RatHiLim	High limit	REAL	100.0
RatIntLi	1 = Select internal ratio (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RatIntOp*	1 = Select internal ratio (via operator)	BOOL	1
RatioExt	External ratio	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
RatioInt*	Internal ratio	REAL	1.0
RatioUnit	Unit of measure for the RationInt, RatioExt input parameter or RatioPV (output parameter)	INT	0
RatLiOp	Select ratio source (internal/external): 1 = Via interconnection 0 = Via operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RatLoLim	Low limit	REAL	0.0
RatOpScale	Limit for scale in bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
RatTrkExt	1 = Bumpless switchover from external to internal ratio active	BOOL	0
SecComPV*	Process value of secondary component	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
SecComUnit	Unit of measure for input parameter SecComPV	INT	1001
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimIn*	Analog input value used for SimOn = 1	REAL	0.0
SimInLi	Value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Ratio error handling (Page 745)	INT	-1
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF

Parameter	Description	Type	Default
Out	Output	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
OutHiAct	1 = High limit overshoot	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OutHiLmOut	Output of high limit	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
OutLoAct	1 = Low limit overshoot	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OutLoLmOut	Output of low limit	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RatExtAct	1 = External ratio used 0 = Internal ratio used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RatHiAct	1 = Limit (high) for ratio active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RatioPV	Current ratio	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RatioOut	Applied ratio (RatioInt or RatioExt)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RatLoAct	1 = Limit (low) for ratio active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status	Status word (Page 739)	DWORD	16#00000000

See also

Ratio messaging (Page 746)
Ratio block diagram (Page 750)
Ratio modes (Page 741)

4.9.7 Ratio block diagram

Ratio block diagram

A block diagram is not provided for this block.

See also

Ratio I/Os (Page 746)

Ratio messaging (Page 746)

Ratio error handling (Page 745)

Ratio functions (Page 742)

Ratio modes (Page 741)

Description of Ratio (Page 739)

4.9.8 Operator control and monitoring

4.9.8.1 Ratio views

Views of the Ratio block

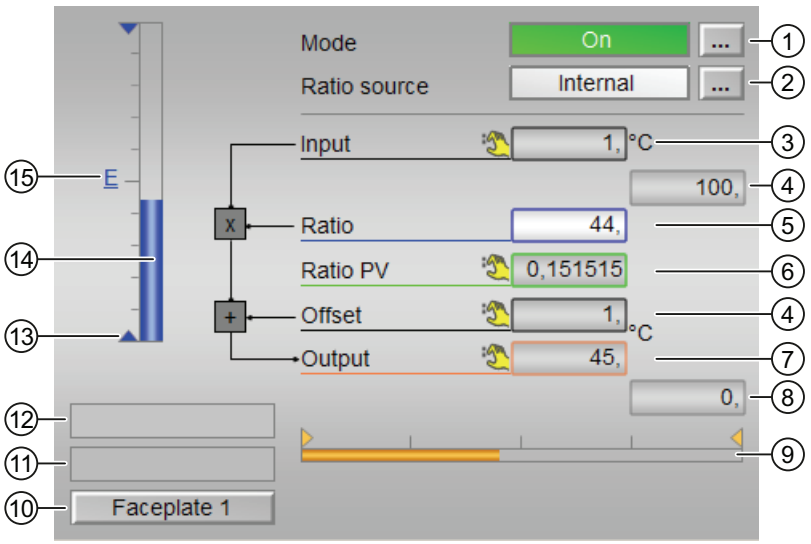
The block Ratio provides the following views:

- Ratio standard view (Page 751)
- Trend view (Page 253)
- Ratio parameter view (Page 754)
- Ratio preview (Page 755)
- Memo view (Page 252)
- Block icon for ratio (Page 756)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

4.9.8.2 Ratio standard view

Ratio standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Displaying and switching the ratio source

This area shows you the currently valid signal source for the ratio setpoint. The following signal sources can be shown here:

- "External"
- "Internal"

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the signal source.

(3) Displaying the input value

The faceplate is a schematic representation of the function of the Ratio block as a signal flow chart:

Output = Input · Ratio + `Offset`

The input is typically the flow setpoint or actual value of the primary component of a ratio controller.

(4) High and low scale range for the ratio

The scale range is based on the bar graph for the ratio specification.

(5) Displaying and switching the default ratio

This area shows you the currently valid specification for the ratio.

The ratio source **(2)** needs to be set to "internal" in order to change this value.

Refer to the Changing values (Page 210) section for information on changing this value.

(6) Displaying the ratio `PV`

This area shows you the current ratio actual value with the corresponding signal status, i.e. the ratio of the actually measured `PV` from the active controller. The task of the ratio controller is to set the flow of all components so that the actual ratio approximates the specified ratio as closely as possible.

(7) Display of the `Offset`

This area shows the current `Offset`.

(8) Displaying the output value

This area shows the current output value `Out`, which typically serves as the setpoint for the flow of the secondary component.

(9) Bar graph for the output

This display graphically represents the output value with the limits set in the Engineering System (ES) (orange triangles, output parameters `OutHiLmOut` and `OutLoLmOut`).

(10) Displaying the limit

This status display is based on the limit of the output value `Out`.

(11) Display area for block states

This area shows if the output value has violated the range limits:

- "Output ≥ HL"
- "Output ≤ LL"

You can set the range limits in the parameter view (Page 754) of the block.

(12) Display area for block states

This area provides additional information on the operating state of the block:

- Simulation

You can find additional information on this in the Simulating signals (Page 47) section.

(13) Display of the limits for the ratio

This blue triangle shows the configured range limits for the ratio.

(14) Bar graph for the default ratio

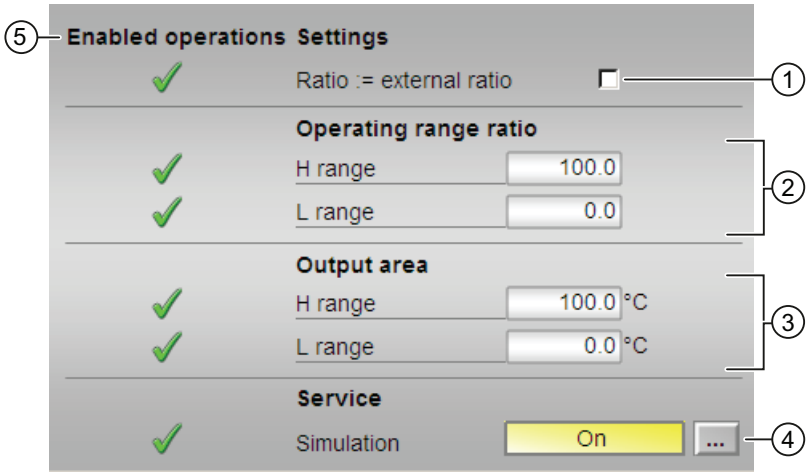
This area shows you the currently valid specification for the ratio in the form of a bar graph. The visible area in the bar graph depends on the configuration of the ratio in the engineering system (ES).

(15) Display of external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

4.9.8.3 Ratio parameter view

Parameter view of Ratio



(1) Settings Ratio := external ratio

When the check box is selected ☑, the ratio is bumplessly switched from external to internal.

(2) Operating range ratio

This is where you specify the operating range for the ratio (input parameters `RatHiLim` or `RatLoLim`). The range is indicated by a blue triangle in the standard view of the bar graph.

(3) Range for output value

This is where you specify the operating range for the output value (input parameters `OutHiLmOut` or `OutLoLmOut`).

(4) Service

You can select the following functions in this area:

- "Simulation"

You can find information about this in the following sections:

- Switching operating states and operating modes (Page 208)
- Simulating signals (Page 47)
- Release for maintenance (Page 52).

(5) Enabled operations

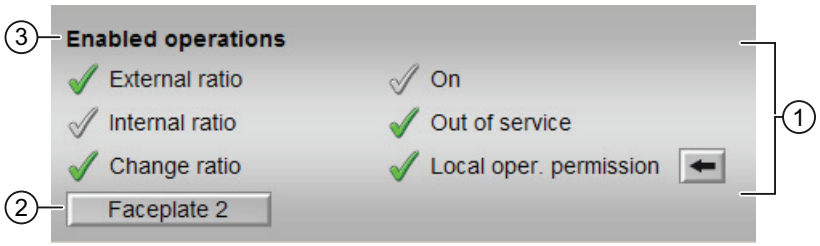
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

4.9.8.4 Ratio preview

Preview of Ratio



(1) The following enabled operations for parameters are shown here:

- "Ratio external": You can change the external ratio.
- "Ratio internal": You can change the internal ratio.
- "Change ratio": You can change the ratio.
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(3) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

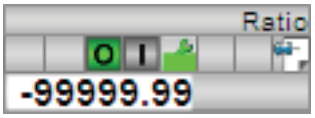
4.9.8.5 Block icon for ratio

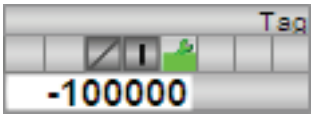
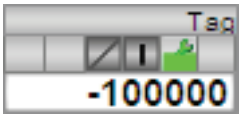
Block icons for Ratio

A variety of block icons are available with the following functions:

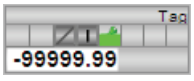
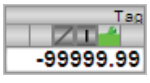
- Process tag type
- Display of the ratio
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits
- Operating modes
- Internal and external setpoint specification
- Signal status, release for maintenance
- Displays for bypassing interlocks
- Interlocks
- Memo display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	

Icons	Selection of the block icon in CFC	Special features
	3	
	4	
	5	
	6	
	7	
	8	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

4.10 SplRange - signal splitter

4.10.1 Description of SplRange

Object name (type + number) and family

Type + number: FC 372

Family: Control

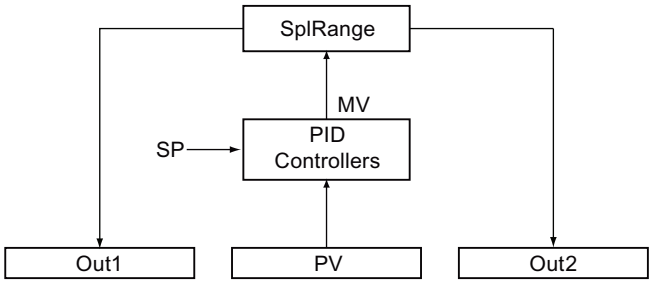
Area of application for SplRange

The block is used for the following applications:

- Splitting the output signal of a PID controller

How it works

The block is used to split signals output coming from a PID controller. You can use this controller to control two valves, for example.



The output parameters are calculated as follows:

`Out1` = `Out1Scale.Low` + ((`NeutPos` - `DeadBand` - `In`) / (`NeutPos` - `DeadBand` - `InScale.Low`)) · (`Out1Scale.High` - `Out1Scale.Low`)

`Out2` = `Out2Scale.Low` + ((`NeutPos` + `DeadBand` - `In`) / (`NeutPos` + `DeadBand` - `InScale.High`)) · (`Out2Scale.High` - `Out2Scale.Low`)

The neutral position (`NeutPos`) forms the reference point for selecting the individual splitter profiles. For details, refer to the SplRange functions (Page 760) section.

Refer to SplRange I/Os (Page 764) to learn the meaning of the parameters.

The block is installed in the run sequence downstream of the controller block. The manipulated variable output (`MV`) of the controller block is interconnected to the input `In` of the SplRange block.

The neutral position (NeutPos) and the dead band zone (DeadBand) can be set by means of the corresponding parameters. DeadBand must be configured to be less than NeutPos.

Out1 and Out2 are adapted to the physical variable by configuring the high/low limits of Out1 and Out2.

The Out1Act or Out2Act output parameter indicates (= 1) that the corresponding Out1 or Out2 output parameter is enabled if the In input value is less than (for Out1) the neutral position (NeutPos) or the In input value is greater than the neutral position (NeutPos) depending on the dead band (Deadband).

Configuration

Use CFC editor to install the block in the OB in which the controller block runs whose manipulated variable is being processed.

There are templates (Templates) for the SplRange block for process tag types in the Advanced Process Library, one example (APL_Example_xx, xx refers to the language variant) with an application scenario for this block being:

- Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for Status parameter

This block does not have the Status parameter.

See also

SplRange messaging (Page 764)

SplRange block diagram (Page 766)

SplRange error handling (Page 763)

SplRange modes (Page 760)

4.10.2 SplRange modes

SplRange operating modes

This block does not have any modes.

See also

SplRange I/Os (Page 764)
SplRange messaging (Page 764)
SplRange error handling (Page 763)
SplRange functions (Page 760)
Description of SplRange (Page 758)
SplRange block diagram (Page 766)

4.10.3 SplRange functions

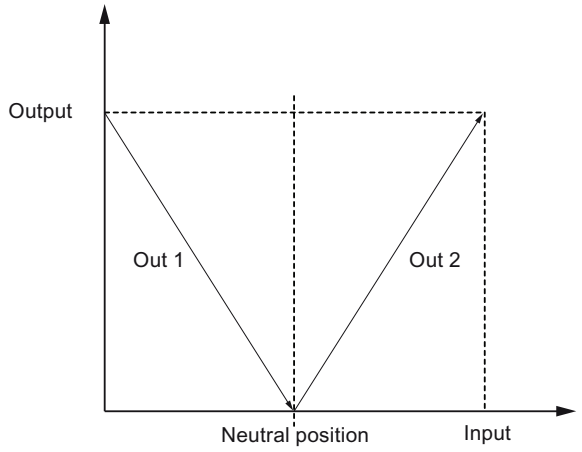
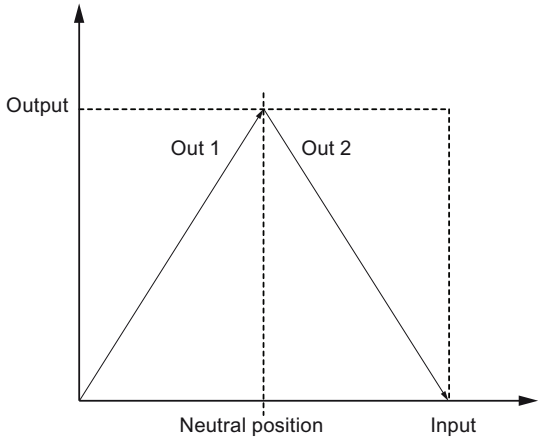
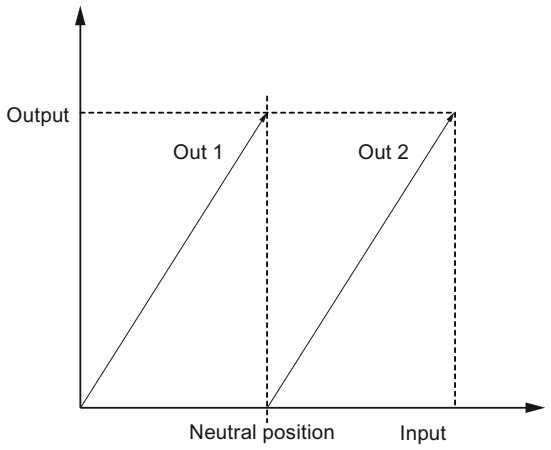
Functions of SplRange

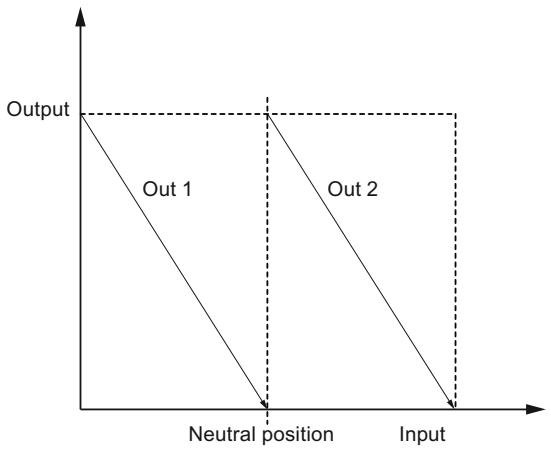
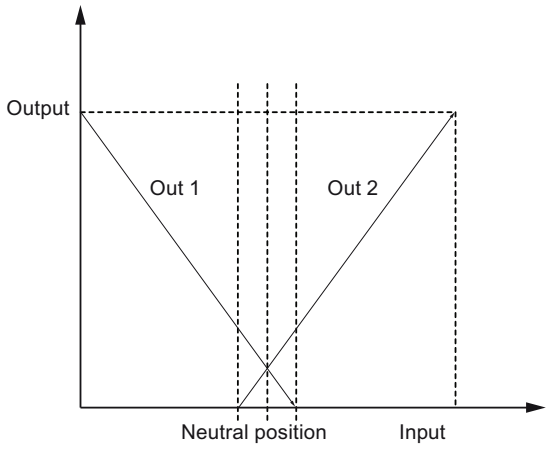
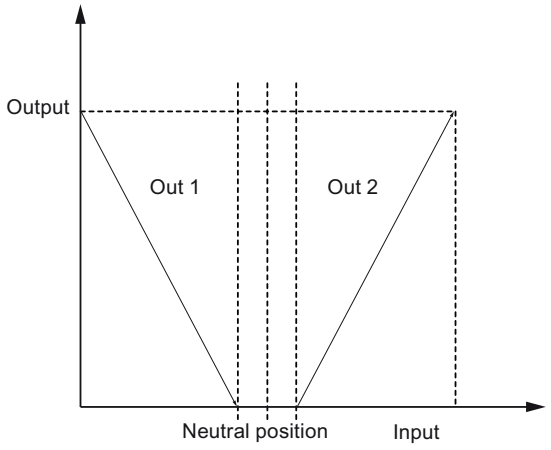
The functions for this block are listed below.

Splitting of the output signal of a controller

The `In` block input can be used to split the output signal of a controller.

The table below shows the six types of signal splitting that are available:

Case	Signal splitting	Setting the I/Os
1		`Out1Scale.Low` = 0.0 and `Out1Scale.High` = 100.0 `Out2Scale.Low` = 0.0 und `Out2Scale.High` = 100.0 `DeadBand` = 0.0 and `NeutPos` = 50.0
2		`Out1Scale.Low` = 100.0 and `Out1Scale.High` = 0.0 `Out2Scale.Low` = 100.0 and `Out2Scale.High` = 0.0 `DeadBand` = 0.0 and `NeutPos` = 50.0
3		`Out1Scale.Low` = 100.0 and `Out1Scale.High` = 0.0 `Out2Scale.Low` = 0.0 and `Out2Scale.High = 100.0` `DeadBand` = 0.0 and `NeutPos` = 50.0

Case	Signal splitting	Setting the I/Os
4		`Out1Scale.Low` = 0.0 and `Out1Scale.High` = 100.0 `Out2Scale.Low` = 100.0 and `Out2Scale.High` = 0.0 `DeadBand` = 0.0 and `NeutPos` = 50.0
5		`Out1Scale.Low` = 0.0 and `Out1Scale.High` = 100.0 `Out2Scale.Low` = 0.0 and `Out2Scale.High` = 100.0 `DeadBand` = -10.0 and `NeutPos` = 50.0
6		`Out1Scale.Low` = 0.0 and `Out1Scale.High` = 100.0 `Out2Scale.Low` = 0.0 and `Out2Scale.High` = 100.0 `DeadBand` = 10.0 and `NeutPos` = 50.0

See also

Description of SplRange (Page 758)

SplRange messaging (Page 764)

SplRange I/Os (Page 764)

SplRange block diagram (Page 766)

SplRange error handling (Page 763)

SplRange modes (Page 760)

4.10.4 SplRange error handling

Error handling of SplRange

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of `In` can no longer be displayed in the REAL number field.

See also

SplRange block diagram (Page 766)

SplRange I/Os (Page 764)

SplRange messaging (Page 764)

SplRange functions (Page 760)

SplRange modes (Page 760)

Description of SplRange (Page 758)

4.10.5 SplRange messaging

Messaging

This block does not offer messaging.

See also

Description of SplRange (Page 758)
SplRange functions (Page 760)
SplRange I/Os (Page 764)
SplRange block diagram (Page 766)
SplRange error handling (Page 763)
SplRange modes (Page 760)

4.10.6 SplRange I/Os

I/Os of SplRange

Input parameters

Parameter	Description	Type	Default
DeadBand	Width of dead band	REAL	0.0
EN	1 = Called block will be processed	BOOL	1
In	Input value	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
InScale	Limit range for the input signal	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0
NeutPos	Neutral position	REAL	50.0
Out1Scale	Limit range of output 1	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0
Out2Scale	Limit range of output 2	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see SplRange error handling (Page 763).	INT	-1
Out1	Output value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out1Act	1 = Output 1 is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out2	Output value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out2Act	1 = Output 2 is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Description of SplRange (Page 758)
SplRange functions (Page 760)
SplRange messaging (Page 764)
SplRange block diagram (Page 766)
SplRange modes (Page 760)

4.10.7 SplRange block diagram

SplRange block diagram

A block diagram is not provided for this block.

See also

SplRange I/Os (Page 764)

SplRange messaging (Page 764)

SplRange error handling (Page 763)

SplRange functions (Page 760)

Description of SplRange (Page 758)

SplRange modes (Page 760)

4.11 AutoExcitation - Process trigger for predictive controller

4.11.1 Description of AutoExcitation

Object name (type + number) and family

Type + number: FB 1842

Family: Control

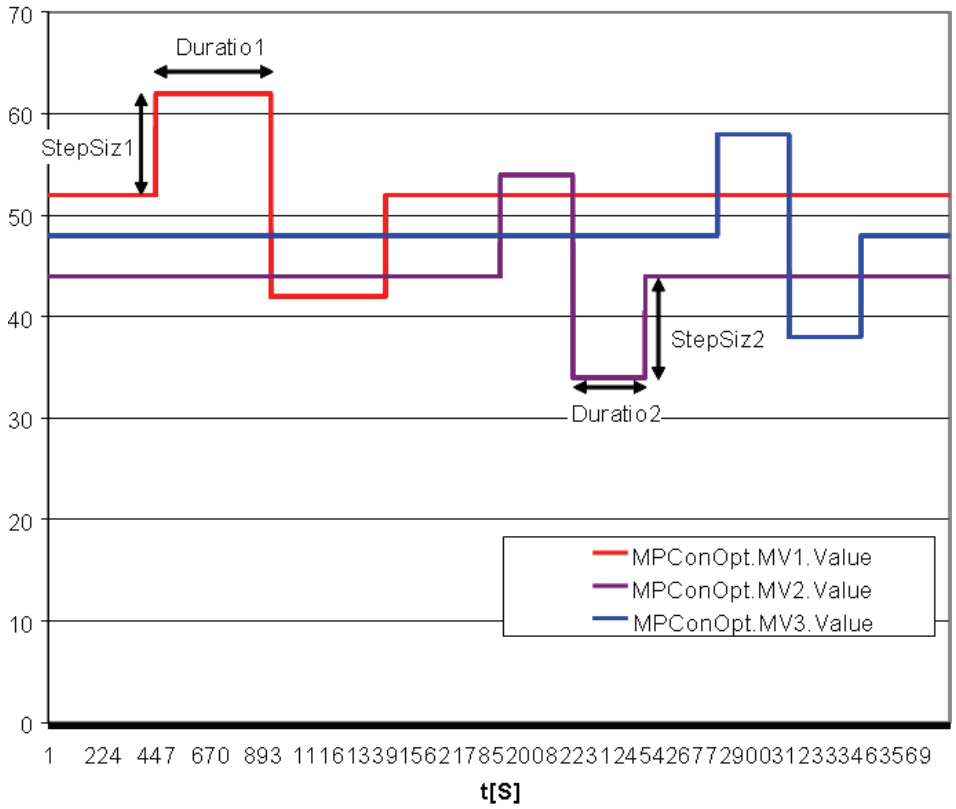
Area of application of AutoExcitation

The block is used to generate suitable trigger signals for the identification of dynamic, multi-variable process models for a model-based predictive controller, ModPreCon . It is interconnected with aModPreCon block for this purpose.

How it works

The AutoExcitation block generates a sequence of abrupt trigger signals for the selected manipulated variables, MV1, MV2 to NumberMVs. A jump is initially made up, down, and then back to the starting point for each manipulated variable, so that the signals is symmetrical to the operating point.

The operating point taken from assigned controller via the MV1Actual...MV4Actual inputs. You set the jump height for each manipulated variable with the StepSiz1... StepSiz4 parameter and the jump duration via the Duratio1... Duratio4 parameter.



Configuration

The AutoExcitation block is part of the new process tag type, ModPreCon. Only the new controller version has the necessary additional inputs for automatic triggering.

If the block retro-installed in an existing CFC, make sure that AutoExcitation andModPreCon are in the same OB cycle.

- Supply the AutoExcitation.MV1Actual...MV4Actual input variables with the appropriate ModPreCon.MV1...MV4 values from the controller.
- Connect the AutoExcitation.NumberMVs input parameter to the ModPreCon.NumberMVs output parameter. Exception: If you do not want to automatically trigger all manipulated variables of the controller, specify the number of manipulated variables to be directly triggered at the AutoExcitation.NumberMVs input parameter .
- Connect the AutoExcitation.MV1Excite... MV4Excite output variables to the appropriate ModPreCon.MV1Excite... MV4Excite input variables on the controller.
- Connect the AutoExcitation.ExciteAct output variable to the ModPreCon.ExciteOn input variables of the controller.

4.11.2 Functions of AutoExcitation

Using AutoExcitation

Start triggering by setting the StartExcite binary input variable to the value 1 .

If you cancel triggering during ongoing operation via StartExcite =0 , the manipulated variables are reset to the original operating point.

When the Next binary input parameter = 1 , you can start the next jump manually before the planned time has expired.

The StepPhase output variable shows the current phase of the attempted jump:

0: Constant

1: Jump up

2: Jump down

3: Jump back to the operating point

The StepTime output variable indicates the remaining time in [s] until the next jump.

4.11.3 Error handling for AutoExcitation

Overview of error numbers

The ErrorNum output parameter can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Default value when the block is installed, the block is not executed
0	There is no error.
60	One of the input parameters, Duratio1, 2, 3 or 4 < SampleTime or SampleTime < 0.001
61	The trigger signals are not adopted correctly by the assigned controller.

4.11.4 I/Os of AutoExcitation

I/Os of AutExcite

Input parameters

Parameter	Description	Type	Default
Duration1	Duration for jump in MV1 in s	REAL	20
Duration2	Duration for jump in MV2 in s	REAL	20
Duration3	Duration for jump in MV3 in s	REAL	20
Duration4	Duration for jump in MV4 in s	REAL	20
MV1Actual	Current value of MV1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV2Actual	Current value of MV2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV3Actual	Current value of MV3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV4Actual	Current value of MV4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Next*	1 = Manual start of the next trigger change	BOOL	0
SampleTime	Sampling time in s	REAL	1

Parameter	Description	Type	Default
StartExcite*	1 = Start of automatic triggering; 0= Cancel automatic triggering	BOOL	1
StepSize1	Step height of MV1	REAL	10
StepSize2	Step height of MV2	REAL	10
StepSize3	Step height of MV3	REAL	10
StepSize4	Step height of MV4	REAL	10

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ErrorNum	Output of current error number	INT	0
ExciteAct	1 = Automatic triggering is active	BOOL	0
MV1Excitation	Value of the trigger for MV1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV2Excitation	Value of the trigger for MV2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV3Excitation	Value of the trigger for MV3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV4Excitation	Value of the trigger for MV4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
StepPhase	Phase of the jump; 0 = Constant, 1= Jump up, 2 = Jump down, 3 = Return	INT	0
StepTime	Time remaining until the next jump phase in s	REAL	0

4.11.5 Operating modes of AutoExcitation

Operating modes of AutoExcitation

This block does not have any modes.

4.11.6 Messaging of AutoExcitation

Messaging of AutoExcitation

This block does not offer messaging.

4.11.7 Block diagram of AutoExcitation

Block diagram of AutoExcitation

A block diagram is not provided for this block.

4.12 LPOptim - Optimization after traversing the linear programming

4.12.1 Description of LPOptim

Object name (type + number) and family

Type + number: FB1844

Family: Control or system

Area of application of LPOptim

Optimization of a linear performance function taking into account constraints after traversing the linear programming.

The LPOptim block is used by the ModPreCon block for static operating point optimization. However, it can also be used separately.

Operating principle

The performance function has a linear relationship to up to four decision variables, x1...x4, with corresponding weighting factors, g1...g4 .

J = g1*x1 + g2*x2 + g3*x3 + g4*x4

The performance function is a hyper-level in a five dimensional space whose gradient direction is described by the gradient vector, Gradient = [g1, g2, g3, g4].

The block can determine both the maximum as well as the minimum of the J performance function. A minimization problem is transformed into an equivalent maximization problem by inverting the gradient vector.

The decision variables are positive and limited by a system of up to eight linear non-equivalence constraints .

The first constraint is, for example

a11*x1+a12*x2+a13*x3+a14*x4 <= b1

All four elements of the first line from the A matrix are combined in the A1n data structure. All eight elements of the B vector are combined in the Begrenzungen data structure.

How it works

The block operates according to the simplex procedure, i.e. based on an iterative algorithm. Due to the linear performance criterion, the solution always lies at an intersection of multiple restrictions.

Configuration

The block can be installed in OB1 because no time-critical calculations are performed. If the block is called by ModPreCon , the user does not have to set parameters directly at LPOptim block.

4.12.2 Functions of LPOptim

Use of LPOptim

The algorithm is started with a positive edge at the Start parameter or if there is a change in one of the input variables (gradient vector and limitations), and displays the optimum variable found at the XOpt1...XOpt4 output parameters when execution is completed.

If no solution is found (non-plausible coefficient), execution is aborted with an error code.

4.12.3 Error handling of LPOptim

Overview of error numbers

The Status output parameter can be used to display the following states:

Status	Meaning
0	There is no error.
10	Unrestricted target function
15	No XOpt found
20	Infinite number of solutions
35	Unlimited permissible range
40	Configuration error

4.12.4 I/Os of LPOptim

I/Os of LPOptim

Input parameters

Parameter	Description	Type	Default
J_Mini	1= Search minimum 0= Search maximum	BOOL	0
Start*	1= Start optimization calculation immediately 0= Start optimization calculation only if one of the input variables has changed	BOOL	0
X1	Decision variable 1 for calculation of J_Act	REAL	0
X2	Decision variable 2 for calculation of J_Act	REAL	0
X3	Decision variable 3 for calculation of J_Act	REAL	0
X4	Decision variable 4 for calculation of J_Act	REAL	0
J_0	Constant part of the performance criterion, irrespective of the decision variables	REAL	0
N_X	Number of decision variables, N_X <= 4	INT	4
N_b	Number of constraints, N_b <= 8	INT	8
Gradient.g1* ... Gradient.g4*	Gradient vector with up to 4 REAL elements	STRUCT	[1, 1, 1, 1]

Parameter	Description	Type	Default
Constraints.b1 ... Constraints.b8	Vector B of the limits with up to 8 REAL elements	STRUCT	[0, 0, 0, 0, 0, 0, 0, 0]
A1n.a11 A1n.a12 A1n.a13 A1n.a14	1. Line of the A matrix contains factors for the elements of vector X in the first constraint	STRUCT	[0, 0, 0, 0]
A2n.a21 A2n.a22 A2n.a23 A2n.a24	2. Line of the A matrix contains factors for the elements of vector X in the second constraint	STRUCT	[0, 0, 0, 0]
A3n.a31 A3n.a32 A3n.a33 A3n.a34	3. Line of the A matrix contains factors for the elements of vector X in the third constraint	STRUCT	[0, 0, 0, 0]
A4n.a41 A4n.a42 A4n.a43 A4n.a44	4. Line of the A matrix contains factors for the elements of vector X in the fourth constraint	STRUCT	[0, 0, 0, 0]
A5n.a51 A5n.a52 A5n.a53 A5n.a54	5. Line of the A matrix contains factors for the elements of vector X in the fifth constraint	STRUCT	[0, 0, 0, 0]
A6n.a61 A6n.a62 A6n.a63 A6n.a64	6. Line of the A matrix contains factors for the elements of vector X in the sixth constraint	STRUCT	[0, 0, 0, 0]
A7n.a71 A7n.a72 A7n.a73 A7n.a74	7. Line of the A matrix contains factors for the elements of vector X in the seventh constraint	STRUCT	[0, 0, 0, 0]
A8n.a81 A8n.a82 A8n.a83 A8n.a84	8. Line of the A matrix contains factors for the elements of vector X in the eighth constraint	STRUCT	[0, 0, 0, 0]

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
Bad	1= Status bad, optimization has failed	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see the error handling of LPOptim.	INT	0
J_Opt	Value of the performance criterion at the optimum	REAL	0
J_Act	Value of the performance criterion for the current assignment of the decision variables in accordance with input parameters X1...X4	REAL	0
X1Opt	Optimum value of the 1st decision variable	REAL	0
X2Opt	Optimum value of the 2nd decision variable	REAL	0
X3Opt	Optimum value of the 3rd decision variable	REAL	0
X4Opt	Optimum value of the 4th decision variable	REAL	0

See also

Error handling of LPOptim (Page 773)

4.12.5 Operating modes of LP_Optim

Operating modes of LPOptim

This block does not have any modes.

4.12.6 Messaging of LP_Optim

Messaging

This block does not offer messaging.

4.12.7 LPOptim block diagram

LPOptim block diagram

A block diagram is not provided for this block.

Dosing blocks

5

5.1 DoseL - Dosing device

5.1.1 Description of DoseL

Object name (type + number) and family

Type + number: FB 1809

Family: Dosage

Area of application for DoseL

The block is used for the following applications:

- Single-component dosing using flow measurement
- Weighing of fill/removal volume using dosing scales

How it works

Processing is performed discretely via a coarse/fine flow control with flow monitoring and setpoint input. The dosing flow can be determined via a maximum of 16 cycles.

A dribbling phase and post dosing can be implemented for both processes. The input value can also be supplied from a pulse module via the `PV1CycLi` output of the Pcs7Cntx (x=1...3) channel block.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the DoseL block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Dosing (DoseLean) (Page 1819)
- Dosing with PA/FF devices (DoseLean_Fb) (Page 1820)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section DoseL I/Os (Page 801).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutoAct.Value`
6	`LocalAct.Value`
7	0: Open padlock in the block icon 1: Closed padlock in the block icon
8	`SP_ExtAct`
9	`Ctrl`
10	`Ctrl2`
11	1 = Dosing by scale
12	0 = Dosing by scale for filling 1 = Dosing by scale for removal
13	`BypProt` active
14	Invalid signal status
15	Mode switchover error
16	1 = `Intlock` is active
17	1 = `Permit` is active
18	1 = `Protect` is active
19	`DosOn`
20	`DosRelax`
21	`DosEnd`
22	`DosOff`
23	`DosPause`
24	`DosStart`
25	1 = Post dosing
26	"Start" command
27	"Pause" command
28	"Continue" command
29	"Cancel" command

Status bit	Parameter
30	`UserAna1` interconnected
31	`UserAna2` interconnected

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock`
1	`DQ_AH_Act`
2	`DQ_AL_Act`
3	`DQ_AH_En`
4	`DQ_AL_En`
5	`DQ_AH_MsgEn`
6	`DQ_AL_MsgEn`
7	`PV_AH_Act`
8	`PV_AL_Act`
9	`PV_AH_En` and `Feature` Bit 7 = 1 or `PV_AH_En` and flow mode
10	`PV_AL_En` and `Feature` Bit 7 = 1 or `PV_AL_En` and flow mode
11	`PV_AH_MsgEn`
12	`PV_AL_MsgEn`
13	`PV_AH2_Act`
14	`PV_AL2_Act`
15	`PV_AH2_En` and `Feature` Bit 7 = 1 or `PV_AH2_En` and flow mode
16	`PV_AL2_En` and `Feature` Bit 7 = 1 or `PV_AL2_En` and flow mode
17	`PV_AH2_MsgEn`
18	`PV_AL2_MsgEn`
19	`CR_AH_Act`
20	`CR_AH_En` and `Feature` Bit 7 = 1 or `CR_AH_En` and flow mode
21	`CR_AH_MsgEn`
22	Display for interlocks in block icon
23	1 = Scales tared
24	Automatic preview 1 = Dosing "On"
25	Automatic preview 1 = Dosing "Dribbling"
26	Automatic preview 1 = Dosing "End"
27	Automatic preview 1 = Dosing "Off"
28	Automatic preview 1 = Dosing "Pause"
29	Forcen active
30	Bypass information from previous function block
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0	"Interlock" button is enabled
1	"Permission" button is enabled
2	"Protection" button is enabled
3	`DosCancelMsgEn`
4	`Feature` Bit 7 = 1 (Calculation of the flow rate for dosing by scale)
5	`Feature` Bit 7 = 1 or flow mode
6	Display flow setpoint in percent
7	Display flow setpoint bar
8	Reset request in automatic mode
9	`Feature` bit 8 = 1 (Fine dosing quantity setpoint absolute)
10	`SimLiOp.Value`
11 - 18	Not used
19	`StartForce`
20	`CancelForce`
21	`PauseForce`
22	`ContForce`
23 - 27	Not used
28	`GrpErr.Value`
29	`RdyToStart.Value`
30 - 31	Not used

Status word allocation for `Status4` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8 - 31	Not used

See also

DoseL functions (Page 783)

DoseL messaging (Page 798)

DoseL modes (Page 781)

DoseL error handling (Page 796)

DoseL block diagram (Page 814)

5.1.2 DoseL modes

DoseL operating modes

The block can be operated using the following modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Dosing actions you can control in "local mode":

- "Start" (positive edge `StartLocal`)
- "Cancel" (`CancelLocal` = 1)
- "Pause" (`PauseLocal` = 1)
- "Continue" (`ContLocal` = 1)

If you operate the block in "local mode", control will only take place via "local" signals (input parameters `StartLocal` = 1, `CancelLocal` = 1, `PauseLocal` = 1 and `ContLocal` = 1).

Note

Unlike the general description, at the `LocalSetting` parameter only the values 0, 1 and 3 can be set, i.e. tracking in "local" mode is not possible with DoseL.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Dosing actions you can control in "automatic mode":

- "Start" (positive edge `StartAut`)
- "Cancel" (`CancelAut` = 1)
- "Pause" (`PauseAut` = 1)
- "Continue" (`ContAut` = 1)

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Dosing actions you can control in "manual mode":

- "Start" (`StartMan` = 1)
- "Cancel" (`CancelMan` = 1)
- "Pause" (`PauseMan` = 1)
- "Continue" (`ContMan` = 1)

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of DoseL (Page 777)

DoseL functions (Page 783)

DoseL error handling (Page 796)

DoseL messaging (Page 798)

DoseL I/Os (Page 801)

DoseL block diagram (Page 814)

5.1.3 DoseL functions

Functions of DoseL

The functions for this block are listed below.

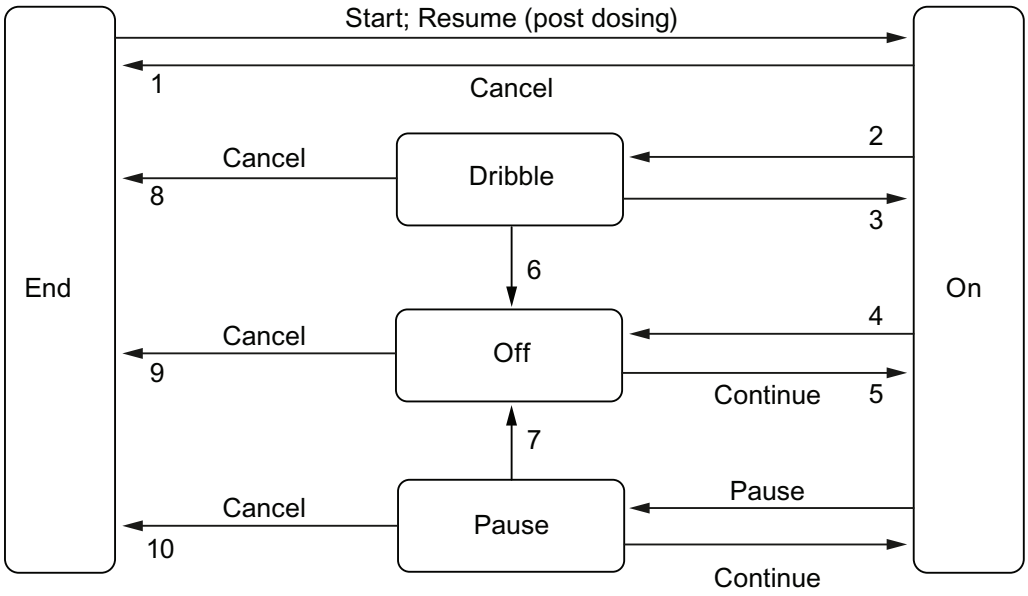
Status diagram

The block provides the following states:

- "End"
- "On"
- "Dribbling"
- "Off"
- "Pause"

The following commands can initiate a state change:

- "Start"
- "Cancel"
- "Pause"
- "Continue"



Dosing can only be started if the dosing setpoint is greater than the current dosing quantity (`DQ_Out`) or if `Feature` Bit 6 is set and no interlock is pending.

However, the following status changes are also performed automatically:

Number in graphic (top)	Function
1	When the dosing quantity is reached, dosing terminates (DQ_Out ≥ DQ_SP).
2	If the dosing quantity reaches the dribbling quantity (relative to dosing setpoint DQ_Out ≥ DQ_SP – DribbOut) the dribbling status becomes active.
3	Automatic dribbling in automatic mode via the Feature Bit 12, if an underdosage was identified after the dribbling time (RelaxTime).
4	• Flow alarm (see input parameter Feature Bit 11) or • interlock.
5	• The flow alarm is acknowledged (also provided via the "Continue" command if Feature Bit 9 = 1) or • The interlock is acknowledged (also provided via the "Continue" command if Feature Bit 9 = 1). • "Continue" command after underdosing.
6	Underdosage identified after the dribbling time (RelaxTime).
7	Interlock
8	Dribbling time (RelaxTime) has expired and dosing quantity is above the low tolerance limit (DQ_Out ≥ DQ_SP_Tol - DQ_AL_Tol)
9	The underdosage is acknowledged or the dosing quantity has been reached (DQ_Out ≥ DQ_SP) via creep flow, for example
10	Dosing quantity has been reached (DQ_Out ≥ DQ_SP) via creep flow, for example

Control outputs

The coarse flow (Ctrl) or fine flow (Ctrl2) control outputs are issued in the "On" status.

The coarse flow control output is active if:

- DQ_Out < DQ_SP – DQ2_SP

The fine flow control output is active if:

- DQ_Out ≥ DQ_SP – DQ2_SP
- Where DQ_Out: Dosing quantity actual value
- DQ_SP: Dosing quantity setpoint
- DQ2_SP: fine dosing quantity setpoint ("calculated")

Output signal as a pulse signal or static signal

This block provides the standard function Output signal as a static signal or pulse signal (Page 40).

In addition to the static control outputs Ctrl, Ctrl2 the block also has pulse outputs P_Ctrl, P_Ctrl2, which are dependent on the static control outputs.

Determining the dosing quantity when using flow dosing

You can activate flow dosing using `Feature` Bit 5 = 0 (Specifying the dosing type (Page 122).)

When using flow dosing, the dosing quantity is determined using the following equation:

$$DQ\_Out = DQ\_Out + \frac{SampleTime}{TI} \cdot \frac{(PV\_Out_{alt} + PV\_Out)}{2}$$

Where:

- `DQ_Out`: Dosing quantity actual value
- `SampleTime`: Sampling time [s]
- `TI`: dimensionless conversion factor for the time basis of the measured value acquisition in the time basis 1 s
- PV_Out_{alt}: Last value `PV_OUT`

The output parameter `PV_OUT` is determined using an average calculation:

$$PV\_Out := \frac{PV\_Out_{(t)} + PV\_Out_{(t-1)} + \ldots + PV\_Out_{(t-(n-1))}}{NumSample_{(N)}}$$

Where:

- `PV_Out(t)` = `PV · Gain`

The average calculation is only active if `NumSample` > 1 and `NumSample` ≤ 16 and serves to smooth systematically pulsating measuring signals.

Note

Integration of the flow for the dosing quantity

The integration of the flow for the dosing quantity is implemented using the trapezoid rule. Compared to the summation of rectangles rule, in which the values are simply added up, the procedural error in the case of the trapezoid rule is smaller for the determination of the numerical integral value.

The dosing quantity is determined in the "On" and "Dribbling" state. In the "End", "Off" and "Pause" states, the flow (creep flow) is determined depending on the `Feature` Bit 13 (Creep rate is always detected in the dosing quantity (Page 141)) and the value `CR_AH_Lim`. Creep rate monitoring is disabled with `CR_AH_En` = 0 .

Determining the dosing quantity when dosing using scales

You can activate scale dosing via the `Feature` Bit 5 = 1 (Specifying the dosing type (Page 122).)

The dosing quantity is determined for a scale dosing in the "Start" state following a positive edge at the input parameter `StandStill`. The `StandStill` input parameter is a feedback signal of the scale.

The process of determining the dosing quantity stops after the dosing quantity is reset in the "End" state.

If the signal is no longer available, you need to configure `StandStill` with 1 permanently; the dosing quantity will then be determined right at the start of the dosing.

When weighing the fill volume (`MeterType` = 0) the dosing quantity is determined using the following equations:

$$DQ\_Out = PV\_Out - DQ\_Tare$$

When weighing the removal volume (`MeterType` = 1):

$$DQ\_Out = DQ\_Tare - PV\_Out$$

with `PV_Out` = `PV` · `Gain`

In the "Start" state, the `DQ_Tare` tare memory is set with `PV_Out` with the first positive edge of `StandStill`.

If you have permanently configured `StandStill` with 1, the tare memory is set right at the start of dosing.

Note

The `DQ_Out` output parameter is the dosing quantity and not the actual scale value. In the "End" state (= following resetting of the dosing quantity), nothing further is displayed, since the dosing procedure is complete. When dosing starts, the actual scale value is transferred to the tare memory, and therefore the dosing quantity always remains 0 after the start of dosing. Therefore, the actual scale value is not displayed in the "End" state.

Calculation of the flow rate for dosing by scale

You can activate the calculation of the flow rate via the `Feature` Bit 7 = 1

(Activating calculation of the flow rate for dosing by scale (Page 121)).

The flow rate for scale dosing is determined by the following equations:

$$PV\_Out = (avPV(t) - avPV(t-1)) \cdot \frac{Gain}{SampleTime}$$

with

$$avPV(t) = \frac{PV(t) + PV(t-1) + ... + PV(t-(N+1))}{NumSample(N)}$$

where `avPV(t)` = internal variable for the mean dosing quantity

Dribbling

The "Dribbling" status is entered automatically in accordance with

- `DQ_Out` ≥ `DQ_SP` – `DribbOut`

Where:

- `DQ_Out`: Dosing quantity actual value
- `DQ_SP`: Dosing quantity setpoint
- `DribbOut`: Dribbling quantity

The dribbling quantity is specified with the input `DribbIn`.

`DribCor` = 1 can be used to automatically determine the dribbling quantity from previous dosing actions:

- `DribbOut` = `DribbOut` - (`DQ_SP` - `DQ_Out`) · `DCF` / 100

`DCF` represents the weighting factor of the last dosing action as a percentage and cannot be set to below 0 or above 100. `DribbOut` is calculated at the end of dosing or the first time an underdosage occurs, and is limited to `DribbMax`. Post dosing is not taken into account.

The "Dribbling" status is active for the period `RelaxTime`. `DribbOut` = 0 deactivates the "Dribbling" status.

Overdosing/underdosing

Once the "Dribbling" status has expired, the dosing quantity is checked for overdosages or underdosages. If the "Dribbling" status is deactivated, the check is performed in the "End" state.

An overdosage has occurred if:

- `DQ_Out` > `DQ_SP_Tol` + `DQ_AH_Tol`

An underdosage has occurred if:

- `DQ_Out` < `DQ_SP_Tol` - `DQ_AL_Tol`
- Where `DQ_Out`: Dosing quantity actual value
- `DQ_SP_Tol`: Dosing quantity setpoint for forming tolerance. This is the same as the dosing quantity setpoint (`DQ_SP`) before and after the check that determines overdosing/underdosing.
- `DQ_AH_Tol`: High tolerance limit
- `DQ_AL_Tol`: Low tolerance limit

If an underdosage is identified after the "Dribbling" status, the "Off" status is entered. The underdosage can be acknowledged in this status (`U_AckOp` = 1 or positive edge `U_AckLi`) and the dosing action completed, or post dosing can be started with the "Continue" command.

Post dosing

If an underdosage is detected after dribbling, post dosing can be performed using the "Continue" command. In automatic mode, `Feature` Bit 12 can be used to start post dosing automatically. Post dosing is active for the period `P_DoseTime`. The block then enters the "Dribbling" state or, if that state is deactivated, the "End" state. If the conditions for the "Dribbling" or "End" states are met within the period `P_DoseTime`, the block switches to these states immediately.

Post dosing can also be carried out in the "End" state by increasing the dosing quantity setpoint and issuing the "Continue" command. Once the dosing quantity has been reset, post dosing can no longer be carried out by means of increasing the setpoint.

If the dribbling correction quantity is smaller than the dribbling quantity, dosing is started for time `P_DoseTime`. If no parameter assignment has been made for `P_DoseTime`, the coarse flow (`Ctrl`) or fine flow (`Ctrl2`) control outputs are set for one cycle.

If no parameter assignment has been made for the dribbling quantity, or the dribbling correction quantity is larger than the dribbling quantity, the dosing procedure is continued without taking time `P_DoseTime` into account.

Information on post dosing via setpoint increase:

- After the setpoint has been increased, the tolerance limits are only updated when the "Continue" command is issued. This ensures the overdosage/underdosage display remains consistent.
- Post dosing can only be carried out after a dosing procedure has been aborted if the setpoint for the dosing quantity has been increased and an actual-value quantity is present.
- In "automatic" and "local" modes, the "Continued" command must be issued on a positive edge to prevent unwanted dosing procedures from taking place after a setpoint increase.

Resetting the dosing quantity

The dosing quantity can only be reset in the "End" status using `RstDQ_Op` = 1 or positive edge `RstDQ_Li`.

`Feature` Bit 6 can be used to reset the dosing quantity automatically when dosing starts.

External/internal setpoint specification

This block provides the standard function Setpoint specification - internal/external (Page 112).

The block always requires the setpoint for the dosing quantity (dosing setpoint). All I/Os for the dosing setpoint start with `DQ_...`. The dosing setpoint is comprised of the coarse and fine setpoints for the coarse/fine flow control. All I/Os for the fine setpoint start with `DQ2_...`. The coarse setpoint is generated internally from the dosing and fine setpoints and is displayed at the output with `DQ1_SP`. If no fine setpoint is available, the coarse setpoint is equal to the dosing setpoint.

Flow setpoints can be specified for the coarse/fine flow setpoint input. All I/Os for the coarse flow start with `SP_...`, and all I/Os for the fine flow with `SP2_...`. The setpoint for coarse or fine flow is displayed at the output `SP` in the "On" status, depending on the coarse/fine flow control.

Setpoint limitation

The setpoints are limited in the block using shared parameters:

- Coarse metering volume: `DQ_HiLim`, `DQ_LoLim`
- Fine metering volume: `DQ2_HiLim`, `DQ2_LoLim`
- Coarse flow rate: `SP_HiLim`, `SP_LoLim`
- Fine flow rate: `SP2_HiLim`, `SP2_LoLim`

If the setpoint limit is violated, external setpoints are limited to the limit you specified. If there are internal setpoints, the last valid value is output.

Bumpless switchover from external to internal setpoint

The parameter `SP_TrkExt` = 1 is used so that the internal setpoint tracks the external setpoint to achieve a Bumpless switchover from the external to the internal setpoint. This allows unwanted jumps at the output parameter to be avoided.

Limit monitoring of the process value

This block provides the standard function Limit monitoring of the process value (Page 72). The calculated flow `PV_Out` is monitored in terms of the limit pairs `PV_AH_Lim` / `PV_AL_Lim` (coarse flow) or `PV_AH2_Lim` / `PV_AL2_Lim` (fine flow), depending on the coarse/fine flow control. Monitoring is only active in the "On" status.

The calculated flow `PV_Out` is monitored in terms of the limit pairs `PV_AH_Lim` / `PV_AL_Lim` (coarse flow) or `PV_AH2_Lim` / `PV_AL2_Lim` (fine flow), depending on the coarse/fine flow control. Monitoring is only active in the "On" status.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Forcing operating modes

This block provides the standard function Forcing operating modes (Page 31). The inputs `StartForce`, `CancelForce`, `PauseForce` and `ContForce` force the block into the states "On", "End" or "Pause".

The "Pause" status can only be forced if the block is in the "On" status.

The "On" state can only be forced from the states

- "Off"
- "Pause"
- "End" if the quantity actual valve is less than the quantity setpoint.

Simulating signals

This block provides the standard function Simulating signals (Page 47).

The flow is simulated with `SimPV`. This input is not active in scale mode, even when the flow is formed by changing quantities (`Feature` Bit 7 = 1)

You can simulate the following values:

- Flow dosing: The flow (`PV`) is specified in the setpoint view with the input (`SimPV`, `SimPV_Li`).
- Dosing using scales: The dosing quantity (`DQ_Out`) is specified in the standard view with the input (`SimDQ`, `SimDQ_Li`).

Interlocks

This block provides the following interlocks:

- Activation enable
- Interlock without reset ("Interlock")
- Interlock with reset ("Protection")

Refer to the section Interlocks (Page 85).

Dosing can only be started if no interlock is present. The interlock function is not active in the "Dribbling" status; nor is the activation enable active in the "On" status. An interlock in the "On" or "Pause" states will cause the block to enter the "Off" status.

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Resetting the block in case of interlocks or errors

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `PV_Out.ST`
- `DQ_Out.ST`
- `DQ_SP.ST`
- `SP.ST`
- `Standstill.ST`
- `LocalLi.ST`
- `StartLocal.ST`
- `CancelLocal.ST`
- `PauseLocal.ST`
- `ContLocal.ST`

The following signal status is formed by:

Signal status	Used status
`DQ_Out.ST`	Formed by the signal status `PV_Out.ST`. The last `DQ_Out.St` signal status is also included for flow dosing and the `DQ_Tare.ST` signal status is included for scale dosing. The worst signal status is applied. The signal status is reset with reset of the dosing quantity.
`DQ_SP.ST`	With an external setpoint `DQ_Ext.ST` (for `DQ_HiLim.ST` or `DQ_LoLim.ST` limit), otherwise good status
`SP.ST`	With an external setpoint `SP_Ext.ST` (coarse flow) / `SP2_Ext.ST` (fine flow) (with `SP_HiLim.ST` or `SP_LoLim.ST` or `SP2_HiLim.ST` or `SP2_LoLim.ST` limit), otherwise good status

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Alarm delays with two time values per limit pair

This block includes the standard function alarm delay for Two time values per limit pair (Page 158) .

Display and operator input area for process values and setpoints

This block includes the standard function Display and operator input area for process values and setpoints (Page 164).

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
4	Setting switch or button mode (Page 140)
5	Specifying the dosing type (Page 122)
6	Resetting the dosing quantity when dosing starts (Page 136)
7	Activating calculation of the flow rate for dosing by scale (Page 121)
8	Use an internal or external setpoint for the absolute fine dosing quantity (Page 126)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Stopping dosing at a flow alarm (Page 115)
12	Automatic post dosing for underdosing in automatic mode (Page 119)
13	Creep rate is always detected in the dosing quantity (Page 141)
15	Flow setpoints in percent (Page 122)
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)
22	Update acknowledgment and error status of the message call (Page 135)
23	Specifying the influence of the signal status on the dosing process (Page 123)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Bit	Function
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

Comments on table:

Feature Bit 4:

- Button mode (`Feature` Bit 4 = 0): The automatic commands in automatic mode are pulse signals, in other words `StartAut`, `CancelAut`, `PauseAut`, `ContAut` can be reset to 0 after switchover to the selected status. In "manual" and "local" modes, however, the automatic commands are static signals, the block state is tracked in the absence of automatic commands.
- Switching mode (`Feature` Bit 4 = 1): The conditions are selected via the inputs `StartAut` (0: Cancel, 1: Start) and `PauseAut` (0: Continue, 1: Pause) with static signals.

Feature Bit 23:

Note

When there is a bad signal status and `Feature` Bit 23 = 1 , the flow is no longer recorded in the dosing quantity in any state. The configure creep rate alarm is output.

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can start dosing
5	1 = Operator can pause dosing
6	1 = Operator can continue dosing
7	1 = Operator can cancel dosing
8	1 = Operator can reset interlock and flow alarms
9	1 = Operator can reset dosing quantity
10	1 = Operator can acknowledge underdosage
11	1 = Operator can select external setpoints
12	1 = Operator can select internal setpoints
13	1 = Operator can enter dosing setpoint
14	1 = Operator can enter dosing setpoint factor for fine dosing
15	1 = Operator can enter flow setpoint for coarse flow

Bit	Function
16	1 = Operator can enter flow setpoint factor for fine flow
17	1 = Operator can activate external/internal bumpless switchover
18	Not used
19	1 = Operator can activate the Release for maintenance function
20	Not used
21	1 = Operator can enter dribbling quantity
22	1 = Operator can enter maximum dribbling quantity
23	1 = Operator can activate/deactivate automatic generation of dribbling quantity
24	1 = Operator can enter weighting factor for generation of dribbling quantity
25	1 = Operator can change the simulation value SimPV
26	1 = Operator can change the simulation value SimDQ
27 - 31	Not used

The block has the following operator control permissions for the `OS1Perm` parameter:

Bit	Function
0	1 = Operator can change the limit for the high alarm for `PV_OUT` (coarse flow)
1	1 = Operator can change the limit for the low alarm for `PV_OUT` (coarse flow)
2	1 = Operator can change the limit for the hysteresis `PV_OUT` (coarse flow)
3	1 = Operator can change the limit for the high alarm for `PV_OUT` (fine flow)
4	1 = Operator can change the limit for the low alarm for `PV_OUT` (fine flow)
5	1 = Operator can change the limit for the hysteresis `PV_OUT` (fine flow)
6	1 = Operator can change the operation high limit of the dosing setpoint
7	1 = Operator can change the operation low limit of the dosing setpoint
8	1 = Operator can change operation high limit of the dosing setpoint factor for fine dosing
9	1 = Operator can change operation low limit of the dosing setpoint factor for fine dosing
10	1 = Operator can change the tolerance value for overdosage
11	1 = Operator can change the tolerance value for overdosage
12	1 = Operator can change operation high limit of the flow setpoint for coarse flow
13	1 = Operator can change operation low limit of the flow setpoint for coarse flow
14	1 = Operator can change operation high limit of the flow setpoint for fine flow
15	1 = Operator can change operation low limit of the flow setpoint for fine flow
16	1 = Operator can change the dribbling time
17	1 = Operator can change the post dosing
18	1 = Operator can change the limit for the high alarm for `PV_OUT` (creep flow)
19	1 = Operator can change the limit for the hysteresis for `PV_OUT` (creep flow)
20 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of DoseL (Page 777)

DoseL messaging (Page 798)

DoseL I/Os (Page 801)

DoseL modes (Page 781)

DoseL error handling (Page 796)

DoseL block diagram (Page 814)

5.1.4 DoseL error handling

Error handling of DoseL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error

Overview of error numbers

The ErrorNum I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
11	Configuration error TI ≤ 0
12	Configuration error: PV_AH_Lim < PV_AL_Lim PV_AH2_Lim ≤ PV_AL2_Lim DQ_HiLim.Value ≤ DQ_LoLim.Value DQ2_HiLim.Value ≤ DQ2_LoLim.Value SP_HiLim.Value ≤ SP_LoLim.Value SP2_HiLim.Value ≤ SP2_LoLim.Value
30	PV is not a valid number
31	PV_Out is not a valid number
32	DQ_Out is not a valid number
41	The value for the LocalSetting I/O is not within the approved limit of 0, 1 or 3.
42	LocalSetting = 0 and LocalLi = 1
48	SP_LiOp = 1 and SP_IntLi = 1 and SP_ExtLi = 1
51	AutModLi = 1 and ManModLi = 1 and Feature Bit Setting switch or button mode (Page 140) = 0 or two I/Os are set at the same time: • in "local mode" StartLocal (pos. edge), CancelLocal, PauseLocal, ContLocalwhen forcing states: StartForce, CancelForce, PauseForce, ContForcein "automatic mode" with pushbutton operation: StartAut (pos. edge), CancelAut, PauseAut, ContAut • in "manual mode": StartMan, CancelMan, PauseMan, ContMan

Mode switchover error

This error can be output by the block, see the section Error handling (Page 104).

See also

Description of DoseL (Page 777)

DoseL modes (Page 781)

DoseL functions (Page 783)

DoseL messaging (Page 798)

DoseL I/Os (Page 801)

DoseL block diagram (Page 814)

5.1.5 DoseL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 1	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId02, SIG 1).

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ Overdosage
	SIG 2	Alarm - low	$$BlockComment$$ Underdosage
	SIG 3	Alarm - high	$$BlockComment$$ PV_OUT - High alarm limit for coarse flow exceeded
	SIG4	Alarm - low	$$BlockComment$$ PV_OUT - Low alarm limit for coarse flow violated
	SIG 5	Alarm - high	$$BlockComment$$ PV_OUT - High alarm limit for coarse flow exceeded
	SIG 6	Alarm - low	$$BlockComment$$ PV_OUT - Low alarm limit for fine flow violated
	SIG 7	Alarm - high	$$BlockComment$$ PV_OUT – Creep flow too great

Message instance	Message identifier	Message class	Event
	SIG 8	Process message - with acknowledgment	$$BlockComment$$ Dosing canceled

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId2	SIG 2	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 3	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	DQ_OUT
5	PV_OUT
6	ExtVal06
7	ExtVa107
8	ExtVa108
9	Reserved
10	Reserved

The associated values 6 ... 8 are allocated to the parameters ExtVa106 ... ExtVa108 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

Associated values for message instance `MsgEvId2`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVa204`
5	`ExtVa205`
6	`ExtVa206`
7	`ExtVa207`
8	`ExtVa208`
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters `ExtVa204` ... `ExtVa208` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of DoseL (Page 777)

DoseL functions (Page 783)

DoseL I/Os (Page 801)

DoseL modes (Page 781)

DoseL error handling (Page 796)

DoseL block diagram (Page 814)

Time stamp (Page 163)

5.1.6 DoseL I/Os

I/Os of DoseL

Input parameters

Parameter	Description	Type	Default
AutModLi*	1= "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock in "local mode" and in "simulation"	BOOL	0
CancelAut*	1 = Select Cancel in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CancelForce	1 = Force cancel	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CancelLocal	1 = Select Cancel in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CancelMan*	1 = Select Cancel in "manual mode"	BOOL	0
ContAut*	1 = Select Continue in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ContForce	1 = Force continue	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ContLocal	1 = Select Continue in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ContMan*	1 = Select Continue in "manual mode"	BOOL	0
CR_A_DC*	Creep flow: Delay time for incoming alarms [s]	REAL	3.0
CR_A_DG*	Creep flow: Delay time for outgoing alarms [s]	REAL	3.0

Parameter	Description	Type	Default
CR_AH_En	Creep flow: 1 = Enable high alarm	BOOL	1
CR_AH_Lim	Creep flow: Limit high alarm	REAL	0.0
CR_AH_MsgEn	Creep flow: 1 = Enable high alarm message	BOOL	1
CR_Hyst*	Creep flow: Hysteresis for alarm limit	REAL	0.0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DCF	Dribbling correction [%]	REAL	25.0
DosCancelMsgEn	1 = Cancel dosing message	BOOL	1
DQ_A_DC*	Overdosage/underdosage: Delay time for incoming alarms [s]	REAL	0.0
DQ_A_DG*	Overdosage/underdosage: Delay time for outgoing alarms [s]	REAL	0.0
DQ_AH_En	Overdosage: 1 = Enable high alarm	BOOL	1
DQ_AH_MsgEn	Overdosage: 1 = Enable high alarm message	BOOL	1
DQ_AH_Tol	Overdosage: Limit high alarm (relative to dosing setpoint)	REAL	0.0
DQ_AL_En	Underdosage: 1 = Enable low alarm	BOOL	1
DQ_AL_MsgEn	Underdosage: 1 = Enable low alarm message	BOOL	1
DQ_AL_Tol*	Underdosage: Limit low alarm (relative to dosing setpoint)	REAL	0.0
DQ_Ext	Dosing quantity: External setpoint	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DQ_HiLim	Dosing quantity: High setpoint limitation	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
DQ_Int*	Dosing quantity: Internal setpoint	REAL	0.0
DQ_LoLim	Dosing quantity: Low setpoint limitation	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DQ_OpScale	Dosing quantity: Limit for scale in bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
DQ_Unit	Unit of measure for dosing quantity	INT	1088

Parameter	Description	Type	Default
DQ2_Ext	Dosing quantity: External setpoint factor for fine dosing	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DQ2_HiLim*	Dosing quantity: High limitation of setpoint factor for fine dosing	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
DQ2_Int*	Dosing quantity: Internal setpoint factor for fine dosing	REAL	0.0
DQ2_LoLim*	Dosing quantity: Low limitation of setpoint factor for fine dosing	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DribbIn	Dribbling quantity	REAL	0.0
DribbMax	Maximum value of automatic determination of dribbling quantity	REAL	100.0
DribbCor	1 = Automatic determination of dribbling quantity	BOOL	0
EN	1 = Called block will be processed	BOOL	1
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
ExtVa204	Associated value 4 for messages (MsgEvID2)	ANY	
ExtVa205	Associated value 5 for messages (MsgEvID2)	ANY	
ExtVa206	Associated value 6 for messages (MsgEvID2)	ANY	
ExtVa207	Associated value 7 for messages (MsgEvID2)	ANY	
ExtVa208	Associated value 8 for messages (MsgEvID2)	ANY	

Parameter	Description	Type	Default
Feature	I/O for additional functions (Page 783)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
Gain	Gain factor	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1
LocalLi	1 = Activate "local mode" via plant signals	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalOp*	1 = "Local mode" via operator	BOOL	0
LocalSetting	Properties for the Local mode (Page 66)	INT	0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
MeterType	Dosing using scales: 0=Up 1=Down	BOOL	0
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp*	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgEvId2	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NumSample	Number of values for average calculation	INT	0
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0

Parameter	Description	Type	Default
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 783)	STRUCT • Bit 0: BOOL • Bit 25: BOOL • Bitt 26: BOOL • Bit 31: BOOL	- • 1 • 1 • 1 • 1
OS1Perm	I/O for operator control permissions (Page 783)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
P_DoseTime*	Duration of post dosing [s]	REAL	0.0
PauseAut*	1 = Select Pause in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PauseForce	1 = Force pause	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PauseLocal	1 = Select Pause in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PauseMan*	1 = Select Pause in "manual mode"	BOOL	0
Perm_En	1 = Activation enable (enable, Permit parameter) is active	BOOL	1
Permit	1 = Enable for opening / closing from neutral position 0 = Valve activation not enabled on OS	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Prot_En	1 = Protective interlock (protection, Protect parameter) is active	BOOL	1
Protect	0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block 1 = Protective interlocking not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
PulseWidth*	Pulse width of control signal [s]	REAL	3.0
PV	Process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_A_DC*	Delay time for incoming PV alarms [s] when using flow dosing (coarse dosing phase)	REAL	3.0

Parameter	Description	Type	Default
PV_A_DG*	Delay time for outgoing PV alarms [s] when using flow dosing (coarse dosing phase)	REAL	3.0
PV_A2_DC*	Delay time for incoming PV alarms [s] when using flow dosing (fine dosing phase)	REAL	3.0
PV_A2_DG*	Delay time for outgoing PV alarms [s] when using flow dosing (fine dosing phase)	REAL	3.0
PV_AH_En	1 = Enable PV alarm (high) limit when using flow dosing (coarse dosing phase)	BOOL	1
PV_AH_Lim	Limit PV alarm (high) when using flow dosing (coarse dosing phase)	REAL	100.0
PV_AH_MsgEn	1 = Enable PV alarm (high) message when using flow dosing (coarse dosing phase)	BOOL	1
PV_AH2_En	1 = Enable PV alarm (high) when using flow dosing (fine dosing phase)	BOOL	1
PV_AH2_Lim	Limit PV alarm (high) when using flow dosing (fine dosing phase)	REAL	100.0
PV_AH2_MsgEn	1 = Enable PV alarm (high) message when using flow dosing (fine dosing phase)	BOOL	1
PV_AL_En	1 = Enable PV alarm limit (low) when using flow dosing (coarse dosing phase)	BOOL	1
PV_AL_Lim	Limit PV alarm (low) when using flow dosing (coarse dosing phase)	REAL	0.0
PV_AL_MsgEn	1 = Enable PV alarm (low) message when using flow dosing (coarse dosing phase)	BOOL	1
PV_AL2_En	1 = Enable PV alarm (low) when using flow dosing (fine dosing phase)	BOOL	1
PV_AL2_Lim	Limit PV alarm (low) when using flow dosing (fine dosing phase)	REAL	0.0
PV_AL2_MsgEn	1 = Enable PV alarm (low) message when using flow dosing (fine dosing phase)	BOOL	1
PV_Hyst*	Hysteresis for PV alarm limits when using flow dosing (coarse dosing phase)	REAL	1.0
PV_Hyst2	Hysteresis for PV alarm limits when using flow dosing (fine dosing phase)	REAL	1.0
PV_OpScale	Limit for scale in PV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
PV_Unit	Unit of measure for process value	INT	1349
RelaxTime*	Duration of dribbling phase [s]	REAL	3.0
RstDQ_Li	1 = Reset dosing quantity via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstDQ_Op*	1 = Reset dosing quantity via operator	BOOL	0

Parameter	Description	Type	Default
RstLi*	1 = Reset interlock/flow monitoring via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset interlock/flow monitoring via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimDQ*	Dosing quantity: Value used in scale mode for SimOn = 1	REAL	0.0
SimDQ_Li	Linkable simulation value DQ	AnaVal	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimPV*	Process value used in flow mode for SimOn = 1	REAL	0.0
SimPV_Li	Process value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_Ext	External flow setpoint - coarse dosing	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_ExtLi	1 = Select external setpoints via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOp*	1 = Select external setpoints via operator	BOOL	0
SP_HiLim	High limit for flow setpoint - coarse dosing	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP_Int*	Internal flow setpoint - coarse dosing	REAL	0.0
SP_IntLi	1 = Select internal setpoints via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_IntOp*	1 = Select internal setpoints via operator	BOOL	0

Parameter	Description	Type	Default
SP_LiOp	Select setpoint source (internal/external): 1 = Via interconnection 0 = Via operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_LoLim	Low limit for flow setpoint - coarse dosing	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_TrkExt	1 = Bumpless switchover from external to internal setpoint active	BOOL	1
SP2_Ext	External flow setpoint - fine dosing	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP2_HiLim	High limit for flow setpoint - fine dosing	STRUCT • Value: REAL • ST: BYTE	- • 100.0 • 16#80
SP2_Int*	Internal flow setpoint - fine dosing	REAL	0.0
SP2_LoLim	Low limit for flow setpoint - fine dosing	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
StandStill	1 = Scales at a standstill, dosing device feedback	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
StartAut*	1 = Select Start in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StartForce	1 = Forced start	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StartLocal	1 = Select Start in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StartMan*	1 = Select Start in "manual mode"	BOOL	0
StepNo	Batch step number	DWORD	16#00000000
TI	Integral action time [s]	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
U_AckLi	1 = Acknowledgment of underdosage via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
U_AckOp*	1 = Acknowledgment of underdosage via operator	BOOL	0

Parameter	Description	Type	Default
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UA2unit	Unit of measure for analog auxiliary value 1	INT	0
UserAna1	Analog auxiliary value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UserAna2	Analog auxiliary value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" is enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CR_AH_Act	Creep flow: 1 = High alarm active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl	Control output for coarse dosing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl2	Control output for fine dosing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DosEnd	1 = End of dosing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DosOff	1 = Dosing off	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DosOn	1 = Dosing on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
DosPause	1 = Dosing pause	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DosRelax	1 = Dosing dribbling	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DosStart	1 = Dosing started	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DQ_AH_Act	AV: 1 = high alarm active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DQ_AL_Act	AV: 1 = low alarm active. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DQ_ExHiAct	Dosing quantity: 1 = High limit for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DQ_ExLoAct	Dosing quantity: 1 = Low limit for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DQ_ExtOut	Dosing quantity: External setpoint, corresponds to input parameter DQ_Ext	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DQ_Out	Dosing quantity	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DQ_SP	Dosing quantity setpoint used by block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DQ_SP_Tol	Setpoint for determining tolerance limits	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DQ_Tare	Tare memory when dosing using scales	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
DQ1_SP	Coarse dosing quantity setpoint used by block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DQ2_ExHiAct	Dosing quantity: 1 = High limit for external setpoint factor for fine dosing has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DQ2_ExLoAct	Dosing quantity: 1 = Low limit for external setpoint factor for fine dosing has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DQ2_ExtOut	Dosing quantity: External setpoint factor for fine dosing [%], corresponds to input parameter DQ2_Ext	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DQ2_SP	Fine dosing quantity setpoint used by block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
DribbOut	Dribbling quantity	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see DoseL error handling (Page 796)	INT	-1
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LockAct	1 = Interlock (Intlock, Permit or Protect) is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000

Parameter	Description	Type	Default
MsgAckn2	Alarm acknowledgement status 2 (output STATUS of second ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgErr2	Alarm error 2 (output ERROR of second ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
MsgStat2	Alarm status 2 (output ERROR of second ALARM_8P)	WORD	16#0000
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Displays of OS_Perm	DWORD	16#FFFFFFFF
OS1PermLog	Display of OS1Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS1PermOut	Display of OS1Perm	DWORD	16#FFFFFFFF
P_Ctrl	1 = Pulse output for coarse dosing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Ctrl2	1 = Pulse output for fine dosing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_AH_Act	1 = PV high alarm enabled (coarse dosing phase). You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_AH2_Act	1 = PV high alarm enabled (fine dosing phase). You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_AL_Act	1 = PV low alarm enabled (coarse dosing phase). You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
PV_AL2_Act	1 = PV low alarm enabled (fine dosing phase). You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Out	Output for process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP	Active flow setpoint	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_ExHiAct	Flow for coarse dosing: 1 = High limit for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExLoAct	Flow for coarse dosing: 1 = Low limit for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtAct	1 = External setpoint is active 0 = Internal setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOut	Flow for coarse dosing: External setpoint, corresponds to input parameter SP_Ext	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP1	Coarse dosing flow setpoint used by block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP2	Fine dosing flow setpoint used by block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP2_ExHiAct	Flow for fine dosing: 1 = High limit for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
SP2_ExLoAct	Flow for fine dosing: 1 = Low limit for external setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP2_ExtOut	Flow for fine dosing: External setpoint, corresponds to input parameter SP2_Ext	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 777)	DWORD	16#00000000
Status2	Status word 2 (Page 777)	DWORD	16#00000000
Status3	Status word 3 (Page 777)	DWORD	16#00000000
Status4	Status word 4 (Page 777)	DWORD	16#00000000

See also

DoseL messaging (Page 798)

DoseL modes (Page 781)

DoseL block diagram (Page 814)

5.1.7 DoseL block diagram

DoseL block diagram

A block diagram is not provided for this block.

See also

Description of DoseL (Page 777)

DoseL modes (Page 781)

DoseL functions (Page 783)

DoseL error handling (Page 796)

DoseL messaging (Page 798)

DoseL I/Os (Page 801)

5.1.8 Operator control and monitoring

5.1.8.1 DoseL views

Views of the DoseL block

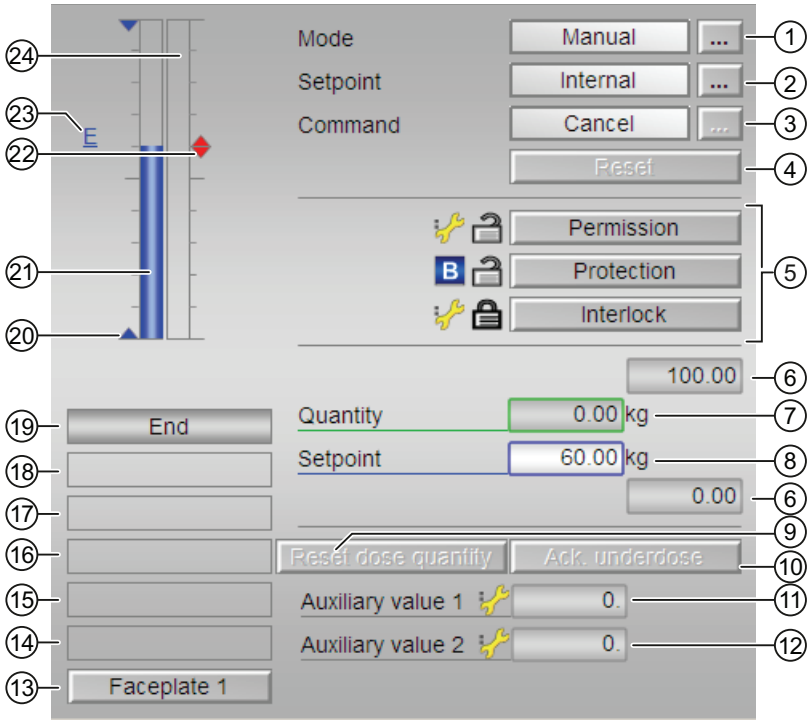
The block DoseL provides the following views:

- DoseL standard view (Page 816)
- Alarm view (Page 250)
- DoseL limit value view (Page 820)
- Trend view (Page 253)
- DoseL parameter view (Page 822)
- Flow setpoint view of DoseL (Page 824)
- Quantity setpoint view of DoseL (Page 827)
- DoseL preview (Page 829)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for DoseL (Page 832)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

5.1.8.2 DoseL standard view

DoseL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Displaying and changing the setpoint

The following states can be shown and changed here:

- "Internal"
- "External"

You can find additional information on this in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

(3) Displaying and changing: Start, continue, pause and cancel

This area shows you the default operating state for the doser. The following states can be shown and changed here:

- "Start"
- "Continue"
- "Pause"
- "Cancel"

You can find additional information on this in the Switching operating states and operating modes (Page 208) section.

(4) Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(5) Operating range for the interlock functions of the block

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocks (Page 85) section.

(6) High and low scale range for the setpoint

This area is already set and cannot be changed.

(7) Displaying and changing the quantity

You can find additional information on this in the Changing values (Page 210) section.

(8) Displaying and changing the setpoint

You can find additional information on this in the Changing values (Page 210) section.

(9) Button: Reset dose quantity

The dosing quantity can only be reset in the "End" status.

(10) Button: Acknowledge underdosing

Acknowledgment of underdosing can only be made in the "Off" status.

(11) and (12) Display of auxiliary values

You can use this area to display two auxiliary values that have been configured in the Engineering System (ES). You can find additional information on this in the Opening additional faceplates (Page 165) section.

(13) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(14) and (15) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"
- "Maintenance"

You can find additional information on this in the Simulating signals (Page 47) section.

(16) Display area for block states

This area provides additional information on the operating state of the block:

- "Invalid signal"
- "Changeover error"
- "Flow"

(17) Display area for block states

This area provides additional information on the operating state of the block:

- "Forced start"
- "Force continue"
- "Force pause"
- "Forced stop"
- "Request 0/1": A reset to "automatic mode" is expected.

(18) Display area for block states

This area provides additional information on the operating state of the block:

- "Underdosed"
- "Overdosed"

(19) Display area for block states

This area provides additional information on the operating state of the block:

- "Coarse dosing"
- "Fine dosing"
- "Relax"
- "Pause"
- "Off"
- "End"
- "Taring"

(20) Limit display for the setpoint

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the ES.

(21) Bar graph for the setpoint

This area shows the current setpoint in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(22) Limit display

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning
- Blue: Tolerance

(23) Display of external setpoint

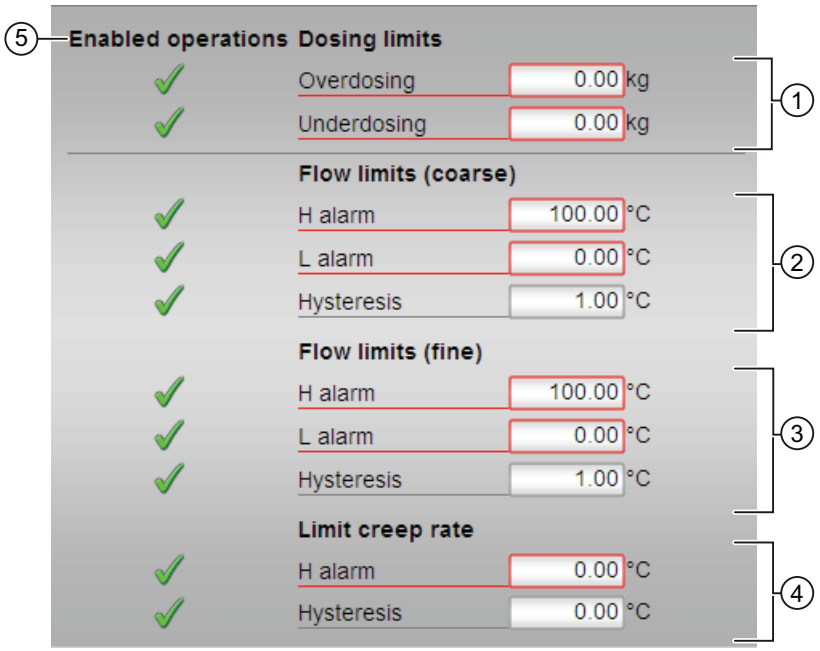
This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(24) Bar graph for the quantity

This area shows you the current quantity in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

5.1.8.3 DoseL limit value view

Limit value view of DoseL



Note

In scale mode with `Feature` Bit 7 = 0, the displays **(2)**, **(3)** and **(4)** are hidden.

(1) Displaying and changing the dosing limits

You can change the dosing limits in this area:

- "Overdosing"
- "Underdosing"

You can find additional information on this in the Changing values (Page 210) section.

(2) Displaying and changing the flow limits (coarse)

You can change the flow limits (coarse) in this area:

- "H alarm"
- "L alarm"
- "Hysteresis"

You can find additional information on this in the Changing values (Page 210) section.

(3) Display and change the flow limits (fine)

You can change the flow limits (fine) in this area:

- "H alarm"
- "L alarm"
- "Hysteresis"

You can find additional information on this in the Changing values (Page 210) section.

(4) Displaying and changing the limit for the creep flow

You can change the limit for the creep rate in this area:

- "H alarm"
- "Hysteresis"

You can find additional information on this in the Changing values (Page 210) section.

(5) Enabled operations

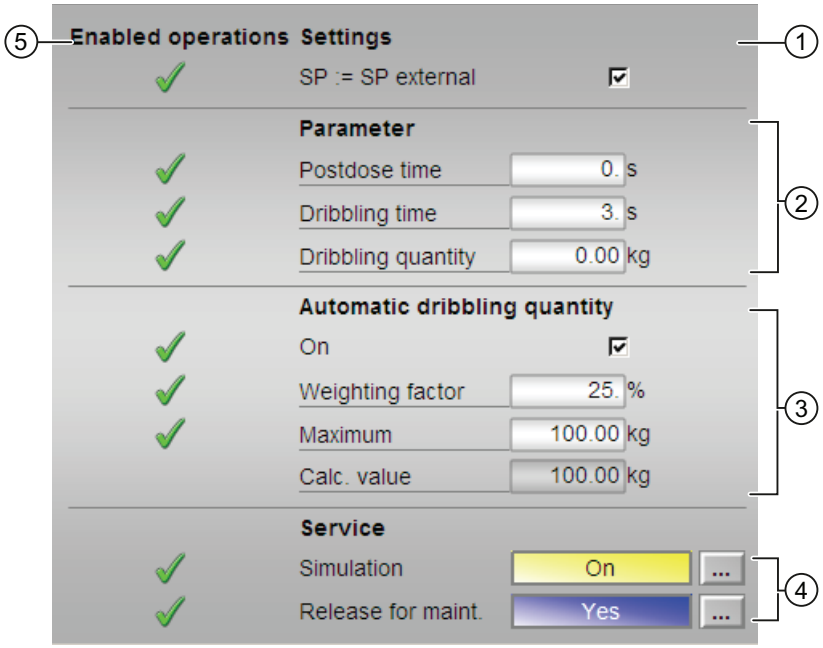
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

5.1.8.4 DoseL parameter view

Parameter view of DoseL



(1) Settings

You can select the following functions in this area:

- "SP:=SP external": ☑ Bumpless switchover of setpoint from external to internal. The internal setpoint is tracked to the external one.

(2) Parameter

In this area, you change parameters and therefore influence the doser. Refer also to the Changing values (Page 210) section for more on this.

You can influence the following parameters:

- "Relax time"
- "Dribble time"
- "Dribble value"

(3) Automatic dribbling quantity

In this area, you change the automatic dribbling quantity parameters, which affects the doser. Refer also to the Changing values (Page 210) section for more on this.

You can change the parameters when the "On" check box is selected ☑.

You can influence the following parameters:

- "Weighting factor"
- "Maximum"
- "Calc. value"

(4) Service

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance"

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

(5) Enabled operations

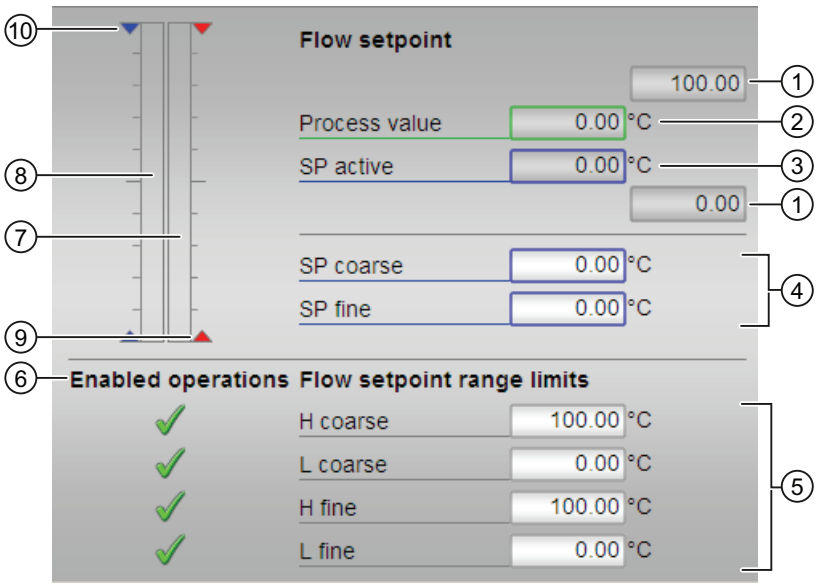
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

5.1.8.5 Flow setpoint view of DoseL

Flow setpoint view for DoseL



Note

1.) This view cannot be selected in scale mode with `Feature` Bit 7 = 0 .

2.) In scale mode with `Feature` Bit 7 = 1 the displays **(3)**, **(4)**, **(5)**, **(6)** and **(8)** are hidden.

3.) If `Feature` Bit 15 = 1, the display of this setpoint view changes. For further information, refer to the description below.

(1) High and low scale range for the process value

These values provide information on the display range for the bar graph **(7)** of the process value. The scale range is defined in the engineering system.

(2) Display of the process value including signal status

This area shows the current process value with the corresponding signal status.

(3) Displaying and changing the SP active value

You can find additional information on this in the Changing values (Page 210) section.

(4) Additional setpoint parameters

You can change the following setpoint parameters in this area:

- "SP coarse"
- "SP fine"

You can find additional information on this in the Changing values (Page 210) section.

(5) Displaying and changing the limits

You can change the limits in this area:

- "H coarse"
- "L coarse"
- "H fine"
- "L fine"

You can find additional information on this in the Changing values (Page 210) section.

(6) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- Green check mark: the OS operator can control this parameter
- Gray check mark: the OS operator cannot control this parameter at this time due to the process
- Red cross: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(7) Bar graph for the process value

This area shows the current process value in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(8) Bar graph for the SP active setpoint

This area shows the current setpoint "SP active" in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

Note

If `Feature` Bit 15 = 1, there are no **(8)** or **(10)** displays. For further information, refer to the description below.

(9) Limit display

These triangles show limits for the flow limits. The flow limits are set in the limit value view.

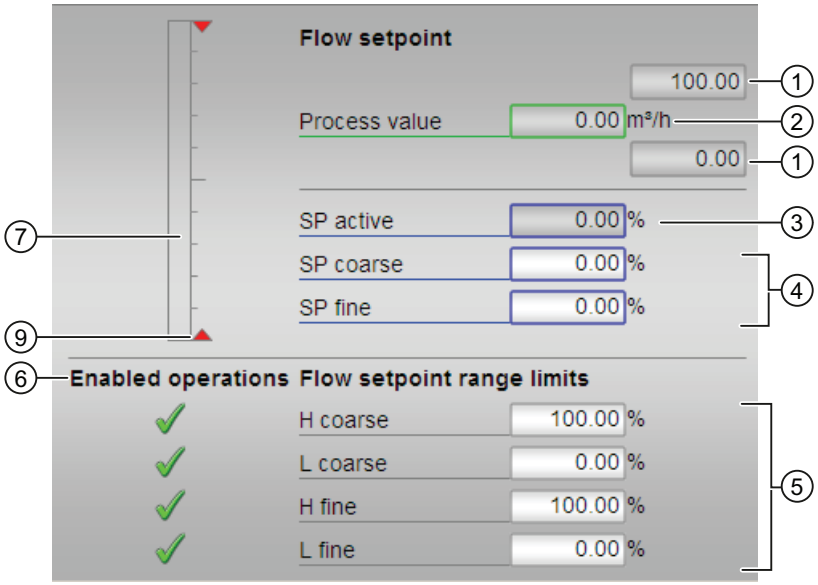
(10) Limit display for the setpoint

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the Engineering System (ES).

Flow setpoint view for `Feature` Bit 15 = 1

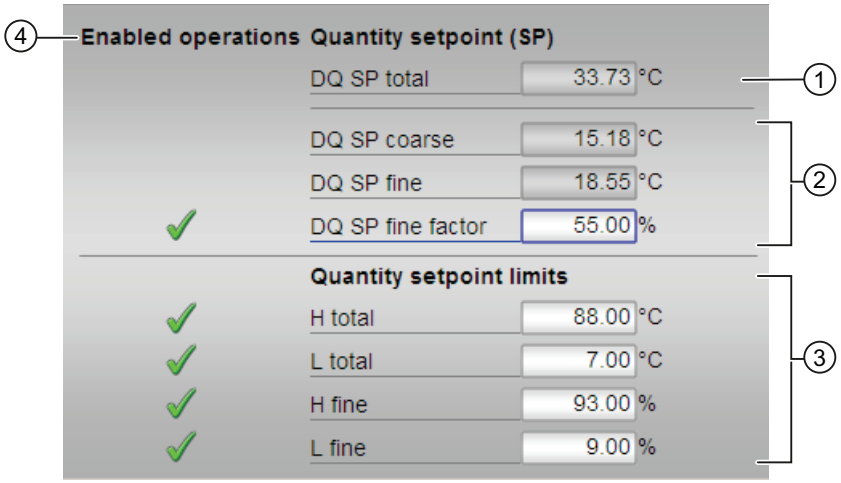
If `Feature` Bit 15 = 1 , the setpoint view changes in the following ways:

- Displays **(8)** and **(10)** are omitted.
- The "SP active" value **(3)** is displayed above the area **(4)**.
- The values in the **(3)**, **(4)** and **(5)** areas contain the unit "%".



5.1.8.6 Quantity setpoint view of DoseL

Quantity setpoint view for DoseL



(1) Displaying and changing the DQ SP total setpoint

You can change the "DQ SP total" setpoint in this area.

You can find additional information on this in the Changing values (Page 210) section.

(2) Displaying and changing additional setpoints

You can change the limits in this area:

- "DQ SP coarse"
- "DQ SP fine"
- "DQ SP fine factor"

You can find additional information on this in the Changing values (Page 210) section.

Note

Special note for `Feature` Bit 8 = 1

If you set this `Feature` Bit with 1, DQ SP fine is no longer displayed in the faceplate. In addition, the display of the unit for DQ SP fine factor is omitted. The input is now performed in an absolute manner.

(3) Displaying and changing the limits

You can change the limits in this area:

- "H total"
- "L total"
- "H fine"
- "L fine"

You can find additional information on this in the Changing values (Page 210) section.

Note

Special note for `Feature` Bit 8 = 1

If you set this `Feature` Bit to 1, the display of the unit for H fine and L fine is switched to the unit configured at `DQ_Unit` . The input is now performed in an absolute manner.

(4) Enabled operations

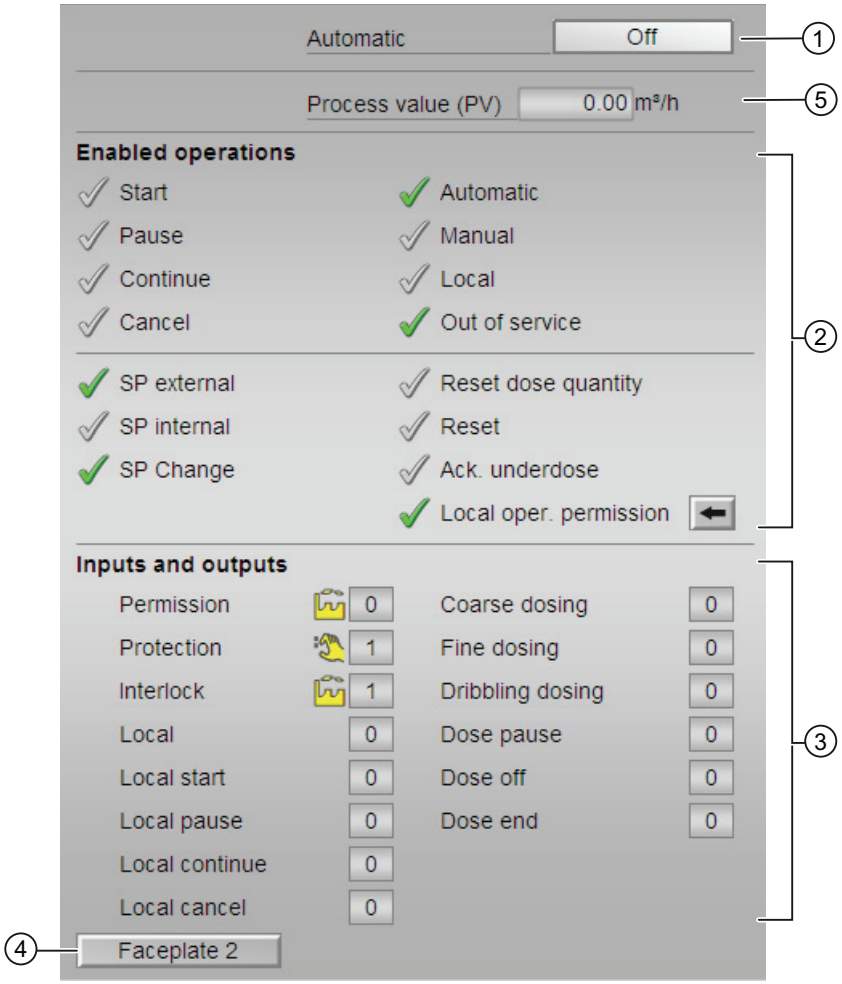
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: The OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

5.1.8.7 DoseL preview

Preview of DoseL



(1) Automatic preview

This area shows you the block status after it has switched from "manual" to "automatic" mode.

If the block is in "automatic mode", the current block state is displayed.

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

The following enabled operations are shown here:

- "Start": You can start the dosing procedure
- "Pause": You can pause the dosing procedure
- "Continue": You can continue the dosing procedure after a pause or an abort.
- "Cancel": You can abort the dosing procedure
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Local": You can switch to "local mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "SP external": You can use the external setpoint
- "SP internal": You can use the internal setpoint
- "Change SP": You can change the setpoint
- "Reset dose quantity": You can reset the dosing quantity
- "Reset": You can reset the block after interlocks or errors
- "Acknowledge underdosing": You can acknowledge underdosing
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Permission":
  - 0 = No OS release for energizing motor
  - 1 = Enable for "starting"/"stopping" from the neutral position
- "Protection":
  - 0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block
  - 1 = "Good" state
- "Interlock":
  - 0 =Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared
  - 1 = "Good" state
- "Local": 1 ="Local mode" is active
- "Local start": 1 = Block is started in "local mode"
- "Local pause": 1= Dosing paused in "local mode"
- "Local continue": 1 = Dosing is continued in "local mode"
- "Local cancel": 1= Dosing is canceled in "local mode"
- "Coarse dosing": 1 = Coarse dosing is performed
- "Fine dosing": 1 = Fine dosing is performed
- "Relax phase": 1 = Dosing procedure is in the relax phase
- "Dose pause": 1 = Dosing pause
- "Dose off": 1 = No dosing taking place
- "Dose end": 1 = Dosing is stopped

(4)Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(5) Process value

This area displays the real process value (PV).

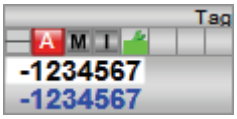
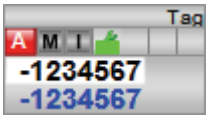
5.1.8.8 Block icon for DoseL

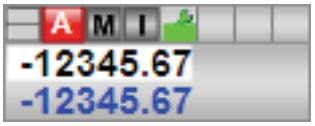
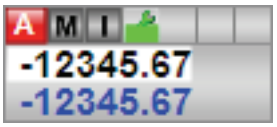
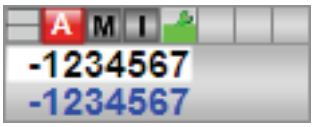
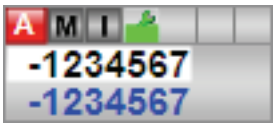
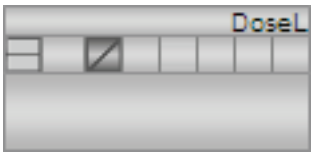
Block icons for DoseL

A variety of block icons are available with the following functions:

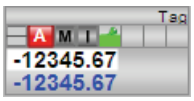
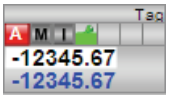
- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault CSF
- Operating modes
- Internal and external setpoint specification
- Signal status, release for maintenance
- Track, force, and bypass
- Interlocks
- Memo display
- Process value (black, with and without decimal places)
- Setpoint (blue, with and without decimal places)

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	

Icons	Selection of the block icon in CFC	Special features
	5	
	6	
	7	
	8	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

Motor and valve blocks

6

6.1 Comparison of large & small blocks

6.1.1 MotL compared to MotS

Comparison of the MotL and MotS blocks

The following tables are intended to help you decide which block to use.

Memory and runtime savings of the small block compared to the large block

You save the following resources for each instance:

- Memory space: ~ 40%
- Runtime: ~ 25%

Block operating modes

	MotL	MotS
Local mode (Page 66)	X	X
Manual mode (Page 63)	X	X
Automatic mode (Page 63)	X	X
Out of service (Page 58)	X	X

Functions of the blocks

	MotL	MotS
Opening additional faceplates (Page 165)	X	X
Operator control permissions (Page 205)	X	X
Limit monitoring of an additional analog value (Page 77)	X	
Limit monitoring with hysteresis (Page 82)	X	
Suppressing messages using the MsgLock parameter (Page 162)	X	X
Interlocks (Page 85)	X	X
Motor protection function (Page 85)	X	X
Disabling interlocks (Page 88)	X	X
Rapid stop for motors (Page 91)	X	

	MotL	MotS
Resetting the block in case of interlocks or errors (Page 33)	X	X
Outputting group errors (Page 107)	X	X
Outputting a signal for start readiness (Page 43)	X	X
Restart lock after switching off the motor (Page 845)	X	
Forming the group status for interlock information (Page 90)	X	X
Forming and outputting the signal status for technologic blocks (Page 93)	X	X
Forcing operating modes (Page 31)	X	
Monitoring the feedbacks (Page 83)	X	X
Release for maintenance (Page 52)	X	X
Specifying warning times for control functions at motors and valves (Page 39)	X	
Simulating signals (Page 47)	X	X
Selecting a unit of measure (Page 168)	X	
Neutral position for motors, valves and controllers (Page 37)	X	X
Output signal as a static signal or pulse signal (Page 40)	X	X
Generating instance-specific messages (Page 162)	X	X
Displaying auxiliary values (Page 167)	X	
Time stamp	X	
SIMATIC BATCH functionality (Page 55)	X	X
Labeling of buttons and text (Page 167)	X	X

Configurable functions using the `Feature` parameter

Bit number	`Feature` bit function	MotL	MotS
0	Setting the startup characteristics (Page 116)	X	X
1	Reaction to the out of service mode (Page 148)	X	X
2	Resetting the commands for changing the mode (Page 135)	X	X
3	Enabling resetting of commands for the control settings (Page 136)	X	X
4	Setting switch or button mode (Page 140)	X	
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)	X	X
10	Exiting local mode (Page 149)	X	X
11	Activating the run time of feedback signals (Page 126)	X	X
14	Enabling rapid stop via faceplate (Page 142)	X	
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)	X	
22	Update acknowledgment and error status of the message call (Page 135)	X	
24	Activating local operating permission (Page 130)	X	X

Bit number	`Feature` bit function	MotL	MotS
25	Suppression of all messages (Page 146)	X	X
28	Disabling operating points (Page 121)	X	
29	Signaling limit violation (Page 142)	X	
30	Resetting depending on the operating mode (Page 137)	X	X
31	Activating reset of interlocks in manual mode (Page 138)	X	X

See also

Description of MotL (Page 839)

MotL modes (Page 843)

MotL error handling (Page 851)

MotL messaging (Page 852)

MotL I/Os (Page 853)

MotL block diagram (Page 860)

6.1.2 VlvL compared to VlvS

Comparison of the VlvL and VlvS blocks

The following tables are intended to help you decide which block to use.

Memory and runtime savings of the small block compared to the large block

You save the following resources for each instance:

- Memory space: ~ 25%
- Runtime: ~ 20%

Modes

	VlvL	VlvS
Local mode (Page 66)	x	x
Manual mode (Page 63)	x	x
Automatic mode (Page 63)	x	x
Out of service (Page 58)	x	x

Functions

	VlvL	VlvS
Opening additional faceplates (Page 165)	x	x
Operator control permissions (Page 205)	x	x
Interlocks (Page 85)	x	x
Disabling interlocks (Page 88)	x	x
Resetting the block in case of interlocks or errors (Page 33)	x	x
Outputting group errors (Page 107)	x	x
Outputting a signal for start readiness (Page 43)	x	x
Forming the group status for interlock information (Page 90)	x	x
Forming and outputting the signal status for technologic blocks (Page 93)	x	x
Forcing operating modes (Page 31)	x	
Monitoring the feedbacks (Page 83)	x	x
Disabling feedback for valves (Page 85)	x	
Suppressing messages using the MsgLock parameter (Page 162)	x	x
Release for maintenance (Page 52)	x	x
Specifying warning times for control functions at motors and valves (Page 39)	x	
Simulating signals (Page 47)	x	x
Selecting a unit of measure (Page 168)	x	
Neutral position for motors, valves and controllers (Page 37)	x	x
Generating instance-specific messages (Page 162)	x	x
Displaying auxiliary values (Page 167)	x	
SIMATIC BATCH functionality (Page 55)	x	x
Output signal as a static signal or pulse signal (Page 40)	x	
Time stamp (Page 1289)	x	
Labeling of buttons and text (Page 167)	x	x

Configurable functions using the `Feature` parameter

Bit number	`Feature` bit function	VlvL	VlvS
0	Setting the startup characteristics (Page 116)	x	x
1	Reaction to the out of service mode (Page 148)	x	x
2	Resetting the commands for changing the mode (Page 135)	x	x
3	Enabling resetting of commands for the control settings (Page 136)	x	x
4	Setting switch or button mode (Page 140)	x	
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)	x	x
10	Exiting local mode (Page 149)	x	x
11	Activating the run time of feedback signals (Page 126)	x	x
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)	x	
22	Update acknowledgment and error status of the message call (Page 135)	x	
24	Activating local operating permission (Page 130)	x	x
25	Suppression of all messages (Page 146)	x	x
30	Resetting depending on the operating mode (Page 137)	x	x
31	Activating reset of interlocks in manual mode (Page 138)	x	x

6.2 MotL - motor (Large)

6.2.1 Description of MotL

Object name (type + number) and family

Type + number: FB 1850

Family: Drives

Area of application for MotL

The block is used for the following applications:

- Control of motors with one control signal

Note

This block is also available as a small block. A comparison of the MotL and MotS blocks is available in the section: MotL compared to MotS (Page 835)

How it works

The block is used to control motors. Various inputs are available for controlling the motor.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section MotL I/Os (Page 853).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	0 = `ManAct.Value` 1 = `AutoAct.Value`
6	`LocalAct.Value`
7	0: Open padlock in the block icon 1: Closed padlock in the block icon
8	`Start.Value`
9	`Stop.Value`
10	Not used
11	`MonStaErr.Value`

Status bit	Parameter
12	MonDynErr.Value
13	BypProt
14	Invalid signal status
15	Mode switchover error
16	1 = Intlock is active
17	1 = Permit is active
18	1 = Protect is active
19	Trip.Value
20	StartForce
21	StopForce
22	Not used
23	"Interlock" button is enabled
24	Reset request in automatic preview
25	WarnAct.Value or Idle Time is active
26	Bypass information from previous function block
27	Automatic preview for "starting"
28	Automatic preview for "stopping"
29	Not used
30	"Permission" button is enabled
31	"Protection" button is enabled

Status word allocation for Status2 parameter

Status bit	Parameter
0	MsgLock
1	AV_AH_Act.Value
2	AV_WH_Act.Value
3	AV_TH_Act.Value
4	AV_TL_Act.Value
5	AV_WL_Act.Value
6	AV_AL_Act.Value
7	AV_AH_En
8	AV_WH_En
9	AV_TH_En
10	AV_TL_En
11	AV_WL_En
12	AV_AL_En
13	AV_AH_MsgEn
14	AV_WH_MsgEn
15	AV_TH_MsgEn

Status bit	Parameter
16	AV_TL_MsgEn
17	AV_WL_MsgEn
18	AV_AL_MsgEn
19	1 = No impact of input signals on "local mode" with LocalSetting = 2 and LocalSetting = 4
20	Motor is stopped
21	The motor is stopping.
22	The motor is starting.
23	the motor is running
24	Error in motor
25 - 29	Not used
30	Display for interlocks in block icon
31	MS_RelOp

Status word allocation for Status3 parameter

Status bit	Parameter
0 - 17	Not used
18	SimLiOp.Value
19	1 = Enable for rapid stop (Feature Bit Enabling rapid stop via faceplate (Page 142))
20 - 22	Not used
23	Command for rapid stop
24	Output command for starting the motor
25	Output command for stopping the motor
26	Show automatic preview in the standard view
27	Not used
28	GrpErr.Value
29	RdyToStart.Value
30	Auxiliary value 1 visible
31	Auxiliary value 2 visible

Status word allocation for `Status4` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8	`AV` not connected
9	Motor protection display (`Trip.Status` ≠ 16#FF)
10	1 = Input parameter `FbkRun` is connected
11 - 31	Not used

See also

MotL functions (Page 845)
MotL messaging (Page 852)
MotL block diagram (Page 860)
MotL error handling (Page 851)
MotL modes (Page 843)

6.2.2 MotL modes

MotL operating modes

The block can be operated using the following modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Motor actions you can control in local mode:

- "Start" (`StartLocal` = 1)
- "Stop" (`StopLocal` = 1)

A motor operated in "local mode" is controlled either by "local" signals or by the feedback signals (e.g the `FbkStart` = 1 input parameter). Configuration takes place via the input parameter `LocalSetting`.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Motor actions you can control in auto mode:

- "Start" (`StartAut` = 1)
- "Stop" (`StopAut` = 1)

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Motor actions you can control in manual mode:

- "Start" (`StartMan` = 1)
- "Stop" (`StopMan` = 1)

"Out of service"

You can find general information about the "Out of service" mode in the Out of service (Page 58) section.

See also

MotL block diagram (Page 860)

MotL I/Os (Page 853)

MotL messaging (Page 852)

MotL error handling (Page 851)

MotL functions (Page 845)

Description of MotL (Page 839)

6.2.3 MotL functions

Functions of MotL

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can stop the motor
5	1 = Operator can start the motor
6	Not used
7	1 = Operator can reset the motor
8	1 = Operator can define the monitoring time for startup
9	1 = Operator can define the monitoring time for runtime
10	1 = Operator can enable the monitoring time function (Bit 8 - 9)
11	1 = Operator can activate the Simulation function
12	1 = Operator can activate the Release for maintenance function
13	1 = Operator can change the high limit (`AV`) for the alarm
14	1 = Operator can change the high limit (`AV`) for the warning
15	1 = Operator can change the high limit (`AV`) for the tolerance
16	1 = Operator can change the limit (`AV`) for hysteresis
17	1 = Operator can lower the limit (`AV`) for the alarm
18	1 = Operator can lower the limit (`AV`) for the warning
19	1 = Operator can lower the limit (`AV`) for the tolerance
20 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Limit monitoring of an additional analog value

This block provides the standard function Limit monitoring of an additional analog value (Page 77).

Limit monitoring with hysteresis

This block provides the standard function Limit monitoring with hysteresis (Page 82).

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Interlocks

This block provides the following interlocks:

- Activation enable
- Interlock without reset ("Interlock")
- Interlock with reset ("Protection")

Refer to the section Interlocks (Page 85) as well as Influence of the signal status on the interlock (Page 88).

Motor protection function

This block provides the standard function Motor protection function (Page 85).

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Rapid stop for motors

This block provides the standard function Rapid stop for motors (Page 91).

Resetting the block in case of interlocks or errors

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `Trip`
- `MonDynErr`
- `MonStaErr`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Restart lock after switching off the motor

After switching off or stopping the motor, it can only be restarted after the time set with the `IdleTime` input parameter.

When the "Stop" command is given, the motor goes immediately into "Stop" mode, and `IdleTime`starts after the feedback (`FbkRun` = 0) is given. The motor cannot be started again until the `IdleTime` has expired.

The `IdleTime` parameter can be set independently of the `MonTiDynamic` parameter.

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `LocalLi.ST`
- `StartLocal.ST`
- `StopLocal.ST`
- `Trip.ST`
- `FbkRunOut.ST`
- `AV_Out.ST`

Forcing operating modes

This block provides the standard function Forcing operating modes (Page 31).

The following states can be enforced:

- "Start" (`StartForce`)
- "Stop" (`StopForce`)

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Specify warning times for control functions

This block provides the standard function Specifying warning times for control functions at motors and valves (Page 39).

You can generate warning signals when, for example, motors are started. Warning signals can be generated in the following modes:

- Manual mode (Page 63) (`WarnTiMan` input parameter)
- Automatic mode (Page 63) (`WarnTiAut` input parameter)

You specify the warning times in seconds using the input parameters `WarnTiMan` and `WarnTiAut`. If, for example, a motor is started, then this is displayed at the output parameter with `WarnAct` = 1. The motor then starts after the set warning time has expired and `WarnAct` then goes back to 0.

A corresponding warning is not output if the warning times (`WarnTiMan` or `WarnTiAut`) are specified with a smaller value than the `SampleTime` parameter.

Simulating signals

This block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Additional value (`SimAV`, `SimAV_Li`)

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37).

Output signal as a pulse signal or static signal

This block provides the standard function Output signal as a static signal or pulse signal (Page 40).

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
4	Setting switch or button mode (Page 140)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
14	Enabling rapid stop via faceplate (Page 142)
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)
19	Reset even with locked state (Page 138)
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

In pushbutton mode (Bit 4 = 0) the automatic commands in "automatic" mode are latching, in other words `StartAut`, `StopAut` can be reset to 0 after changing the control. In "manual" and "local" modes, however, the automatic commands are not saved and in the absence of automatic commands the automatic control is tracked.

In switching mode (Bit 4 = 1), the control is selected with the static signal `StartAut`. If `StartAut` input is not set the motor is stopped. Control via `StopAut` is not needed. If the "Activate command reset for control" function (Bit 3 = 1) is also activated, the `StartAut` input is reset to the neutral position after evaluation in the block.

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Button labels

This block provides the standard function Labeling of buttons and text (Page 167).

Instance-specific text can be configured for the following parameters:

- `StartMan`
- `StopMan`
- `RapidStp`

See also

MotL messaging (Page 852)

MotL I/Os (Page 853)

MotL block diagram (Page 860)

MotL error handling (Page 851)

MotL modes (Page 843)

Description of MotL (Page 839)

6.2.4 MotL error handling

Error handling of MotL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
41	The value for the `LocalSetting` I/O is not within the approved limit of 0 to 4.
42	`LocalSetting` = 0 oder `LocalSetting` = 3 or `LocalSetting` = 4 and `LocalLi` = 1
51	`StartLocal` = 1 and `StopLocal` = 1 `StartAut` = 1 and `StopAut` = 1 `AutModLi` = 1 and `ManModLi` = 1 `StartForce` = 1 and `StopForce` = 1
52	`LocalAct` = 1 and `LocalSetting` = 2 or 4 and `SimOn` = 1

Mode switchover error

This error can be output by the block, see chapter Error handling (Page 104).

Invalid input signals

This error can be output by the block, see the section Error handling (Page 104).

See also

MotL block diagram (Page 860)

MotL I/Os (Page 853)

MotL messaging (Page 852)

MotL functions (Page 845)

MotL modes (Page 843)

Description of MotL (Page 839)

6.2.5 MotL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ Motor feedback error
	SIG 2	AS process control message - fault	$$BlockComment$$ Motor protection triggered
	SIG 3	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId1, SIG 3).

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 4	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 5	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 6	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVa104`
5	`ExtVa105`
6	`ExtVa106`
7	`ExtVa107`
8	`ExtVa108`
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters `ExtVa104` ... `ExtVa108` , and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of MotL (Page 839)

MotL functions (Page 845)

MotL I/Os (Page 853)

MotL block diagram (Page 860)

MotL error handling (Page 851)

MotL modes (Page 843)

6.2.6 MotL I/Os

I/Os of MotL

Input parameters

Parameter	Description	Type	Default
`AutModLi*`	1 = "Automatic mode" via interconnection or SFC (controlled by `ModLiOp` = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
`AutModOp*`	1 = "Automatic mode" via operator (controlled by `ModLiOp` = 0)	BOOL	0

Parameter	Description	Type	Default
AV	Input additional analog value, to be connected to AV_Tech of the AV block	ANY	
AV_AH_Lim	Limit high alarm	REAL	95.0
AV_AL_Lim	Limit low alarm	REAL	5.0
AV_Hyst	Hysteresis for alarm, warning and tolerance limits	REAL	1.0
AV_TH_Lim	Limit high tolerance	REAL	85.0
AV_TL_Lim	Limit low tolerance	REAL	15.0
AV_WH_Lim	Limit high warning	REAL	90.0
AV_WL_Lim	Limit low warning	REAL	10.0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock in "local mode" and in "simulation"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
FbkRun	Feedback for starting is present: 1 = Start 0 = Stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF

Parameter	Description	Type	Default
Feature	I/O for additional functions (Page 845)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
IdleTime*	Wait time for restart in [s]	REAL	5.0
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1
LocalLi	1 = Activate "local mode" via plant signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalOp*	1 = "Local mode" via operator	BOOL	0
LocalSetting	Properties for the Local mode (Page 66)	INT	0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Monitor	1 = Feedback monitoring	BOOL	1
MonTiDynamic*	Monitoring time for feedback errors after operation in [s]	REAL	3.0
MonTiStatic*	Monitoring time for feedback errors without operation in [s]	REAL	3.0
MS_RelOp*	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000

Parameter	Description	Type	Default
OS_Perm	I/O for operator control permissions (Page 845)	STRUCT • Bit 0: BOOL • Bit 20: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
Permit	1 = Enable for opening / closing from neutral position 0 = No OS release for energizing motor	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Perm_En	1 = Activation enable (enable, Permit parameter) is active	BOOL	1
Protect	0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block 1 = Protective interlocking not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Prot_En	1 = Protective interlock (protection, Protect parameter) is active	BOOL	1
PulseWidth*	Pulse width of control signal [s]	REAL	3.0
RapidStp*	Rapid stop for the motor: 0 = Motor On 1 = Motor Off	BOOL	0
RstLi*	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SimAV*	Additional value used for SimOn = 1	REAL	0.0
SimAV_Li	Additional analog value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
SimLiOp	Activation/deactivation of the simulation 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-

Parameter	Description	Type	Default
StartAut*	1 = Starting the motor in "automatic mode"	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
StartForce	1 = Force motor start	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
StartLocal	1 = Starting the motor in "local mode"	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
StartMan*	1 = Starting the motor in "manual mode"	BOOL	0
StepNo	Batch step number	DWORD	16#00000000
StopAut*	1 = Stopping the motor in "automatic mode"	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
StopForce	1 = Force motor stop	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
StopLocal	1 = Stopping the motor in "local mode"	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
StopMan*	1 = Stopping the motor in "manual mode"	BOOL	0
Trip	1 = Motor is in "good" state	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#FF
UserAna1	Analog auxiliary value 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UserAna2	Analog auxiliary value 2	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00
WarnTiAut	Prewarning of motor start in "automatic mode" in [s]	REAL	0.0
WarnTiMan	Prewarning of motor start in "manual mode" in [s]	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" is enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AV_OpScale	Limit for scale in AV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
AV_Out	Output additional analog value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
AV_Unit	Unit of measure for additional analog value	INT	0
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MotL error handling (Page 851)	INT	-1
FbkRunOut	Feedback for starting is present: 1 = Start 0 = Stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LockAct	1 = Interlock (Intlock, Permit, Protect) or Trip is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
MonDynErr	1 = Feedback error due to control change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonStaErr	1 = Feedback error due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Stop	0 = Pulse signal for stopping the motor	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
P_Start	1 = Pulse signal for starting the motor	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
R_StpAct	1 = Rapid stop of the motor is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Run	1 = Motor is running	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80

Parameter	Description	Type	Default
Start	1 = Control of motor: started	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Status1	Status word 1 (Page 839)	DWORD	16#00000000
Status2	Status word 2 (Page 839)	DWORD	16#00000000
Status3	Status word 3 (Page 839)	DWORD	16#00000000
Status4	Status word 4 (Page 839)	DWORD	16#00000000
Stop	1 = Motor stopped	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
WarnAct	1 = Prewarning for motor start active (parameters WarnTiAut and WarnTiMan)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

MotL modes (Page 843)

MotL block diagram (Page 860)

MotL messaging (Page 852)

6.2.7 MotL block diagram

MotL block diagram

A block diagram is not provided for this block.

See also

MotL I/Os (Page 853)

MotL messaging (Page 852)

MotL error handling (Page 851)

MotL functions (Page 845)

MotL modes (Page 843)

Description of MotL (Page 839)

6.2.8 Operator control and monitoring

6.2.8.1 MotL views

Views of the MotL block

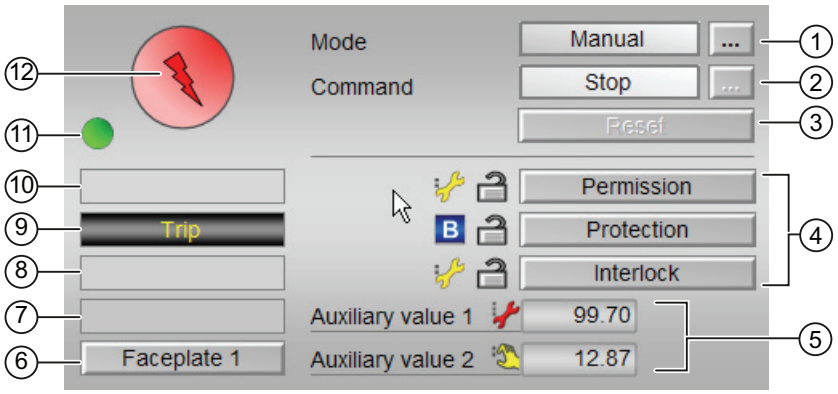
The MotL block provides the following views:

- MotL standard view (Page 861)
- Alarm view (Page 250)
- Limit value view of motors (Page 243)
- Trend view (Page 253)
- Parameter view for motors and valves (Page 236)
- MotL preview (Page 865)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for MotL (Page 868)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.2.8.2 MotL standard view

MotL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Manual and automatic mode for motors, valves and dosers (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Starting and stopping the motor

This area shows you the default operating state for the motor. The following states can be shown and executed here:

- "Start"
- "Stop"
- "Rapid stop"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(4) Operator control and display area for interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocking functions (Page 85) section.

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

  If there is a bypass of one of the interlock signals, the symbol for the bypass is shown instead of the signal status.

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(5)Display of auxiliary values

This display is only visible when the corresponding block input is connected.

You can use this area to display two auxiliary values that have been configured in the Engineering System (ES). You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(6) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(7) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(8) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"
- "Delay"

You will find more detailed information on this in the chapters Simulating signals (Page 47) and Display of delay times (Page 31).

(9) Display area for block states

This area provides additional information on the operating state of the block (from high to low according to priority):

- "Motor protection"
- "Runtime error"
- "Control deviation"
- "Invalid signal"
- "Changeover error"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error") and Motor protection function (Page 85).

(10) Display area for block states

This area provides additional information on the operating state of the block:

- "Forced start"
- "Forced stop"
- "Request 0/1": A reset to "automatic mode" is expected.

You can find additional information on this in the Forcing operating modes (Page 31) section.

(11) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the motor would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

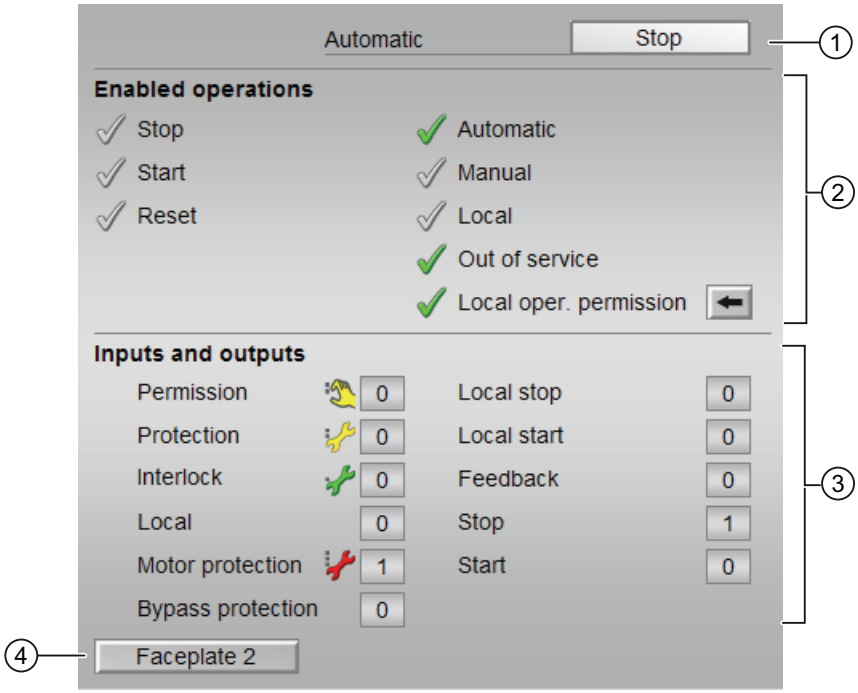
(12) Status display of the motor

The current status of the motor is graphically displayed here.

You can find more information about this in the section Block icon for MotL (Page 868).

6.2.8.3 MotL preview

Preview of MotL



(1) Automatic preview

This area shows you the block status after it has switched from "manual" to "automatic" mode.

If the block is in "automatic mode", the current block state is displayed.

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Stop": You can stop the motor.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Start": You can start the motor.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Reset": You can reset the motor after interlocks or errors.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Local": You can switch to "local mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Permission":

  This display is only visible when the corresponding block input is connected.

  – 0 = No OS release for energizing motor

  – 1 =Enable for "starting"/"stopping" from the neutral position

- "Protection":

  This display is only visible when the corresponding block input is connected.

  – 0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block

  – 1 = "Good" state

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Local": 1= Block is operated in "local mode"
- "Motor protection": 1 = Motor is in "good" state
- "Interlock deact.":

  – 0 = Bypass disabled

  – 1 = Bypassing interlock in "local mode" and in "simulation"

- "Local stop": 1 = Stopping the motor in "local mode"
- "Local start": 1 = Starting the motor in "local mode"
- "Feedback →": 1 = Motor has started and is running
- "Stop": 1 = Stopping the motor
- "Start": 1 = Starting the motor

(4) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

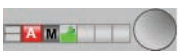
6.2.8.4 Block icon for MotL

Block icons for MotL

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault CSF
- Operating modes
- Signal status, release for maintenance
- Displays for bypassing interlocks
- Interlocks
- Memo display
- Motor state display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	

Icons	Selection of the block icon in CFC	Special features
	10	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	
	3	
	4	
	5	
	6	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Motor state display

The following motor states are shown here:

Icon	Meaning
	Motor started (motor icon changes)
	The motor is running.
	Motor stopped (motor icon changes)
	Motor idle
	Error at motor (monitoring error, motor protection)
	Motor out of service

6.3 MotS - motor (Small)

6.3.1 Description of MotS

Object name (type + number)

Type + number: FB 1910

Family: Drives

Area of application for MotS

The block is used for the following applications:

- Controlling motors

Note

This block is also available as a large block. A comparison of the MotL and MotS blocks is available in the section: MotL compared to MotS (Page 835)

How it works

The block is used to control motors. Various inputs are available for controlling the motor.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation

For a description of the individual parameters, see the MotS I/Os (Page 882) section.

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	0 = `ManAct.Value` 1 = `AutoAct.Value`
6	`LocalAct.Value`
7	`LockAct.Value`
8	`Start.Value`
9	Motor is stopped
10	Not used
11	`MonStaErr.Value`
12	`MonDynErr.Value`
13	`BypProt`
14	Invalid signal status
15	Not used
16	1 = `Intlock` is active
17 - 18	Not used
19	`Trip`
20 - 22	Not used
23	"Interlock" button is enabled
24	Reset request in automatic preview
25	Not used
26	Bypass information from previous function block

Status bit	Parameter
27	Automatic preview for "starting"
28	Automatic preview for "stopping"
29 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock`
1 - 18	Not used
19	1 = No impact of input signals on "local mode" when `LocalSetting` = 2
20	Motor is stopped
21	The motor is stopping.
22	The motor is starting.
23	The motor is running.
24	Error in motor
25 - 29	Not used
30	Display for interlocks in block icon
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0 - 23	Not used
24	Output command for "starting" the motor
25	Output command for "stopping" the motor
26	Show automatic preview in the standard view
27	Not used
28	`GrpErr.Value`
29	Enable for "starting" the motor
30	Not used
31	Not used

Status word allocation for `Status4` parameter

Status bit	Parameter
0 - 8	Not used
9	`Trip` not connected
10	Do not connect `FbkOutRun`
11 - 31	Not used

See also

MotS reporting (Page 880)

MotS block diagram (Page 886)

MotS functions (Page 875)

MotS error handling (Page 879)

MotS operating modes (Page 873)

6.3.2 MotS operating modes

MotS operating modes

The block can be operated using the following modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Note

"Local mode" for the block MotS

In contrast to the "Large" blocks, it is only possible to perform settings in this block `LocalSetting` with 0 or 2. A "local operation" is accordingly possible only via the internal tracking of the feedback value.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Motor actions you can control in auto mode:

- "Start" (`StartAut` = 1)
- "Stop" (`StopAut` = 1)

Note

Information about the "Small" block

This "Small" block works with pushbutton operation. The automatic commands are therefore latching, in other words, `OpenAut`, `CloseAut` can be reset to 0 after the control is changed. In "manual" and "local" modes, however, the automatic commands are not saved and in the absence of automatic commands the automatic control is tracked.

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Motor actions you can control in "manual mode":

- "Start" (`StartMan` = 1)
- "Stop" (`StopMan` = 1)

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of MotS (Page 870)

MotS functions (Page 875)

MotS error handling (Page 879)

MotS reporting (Page 880)

MotS I/Os (Page 882)

MotS block diagram (Page 886)

6.3.3 MotS functions

Functions of MotS

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can stop the motor
5	1 = Operator can start the motor
6	Not used
7	1 = Operator can reset the motor
8	1 = Operator can define the monitoring time for startup
9	Not used
10	1 = Operator can activate the monitoring time function (Bit 8)
12	1 = Operator can activate the Release for maintenance function
13 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Button labels

This block provides the standard function Labeling of buttons and text (Page 167).

Instance-specific text can be configured for the following parameters:

- `StartMan`
- `StopMan`

Interlocks

This block provides the following interlocks:

- Interlock without reset (interlock)

Refer to the section Interlocks (Page 85) as well as Influence of the signal status on the interlock (Page 88).

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Motor protection function

This block provides the standard function Motor protection function (Page 85).

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Resetting the block in case of interlocks or errors

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `Trip`
- `MonDynErr`
- `MonStaErr`

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `LocalLi.ST`
- `Trip.ST`
- `FbkRunOut.ST`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83).

Simulating signals

This block provides the standard function Simulating signals (Page 47).

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37).

Output signal as a static signal

This block provides the standard function Output signal as a static signal or pulse signal (Page 40).

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
19	Reset even with locked state (Page 138)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

See also

Description of MotS (Page 870)

MotS error handling (Page 879)

MotS reporting (Page 880)

MotS I/Os (Page 882)

MotS block diagram (Page 886)

MotS operating modes (Page 873)

Selecting a unit of measure (Page 168)

6.3.4 MotS error handling

Error handling of MotS

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers.

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
41	The value for the `LocalSetting` I/O is not 0 or 2
42	`LocalSetting` = 0 and `LocalLi` = 1
51	`StartAut` = 1 and `StopAut` = 1, `AutModLi` = 1 and `ManModLi` = 1
52	`LocalAct` = 1 and `LocalSetting` = 2 and `SimOn` = 1

Mode switchover error

This error can be output by the block, see chapter Error handling (Page 104).

Invalid input signals

This error can be output by the block, see the section Error handling (Page 104).

See also

MotS functions (Page 875)

MotS reporting (Page 880)

MotS I/Os (Page 882)

Description of MotS (Page 870)

MotS operating modes (Page 873)

MotS block diagram (Page 886)

6.3.5 MotS reporting

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ Motor feedback error
	SIG 2	AS process control message - fault	$$BlockComment$$ Motor protection triggered
	SIG 3	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId1, SIG 3).

Instance-specific messages

You have the option to use two instance-specific messages for this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 4	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 5	AS process control message - fault	$$BlockComment$$ External message 2

Explanation:

$$BlockComment$$: Content of the instance-specific comment.

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVa104`
5	`ExtVa105`
6 - 10	Reserved

The associated values 4 ... 5 are allocated to the parameters `ExtVa104` ... `ExtVa105` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of MotS (Page 870)

MotS functions (Page 875)

MotS error handling (Page 879)

MotS block diagram (Page 886)

MotS I/Os (Page 882)

MotS operating modes (Page 873)

6.3.6 MotS I/Os

I/Os of MotS

Input parameters

Parameter	Description	Type	Default
AutModLi*	1 = "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock in "local mode" and in "simulation"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
FbkRun	Feedback for starting is present: 1 = Start 0 = Stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
Feature	I/O for additional functions (Page 875)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1

Parameter	Description	Type	Default
LocalLi	1 = Activate "local mode" via plant signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalSetting	Properties for the Local mode (Page 66)	INT	0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Monitor	1 = Feedback monitoring	BOOL	1
MonTiDynamic*	Monitoring time for feedback errors after operation in [s]	REAL	3.0
MS_RelOp*	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 875)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
RstLi*	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SimOn	1 = Simulation on	BOOL	0

Parameter	Description	Type	Default
SelFp1	Call a block saved in this parameter as additional faceplate (Page 165) in standard view	ANY	-
StartAut*	1 = Starting the motor in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StartMan*	1 = Starting the motor in "manual mode"	BOOL	0
StepNo	Batch step number	DWORD	16#00000000
StopAut*	1 = Stopping the motor in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopMan*	1 = Stopping the motor in "manual mode"	BOOL	0
Trip	1 = Motor is in "good" state	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" is enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MotS error handling (Page 879)	INT	-1
FbkRunOut	Feedback for starting is present: 1 = Start 0 = Stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LockAct	1 = Interlock or Trip is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
MonDynErr	1 = Feedback error due to control change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonStaErr	1 = Feedback error due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Run	1 = Motor is running	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Start	1 = Control of motor: started	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Status1	Status word 1 (Page 870)	DWORD	16#00000000
Status2	Status word 2 (Page 870)	DWORD	16#00000000
Status3	Status word 3 (Page 870)	DWORD	16#00000000

Parameter	Description	Type	Default
Status4	Status word 4 (Page 870)	DWORD	16#00000000
Stop	1 = Motor stopped	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

MotS reporting (Page 880)
MotS block diagram (Page 886)
MotS operating modes (Page 873)

6.3.7 MotS block diagram

MotS block diagram

A block diagram is not provided for this block.

See also

Description of MotS (Page 870)
MotS functions (Page 875)
MotS reporting (Page 880)
MotS I/Os (Page 882)
MotS operating modes (Page 873)
MotS error handling (Page 879)

6.3.8 Operator control and monitoring

6.3.8.1 MotS views

Views of the MotS block

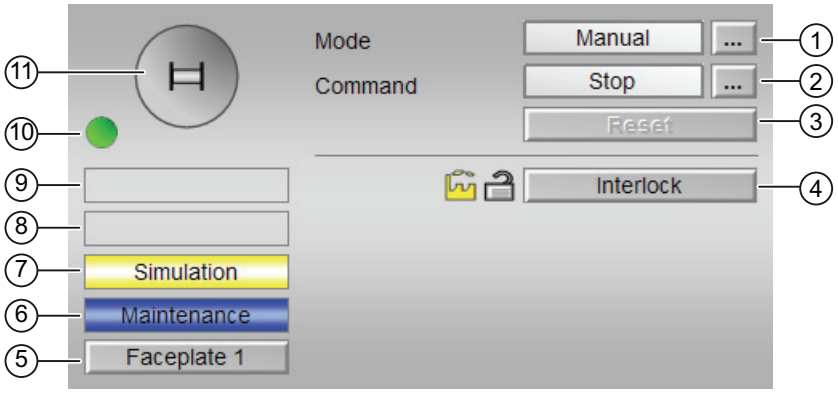
The block MotS provides the following views:

- MotS standard view (Page 887)
- Alarm view (Page 250)
- Trend view (Page 253)
- Parameter view for motors and valves (Page 236)
- MotS preview (Page 891)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for MotS (Page 893)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.3.8.2 MotS standard view

MotS standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Starting and stopping the motor

This area shows you the default operating state for the motor. The following states can be shown and executed here:

- "Start"
- "Stop"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) Resetting the block

Click "Reset" for errors. Additional information is available in the section Resetting the block in case of interlocks or errors (Page 33).

(4) Operator control and display area for the interlock function of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock function of the block. Additional information is available in the section Interlocks (Page 85).

The following is displayed in addition to the button:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

  If there is a bypass of one of the interlock signals, the symbol for the bypass is shown instead of the signal status.

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(5) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

(6)Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(7) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

Additional information is available in the section Simulating signals (Page 47).

(8) Display area for block states

This area provides additional information on the operating state of the block (from high to low according to priority):

- "Motor protection"
- "Runtime error"
- "Control deviation"
- "Invalid signal"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (subsection "Invalid input signals") and Motor protection function (Page 85).

(9) Display area for block states

This area provides additional information on the operating state of the block:

- "Request 0/1": A reset to "automatic mode" is expected.

(10) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the motor would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

(11) Status display of the motor

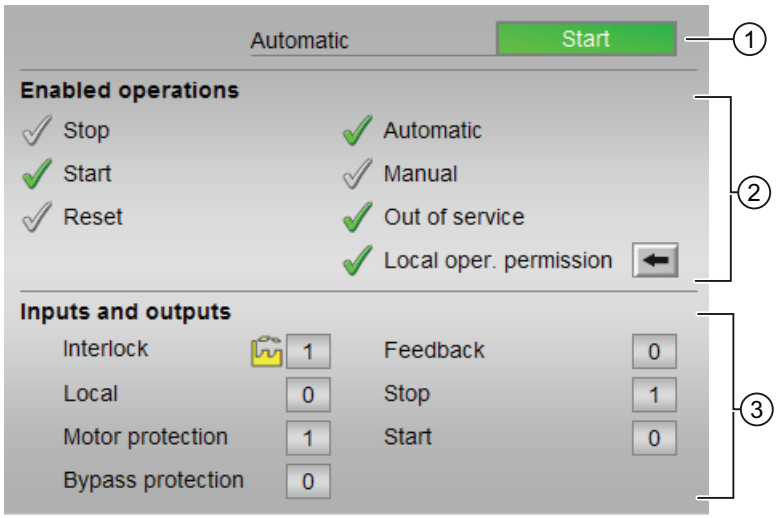
The current status of the motor is graphically displayed here:

- Green: The motor is running
- Gray: Motor idle
- Red: A fault has occurred

Additional information is available in the section Block icon for MotS (Page 893).

6.3.8.3 MotS preview

Preview of MotS



(1) Automatic preview

This area shows you the block status after it has switched from "manual" to "automatic" mode. If the block is in "automatic mode", the current block state is displayed.

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Stop": You can stop the motor.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Start": You can start the motor.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Reset": You can reset the motor after interlocks or errors.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Local": 1= Block is operated in "local mode"
- "Motor protection": 1 = Motor is in "good" state
- "Interlock deact.":

  – 0 = Bypass disabled

  – 1 = Bypassing interlock in "local mode" and in "simulation"

- "Feedback →": 1 = Motor has started and is running
- "Stop": 1 = Stopping the motor
- "Start": 1 = Starting the motor

6.3.8.4 Block icon for MotS

Block icons for MotS

A variety of block icons are available with the following functions:

- Process tag type
- Violation of alarm, warning, and tolerance limits as well as the process control fault CSF
- Operating modes
- Signal status, release for maintenance
- Displays for bypassing interlocks
- Interlocks
- Memo display
- Motor state display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	
	3	
	4	
	5	
	6	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Motor state display

The following motor states are shown here:

Icon	Meaning
	Motor started (motor icon changes)
	The motor is running
	Motor stopped (motor icon changes)
	Motor idle
	Error at motor (monitoring error, motor protection)

6.4 MotRevL - Reversible motor

6.4.1 Description of MotRevL

Object name (type + number) and family

Type + number: FB 1851

Family: Drives

Area of application for MotRevL

The block is used for the following applications:

- Control of reversible motors

How it works

The block is used to control reversible motors. Various inputs are available for controlling the motor.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the MotRevL block, the Advanced Process Library contains a template for process tag types as an example with an application scenario for this block.

Example of process tag types:

- Reversing motor (MotorReversible) (Page 1822)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section MotRevL I/Os (Page 911).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	0 = `ManAct.Value` 1 = `AutoAct.Value`
6	`LocalAct.Value`
7	0: Open padlock in the block icon 1: Closed padlock in the block icon
8	`Fwd.Value`
9	Motor is stopped
10	`Rev.Value`
11	`MonStaErr.Value`
12	`MonDynErr.Value`
13	`BypProt`
14	Invalid signal status
15	Mode switchover error
16	1 = `Intlock` is active
17	1 = `Permit` is active
18	1 = `Protect` is active
19	`Trip.Value`
20	`FwdForce`
21	`StopForce`

Status bit	Parameter
22	RevForce
23	"Interlock" button is enabled
24	Reset request in automatic preview
25	WarnAct.Value or IdleTime active
26	Bypass information from previous function block
27	Automatic preview for forward mode
28	Automatic preview for "stopping"
29	Automatic preview for reverse mode
30	"Permission" button is enabled
31	"Protection" button is enabled

Status word allocation for Status2 parameter

Status bit	Parameter
0	MsgLock
1	AV_AH_Act.Value
2	AV_WH_Act.Value
3	AV_TH_Act.Value
4	AV_TL_Act.Value
5	AV_WL_Act.Value
6	AV_AL_Act.Value
7	AV_AH_En
8	AV_WH_En
9	AV_TH_En
10	AV_TL_En
11	AV_WL_En
12	AV_AL_En
13	AV_AH_MsgEn
14	AV_WH_MsgEn
15	AV_TH_MsgEn
16	AV_TL_MsgEn
17	AV_WL_MsgEn
18	AV_AL_MsgEn
19	1 = No impact of input signals on "local mode" with LocalSetting = 2 and LocalSetting = 4
20	Motor is stopped
21	Motor stops in forward mode
22	Motor stops in reverse mode
23	Motor starts in forward mode
24	Motor runs in forward mode

Status bit	Parameter
25	Motor starts in reverse mode
26	Motor runs in reverse mode
27	Error when stopping motor
28	Error in forward mode of motor
29	Error in reverse mode of motor
30	Display for interlocks in block icon
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0 - 17	Not used
18	`SimLiOp.Value`
19	1 = Enable for rapid stop (`Feature` Bit Enabling rapid stop via faceplate (Page 142))
20 - 22	Not used
23	Command for rapid stop
24	Command for starting → the motor
25	Command for starting ← the motor
26	Show automatic preview in the standard view
27	Not used
28	`GrpErr.Value`
29	`RdyToStart.Value`
30	Auxiliary value 1 visible
31	Auxiliary value 2 visible

Status word allocation for `Status4` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal `3` of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8	`AV` not connected
9	Motor protection display (`Trip.Status` ≠ 16#FF)
10	1 = Input parameter `FbkFwd` is connected
11	1 = Input parameter `FbkRev` is connected
12 - 31	Not used

See also

MotRevL functions (Page 901)
MotRevL messaging (Page 909)
MotRevL block diagram (Page 919)
MotRevL error handling (Page 908)
MotRevL modes (Page 900)

6.4.2 MotRevL modes

MotRevL operating modes

The block can be operated using the following modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Motor actions you can control in local mode:

- "Starting in forward" (`FwdLocal` = 1)
- "Starting in reverse" (`RevLocal` = 1)
- "Stopping" (`StopLocal` = 1)

A motor operated in "local mode" is controlled either by "local" signals or by the feedback signals (input parameters `FbkFwd` = 1 and `FbkRev` = 1) . Configuration takes place via the input parameter `LocalSetting`.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Motor actions you can control in auto mode:

- "Starting in forward" (`FwdAut` = 1)
- "Starting in reverse" (`RevAut` = 1)
- "Stopping" (`StopAut` = 1)

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Motor actions you can control in "manual mode":

- "Starting in forward" (`FwdMan` = 1)
- "Starting in reverse" (`RevMan` = 1)
- "Stopping" (`StopMan` = 1)

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

MotRevL block diagram (Page 919)

MotRevL I/Os (Page 911)

MotRevL messaging (Page 909)

MotRevL error handling (Page 908)

MotRevL functions (Page 901)

Description of MotRevL (Page 895)

6.4.3 MotRevL functions

Functions of MotRevL

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the OS_Perm parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can stop the motor
5	1 = Operator can start the motor in forward
6	1 = Operator can start the motor in reverse
7	1 = Operator can reset the motor
8	1 = Operator can define the monitoring time for startup
9	1 = Operator can define the monitoring time for runtime
10	1 =Operator can enable the monitoring time function (Bit 8 - 9)
11	1 = Operator can activate the Simulation function
12	1 = Operator can activate the Release for maintenance function
13	1 = Operator can change the high limit (AV) for the alarm
14	1 = Operator can change the high limit (AV) for the warning
15	1 = Operator can change the high limit (AV) for the tolerance
16	1 = Operator can change the limit (AV) for hysteresis
17	1 = Operator can lower the limit (AV) for the alarm
18	1 = Operator can lower the limit (AV) for the warning
19	1 = Operator can lower the limit (AV) for the tolerance
20 - 31	Not used

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Restart lock after changing direction of rotation or switching off the motor

Use the input parameter IdleTime to enter a restart lock for changing the direction of rotation or restarting the motor. Use the Feature Bit Enabling direct changeover between forward and reverse (Page 121) to define how the change is to take place. When the "Stop" command is given, the motor goes immediately into "Stop" mode, and IdleTime starts after the feedback (FbkFwd and FbkRev = 0) is given. The motor cannot be started again until the IdleTime has expired.

The IdleTime parameter can be set independently of the MonTiDynamic parameter.

Limit monitoring of an additional analog value

This block provides the standard function Limit monitoring of an additional analog value (Page 77).

Limit monitoring with hysteresis

This block provides the standard function Limit monitoring with hysteresis (Page 82). It is performed via the input parameter `AV_Hyst`.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Interlocks

This block provides the following interlocks:

- Activation enable
- Interlock without reset ("Interlock")
- Interlock with reset ("Protection")

Refer to the section Interlocks (Page 85) as well as Influence of the signal status on the interlock (Page 88).

Motor protection function

This block provides the standard function Motor protection function (Page 85).

Rapid stop for motors

This block provides the standard function Rapid stop for motors (Page 91).

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Resetting the block in case of interlocks or errors

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `Trip`
- `MonDynErr`
- `MonStaErr`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `FbkFwdOut.ST`
- `FbkRevOut.ST`
- `LocalLi.ST`
- `FwdLocal.ST`
- `StopLocal.ST`
- `RevLocal.ST`
- `Trip.ST`
- `AV_Out.ST`

Forcing operating modes

This block provides the standard function Forcing operating modes (Page 31).

The following states can be enforced:

- "Start in forward" (`FwdForce`)
- "Start in reverse" (`RevForce`)
- "Stop" (`StopForce`)

Note

The `Feature` Bit Enabling direct changeover between forward and reverse (Page 121) for this block has no function with forced operating states. The motor can always be reversed directly.

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Specify warning times for control functions

This block provides the standard function Specifying warning times for control functions at motors and valves (Page 39).

You can generate warning signals when, for example, motors are started. Warning signals can be generated in the following modes:

- Manual mode (Page 63) (`WarnTiMan` input parameter)
- Automatic mode (Page 63) (`WarnTiAut` input parameter)

You specify the warning times in seconds using the input parameters `WarnTiMan` and `WarnTiAut`. If, for example, a motor is started, then this is displayed at the output parameter with `WarnAct` = 1. The motor then starts after the set warning time has expired and `WarnAct` then goes back to 0.

A corresponding warning is not output if the warning times (`WarnTiMan` or `WarnTiAut`) are specified with a smaller value than the `SampleTime` parameter.

Simulating signals

This block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Additional value (`SimAV`, `SimAV_Li`)

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37).

Output signal as a pulse signal or static signal

This block provides the standard function Output signal as a static signal or pulse signal (Page 40).

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
4	Setting switch or button mode (Page 140)
7	Enabling direct changeover between forward and reverse (Page 121)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
14	Enabling rapid stop via faceplate (Page 142)
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)
19	Reset even with locked state (Page 138)
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Bit	Function
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

In pushbutton mode (Bit 4 = 0) the automatic commands in "automatic" mode are latching, in other words `FwdAut`, `RevAut`, `StopAut` can be reset to 0 after changing the control. In "manual" and "local" modes, however, the automatic commands are not saved and in the absence of automatic commands the automatic control is tracked.

In switching mode (Bit 4 = 1), control is selected with the static signals `FwdAut`, `RevAut`. If `FwdAut` and `RevAut` inputs are not set the motor is stopped. Control via `StopAut` is not needed. If the "Activate command reset for control" function (Bit 3 = 1) is also activated, the inputs `FwdAut`, `RevAut` are reset to the neutral position after evaluation in the block.

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `FwdMan`
- `RevMan`
- `StopMan`
- `RapidStp`

See also

Description of MotRevL (Page 895)

MotRevL messaging (Page 909)

MotRevL I/Os (Page 911)

MotRevL block diagram (Page 919)

MotRevL error handling (Page 908)

MotRevL modes (Page 900)

6.4.4 MotRevL error handling

Error handling of MotRevL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error
- Invalid input signals

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
41	The value for the `LocalSetting` I/O is not within the approved limit of 0 to 4..
42	`LocalSetting` = 0 or `LocalSetting` = 3 oder `LocalSetting` = 4 and `LocalLi` = 1
51	`FwdLocal` = 1 and `StopLocal` = 1 `RevLocal` = 1 and `StopLocal` = 1 `FwdLocal` = 1 and `RevLocal` = 1 `FwdAut` = 1 and `StopAut` = 1 `RevAut` = 1 and `StopAut` = 1 `FwdAut` = 1 and `RevAut` = 1 `AutModLi` = 1 and `ManModLi` = 1 `FwdForce` = 1 and `StopForce` = 1 `RevForce` = 1 and `StopForce` = 1 `FwdForce` = 1 and `RevForce` = 1
52	`LocalAct` = 1 and `LocalSetting` = 2 or 4 and `SimOn` = 1

Mode switchover error

This error can be output by the block, see section Error handling (Page 104).

Invalid input signals

This error can be output by the block, see the section Error handling (Page 104).

See also

MotRevL block diagram (Page 919)
MotRevL I/Os (Page 911)
MotRevL messaging (Page 909)
Description of MotRevL (Page 895)
MotRevL modes (Page 900)
MotRevL functions (Page 901)

6.4.5 MotRevL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ Motor feedback error
	SIG 2	AS process control message - fault	$$BlockComment$$ Motor protection triggered
	SIG 3	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId1, SIG 3).

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 4	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 5	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 6	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	ExtVa104
5	ExtVa105
6	ExtVa106
7	ExtVa107
8	ExtVa108
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters ExtVa104 ... ExtVa108 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of MotRevL (Page 895)

MotRevL functions (Page 901)

MotRevL I/Os (Page 911)

MotRevL block diagram (Page 919)

MotRevL error handling (Page 908)

MotRevL modes (Page 900)

6.4.6 MotRevL I/Os

I/Os of MotRevL

Input parameters

Parameter	Description	Type	Default
AutModLi*	1 = "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
AV	Input additional analog value, to be connected to AV_Out of the AV block	ANY	
AV_AH_Lim	Limit high alarm	REAL	95.0
AV_AL_Lim	Limit low alarm	REAL	5.0
AV_Hyst	Hysteresis for alarm, warning and tolerance limits	REAL	1.0
AV_TH_Lim	Limit high tolerance	REAL	85.0
AV_TL_Lim	Limit low tolerance	REAL	15.0
AV_WH_Lim	Limit high warning	REAL	90.0
AV_WL_Lim	Limit low warning	REAL	10.0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock in "local mode" and in "simulation"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
FbkFwd	1 = Feedback for forward mode is present	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkRev	1 = Feedback for reverse mode is present	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
Feature	I/O for additional functions (Page 901)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
FwdAut*	1 = Activating forward mode of motor in automatic mode	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FwdForce	1 = Forcing activation of motor forward mode	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FwdLocal	1 = Activation of forward motor operation in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FwdMan*	1 = Activation of forward motor operation in "manual mode"	BOOL	0
IdleTime*	Wait time for change of direction or restart in [s]	REAL	5.0
Intlock	1 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 0 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1

Parameter	Description	Type	Default
LocalLi	1 = Activate "local mode" via plant signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalOp*	1 = "Local mode" via operator	BOOL	0
LocalSetting	Characteristics of Local mode (Page 66)	INT	0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Monitor	1 = Feedback monitoring	BOOL	1
MonTiDynamic*	Monitoring time for feedback errors after operation in [s]	REAL	3.0
MonTiStatic*	Monitoring time for feedback errors without operation in [s]	REAL	3.0
MsgEvId1	Message number (assigned automatically)	DWORD	16#000000FF
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp*	1 = Release for maintenance via OS operator	BOOL	0
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 901)	STRUCT • Bit 0: BOOL • Bit 20: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
Permit	1 = Enable for opening / closing from neutral position 0 = No OS release for energizing motor	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Perm_En	1 = Activation enable (enable, Permit parameter) is active	BOOL	1

Parameter	Description	Type	Default
Protect	0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block 1 = Protective interlocking not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Prot_En	1 = Protective interlock (protection, Protect parameter) is active	BOOL	1
PulseWidth*	Pulse width of control signal [s]	REAL	3.0
RapidStp*	Rapid stop for the motor: 0 = Motor On 1 = Motor Off	BOOL	0
RevAut*	1 = Activation of reverse motor operation in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RevForce	1 = Force activation of reverse motor operation	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RevLocal	1 = Activation of reverse motor operation in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RevMan*	1 = Activation of reverse motor operation in "manual mode"	BOOL	0
RstLi*	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SimAV*	Additional value used for SimOn = 1	REAL	0.0
SimAV_Li	Additional analog value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-

Parameter	Description	Type	Default
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
StepNo	Batch step number	DWORD	16#00000000
StopAut*	1 = Stop the motor in automatic mode	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopForce	1 = Force motor stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopLocal	1 = Stopping the motor in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopMan*	1 = Stopping the motor in "manual mode"	BOOL	0
Trip	1 = Motor is in "good" state	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
UserAna1	Analog auxiliary value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UserAna2	Analog auxiliary value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00
WarnTiAut*	Prewarning of motor start in automatic mode in [s]	REAL	0.0
WarnTiMan*	Prewarning of motor start in manual mode in [s]	REAL	0.0

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" is enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AV_OpScale	Limit for scale in AV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
AV_Out	Output additional analog value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
AV_Unit	Unit of measure for additional analog value	INT	0
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MotRevL error handling (Page 908)	INT	-1
FbkFwdOut	Feedback: 1 = Forward operation active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkRevOut	Feedback: 1 = Reverse operation active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Fwd	1 = Control of motor forward	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LockAct	1 = Interlock (Intlock, Permit, Protect) or Trip is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80

Parameter	Description	Type	Default
MonDynErr	1 = Feedback error due to control change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonStaErr	1 = Feedback error due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
P_Fwd	1 = Pulse signal for starting the motor in forward	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Rev	1 = Pulse signal for starting the motor in reverse	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Stop	0 = Pulse signal for stopping the motor	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
R_StpAct	1 = Rapid stop of the motor is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80

Parameter	Description	Type	Default
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Rev	1 = Control of motor: Reverse	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RunFwd	1 = Motor is running forwards	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RunRev	1 = Motor is running in reverse	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Status1	Status word 1 (Page 895)	DWORD	16#00000000
Status2	Status word 2 (Page 895)	DWORD	16#00000000
Status3	Status word 3 (Page 895)	DWORD	16#00000000
Status4	Status word 4 (Page 895)	DWORD	16#00000000
Stop	1 = Motor stopped	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
WarnAct	1 = Prewarning for motor start active (parameters WarnTiAut and WarnTiMan)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

MotRevL messaging (Page 909)

MotRevL block diagram (Page 919)

MotRevL modes (Page 900)

6.4.7 MotRevL block diagram

MotRevL block diagram

A block diagram is not provided for this block.

See also

MotRevL I/Os (Page 911)

MotRevL messaging (Page 909)

MotRevL error handling (Page 908)

MotRevL functions (Page 901)

MotRevL modes (Page 900)

Description of MotRevL (Page 895)

6.4.8 Operator control and monitoring

6.4.8.1 MotRevL views

Views of the MotRevL block

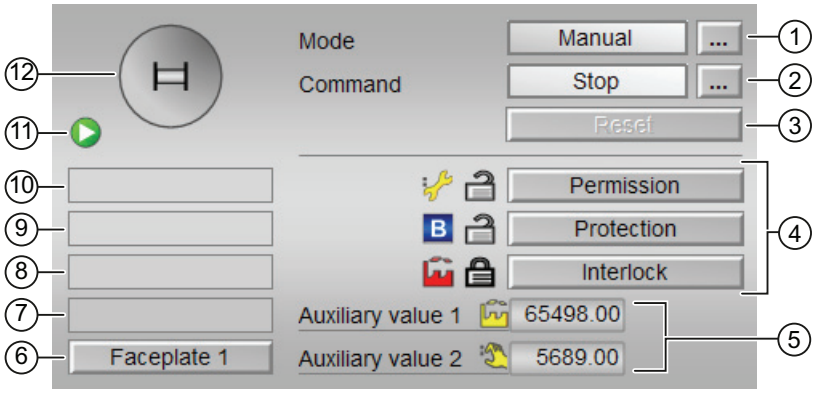
The block MotRevL provides the following views:

- MotRevL standard view (Page 920)
- Alarm view (Page 250)
- Limit value view of motors (Page 243)
- Trend view (Page 253)
- Parameter view for motors and valves (Page 236)
- MotRevL preview (Page 923)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for MotRevL (Page 926)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.4.8.2 MotRevL standard view

MotRevL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Starting and stopping the motor

This area shows you the default operating state for the motor. The following states can be shown and executed here:

- "Start→ "
- "Start ←"
- "Stop"
- "Rapid stop"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(4) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocking functions (Page 85) section.

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

  If there is a bypass of one of the interlock signals, the symbol for the bypass is shown instead of the signal status.

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(5)Display of auxiliary values

This display is only visible when the corresponding block input is connected.

You can use this area to display two auxiliary values that have been configured in the Engineering System (ES). You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(6) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(7) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(8) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"
- "Delay"

You will find more detailed information on this in the chapters Simulating signals (Page 47) and Display of delay times (Page 31)

(9) Display area for block states

This area provides additional information on the operating state of the block:

- "Motor protection"
- "Runtime error"
- "Control deviation"
- "Invalid signal"
- "Changeover error"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error") and Motor protection function (Page 85).

(10) Display area for block states

This area provides additional information on the operating state of the block:

- "Forced stop"
- "Forced start →"
- "Forced start ←"
- "Request 0/1": A reset to "automatic mode" is expected.

You can find additional information on this in the Forcing operating modes (Page 31) section.

(11) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the motor would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

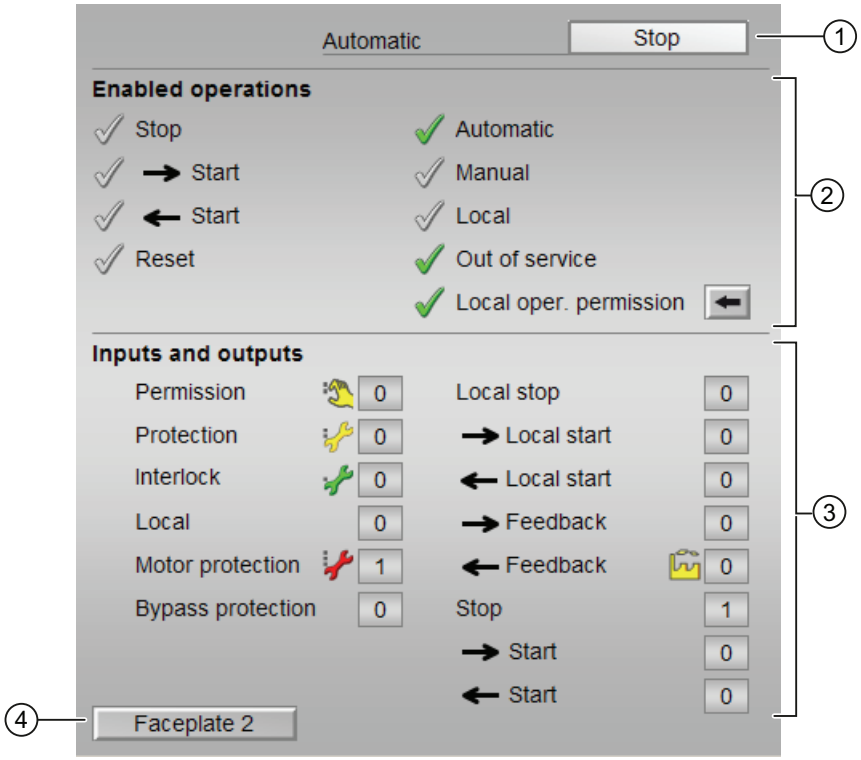
(12) Status display of the motor

The current status of the motor is graphically displayed here.

You can find more information about this in the section Block icon for MotRevL (Page 926).

6.4.8.3 MotRevL preview

Preview of MotRevL



(1) Automatic preview

This area shows you the block status after it has switched from "manual" to "automatic" mode.

If the block is in "automatic mode", the current block state is displayed.

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Stop": You can stop the motor.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Start →": You can start the motor.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Start ←": You can start the motor.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Reset": You can reset the motor after interlocks or errors.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Local": You can switch to "local mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Permission":

  This display is only visible when the corresponding block input is connected.

  – 0 = No OS release for energizing motor

  – 1 =Enable for "starting"/"stopping" from the neutral position

- "Protection":

  This display is only visible when the corresponding block input is connected.

  – 0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block

  – 1 = "Good" state

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 =Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Local": 1= Block is operated in "local mode"
- "Motor protection": 1 = Motor is in "good" state
- "Interlock deact.":

  – 0 = Bypass disabled

  – 1 =Bypassing interlock in "local mode" and in "simulation"

- "Local stop": 1 =Stopping the motor in "local mode"
- "Local start →": 1 = Starting the motor in "local mode"
- "Local start ←": 1 = Starting the motor in "local mode"
- "Feedback →": 1 = Motor has started and is running
- "Feedback ←": 1 = Motor has started and is running
- "Stop": 1 =Stopping the motor
- "Start →": 1 = Starting the motor
- "Start ←": 1 = Starting the motor

(4) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

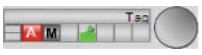
6.4.8.4 Block icon for MotRevL

Block icons for MotRevL

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault CSF
- Operating modes
- Signal status, release for maintenance
- Displays for bypassing interlocks
- Interlocks
- Memo display
- Motor state display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	
	7	
	8	

Icons	Selection of the block icon in CFC	Special features
	9	
	10	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Motor state display

The following motor states are shown here:

Icon	Meaning
	Motor started (motor icon changes)
	the motor is running
	Motor stopped (motor icon changes)
	Motor idle
	Error at motor (monitoring error, motor protection)
	Motor out of service

6.5 MotSpdCL - Controllable motor with two directions of rotation

6.5.1 Description of MotSpdCL

Object name (type + number) and family

Type + number: FB 1854

Family: Drives

Area of application for MotSpdCL

The block is used for the following applications:

- Control of motors with two directions of rotation and different speeds

How it works

The block is used to control motors with two directions of rotation for different speeds. Various inputs are available for controlling the motor.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the MotSpdCL block, the Advanced Process Library contains a template for process tag types as an example with an application scenario for this block.

Example of process tag types:

- Reversing motor with controllable speed (MotorSpeedControlled) (Page 1822)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Note

At a warm restart with the `Feature` Bit set to 0, the block is switched to manual mode and the setpoint is set to internal and to 0.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

For a description of the individual parameters, see the MotSpdCL I/Os (Page 946) section.

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	0 = `ManAct.Value` 1 = `AutoAct.Value`
6	`LocalAct.Value`
7	0: Open padlock in the block icon 1: Closed padlock in the block icon
8	`Fwd.Value`
9	`SimLiOp.Value`
10	`Rev.Value`
11	`MonStaErr.Value`
12	`MonDynErr.Value`
13	`BypProt`
14	Invalid signal status
15	Mode switchover error
16	1 = `Intlock` is active

Status bit	Parameter
17	1 = `Permit` is active
18	1 = `Protect` is active
19	`Trip`
20	`FwdForce`
21	`StopForce`
22	`RevForce`
23	"Interlock" button is enabled
24	Reset request in automatic preview
25	`WarnAct.Value` or `IdleTime` active
26	Bypass information from previous function block
27	Automatic preview for forward mode
28	Automatic preview for "stopping"
29	Automatic preview for reverse mode
30	"Permission" button is enabled
31	"Protection" button is enabled

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock`
1	`AV_AH_Act.Value`
2	`AV_WH_Act.Value`
3	`AV_TH_Act.Value`
4	`AV_TL_Act.Value`
5	`AV_WL_Act.Value`
6	`AV_AL_Act.Value`
7	`AV_AH_En`
8	`AV_WH_En`
9	`AV_TH_En`
10	`AV_TL_En`
11	`AV_WL_En`
12	`AV_AL_En`
13	`AV_AH_MsgEn`
14	`AV_WH_MsgEn`
15	`AV_TH_MsgEn`
16	`AV_TL_MsgEn`
17	`AV_WL_MsgEn`
18	`AV_AL_MsgEn`
19	1 = No impact of input signals on "local mode" with `LocalSetting` = 2 and `LocalSetting` = 4

Status bit	Parameter
20	Motor is stopped
21	Motor stops in forward mode
22	Motor stops in reverse mode
23	Motor starts in forward mode
24	Motor runs in forward mode
25	Motor starts in reverse mode
26	Motor runs in reverse mode
27	Error when "stopping" the motor
28	Error in forward mode of motor
29	Error in reverse mode of motor
30	SP_ExtAct.Value
31	Display for interlocks in block icon

Status word allocation for Status3 parameter

Status bit	Parameter
0	Not used
1	RbkWH_Act.Value
2 - 3	Not used
4	RbkWL_Act.Value
5 - 6	Not used
7	RbkWH_En
8 - 9	Not used
10	RbkWL_En
11 - 13	Not used
14	RbkWH_MsgEn
15 - 16	Not used
17	RbkWL_MsgEn
18	Motor is stopped
19	1 = Enable for rapid stop (Feature Bit Enabling rapid stop via faceplate (Page 142))
20	SP_RmpModTime
21	SP_RmpOn
22	SP_UpRaAct, SP_DnRaAct limits enabled for gradient mode (SP_RateOn = 1)
23	Command for "rapid stop" of the motor
24	Command for "starting" → the motor
25	Command for "starting" ← the motor
26	Show automatic preview in the standard view
27	RdyToStart.Value
28	GrpErr.Value
29	MS_RelOp

Status bit	Parameter
30	Auxiliary value 1 visible
31	Auxiliary value 2 visible

Status word allocation for `Status4` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8	`AV` not connected
9	Motor protection display (`Trip.Status` ≠ 16#FF)
10	1 = Input parameter `FbkFwd` is connected
11	1 = Input parameter `FbkRev` is connected
12	1 = Setpoint difference high limit violated (`ER_AH_Act.Value`)
13	1 = Setpoint difference low limit violated (`ER_AL_Act.Value`)
14	1 = Monitor setpoint difference high limit (`ER_AH_En`)
15	1 = Monitor setpoint difference low limit (`ER_AL_En`)
16	1 = Report setpoint difference high limit violation (`ER_AH_MsgEn`)
17	1 = Report setpoint difference low limit violation (`ER_AL_MsgEn`)
18	1 = Monitoring of setpoint difference "`SP` - `Rbk`" activated
19 - 31	Not used

See also

MotSpdCL block diagram (Page 957)
MotSpdCL messaging (Page 944)
MotSpdCL error handling (Page 943)
MotSpdCL functions (Page 934)
MotSpdCL modes (Page 933)

6.5.2 MotSpdCL modes

MotSpdCL operating modes

The block can be operated using the following modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Motor actions you can control in local mode:

- "Starting in forward" (`FwdLocal` = 1)
- "Starting in reverse" (`RevLocal` = 1)
- "Stopping" (`StopLocal` = 1)

A motor operated in "local mode" is controlled either by "local" signals or by the feedback signals (input parameters `FbkFwd` = 1and `FbkRev` = 1). Configuration takes place via the input parameter `LocalSetting`.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Motor actions you can control in auto mode:

- "Starting in forward" (`FwdAut` = 1)
- "Starting in reverse" (`RevAut` = 1)
- "Stopping" (`StopAut` = 1)

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Motor actions you can control in "manual mode":

- "Starting in forward" (`FwdMan` = 1)
- "Starting in reverse" (`RevMan` = 1)
- "Stopping" (`StopMan` = 1)

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

MotSpdCL block diagram (Page 957)

MotSpdCL I/Os (Page 946)

MotSpdCL messaging (Page 944)

MotSpdCL error handling (Page 943)

MotSpdCL functions (Page 934)

Description of MotSpdCL (Page 928)

6.5.3 MotSpdCL functions

Functions of MotSpdCL

The functions for this block are listed below.

Alarm delays with two time values per limit pair

This block has the standard function alarm delay for Two time values per limit pair (Page 158) limit monitoring of the feedback.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can stop the motor
5	1 = Operator can start the motor in forward
6	1 = Operator can start the motor in reverse
7	1 = Operator can reset the motor
8	1 = Operator can define the monitoring time for startup
9	1 = Operator can define the monitoring time for runtime
10	Not used
11	1 = Operator can activate the Simulation function
12	1 = Operator can activate the Release for maintenance function
13	1 = Operator can change the limit (`AV`) for high alarm
14	1 = Operator can change the limit (`AV`) for high warning
15	1 = Operator can change the limit (`AV`) for high tolerance
16	1 = Operator can change the limit (`AV`) for hysteresis
17	1 = Operator can change the limit (`AV`) for low alarm
18	1 = Operator can change the limit (`AV`) for low warning
19	1 = Operator can change the limit (`AV`) for low tolerance
20	1 = Operator can enable the bumpless switchover from external to internal `SP_TrkExt`
21	1 = Operator can change the internal setpoint `SP_Int`
22	1 = Operator can switch the setpoint to "external" `SP_ExtOp`
23	1 = Operator can switch the setpoint to "internal" `SP_IntOp`
24	1 = Operator can enable the setpoint's gradient limitation function `SP_RateOn`
25	1 = Operator can change the setpoint's high limit for the ramp `SP_UpRaLim`
26	1 = Operator can change the setpoint's low limit for the ramp `SP_DnRaLim`
27	1 = Operator can enable the setpoint ramp function `SP_RmpOn`
28	1 = Operator can switch between the time value or the value for the ramp `SP_RmpModTime`
29	1 = Operator can change the ramp time `SP_RmpTime`
30	1 = Operator can change the target setpoint `SP_RmpTarget` for the setpoint ramp
31	Not used

The block has the following permissions for the OS1Perm parameter:

Bit	Function
0	Not used
1	1 = Operator can change the limit (Rbk) for high warning
2	Not used
3	1 = Operator can change the limit (Rbk) for hysteresis
4	Not used
5	1 = Operator can change the limit (Rbk) for low warning
6	1 = Operator can change the limit (setpoint difference) ER_AH_Lim for the high alarm
7	1 = Operator can change the hysteresis (setpoint difference) ER_Hyst
8	1 = Operator can change the limit (setpoint difference) ER_AL_Lim for the low alarm
9	1 = Operator can change the simulation value SimRbk
10 - 31	Not used

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Restart lock after changing direction of rotation or switching off the motor

Use the input parameter IdleTime to enter a restart lock for changing the direction of rotation or restarting the motor. Use the Feature Bit Enabling direct changeover between forward and reverse (Page 121) to define how the change is to take place. When the "Stop" command is given, the motor goes immediately into Stop mode and IdleTime starts after the feedback (FbkFwd and FbkRev = 0) is given. The motor cannot be started again until the IdleTime has expired.

The IdleTime parameter can be set independently of the MonTiDynamic parameter.

Limit monitoring of an additional analog value

This block provides the standard function Limit monitoring of an additional analog value (Page 77).

Limit monitoring of the feedback

The block provides the standard function Limit monitoring of the feedback (Page 80). This limit monitoring is only active when the motor has started.

Limit monitoring with hysteresis

This block provides the standard function Limit monitoring with hysteresis (Page 82). It is performed via the input parameter AV_Hyst.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

External/internal setpoint specification

The block provides the standard function Setpoint specification - internal/external (Page 112).

Setpoint limitation

Limit the setpoint using the parameters:

- `SP_HiLim` (top)
- `SP_LoLim` (bottom)

Limit violations are displayed at the `SP_HiAct` and `SP_LoAct` output parameters with a 1.

Gradient limit of the setpoint

The block provides the standard function Gradient limit of the setpoint (Page 109).

Using setpoint ramp

The block provides the standard function Using setpoint ramp (Page 108).

Formation of the setpoint difference

The block always forms the setpoint difference:

`ER.Value` = SP`_Out` - `RbkOut.Value`.

Limit monitoring of the setpoint difference

The block provides the standard function Limit monitoring of setpoint, manipulated variable and control deviation (Page 81).

To transmit the messages, you need to enable `Feature` Bit 5 Alarm setpoint difference (Page 143).

When the function activated, the message configuration should be adapted as follows:

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 7	Alarm - high	$$BlockComment$$ ER - high alarm limit SP - Rbk violated
	SIG 8	Alarm - low	$$BlockComment$$ ER - low alarm limit SP - Rbk violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Interlocks

This block provides the following interlocks:

- Activation enable
- Interlock without reset ("Interlock")
- Interlock with reset ("Protection")

Refer to the section Interlocks (Page 85) as well as Influence of the signal status on the interlock (Page 88).

Motor protection function

This block provides the standard function Motor protection function (Page 85).

Rapid stop for motors

This block provides the standard function Rapid stop for motors (Page 91).

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Resetting the block in case of interlocks or errors

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `Trip`
- `MonDynErr`
- `MonStaErr`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `FbkFwdOut.ST`
- `FbkRevOut.ST`
- `LocalLi.ST`
- `FwdLocal.ST`
- `StopLocal.ST`
- `RevLocal.ST`
- `Trip.ST`
- `AV_Out.ST`
- `RbkOut.ST`
- `SP_Out.ST`

Forcing operating modes

This block provides the standard function Forcing operating modes (Page 31).

The following states can be enforced:

- "Start in forward" (FwdForce)
- "Start in reverse" (RevForce)
- "Stop" (StopForce)

Note

The Feature Bit Enabling direct changeover between forward and reverse (Page 121) for this block has no function with forced operating states. The motor can always be reversed directly.

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Specify warning times for control functions

This block provides the standard function Specifying warning times for control functions at motors and valves (Page 39).

You can generate warning signals when, for example, motors are started. Warning signals can be generated in the following modes:

- Manual mode (Page 63) (WarnTiMan input parameter)
- Automatic mode (Page 63) (WarnTiAut input parameter)

You specify the warning times in seconds using the input parameters WarnTiMan and WarnTiAut. If, for example, a motor is started, then this is displayed at the output parameter with WarnAct = 1 . The motor then starts after the set warning time has expired and WarnAct then goes back to 0 .

A corresponding warning is not output if the warning times (WarnTiMan or WarnTiAut) are specified with a smaller value than the SampleTime parameter.

Simulating signals

This block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Additional value (SimAV, SimAV_Li)
- Position feedback (SimRbk, SimRbkLi)

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37).

Output signal as a pulse signal or static signal

This block provides the standard function Output signal as a static signal or pulse signal (Page 40).

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
4	Setting switch or button mode (Page 140)
5	Alarm setpoint difference (Page 143)
7	Enabling direct changeover between forward and reverse (Page 121)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
14	Enabling rapid stop via faceplate (Page 142)
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)
19	Reset even with locked state (Page 138)
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
28	Disabling operating points (Page 121)

Bit	Function
29	Signaling limit violation (Page 142)
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

In pushbutton mode (Bit 4 = 0) the automatic commands in "automatic" mode are latching, in other words `FwdAut`, `RevAut`, `StopAut` can be reset to 0 after changing the control. In "manual" and "local" modes, however, the automatic commands are not saved and in the absence of automatic commands the automatic control is tracked.

In switching mode (Bit 4 = 1), control is selected with the static signals `FwdAut`, `RevAut` . If `FwdAut`, `RevAut` inputs are not set, the motor is stopped. Control via `StopAut` is not needed. If the "Activate command reset for control" function (Bit 3 = 1) is also activated, the inputs `FwdAut`, `RevAut` are reset to the neutral position after evaluation in the block.

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `FwdMan`
- `RevMan`
- `StopMan`
- `RapidStp`

See also

MotSpdCL block diagram (Page 957)

MotSpdCL I/Os (Page 946)

MotSpdCL messaging (Page 944)

MotSpdCL error handling (Page 943)

MotSpdCL modes (Page 933)

Description of MotSpdCL (Page 928)

6.5.4 MotSpdCL error handling

Error handling of MotSpdCL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
41	The value for the `LocalSetting` I/O is not within the approved limit of 0 to 4.
42	`LocalSetting` = 0 or `LocalSetting` = 3 or `LocalSetting` = 4 and `LocalLi` = 1
51	`FwdLocal` = 1 and `StopLocal` = 1 `RevLocal` = 1 and `StopLocal` = 1 `FwdLocal` = 1 and `RevLocal` = 1 `FwdAut` = 1 and `StopAut` = 1 `RevAut` = 1 and `StopAut` = 1 `FwdAut` = 1 and `RevAut` = 1 `AutModLi` = 1 and `ManModLi` = 1 `FwdForce` = 1 and `StopForce` = 1 `RevForce` = 1 and `StopForce` = 1 `FwdForce` = 1 and `RevForce` = 1 `SP_LiOp` = 1 and `SP_IntLi` = 1 and `SP_ExtLi` = 1
52	`LocalAct` = 1 and `LocalSetting` = 2 or 4 and `SimOn` = 1

Mode switchover error

This error can be output by the block, see section Error handling (Page 104).

Invalid input signals

This error can be output by the block, see the section Error handling (Page 104).

See also

MotSpdCL block diagram (Page 957)
MotSpdCL I/Os (Page 946)
MotSpdCL messaging (Page 944)
MotSpdCL functions (Page 934)
MotSpdCL modes (Page 933)
Description of MotSpdCL (Page 928)

6.5.5 MotSpdCL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ Motor feedback error
	SIG 2	AS process control message - fault	$$BlockComment$$ Motor protection triggered
	SIG 3	AS process control message - fault	$$BlockComment$$ External error has occurred
	SIG 4	Warning - high	$$BlockComment$$ Rbk - high warning limit violated
	SIG 5	Warning - low	$$BlockComment$$ Rbk - low warning limit violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1,, a process control fault is triggered (MsgEvId1, SIG 3).

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 6	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 7	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 8	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	ExtVa104
5	ExtVa105
6	ExtVa106
7	ExtVa107
8	ExtVa108
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters ExtVa104 ... ExtVa108 , and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

MotSpdCL block diagram (Page 957)

MotSpdCL I/Os (Page 946)

MotSpdCL error handling (Page 943)

MotSpdCL functions (Page 934)

MotSpdCL modes (Page 933)

Description of MotSpdCL (Page 928)

6.5.6 MotSpdCL I/Os

I/Os of MotSpdCL

Input parameters

Parameter	Description	Type	Default
AutModLi*	1 = "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
AV	Input additional analog value, to be connected to AV_Tech of the AV block	ANY	
AV_AH_Lim	Limit high alarm	REAL	95.0
AV_AL_Lim	Limit low alarm	REAL	5.0
AV_Hyst	Hysteresis for alarm, warning and tolerance limits	REAL	1.0
AV_TH_Lim	Limit high tolerance	REAL	85.0
AV_TL_Lim	Limit low tolerance	REAL	15.0
AV_WH_Lim	Limit high warning	REAL	90.0
AV_WL_Lim	Limit low warning	REAL	10.0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock in "local mode" and in "simulation"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1
ER_AH_En	1 = Activate alarm (high) for setpoint difference monitoring	BOOL	1
ER_AH_Lim	Alarm limit (high) for setpoint difference monitoring	REAL	100.0
ER_AH_MsgEn	1 = Activate messages for alarm (high) for setpoint difference monitoring Messages are only output if you have also enabled the Feature bit 5 Alarm setpoint difference (Page 143).	BOOL	1
ER_AL_En	1 = Activate alarm (low) for setpoint difference monitoring	BOOL	1
ER_AL_Lim	Alarm limit (low) for setpoint difference monitoring	REAL	-100.0

Parameter	Description	Type	Default
ER_AL_MsgEn	1 = Activate messages for alarm (low) for setpoint difference monitoring Messages are only output if you have also enabled the Feature bit 5 Alarm setpoint difference (Page 143).	BOOL	1
ER_Hyst	Alarm hysteresis for control deviation	REAL	1.0
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
FactGR	Gear reducing factor	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
FbkFwd	1 = Feedback for forward mode is present	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkRev	1 = Feedback for reverse mode is present	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
Feature	I/O for additional functions (Page 934)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0

Parameter	Description	Type	Default
FwdAut*	1 = Activation of forward motor operation in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FwdForce	1 = Forcing activation of motor forward mode	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FwdLocal	1 = Activation of forward motor operation in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FwdMan*	1 = Activation of forward motor operation in "manual mode"	BOOL	0
IdleTime*	Wait time for change of direction or restart in [s]	REAL	5.0
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1
LocalLi	1 = Activate "local mode" via plant signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalOp*	1 = "Local mode" via operator	BOOL	0
LocalSetting	Characteristics of Local mode (Page 66)	INT	0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Monitor	1 = Feedback monitoring	BOOL	1
MonTiDynamic*	Monitoring time for feedback errors after operation in [s]	REAL	3.0
MonTiStatic*	Monitoring time for feedback errors without operation in [s]	REAL	3.0
MS_RelOp*	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 934)	STRUCT • Bit 0: BOOL • Bit 10: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
OS1Perm	I/O for operator control permissions (Page 934)	STRUCT • Bit 0: BOOL • Bit 9: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
Permit	1 = Enable for opening / closing from neutral position 0 = No OS release for energizing motor	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Perm_En	1 = Activation enable (enable, Permit parameter) is active	BOOL	1
Protect	0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block 1 = Protective interlocking not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Prot_En	1 = Protective interlock (protection, Protect parameter) is active	BOOL	1
PulseWidth*	Pulse width of control signal [s]	REAL	3.0
RapidStp*	Rapid stop for the motor: 0 = Motor On 1 = Motor Off	BOOL	0
Rbk	Additional analog value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RbkW_DC*	Delay time for incoming warnings [s]	REAL	0.0
RbkW_DG*	Delay time for outgoing warnings [s]	REAL	0.0
RbkHyst	Hysteresis for warning limits	REAL	1.0
RbkOpScale	Limit for scale in bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
RbkUnit	Unit of measure for additional analog value	INT	0

Parameter	Description	Type	Default
RbkWH_En	1 = Enable high warning	BOOL	1
RbkWH_Lim	Limit high warning	REAL	90.0
RbkWH_MsgEn	1 = Enable high warning message	BOOL	1
RbkWL_En	1 = Enable low warning	BOOL	1
RbkWL_Lim	Limit low warning	REAL	10.0
RbkWL_MsgEn	1 = Enable low warning message	BOOL	1
RevAut*	1 = Activation of reverse motor operation in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RevForce	1 = Force activation of reverse motor operation	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RevLocal	1 = Activation of reverse motor operation in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RevMan*	1 = Activation of reverse motor operation in "manual mode"	BOOL	0
RstLi*	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimAV*	Additional value used for SimOn = 1	REAL	0.0
SimAV_Li	Additional analog value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimRbk*	Position feedback used for SimOn = 1	REAL	0.0

Parameter	Description	Type	Default
SimRbkLi	Position feedback used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
SP_DnRaLim	Limit (low) for the gradient of the setpoint [RbkUnit/s]	REAL	100.0
SP_Ext	external setpoint - (to interconnection)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_ExtLi	1 = Select external setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtOp*	1 = Select external setpoint (via operator)	BOOL	0
SP_HiLim	Limit (high) of setpoint	REAL	100.0
SP_LoLim	Limit (low) of setpoint	REAL	0.0
SP_Int*	Internal setpoint for operation	REAL	1.0
SP_IntLi	1 = Select internal setpoint (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_IntOp*	1 = Select internal setpoint (via operator)	BOOL	1
SP_LiOp	Select setpoint source (internal/external): 1 = Via interconnection 0 = Via operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_RateOn*	1 = Activate limitation of setpoint gradients	BOOL	0
SP_RmpModTime	1 = Use time (SP_RmpTime) for setpoint ramp 0 = Use gradient	BOOL	0
SP_RmpOn*	1 = Activate setpoint ramp to target setpoint SP_RmpTarget	BOOL	0
SP_RmpTarget	Target setpoint for setpoint ramp	REAL	0.0
SP_RmpTime*	Time for setpoint ramp [s] from current SP up to SP_RmpTarget	REAL	0.0
SP_TrkExt	1 = Bumpless switchover from external to internal setpoint active	BOOL	0
SP_UpRaLim	Gradient limit (high) for the setpoint [RbkUnit/s]	REAL	100.0
StepNo	Batch step number	DWORD	16#00000000
StopAut*	1 = Stopping the motor in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopForce	1 = Force motor stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
StopLocal	1 = Stopping the motor in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopMan*	1 = Stopping the motor in "manual mode"	BOOL	0
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
Trip	1 = Motor is in "good" state	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
UserAna1	Analog auxiliary value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UserAna2	Analog auxiliary value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00
WarnTiAut*	Prewarning of motor start in "automatic mode" in [s]	REAL	0.0
WarnTiMan*	Prewarning of motor start in "manual mode" in [s]	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" is enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AV_OpScale	Limit for scale in AV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
AV_Out	Output additional analog value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
AV_Unit	Unit of measure for additional analog value	INT	0

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ER	Control deviation	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
ER_AH_Act	1 = Alarm limit (high) for control deviation violated.	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ER_AL_Act	1 = Alarm limit (low) for control deviation violated.	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MotSpdCL error handling (Page 943)	INT	-1
FbkFwdOut	Feedback: 1 = Forward operation active	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
FbkRevOut	Feedback: 1 = Reverse operation active	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
Fwd	1 = Control of motor forward	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
GrpErr	1 = Group error pending	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
LocalAct	1 = "Local mode" enabled	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
LockAct	1 = Interlock (Intlock, Permit, Protect) or Trip is active	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ManAct	1 = "Manual mode" enabled	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#80
MonDynErr	1 = Feedback error due to control change	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

Parameter	Description	Type	Default
MonStaErr	1 = Feedback error due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
OosAct	1 = Block is "out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS1PermOut	Display of OS1Perm	DWORD	16#FFFFFFFF
OS1PermLog	Display of OS1Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
P_Fwd	1 = Pulse signal for starting the motor in forward	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Rev	1 = Pulse signal for starting the motor in reverse	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Stop	0 = Pulse signal for stopping the motor	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
R_StpAct	1 = Rapid stop of the motor is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkOut	Output of readback value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
RbkWH_Act	1 = Warning (high) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkWL_Act	1 = Warning (low) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Rev	1 = Control of motor: Reverse	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RunFwd	1 = Motor is running forwards	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RunRev	1 = Motor is running in reverse	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_DnRaAct	1 = Negative gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_ExtAct	1 = External setpoint is active 0 = Internal setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_HiAct	1 = Limit (high) for setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_LoAct	1 = Limit (low) for setpoint has been reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_Out	Setpoint used by controller	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
SP_Out2	Additional setpoint, without gear reducing factor	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_RateTarget	Target setpoint for the gradient limitation	REAL	0.0
SP_UpRaAct	1 = Positive gradient limiting of setpoint is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Starting	1 = Motor will start	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Status1	Status word 1 (Page 928)	DWORD	16#00000000
Status2	Status word 2 (Page 928)	DWORD	16#00000000
Status3	Status word 3 (Page 928)	DWORD	16#00000000
Status4	Status word 4 (Page 928)	DWORD	16#00000000
ST_Worst	Worst signal status	BYTE	16#80
Stop	1 = Motor is stopping	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Stopping	1 = Motor will stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
WarnAct	1 = Prewarning for motor start active (parameters WarnTiAut and WarnTiMan)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

MotSpdCL block diagram (Page 957)

MotSpdCL messaging (Page 944)

MotSpdCL modes (Page 933)

6.5.7 MotSpdCL block diagram

MotSpdCL block diagram

A block diagram is not provided for this block.

See also

MotSpdCL I/Os (Page 946)

MotSpdCL messaging (Page 944)

MotSpdCL error handling (Page 943)

MotSpdCL functions (Page 934)

MotSpdCL modes (Page 933)

Description of MotSpdCL (Page 928)

6.5.8 Operator control and monitoring

6.5.8.1 MotSpdCL views

Views of the MotSpdCL block

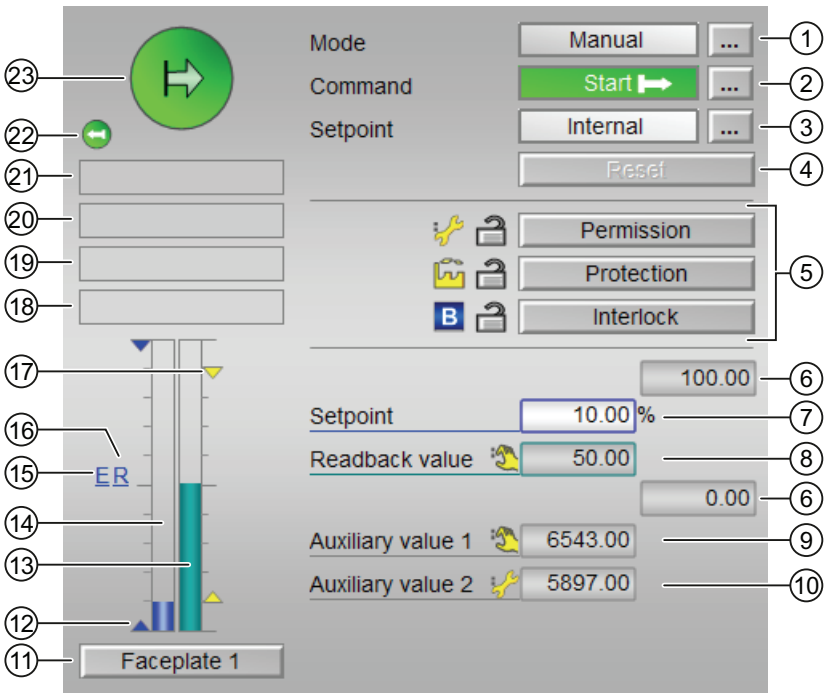
The block MotSpdCL provides the following views:

- MotSpdCL standard view (Page 958)
- Alarm view (Page 250)
- Limit value view of motors (Page 243)
- MotSpdCL limit value view for readback values (Page 963)
- Trend view (Page 253)
- Ramp view (Page 248)
- MotSpdCL parameter view (Page 964)
- MotSpdCL preview (Page 966)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for MotSpdCL (Page 969)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.5.8.2 MotSpdCL standard view

MotSpdCL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Starting and stopping the motor

This area shows you the default operating state for the variable motor. The following states can be shown and executed here:

- "Start |→"
- "Start ←|"
- "Stop"
- "Rapid stop"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) Switching the setpoint internal/external

This area shows how to specify the setpoint. The setpoint can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

You can find additional information on this in the Setpoint specification - internal/external (Page 112) section.

(4) Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(5) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocking functions (Page 85) section.

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

  If there is a bypass of one of the interlock signals, the symbol for the bypass is shown instead of the signal status.

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(6) High and low scale range for the setpoint

This area is already set and cannot be changed.

(7) Displaying and changing the setpoint including signal status

This area shows the current setpoint with the corresponding signal status.

Refer to the Changing values (Page 210) section for information on changing the setpoint. The setpoint specification also needs to be set to "Internal" for this block.

(8) Displaying the read back value

This area shows you the current readback value with the corresponding signal status.

(9) and (10) Display of auxiliary values

This display is only visible when the corresponding block input is connected.

You can use this area to display two auxiliary values that have been configured in the Engineering System (ES). You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(11) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(12) Displaying the limits

These triangles show the `SP_HiLim` and `SP_LoLim` setpoint limits configured in the Engineering System (ES).

(13) Bar graph for the readback value

This area shows you the current readback value in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(14) Bar graph for the setpoint

This area shows the current setpoint in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

(15) Display of external setpoint

This display [E] is only visible when you have selected "Internal" setpoint specification. It shows the external setpoint that would apply if you were to change the setpoint specification to "external".

(16) Display for the target setpoint of the setpoint ramp

This display [R] shows the target setpoint and is only visible if you have enabled ramp generation in the Ramp view (Page 248).

(17) Limit display

These colored triangles show you the configured limits in the respective bar graph.

(18) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on this topic is available in chapters Release for maintenance (Page 52) Display area for block states.

(19) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"
- "Delay"

You will find more detailed information on this in the chapters Simulating signals (Page 47) and Display of delay times (Page 31).

(20) Display area for block states

This area provides additional information on the operating state of the block:

- "Motor protection"
- "Runtime error"
- "Control deviation"
- "Invalid signal"
- "Changeover error"

You will find more detailed information on these errors in the chapters Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error") and Motor protection function (Page 85).

(21) Display area for block states

This area provides additional information on the operating state of the block:

- "Forced stop"
- "Forced start |→"
- "Forced start ←|"
- "Request 0/1": A reset to "automatic mode" is expected.

You can find additional information on this in the Forcing operating modes (Page 31) section.

(22) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the motor would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

(23) Status display of the motor

The current status of the motor is graphically displayed here.

You can find more information about this in the section Block icon for MotSpdCL (Page 969).

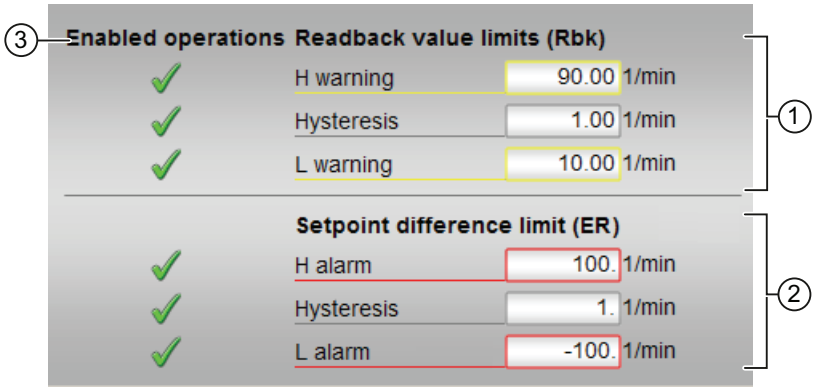
6.5.8.3 MotSpdCL limit value view for readback values

Limit value view for readback values of MotSpdCL

Several values are set in this view by default:

- Readback value limits

The toolbars of the faceplate and the block icon indicate when the limits are reached or exceeded.



(1) Displaying and changing the limits for the readback value

In this area, you can enter the limits for the readback value. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H warning": Warning high
- "Hysteresis"
- "L warning": Warning low

(2) Displaying and changing the limits for the setpoint difference

In this area, you can enter the limits for the setpoint difference. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "Hysteresis"
- "L alarm": Alarm low

(3) Enabled operations

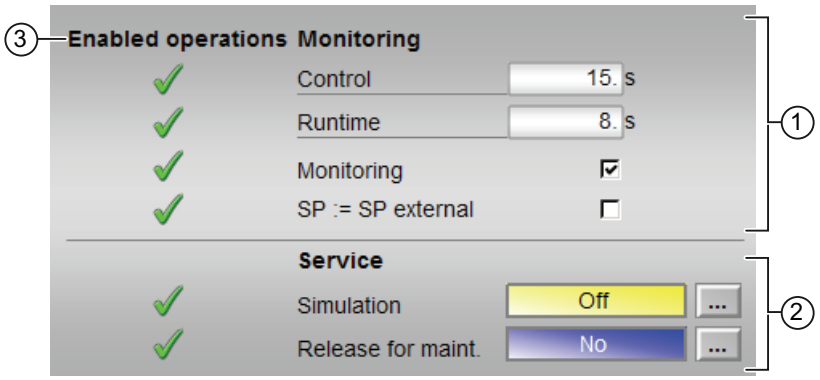
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

6.5.8.4 MotSpdCL parameter view

Parameter view of MotSpdCL



(1) Monitoring

In this area, you change parameters and therefore influence the motor. Refer to the Changing values (Page 210) section for more on this.

You can influence the following parameters:

- "Control": Monitoring time during startup and shutdown of the motor (dynamic)
- "Runtime": Monitoring time during permanent operation of the motor (static)

Enable monitoring

You can enable monitoring by clicking the check box (☑)

You can find additional information on this in the Monitoring the feedbacks (Page 83) section.

Activating bumpless switchover

"SP := SP external": ☑ Bumpless switchover of setpoint from external to internal. The internal setpoint is tracked to the external one.

(2) Service

You can select the following functions in this area:

- Simulation
- Release for maintenance

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

(3) Enabled operations

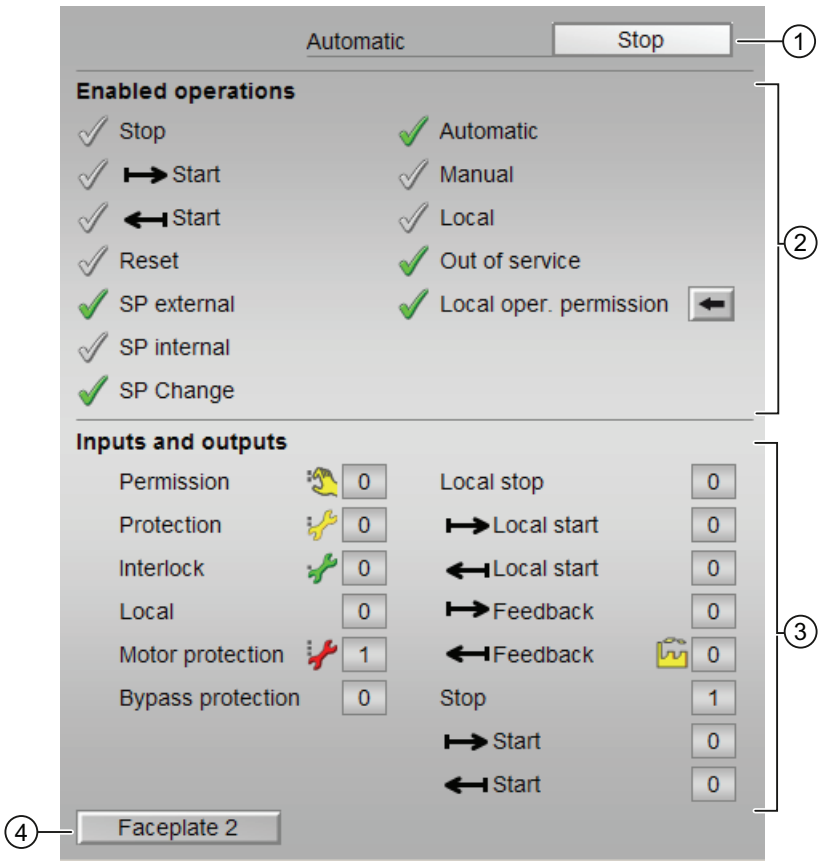
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

6.5.8.5 MotSpdCL preview

Preview of MotSpdCL



(1) Automatic preview

This area shows you the block status after its has switched from "manual" to "automatic" mode.

If the block is in "automatic mode", the current block state is displayed.

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Stop": You can stop the motor.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Start |→ ": You can start the motor.

  If text is configured for this command, it is also displayed in brackets. You can find additional information on this in the Labeling of buttons and text (Page 167) section.

- "Start ←|": You can start the motor.

  If text is configured for this command, it is also displayed in brackets. You can find additional information on this in the Labeling of buttons and text (Page 167) section.

- "Reset": You can reset the motor after interlocks or errors.
- "SP external": You can feedforward the external setpoint.
- "SP internal": You can feedforward the internal setpoint.
- "Change SP": You can change the setpoint.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Local": You can switch to "local mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Permission":

  This display is only visible when the corresponding block input is connected.

  – 0 = No OS release for energizing motor

  – 1 = Enable for "opening"/"closing" from the neutral position

- "Protection":

  This display is only visible when the corresponding block input is connected.

  – 0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block

  – 1 = "Good" state

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Local": 1 = Block is operated in "local mode"
- "Motor protection": 1 = Motor is in "good" state
- "Interlock deact.":

  – 0 = Bypass disabled

  – 1 = Bypassing interlock in "local mode" and in "simulation"

- "Local stop": 1= Block is operated in "local mode"
- "Local start |→": 1= Block is operated in a controlled manner in "local mode"
- "Local start ←|": 1= Block is operated in a controlled manner in "local mode"
- "Feedback |→": 1 = Motor has started and is running
- Feedback←|: 1 = Motor has started and is running
- "Stop": 1 = Stopping the motor
- "Start | →" 1 = Starting the motor
- "Start ←|": 1 = Starting the motor

(4)Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

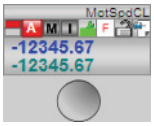
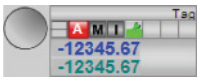
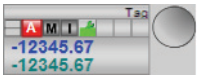
6.5.8.6 Block icon for MotSpdCL

Block icons for MotSpdCL

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault CSF
- Operating modes
- Internal and external setpoint specification
- Signal status, release for maintenance
- Displays for bypassing interlocks
- Interlocks
- Memo display
- Motor state display
- Setpoint (blue, with decimal places)
- Feedback value (green, with decimal places)

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	

Icons	Selection of the block icon in CFC	Special features
	7	
	8	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

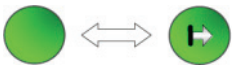
Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Motor state display

The following motor states are shown here:

Icon	Meaning
	Motor started (motor icon changes)
	the motor is running
	Motor stopped (motor icon changes)
	Motor idle
	Error at motor (monitoring error, Motor protection)
	Motor out of service

6.6 MotSpdL - Two-speed motor

6.6.1 Description of MotSpdL

Object name (type + number) and family

Type + number: FB 1856

Family: Drives

Area of application for MotSpdL

The block is used for the following applications:

- Control of reversible motors

How it works

The block is used to control motors with two speeds. Various inputs are available for controlling the motor. You can add monitoring of a maximum of two feedbacks produced by the contactor relay and a switching mode with which the speed change can be performed.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB3x). The block is also installed automatically in the startup OB (OB100).

Further addressing is not required.

For the MotSpdL block, the Advanced Process Library contains a template for process tag types as an example with an application scenario for this block.

Example of process tag types:

- Two-speed motor (Motor2Speed) (Page 1821)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section MotSpdL I/Os (Page 986).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	0 = `ManAct.Value` 1 = `AutoAct.Value`
6	`LocalAct.Value`
7	0: Open padlock in the block icon 1: Closed padlock in the block icon
8	`Spd1.Value`
9	Motor is stopped
10	`Spd2.Value`
11	`MonStaErr.Value`
12	`MonDynErr.Value`
13	`BypProt`
14	Invalid signal status
15	Mode switchover error
16	1 = `Intlock` is active
17	1 = `Permit` is active
18	1 = `Protect` is active
19	`Trip.Value`
20	`Spd1Force.Value`

Status bit	Parameter
21	StopForce.Value
22	Spd2Force.Value
23	"Interlock" button is enabled
24	Reset request in automatic preview
25	WarnAct:Value, IdleTime or SwOverTi active
26	Bypass information
27	Automatic preview for (Speed1)
28	Automatic preview for (Stop)
29	Automatic preview for (Speed2)
30	"Permission" button is enabled
31	"Protection" button is enabled

Status word allocation for Status2 parameter

Status bit	Parameter
0	MsgLock
1	AV_AH_Act.Value
2	AV_WH_Act.Value
3	AV_TH_Act.Value
4	AV_TL_Act.Value
5	AV_WL_Act.Value
6	AV_AL_Act.Value
7	AV_AH_En
8	AV_WH_En
9	AV_TH_En
10	AV_TL_En
11	AV_WL_En
12	AV_AL_En
13	AV_AH_MsgEn
14	AV_WH_MsgEn
15	AV_TH_MsgEn
16	AV_TL_MsgEn
17	AV_WL_MsgEn
18	AV_AL_MsgEn
19	1 = No impact of input signals on "local mode" with LocalSetting = 2 and LocalSetting = 4
20	Motor is stopped
21	Motor stops at speed 1
22	Motor stops at speed 2

Status bit	Parameter
23	Motor starts at speed 1
24	Motor running at speed 1
25	Motor starts at speed 2
26	Motor running at speed 2
27	Error when stopping motor
28	Error with motor speed 1
29	Error with motor speed 2
30	Display for interlocks in block icon
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0 - 17	Not used
18	`SimLiOp.Value`
19	1 = Enable for rapid stop (`Feature` Bit Enabling rapid stop via faceplate (Page 142))
20 - 22	Not used
23	Command for rapid stop
24	Command for starting > the motor
25	Command for starting >> the motor
26	Show automatic preview in the standard view
27	Not used
28	`GrpErr.Value`
29	`RdyToStart.Value`
30	Auxiliary value 1 visible
31	Auxiliary value 2 visible

Status word allocation for `Status4` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal `6` of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8	`AV` not connected

Status bit	Parameter
9	Motor protection display (`Trip.Status` ≠ 16#FF)
10	1 = Input parameter `FbkSpd1` is connected
11	1 = Input parameter `FbkSpd2` is connected
12 - 31	Not used

See also

Functions of MotSpdL (Page 976)

MotSpdL messaging (Page 984)

MotSpdL block diagram (Page 994)

MotSpdL error handling (Page 983)

MotSpdL modes (Page 975)

6.6.2 MotSpdL modes

MotSpdL modes

The block can be operated using the following modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions. This includes, for example, the parameters for mode changes.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Motor actions you can control in local mode:

- starting with speed 1 (`Spd1Local` = 1)
- starting with speed 2 (`Spd2Local` = 1)
- stopping (`StopLocal` = 1).

A motor operated in "local" mode is controlled either by "local" signals (input parameters `Spd1Local` = 1, `Spd2Local` = 1 and `StopLocal` = 1) or feedback signals (input parameters `FbkSpd1` = 1 and `FbkSpd2` = 1). Configuration takes place via the input parameter `LocalSetting`.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Motor actions you can control in auto mode:

- starting with speed 1 (`Spd1Aut` = 1)
- starting with speed 2 (`Spd2Aut` = 1)
- stopping (`StopAut` = 1).

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Motor actions you can control in "manual mode":

- starting with speed 1 (`Spd1Man` = 1)
- starting with speed 2 (`Spd2Man` = 1)
- stopping (`StopMan` = 1).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58)

See also

MotSpdL block diagram (Page 994)

MotSpdL I/Os (Page 986)

MotSpdL messaging (Page 984)

MotSpdL error handling (Page 983)

Functions of MotSpdL (Page 976)

Description of MotSpdL (Page 971)

6.6.3 Functions of MotSpdL

Functions of MotSpdL

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can stop the motor
5	1 = Operator can start the motor at speed 1
6	1 = Operator can start the motor at speed 2
7	1 = Operator can reset the motor
8	1 = Operator can define the monitoring time for startup
9	1 = Operator can define the monitoring time for runtime
10	1 = Operator can activate the monitoring time function (Bit 8 - 9)
11	1 = Operator can activate the Simulation function
12	1 = Operator can activate the Release for maintenance function
13	1 = Operator can change the limit (`AV`) for high alarm
14	1 = Operator can change the limit (`AV`) for high warning
15	1 = Operator can change the limit (`AV`) for high tolerance
16	1 = Operator can change the limit (`AV`) for hysteresis
17	1 = Operator can change the limit (`AV`) for low alarm
18	1 = Operator can change the limit (`AV`) for low warning
19	1 = Operator can change the limit (`AV`) for low tolerance
20 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Restart lock after switching off the motor

After switching off or stopping the motor, it can only be restarted after the time set with the `IdleTime` input parameter. When the "Stop" command is given, the motor goes immediately into "Stop" mode, and `IdleTime` starts after the feedback (`FbkSpd1` and `FbkSpd2` = 0) is given. The motor cannot be started again until the `IdleTime` has expired.

The `IdleTime` parameter can be set independently of the `MonTiDynamic` parameter.

Limit monitoring of an additional analog value

This block provides the standard function Limit monitoring of an additional analog value (Page 77).

Limit monitoring with hysteresis

This block provides the standard function Limit monitoring with hysteresis (Page 82).

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Labeling of buttons and text (Page 167).

Interlocks

This block provides the following interlocks:

- Activation enable
- Interlock without reset ("Interlock")
- Interlock with reset ("Protection")

Refer to the section Interlocks (Page 85) as well as Influence of the signal status on the interlock (Page 88).

Motor protection function

This block provides the standard function Motor protection function (Page 85).

Rapid stop for motors

This block provides the standard function Rapid stop for motors (Page 91).

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Resetting the block in case of interlocks or errors

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `Trip`
- `MonDynErr`
- `MonStaErr`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `FbkSpd1Out.ST`
- `FbkSpd2Out.ST`
- `LocalLi.ST`
- `Spd1Local.ST`
- `StopLocal.ST`
- `Spd2Local.ST`
- `Trip.ST`
- `AV_Out.ST`

Forcing operating modes

This block provides the standard function Forcing operating modes (Page 31).

The following states can be enforced:

- Speed 1 (`Spd1Force`)
- Speed 2 (`Spd2Force`)
- Stop (`StopForce`)

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Specify warning times for control functions

This block provides the standard function Specifying warning times for control functions at motors and valves (Page 39).

You can generate warning signals when, for example, motors are started. Warning signals can be generated in the following modes:

- Manual mode (Page 63) (`WarnTiMan` input parameter)
- Automatic mode (Page 63) (`WarnTiAut` input parameter)

You specify the warning times in seconds using the input parameters `WarnTiMan` and `WarnTiAut`. If, for example, a motor is started, then this is displayed at the output parameter with `WarnAct` = 1. The motor then starts after the set warning time has expired and `WarnAct` then goes back to 0.

A corresponding warning is not output if the warning times (`WarnTiMan` or `WarnTiAut`) are specified with a smaller value than the `SampleTime` parameter.

Step control mode for the speed change

Use the input parameter `SwiOverTi` and the `Feature` Bit 5 (Specifying switching mode (Page 141)) to specify how the motor is to carry out the speed change.

In so doing use the input parameter `SwiOverTi` to adjust the switching time. You have the following options:

- Switching on and off occurs immediately
- Switching on via speed 1
- Switching off via speed 1

Switching on and off occurs immediately: This setting enables you to switch directly from the "Off" state to speed 2 or from speed 2 (`Spd2`) to "Off".

Switching on via speed 1: The speed change from the "Off" condition to speed 2 (`Spd2`) is accomplished via speed 1 (`Spd1`) and after expiration of the time at the parameter `SwiOverTi`.

Switching off via speed 1: The speed change from speed 2 (`Spd2`) to the "Off" state is accomplished via speed 1 (`Spd1`) and after expiration of the time at parameter `SwiOverTi`.

Step control mode	`SwiOverTi`	`Feature` Bit 5
Switching on and off occurs immediately	= 0.0	0/1
Switching on only via speed 1	> 0.0	0
Switching on and off via speed 1	> 0.0	1

Simulating signals

This block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Additional value (`SimAV`, `SimAV_Li`)

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37).

Output signal as a pulse signal or static signal

This block provides the standard function Output signal as a static signal or pulse signal (Page 40).

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
4	Setting switch or button mode (Page 140)
5	Specifying switching mode (Page 141)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
14	Enabling rapid stop via faceplate (Page 142)
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)
19	Reset even with locked state (Page 138)
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)

Bit	Function
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

In pushbutton mode (Bit 4 = 0) the automatic commands in "automatic" mode are latching, in other words `Spd1Aut`, `Spd2Aut`, `StopAut` can be reset to 0 after changing the control. In "manual" and "local" modes, however, the automatic commands are not saved and in the absence of automatic commands the automatic control is tracked.

In switching mode (Bit 4 = 1), control is selected with the static signals `Spd1Aut`, `Spd2Aut`. If `Spd1Aut`, `Spd2Aut` inputs are not set, the motor is stopped. Control via `StopAut` is not needed. If the "Activate command reset for control" function (Bit 3 = 1) is also activated, the inputs `Spd1Aut`, `Spd2Aut` are reset to the neutral position after evaluation in the block.

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `Spd1Man`
- `Spd2Man`
- `StopMan`
- `RapidStp`

See also

MotSpdL block diagram (Page 994)

MotSpdL modes (Page 975)

MotSpdL error handling (Page 983)

MotSpdL I/Os (Page 986)

6.6.4 MotSpdL error handling

Error handling of MotSpdL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error
- Invalid input signals

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
41	The value for the `LocalSetting` I/O is not within the approved limit of 0 to 4..
42	`LocalSetting` = 0 or `LocalSetting` = 3 or `LocalSetting` = 4 and `LocalLi` = 1
51	`Spd1Local` = 1 and `StopLocal` = 1 `Spd2Local` = 1 and `StopLocal` = 1 `Spd1Local` = 1 and `Spd2Local` = 1 `Spd1Aut` = 1 and `StopAut` = 1 `Spd2Aut` = 1 and `StopAut` = 1 `Spd1Aut` = 1 and `Spd2Aut` = 1 `AutModLi` = 1 and `ManModLi` = 1 `Spd1Force` = 1 and `StopForce` = 1 `Spd2Force` = 1 and `StopForce` = 1 `Spd1Force` = 1 and `Spd2Force` = 1
52	`LocalAct` = 1 and `LocalSetting` = 2 or 4 and `SimOn` = 1

Mode switchover error

This error can be output by the block, see section Error handling (Page 104).

Invalid input signals

This error can be output by the block, see the section Error handling (Page 104).

See also

MotSpdL block diagram (Page 994)

MotSpdL I/Os (Page 986)

Functions of MotSpdL (Page 976)

MotSpdL modes (Page 975)

Description of MotSpdL (Page 971)

MotSpdL messaging (Page 984)

6.6.5 MotSpdL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ Motor feedback error
	SIG 2	AS process control message - fault	$$BlockComment$$ Motor protection triggered
	SIG 3	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId1, SIG 3).

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 4	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 5	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 6	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	ExtVa104
5	ExtVa105
6	ExtVa106
7	ExtVa107
8	ExtVa108
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters ExtVa104 ... ExtVa108 and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

MotSpdL block diagram (Page 994)

MotSpdL modes (Page 975)

MotSpdL error handling (Page 983)

6.6.6 MotSpdL I/Os

I/Os of MotSpdL

Input parameters

Table 6- 1

Parameter	Description	Type	Default
AutModLi*	1 = "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
AV	Input additional analog value, to be connected to AV_Tech of the AV block	ANY	
AV_AH_Lim	Limit high alarm	REAL	95.0
AV_AL_Lim	Limit low alarm	REAL	5.0
AV_Hyst	Hysteresis for alarm, warning and tolerance limits	REAL	1.0
AV_TH_Lim	Limit high tolerance	REAL	85.0
AV_TL_Lim	Limit low tolerance	REAL	15.0
AV_WH_Lim	Limit high warning	REAL	90.0
AV_WL_Lim	Limit low warning	REAL	10.0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock in "local mode" and in "simulation"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
FbkSpd1	1 = Feedback for speed 1 is present	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkSpd2	1 = Feedback for speed 2 is present	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
Feature	I/O for additional functions (Page 976)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
IdleTime*	Wait time for restart of motor in [s]	REAL	5.0
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1
LocalLi	1 = Activate "local mode" via plant signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalOp*	1 = "Local mode" via operator	BOOL	0
LocalSetting	Properties for the Local mode (Page 66)	INT	0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1

Parameter	Description	Type	Default
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Monitor	1 = Feedback monitoring	BOOL	1
MonTiDynamic*	Monitoring time for feedback errors after operation in [s]	REAL	3.0
MonTiStatic*	Monitoring time for feedback errors without operation in [s]	REAL	3.0
MS_RelOp	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp*	1 = Release for maintenance via OS operator	BOOL	0
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 976)	STRUCT • Bit 0: BOOL • Bit 20: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
Permit	1 = Enable for opening / closing from neutral position 0 = No OS release for energizing motor	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Perm_En	1 = Activation enable (enable, Permit parameter) is active	BOOL	1
Protect	0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block 1 = Protective interlocking not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Prot_En	1 = Protective interlock (protection, Protect parameter) is active	BOOL	1
PulseWidth*	Pulse width of control signal [s]	REAL	3.0
RapidStp*	Rapid stop for the motor: 0 = Motor On 1 = Motor Off	BOOL	0

Parameter	Description	Type	Default
Spd1Aut*	1 = Activation of motor speed 1 in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Spd2Aut*	1 = Activation of motor speed 2 in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Spd1Force	1 = Force activation of motor speed 1 in automatic mode	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Spd2Force	1 = Force activation of motor speed 2 in automatic mode	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Spd1Local	1 = Activation of motor speed 1 in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Spd2Local	1 = Activation of motor speed 2 in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Spd1Man*	1 = Activation of motor speed 1 in "manual mode"	BOOL	0
Spd2Man*	1 = Activation of motor speed 2 in "manual mode"	BOOL	0
RstLi*	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SimAV*	Additional value used for SimOn = 1	REAL	0.0
SimAV_Li	Additional analog value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0

Parameter	Description	Type	Default
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
StepNo	Batch step number	DWORD	16#00000000
StopAut*	1 = Stopping the motor in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopForce	1 = Force motor stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopLocal	1 = Stopping the motor in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopMan*	1 = Stopping the motor in "manual mode"	BOOL	0
SwOverTi*	Time for speed change	REAL	0.0
Trip	1 = Motor is in "good" state	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
UserAna1	Analog auxiliary value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UserAna2	Analog auxiliary value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00
WarnTiAut*	Prewarning of motor start in "automatic mode" in [s]	REAL	0.0
WarnTiMan*	Prewarning of motor start in "manual mode" in [s]	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" is enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AV_OpScale	Limit for scale in AV bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
AV_Out	Output additional analog value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
AV_Unit	Unit of measure for additional analog value	INT	0
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MotSpdL error handling (Page 983)	INT	-1
FbkSpd1Out	Feedback: 1 = Speed 1 active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkSpd2Out	Feedback: 1 = Speed 2 active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LockAct	1 = Interlock (Intlock, Permit, Protect) or Trip is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
MonDynErr	1 = Feedback error due to control change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
MonStaErr	1 = Feedback error due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Spd1	1 = Pulse signal for starting the motor with speed 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Spd2	1 = Pulse signal for starting the motor with speed 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Stop	0 = Pulse signal for stopping the motor	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
R_StpAct	1 = Rapid stop of the motor is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
RunSpd1	1 = Motor running at speed 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RunSpd2	1 = Motor running at speed 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Spd1	1 = Control of motor: Speed 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Spd2	1 = Control of motor: Speed 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Starting	1 = Motor will start	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Status1	Status word 1 (Page 971)	DWORD	16#00000000
Status2	Status word 2 (Page 971)	DWORD	16#00000000
Status3	Status word 3 (Page 971)	DWORD	16#00000000
Status4	Status word 4 (Page 971)	DWORD	16#00000000
Stop	1 = Motor is stopping	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Stoping	1 = Motor will stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
WarnAct	1 = Prewarning for motor start active (parameters WarnTiAut and WarnTiMan)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

MotSpdL messaging (Page 984)

MotSpdL block diagram (Page 994)

MotSpdL modes (Page 975)

6.6.7 MotSpdL block diagram

MotSpdL block diagram

A block diagram is not provided for this block.

See also

MotSpdL I/Os (Page 986)

MotSpdL messaging (Page 984)

MotSpdL error handling (Page 983)

Functions of MotSpdL (Page 976)

MotSpdL modes (Page 975)

Description of MotSpdL (Page 971)

6.6.8 Operator control and monitoring

6.6.8.1 MotSpdL views

Views of the MotSpdL block

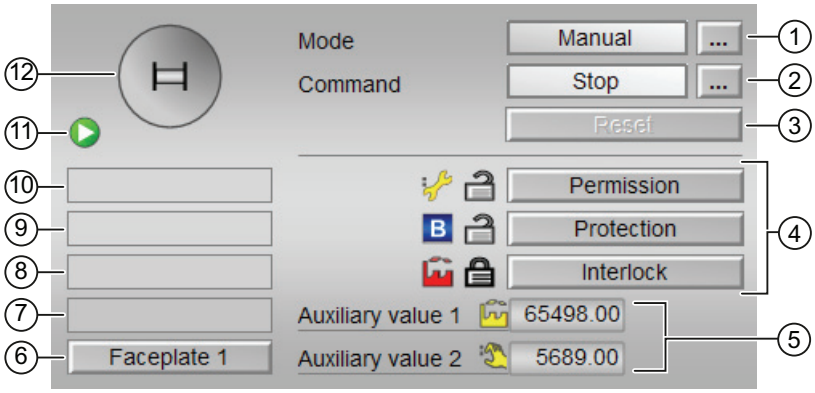
The block MotSpdL provides the following views:

- MotSpdL standard view (Page 995)
- Alarm view (Page 250)
- Limit value view of motors (Page 243)
- Trend view (Page 253)
- Parameter view for motors and valves (Page 236)
- MotSpdL preview (Page 998)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for MotSpdL (Page 1001)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.6.8.2 MotSpdL standard view

MotSpdL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Starting and stopping the motor

This area shows you the default operating state for the motor. The following states can be shown and executed here:

- "Start >"
- "Start >>"
- "Stop"
- "Rapid stop"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(4) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocking functions (Page 85) section.

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

  If there is a bypass of one of the interlock signals, the symbol for the bypass is shown instead of the signal status.

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(5) Display of auxiliary values

This display is only visible when the corresponding block input is connected.

You can use this area to display two auxiliary values that have been configured in the Engineering System (ES). You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(6) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(7) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(8) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"
- "Delay"

You will find more detailed information on this in the chapters Simulating signals (Page 47) and Display of delay times (Page 31).

(9) Display area for block states

This area provides additional information on the operating state of the block:

- "Motor protection"
- "Runtime error"
- "Control deviation"
- "Invalid signal"
- "Changeover error"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error") and Motor protection function (Page 85).

(10) Display area for block states

This area provides additional information on the operating state of the block:

- "Forced stop"
- "Forced start >"
- "Forced start >>"
- "Request 0/1": A reset to "automatic mode" is expected.

You can find additional information on this in the Forcing operating modes (Page 31) section.

(11) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the motor would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

(12) Status display of the motor

The current status of the motor is graphically displayed here.

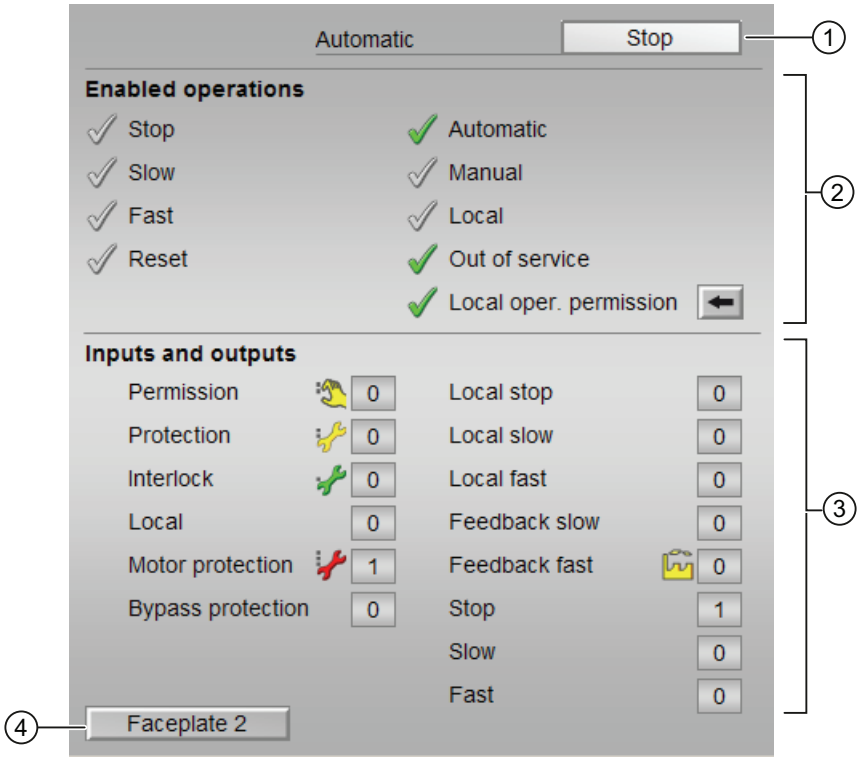
You can find more information about this in the section Block icon for MotSpdL (Page 1001).

See also

Functions of the blocks (Page 31)

6.6.8.3 MotSpdL preview

Preview of MotSpdL



(1) Automatic preview

This area shows you the block status after it has switched from "manual" to "automatic" mode.

If the block is in "automatic mode", the current block state is displayed.

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Stop": You can stop the motor.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Slow": You can start the motor in the "slow" state.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Fast": You can start the motor in the "fast" state.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Reset": You can reset the motor after interlocks or errors.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Local": You can switch to "local mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Permission":

  This display is only visible when the corresponding block input is connected.

  – 0 = No OS release for energizing motor

  – 1 =Enable for "starting"/"stopping" from the neutral position

- "Protection":

  This display is only visible when the corresponding block input is connected.

  – 0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block

  – 1 = "Good" state

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 =Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Local": 1 = Block is operated in "local mode"
- "Motor protection": 1 = Motor is in "good" state
- "Interlock deact.":

  – 0 = Bypass disabled

  – 1 =Bypassing interlock in "local mode" and in "simulation"

- "Local stop": 1 =Stopping the motor in "local mode"
- "Local slow": 1 = Starting the motor in "local mode", slow
- "Local fast": 1 = Starting the motor in "local mode", fast
- "Feedback slow": 1 = Motor has started and is running slow
- "Feedback fast": 1 = Motor has started and is running fast
- "Stop": 1 =Stopping the motor
- "Slow": 1 = Motor is running slow
- "Fast": 1 = Motor is running fast

(4)Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

6.6.8.4 Block icon for MotSpdL

Properties of the MotSpdLblock icon

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault CSF
- Operating modes
- Signal status, release for maintenance
- Displays for bypassing interlocks
- Interlocks
- Memo display
- Motor state display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	

Icons	Selection of the block icon in CFC	Special features
	10	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	
	3	
	4	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Motor state display

The following motor states are shown here:

Icon	Meaning
	Motor started (motor icon changes)
	the motor is running
	Motor stopped (motor icon changes)
	Motor idle
	Error at motor (monitoring error, motor protection)
	Motor out of service

6.7 ShrdResS - Multiplexer for shared resources

6.7.1 Description for ShrdResS

Object name (type + number) and family

Type + number: FB 1914

Family: Drives

Area of application for ShrdResS

The block is used for the following applications:

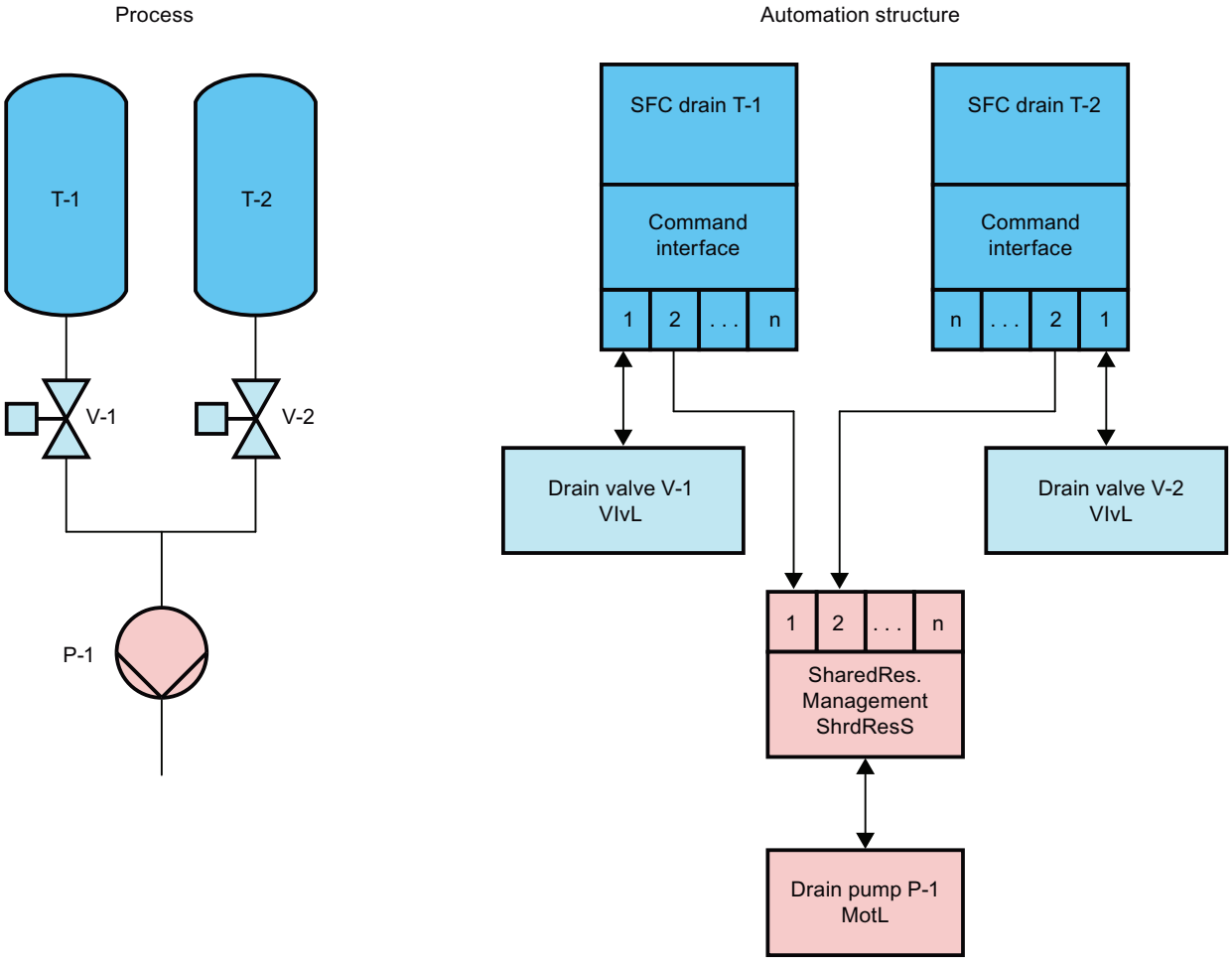
- Organize individual requests for downstream block from upstream applications

How it works

The block coordinates the access from up to four CFC or SFC step sequencers to a technologic block of the families "Drives" or "Dose". These blocks include:

- Motors
- Valves
- Dosers

The block has four channels, each with a standardized command interface.



The block can be cascaded via the fourth channel so that accesses via more than four upstream applications are possible. Use the cascade by interconnecting the output parameter `CasOut` of the first block to the input parameter `CasIn` of the second block. The output interface of the upstream block is then used as channel 4 for the second block.

As soon as a channel is allocated, its command interface is aligned 1-to-1 with the command interface at the output.

The channel with the lower number always has priority with shared allocation. Cascaded blocks are always allocated to channel 4 of the upstream block; they are then in 4th place.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status` parameter

You can find a description for each parameter in section ShrdResS I/Os (Page 1011).

Status bit	Parameter
0	`ReadyIn`, readiness signal of the interconnected technologic block
1	`ChnEn_1`
2	`ChnEn_2`
3	`ChnEn_3`
4	`ChnEn_4`
5	`Ready`, channel allocation is possible
6	`ActChnNo` = 1, 1 = Channel 1 enabled
7	`ActChnNo` = 2, 1 = Channel 2 enabled
8	`ActChnNo` = 3, 1 = Channel 3 enabled
9	`ActChnNo` = 4, 1 = Channel 4 enabled
10	`MultiOcc`, 1 = Request for more than one channel
11	`Cascaded`, 1 = 4. Channel is cascaded
12	`BatchEn`
13	`Occupied`
14 - 20	Not used
21	`BaEn_1`
22	`BaEn_2`
23	`BaEn_3`
24	`BaEn_4`
25	`Occ_1`
26	`Occ_2`
27	`Occ_3`
28	`Occ_4`
29 - 31	Not used

See also

ShrdResS operating modes (Page 1006)
ShrdResS functions (Page 1006)
Error handling of ShrdResS (Page 1010)
ShrdResS messaging (Page 1011)
ShrdResS block diagram (Page 1020)

6.7.2 ShrdResS operating modes

ShrdResS operating modes

This block does not have any modes.

See also

Description for ShrdResS (Page 1003)
ShrdResS functions (Page 1006)
Error handling of ShrdResS (Page 1010)
ShrdResS messaging (Page 1011)
ShrdResS I/Os (Page 1011)
ShrdResS block diagram (Page 1020)

6.7.3 ShrdResS functions

Functions of ShrdResS

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

If the block is cascaded, the standard view of the ShrdResS block interconnected to `CasIn` can be opened in addition to the freely configured faceplate.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

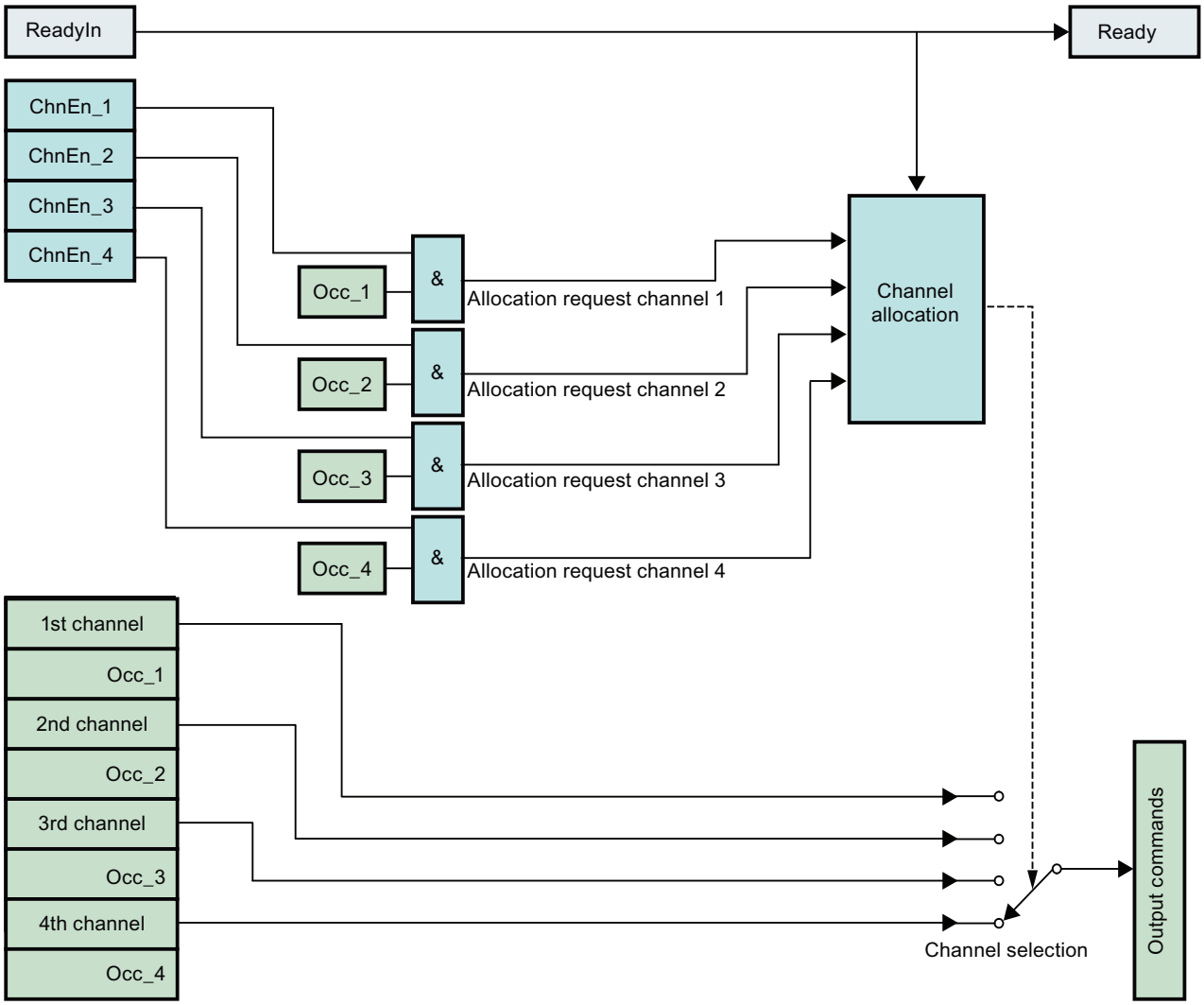
Bit	Function
0	Setting the startup characteristics (Page 116)

Readiness signal

In order to assign one of the channels, the ready signal must be `ReadyIn` = 1 and at least one channel enable must be `ChnEn_x = 1` (x = 1...4) . The ready signal is output at the `Ready` output.

Channel management

Overview of the channel management



Allocate/enable channel

A channel can only be allocated if the readiness signal (`ReadyIn` = 1) and the respective channel enabling is available for the allocation `ChnEn_x` = 1.

With `ChnEn_x` = 0 the channel x is disabled and cannot be allocated.

The allocation of a channel by the upstream application is accomplished via the input `Occ_x`. As long as this input is 1, the channel is allocated and enabled. The applied commands are aligned 1-to-1 with the output command interface.

The number of the allocated channel is displayed at the output `ActChnNo` (INT format). If no channel is allocated, the output is 0.

Enable/disable channel

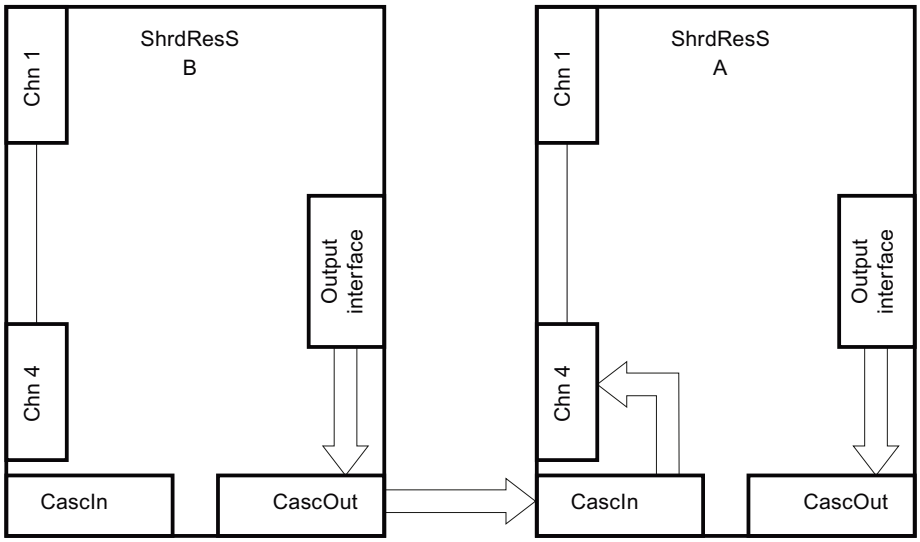
If no channel enabling via `Occ_x` = 0 occurs or if the channel is disabled via `ChnEn_x` = 0, the next highest priority channel is automatically switched to the command outputs. If there is no other allocation request (every `Occ_x` = 0), the commands of the output interface are reset to the default values.

Channel prioritization

Channel 1 has the highest priority, channel 4 has the lowest. If the input `Occ_x` is set at multiple enabled channels, the channel with the highest priority is allocated and the output `MultiOcc` = 1 is set.

Cascading

For cascading, the output `CasOut` of a ShrdResS block B must be connected with the input `CasIn` of the downstream ShrdResS block A. Therefore, the fourth channel of the downstream block ShrdResS A is allocated by the ShrdResS B block connected to `CasIn`. The command interface of the fourth channel is tracked in this case to the output interface of the connected ShrdResS B block.



Any values applied via interconnection at the 4th channel of block A are not taken into account in the block code during cascading.

See also

Description for ShrdResS (Page 1003)

ShrdResS operating modes (Page 1006)

Error handling of ShrdResS (Page 1010)

ShrdResS messaging (Page 1011)

ShrdResS I/Os (Page 1011)

ShrdResS block diagram (Page 1020)

6.7.4 Error handling of ShrdResS

ShrdResS error handling

Please refer to the section Error handling (Page 104) in the basic instructions.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block will not be processed
0	There is no error.
40	Interconnection error on `CasIn`, incorrect block type interconnected

See also

Description for ShrdResS (Page 1003)

ShrdResS operating modes (Page 1006)

ShrdResS functions (Page 1006)

ShrdResS messaging (Page 1011)

ShrdResS I/Os (Page 1011)

ShrdResS block diagram (Page 1020)

6.7.5 ShrdResS messaging

Messaging

This block does not offer messaging.

See also

Description for ShrdResS (Page 1003)
ShrdResS operating modes (Page 1006)
ShrdResS functions (Page 1006)
Error handling of ShrdResS (Page 1010)
ShrdResS I/Os (Page 1011)
ShrdResS block diagram (Page 1020)

6.7.6 ShrdResS I/Os

I/Os of ShrdResS

Input parameters

Parameter	Description	Type	Default
AutMod_1*	1= "Automatic mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutMod_2*	1= "Automatic mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutMod_3*	1= "Automatic mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutMod_4*	1= "Automatic mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
BaEn_1	1 = Enable allocation for channel 1	BOOL	0
BaEn_2	1 = Enable allocation for channel 2	BOOL	0
BaEn_3	1 = Enable allocation for channel 3	BOOL	0
BaEn_4	1 = Enable allocation for channel 4	BOOL	0

Parameter	Description	Type	Default
BaID_1	Batch number for channel 1	DWORD	16#00000000
BaID_2	Batch number for channel 2	DWORD	16#00000000
BaID_3	Batch number for channel 3	DWORD	16#00000000
BaID_4	Batch number for channel 4	DWORD	16#00000000
BaName_1	Batch designation for channel 1	S7-String	
BaName_2	Batch designation for channel 2	S7-String	
BaName_3	Batch designation for channel 3	S7-String	
BaName_4	Batch designation for channel 4	S7-String	
CasIn	Input for cascade, to be interconnected with the output parameter CasOut of the preceding ShrdResS block	ANY	
ChnEn_1	1 = Channel 1 is enabled and can be allocated 0 = Channel 1 is blocked and cannot be allocated.	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
ChnEn_2	1 = Channel 2 is enabled and can be allocated 0 = Channel 2 is blocked and cannot be allocated.	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
ChnEn_3	1 = Channel 3 is enabled and can be allocated 0 = Channel 3 is blocked and cannot be allocated.	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
ChnEn_4*	1 = Channel 4 is enabled and can be allocated 0 = Channel 4 is blocked and cannot be allocated.	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
ChnCmd_1	Channel input 1 (reserved)	STRUCT	
ChnCmd_2	Channel input 2 (reserved)	STRUCT	
ChnCmd_3	Channel input 3 (reserved)	STRUCT	
ChnCmd_4	Channel input 4 (reserved)	STRUCT	
Ctrl01_1*	1. Control command for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl02_1*	2. Control command for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl03_1*	3. Control command for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl04_1*	4. Control command for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Ctrl05_1*	5. Control command for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl06_1*	6. Control command for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl01_2*	1. Control command for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl02_2*	2. Control command for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl03_2*	3. Control command for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl04_2*	4. Control command for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl05_2*	5. Control command for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl06_2*	6. Control command for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl01_3*	1. Control command for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl02_3*	2. Control command for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl03_3*	3. Control command for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl04_3*	4. Control command for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Ctrl05_3*	5. Control command for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl06_3*	6. Control command for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl01_4*	1. Control command for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl02_4*	2. Control command for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl03_4*	3. Control command for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl04_4*	4. Control command for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl05_4*	5. Control command for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl06_4*	6. Control command for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CtrlW1_1*	1. Available user control word for channel 1	DWORD	16#00000000
CtrlW1_2*	1. Available user control word for channel 2	DWORD	16#00000000
CtrlW1_3*	1. Available user control word for channel 3	DWORD	16#00000000
CtrlW1_4*	1. Available user control word for channel 4	DWORD	16#00000000
CtrlW2_1*	2. Available user control word for channel 1	DWORD	16#00000000
CtrlW2_2*	2. Available user control word for channel 2	DWORD	16#00000000
CtrlW2_3*	2. Available user control word for channel 3	DWORD	16#00000000
CtrlW2_4*	2. Available user control word for channel 4	DWORD	16#00000000
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1006)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0

Parameter	Description	Type	Default
ManMod_1*	1 = "Manual mode" via interconnection for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManMod_2*	1 = "Manual mode" via interconnection for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManMod_3*	1 = "Manual mode" via interconnection for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManMod_4*	1 = "Manual mode" via interconnection for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ModLi_1*	1 = Control via interconnection or SFC for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ModLi_2*	1 = Control via interconnection or SFC for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ModLi_3*	1 = Control via interconnection or SFC for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ModLi_4*	1 = Control via interconnection or SFC for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occ_1	1 = Occupied Is also used as a control signal for the channel allocation for channel 1	BOOL	0
Occ_2	1 = Occupied Is also used as a control signal for the channel allocation for channel 2	BOOL	0
Occ_3	1 = Occupied Is also used as a control signal for the channel allocation for channel 3	BOOL	0
Occ_4*	1 = Occupied Is also used as a control signal for the channel allocation for channel 4	BOOL	0
ReadyIn	Readiness signal: 1 = Signal for channel enabling active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
RstLi_1*	1 = Resetting via interconnection for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstLi_2*	1 = Resetting via interconnection for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstLi_3*	1 = Resetting via interconnection for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstLi_4*	1 = Resetting via interconnection for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SelFpRes	Selection for faceplate source	ANY	
SP_Ex_1	1 = Select external setpoint (via interconnection) for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_Ex_2	1 = Select external setpoint (via interconnection) for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_Ex_3	1 = Select external setpoint (via interconnection) for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_Ex_4	1 = Select external setpoint (via interconnection) for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_In_1*	1 = Select internal setpoint (via interconnection) for channel 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_In_2*	1 = Select internal setpoint (via interconnection) for channel 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_In_3*	1 = Select internal setpoint (via interconnection) for channel 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP_In_4*	1 = Select internal setpoint (via interconnection) for channel 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
SP1Ext_1*	1. External setpoint for channel 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP2Ext_1*	2. External setpoint for channel 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP1Ext_2*	1. External setpoint for channel 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP2Ext_2*	2. External setpoint for channel 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP1Ext_3*	1. External setpoint for channel 3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP2Ext_3*	2. External setpoint for channel 3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP1Ext_4*	1. External setpoint for channel 4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP2Ext_4*	2. External setpoint for channel 4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
StepNo_1	Step number for channel 1	DWORD	16#00000000
StepNo_2	Step number for channel 2	DWORD	16#00000000
StepNo_3	Step number for channel 3	DWORD	16#00000000
StepNo_4	Step number for channel 4	DWORD	16#00000000

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ActChnNo	Displaying the allocated channel	INT	0
AutMod	1= "Automatic mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
Cascaded	1 = Block is cascaded	BOOL	0
CasOut	1 = Output parameter for cascade formation, to be interconnected with the input parameter CasIn of the following ShrdResS block	DWORD	16#00000000
Ctrl01	1. Control command	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl02	2. Control command	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl03	3. Control command	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl04	4. Control command	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl05	5. Control command	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl06	6. Control command	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CtrlW1	1. Available user control word	DWORD	16#00000000
CtrlW2	2. Available user control word	DWORD	16#00000000
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Error handling of ShrdResS (Page 1010)	INT	-1
ManMod	1 = "Manual mode" via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ModLi	1 = Control via interconnection or SFC	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
MultiOcc	1 = More than one channel request is present	BOOL	0
Occupied	1 = Occupied Is also used as a control signal for the channel allocation	BOOL	0
Ready	1 = Active readiness	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
RstLi	1 = Reset via interconnection	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
SP_ExtLi	1 = Select external setpoint (via interconnection)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
SP_IntLi	1 = Select internal setpoint (via interconnection)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
SP1Ext	1. External setpoint	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
SP2Ext	2. External setpoint	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
Status1	Status word 1 (Page 1003)	DWORD	16#00000000
StepNo	Step number	DWORD	16#00000000

See also

ShrdResS operating modes (Page 1006)
ShrdResS messaging (Page 1011)
ShrdResS block diagram (Page 1020)

6.7.7 ShrdResS block diagram

ShrdResS block diagram

A block diagram is not provided for this block.

See also

Description for ShrdResS (Page 1003)

ShrdResS operating modes (Page 1006)

ShrdResS functions (Page 1006)

Error handling of ShrdResS (Page 1010)

ShrdResS messaging (Page 1011)

ShrdResS I/Os (Page 1011)

6.7.8 Operator control and monitoring

6.7.8.1 ShrdResS views

Views of the ShrdResS block

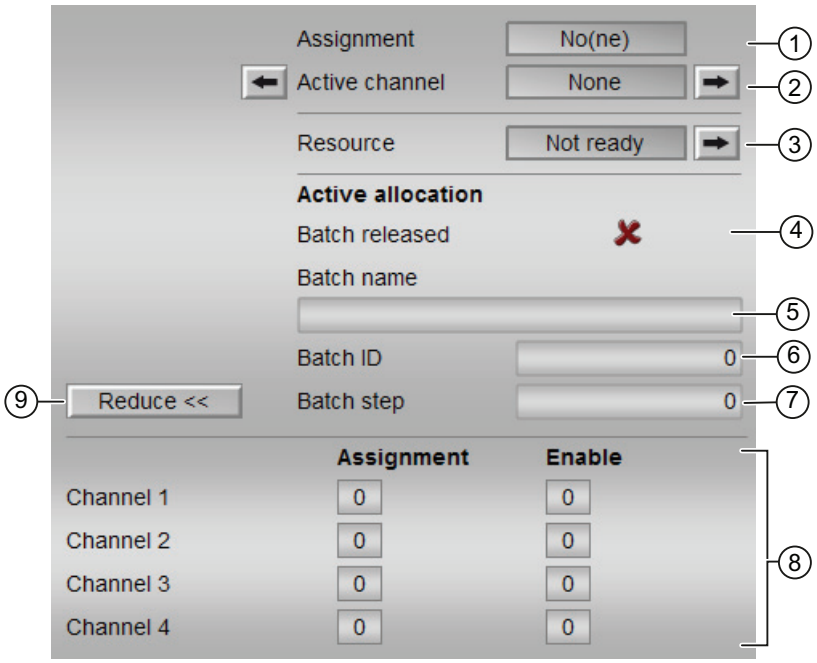
The block ShrdResS provides the following views:

- ShrdResS standard view (Page 1021)
- ShrdResS preview (Page 1023)
- Memo view (Page 252)
- ShrdResS block icon (Page 1024)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.7.8.2 ShrdResS standard view

ShrdResS standard view



(1) Allocation

The allocation status is displayed in this area.

- "None": Display for `Status1.Bit 10 = 0` and `Status1.Bit 13 = 0`
- "Requested": Display for `Status1.Bit 10 = 1` and `Status1.Bit 13 = 0`
- "Active": Display for `Status1.Bit 13 = 1`

(2) Active channel

The channel number of the active channel is displayed in this area.

If text is configured for this command (Text 1 in the object properties), it is displayed as additional text and button label for command selection. Additional information is available in the section Labeling of buttons and text (Page 167).

Use the ← button to switch to the standard view of the connected `CasIn` block.

Use the → button to switch to the standard view of the connected `CasOut` block.

(3) Resource

The status of the general enable signal is displayed in this area.

- "Idle": Display for `ReadyIn = 1`
- "Not ready": Display for `ReadyIn = 0`

Use the → button to switch to the standard view of the connected `SelFpRes` block.

(4) Release batch:

This area shows you if the block is released for operation via SIMATIC BATCH (`BatchEn = 1`).

(5) Batch name

This area shows the name of the batch that is currently running (`Batchname`).

(6) Batch ID

This area shows the identification number of the batch that is currently running (`BatchID`).

(7) Batch step

This area shows you the step number of the batch that is currently running (`StepNo`).

(8) Display channel 1-4

This area is only visible when the **(9)** "Expand" button is pressed.

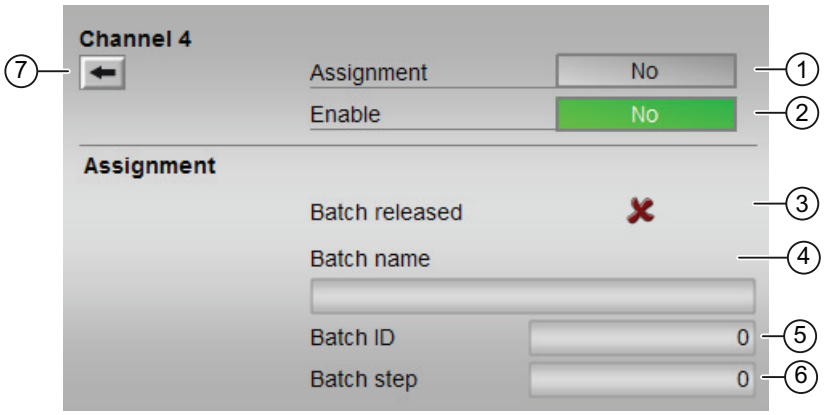
The "Allocation" und "Release" status of channels 1-4 are displayed in this area.

(9) Expand / Collapse

This button enables or disables the display area **(8)**. The label of the button changes accordingly.

6.7.8.3 ShrdResS preview

ShrdResS preview



Each of the four channels has its own preview. The previews of the individual channels are identical except for number **(7)** . The preview described here is based on channel 4.

(1) Allocation

The allocation status of the channel is displayed in this area.

- "No": Display for `Occ_1 = 0`
- "Requested": Display for `Occ_1 = 1`and `ActChnNo = 0`
- "Active": Display for `ActChnNo = 1`

(2) Enable

The status of the enable is displayed in this area.

- "Yes": Display for `ChnEn = 1`
- "No": Display for `ChnEn = 0`

(3) Release batch:

This area shows you if the block is released for operation via SIMATIC BATCH (`BatchEn = 1`).

(4) Batch name

This area shows the name of the batch that is currently running (`Batchname`).

(5) Batch ID

This area shows the identification number of the batch that is currently running (`BatchID`).

(6) Batch step

This area shows you the step number of the batch that is currently running (`StepNo`).

(7) button ←

Use the ← button to switch to the standard view of the cascaded ShrdResS block. This button is only available for channel 4.

6.7.8.4 ShrdResS block icon

Block icons for ShrdResS

A variety of block icons are available with the following functions:

- Display active channel
- Process tag type (2 only)
- Memo display (2 only)
- Fixed text (language dependent, 2 only)

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

6.8 Vlv2WayL - Two-way valve

6.8.1 Description of Vlv2WayL

Object name (type + number) and family

Type + number: FB 1897

Family: Drives

Area of application for Vlv2WayL

The block is used for the following applications:

- Control of multi-way valves with up to three switching positions. One of these positions is the neutral position (de-energized position)
- Control of three individual valves (valve network) to implement a 2-way valve circuit with neutral position (de-energized position)

How it works

The multi-way valve (or valve network) is controlled via position 0 (neutral position), position 1 (way 1), or position 2 (way 2). Various inputs are available for controlling the positions.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the Vlv2WayL block, the Advanced Process Library contains a template for process tag types as an example with an application scenario for this block.

Example of process tag types:

- Two-way valve (Valve2Way) (Page 1825)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section Vlv2WayL I/Os (Page 1040).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutoAct.Value`
6	`LocalAct.Value`
7	0: Open padlock in the block icon 1: Closed padlock in the block icon
8	"Open"/"Closed" command for `V0`
9	"Open"/"Closed" command for `V1`
10	"Open"/"Closed" command for `V2`
11	Feedback error without control change
12	Feedback error due to control change
13	`BypProt` active
14	Invalid signal status
15	Mode switchover error
16	1 = `Intlock` is active
17	1 = `Permit` is active
18	1 = `Protect` is active
19	`Pos0Force.Value`
20	`Pos1Force.Value`
21	`Pos2Force.Value`
22	Feedback for Pos0 OK
23	Feedback for Pos1 OK
24	Feedback for Pos2 OK
25	Feedback for current position OK
26	Automatic preview Pos0
27	Automatic preview Pos1
28	Automatic preview Pos2
29	`SafeV0`
30	`SafeV1`
31	`SafeV2`

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock`
1	Forcing active
2	Display for interlocks in block icon
3	`WarnAct.Value`
4 - 13	Not used
14	1 = Input parameter `FbkP0` is connected
15	1 = Input parameter `FbkV0` is connected
16	1 = Input parameter `FbkV1` is connected
17	1 = Input parameter `FbkV2` is connected
18	Reset request in automatic
19	1 = No impact of input signals on "local mode" with `LocalSetting` = 2 and `LocalSetting` = 4
20	`CtrlV0.Value`
21	`CtrlV1.Value`
22	`CtrlV2.Value`
23	`FbkV0Out.Value`
24	`FbkV1Out.Value`
25	`FbkV2Out.Value`
26	`FbkP0Out.Value`
27	Feedback `V0` (`FbkV0`), for OS display only
28	Feedback `V1` (`FbkV1`), for OS display only
29	Feedback `V2` (`FbkV2`), for OS display only
30	Bypass information from previous function block
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0	"Interlock" button is enabled
1	"Permission" button is enabled
2	"Protection" button is enabled
3	`Pos0Out`
4	Travel in position 0
5	Monitoring error in position 0
6	`Pos1Out`
7	Travel in position 1
8	Monitoring error in position 1
9	`Pos2Out`
10	Travel in position 2

Status bit	Parameter
11	Monitoring error in position 2
12	Preview position 0 control `CtrlV0`
13	Preview position 0 control `CtrlV1`
14	Preview position 0 control `CtrlV2`
15	Preview position 1 control `CtrlV0`
16	Preview position 1 control `CtrlV1`
17	Preview position 1 control `CtrlV2`
18	Preview position 2 control `CtrlV0`
19	Preview position 2 control `CtrlV1`
20	Preview position 2 control `CtrlV2`
21	Preview for automatic control `CtrlV0`
22	Preview for automatic control `CtrlV1`
23	Preview for automatic control `CtrlV2`
24	`UserAna1` interconnected
25	`UserAna2` interconnected
26	Show automatic preview in the standard view
27	Not used
28	`GrpErr.Value`
29	`RdyToStart.Value`
30 - 31	Not used

Status word allocation for `Status4` parameter

Status bit	Parameter
0	Effective signal `1` of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8 - 31	Not used

See also

Vlv2WayL functions (Page 1030)
Vlv2WayL messaging (Page 1038)
Vlv2WayL block diagram (Page 1048)
Vlv2WayL error handling (Page 1037)
Vlv2WayL modes (Page 1029)
Resetting the block in case of interlocks or errors (Page 33)

6.8.2 Vlv2WayL modes

Vlv2WayL operating modes

The block can be operated using the following modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Valve actions you can control in "local mode":

- Travel to neutral position (`Pos0Local` = 1)
- Moving to position 1 (`Pos1Local` = 1)
- Moving to position 2 (`Pos2Local` = 1).

A block operated in "local mode" is controlled either by "local" signals (input parameters `Pos0Local` = 1, `Pos1Local` = 1 and `Pos2Local` = 1) or by feedback signals (input parameters `FdbV0`, `FdbV1`, `FdbV2` and `FdbP0`; if no position can be assigned, the last valid position is accepted). Configuration takes place via the input parameter `LocalSetting`.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Valve actions you can control in "automatic mode":

- Travel to neutral position (`Pos0Aut` = 1)
- Moving to position 1 (`Pos1Aut` = 1)
- Moving to position 2 (`Pos2Aut` = 1).

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Valve actions you can control in "manual mode":

- Travel to neutral position (`Pos0Man` = 1)
- Moving to position 1 (`Pos1Man` = 1)
- Moving to position 2 (`Pos2Man` = 1).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Vlv2WayL block diagram (Page 1048)

Vlv2WayL I/Os (Page 1040)

Vlv2WayL messaging (Page 1038)

Vlv2WayL error handling (Page 1037)

Vlv2WayL functions (Page 1030)

Description of Vlv2WayL (Page 1025)

6.8.3 Vlv2WayL functions

Functions of Vlv2WayL

The functions for this block are listed below.

Defining valve positions for individual valves

The control outputs for position 1 and position 2 can be selected individually with DefPos1 and DefPos2:

Route 1 or route 2	Control outputs		
DefPos1 or DefPos2	Valve V0 (CtrlV0)	Valve V1 (CtrlV1)	Valve V2 (CtrlV2)
0	closed	closed	closed
1	closed	closed	open
2	closed	open	closed
3	closed	open	open
4	open	closed	closed
5	open	closed	open
6	open	open	closed
7	open	open	open

Position 0 is the neutral position (de-energized state) and cannot be configured. In position 0 all control outputs are de-energized (CtrlVx = 0).

Output signal as a pulse signal or static signal

This block provides the standard function Output signal as a static signal or pulse signal (Page 40). In addition to the static control outputs CtrlV0, CtrlV1, CtrlV2 the block also has pulse outputs P_CtrlV0, P_CtrlV1, P_CtrlV2 which are dependent on the static control outputs. In addition, for position 0 the pulse signal P_CtrlP0 is output.

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37). The neutral position (de-energized state) is set individually using parameters SafeV0, SafeV1, and SafeV2 for each valve (CtrlV0, CtrlV1, and CtrlV2):

- SafeVx = 0 means that at CtrlVx = 0 the valve drive closes and atCtrlVx = 1 it opens (de-energized state is "closed")
- SafeVx = 1 means that at CtrlVx = 0 the valve drive opens and atCtrlVx = 1 it closes(de-energized state is "open")

Specify warning times for control functions

This block provides the standard function Specifying warning times for control functions at motors and valves (Page 39). The warning signal is output before the valve moves into position 1 or position 2 . No warning signal is output for position 0 (neutral position).

You can generate warning signals when, for example, valves open. Warning signals can be generated in the following modes:

- Manual mode (Page 63) (`WarnTiMan` input parameter)
- Automatic mode (Page 63) (`WarnTiAut` input parameter)

You specify the warning times in seconds using the input parameters `WarnTiMan` and `WarnTiAut`. If, for example, a valve opens then, this is displayed at the output parameter with `WarnAct` = 1. The valve then opens after the set warning time has expired and `WarnAct` then returns to 0.

A corresponding warning is not output if the warning times (`WarnTiMan` or `WarnTiAut`) are specified with a smaller value than the `SampleTime` parameter.

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83).

Startup characteristic monitoring is individually set up for every output signal `CtrlV0`, `CtrlV1` and , `CtrlV2` via parameters `MonTiV0Dynamic`, `MonTiV1Dynamic` and `MonTiV2Dynamic` and is set for position 0 via `MonTiP0Dynamic`. The parameter `MonTiStatic` monitors compliance with the position.

Note

The monitoring function does not take into consideration the neutral positions, i.e. feedback messages `FbkV0`, `FbkV1` and , `FbkV2` must correspond to the `CtrlV0`, `CtrlV1`, and `CtrlV2` controls (e.g. `CtrlV0` = 1 means that the feedback `FbkV0` is monitored for "1").

`FbkP0` must not occur for positions 1 or 2; at position 0 `FbkV0`, `FbkV1` and `FbkV2` must not occur.

If there are several feedback messages for position 0 (e.g. with a valve network), these must be combined using an upstream UND block at `FbkP0`.

Disabling feedback

This block provides the standard function Disabling feedback for valves (Page 85). Feedback monitoring can be deactivated separately for each feedback with `NoFdbV0`, `NoFdbV1`, `NoFdbV2` or `NoFdbP0` as required.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Forcing operating modes

This block provides the standard function Forcing operating modes (Page 31). The inputs `Pos0Force`, `Pos1Force`, `Pos2Force` force the block into position 0, position 1 or position 2.

Simulating signals

This block provides the standard function Simulating signals (Page 47)

Interlocks

This block provides the following interlocks:

- Activation enable
- Interlock without reset ("Interlock")
- Interlock with reset ("Protection")

Refer to the Interlocks (Page 85) section for more on this.

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Resetting the block in case of interlocks or errors

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `MonDynV0`
- `MonDynV1`
- `MonDynV2`
- `MonDynP0`
- `MonStaV0`
- `MonStaV1`
- `MonStaV2`
- `MonStaP0`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `FbkV0Out.ST`
- `FbkV1Out.ST`
- `FbkV2Out.ST`
- `FbkP0Out.ST`
- `LocalLi.ST`
- `Pos0Local.ST`
- `Pos1Local.ST`
- `Pos2Local.ST`

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can switch to position 0
5	1 = Operator can switch to position 1
6	1 = Operator can switch to position 2
7	1 = Operator can reset the valve
8	1 = Operator can define the monitoring time for startup
9	1 = Operator can define the monitoring time for runtime
10	1 = Operator can activate the monitoring time function (Bit 8 - 9)
11	Not used
12	1 = Operator can activate the Release for maintenance function
13 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Configurable reactions with the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
4	Setting switch or button mode (Page 140)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)

Bit	Function
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

In pushbutton mode (Bit 4 = 0) the automatic commands in "automatic mode" are latching, in other words `Pos0Aut`, `Pos1Aut`, `Pos2Aut` can be reset to 0 after switching to the selected position. In "manual" and "local" modes, however, the automatic commands are not saved and in the absence of automatic commands the position is tracked.

In switching mode (Bit 4 = 1) positions 1 and 2 are selected by static signals via inputs `Pos1Aut` and `Pos2Aut`. If inputs `Pos1Aut` and `Pos2Aut` are not set, the block switches to position 0. Control via `Pos0Aut` is not needed.

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `Pos0Man`
- `Pos1Man`
- `Pos2Man`

See also

Description of Vlv2WayL (Page 1025)

Vlv2WayL messaging (Page 1038)

Vlv2WayL I/Os (Page 1040)

Vlv2WayL block diagram (Page 1048)

Vlv2WayL error handling (Page 1037)

Vlv2WayL modes (Page 1029)

6.8.4 Vlv2WayL error handling

Vlv2WayL error handling

Refer to the chapter Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
41	The value for the `LocalSetting` I/O is not within the approved limit of 0 to 4.
42	`LocalSetting` = 0 and `LocalLi` = 1
51	For `ModLiOp` = 1: • `AutModLi` = 1 and `ManModLi` = 1 If "local mode" is enabled: • `Pos0Local` = 1 and `Pos1Local` = 1 • `Pos0Local` = 1 and `Pos2Local` = 1 • `Pos1Local` = 1 and `Pos2Local` = 1 If "automatic mode" is enabled: • `Pos0Aut` = 1 and `Pos1Aut` = 1 • `Pos0Aut` = 1 and `Pos2Aut` = 1 • `Pos1Aut` = 1 and `Pos2Aut` = 1 Generally: • `Pos0Force` = 1 and `Pos1Force` = 1 • `Pos0Force` = 1 and `Pos2Force` = 1 • `Pos1Force` = 1 and `Pos2Force` = 1
52	`LocalAct` = 1 and `LocalSetting` = 2 or 4 and `SimOn` = 1

Mode switchover error

This error can be output by the block, see the section Error handling (Page 104).

Invalid input signals

This error can be output by the block, see the section Error handling (Page 104).

See also

Vlv2WayL block diagram (Page 1048)

Vlv2WayL I/Os (Page 1040)

Vlv2WayL messaging (Page 1038)

Vlv2WayL functions (Page 1030)

Vlv2WayL modes (Page 1029)

Description of Vlv2WayL (Page 1025)

6.8.5 Vlv2WayL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ Position 0 feedback error (neutral position)
	SIG 2	AS process control message - fault	$$BlockComment$$ Position 1 or 2 feedback error
	SIG 3	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId1, SIG 3).

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 4	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 5	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 6	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	ExtVa104
5	ExtVa105
6	ExtVa106
7	ExtVa107
8	ExtVa108
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters ExtVa104 ... ExtVa108 , and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of Vlv2WayL (Page 1025)

Vlv2WayL functions (Page 1030)

Vlv2WayL I/Os (Page 1040)

Vlv2WayL block diagram (Page 1048)

Vlv2WayL error handling (Page 1037)

Vlv2WayL modes (Page 1029)

6.8.6 Vlv2WayL I/Os

I/Os of Vlv2WayL

Input parameters

Parameter	Description	Type	Default
AutModLi*	1= "Automatic mode" via: Interconnection or SFC (controlled via ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 0)	BOOL	0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock in "local mode" and in "simulation"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
DefPos1	Output signal parameter setting for position 1	INT	3
DefPos2	Output signal parameter setting for position 2	INT	6
EN	1 = Called block will be processed	BOOL	1
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	

Parameter	Description	Type	Default
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
FbkP0	1 = Feedback for position 0	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#FF
FbkV0	1 = Feedback for control output CtrlV0	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#FF
FbkV1	1 = Feedback for control output CtrlV1	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#FF
FbkV2	1 = Feedback for control output CtrlV2	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#FF
Feature	I/O for additional functions (Page 1030)	STRUCT • Bit:0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value:BOOL • ST:BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1
LocalLi	1 = Activate "local mode" via plant signals	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
LocalOp*	1 = "Local mode" via operator	BOOL	0
LocalSetting	Properties for the Local mode (Page 66)	INT	0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
ManModOp*	1 = "Manual mode" via OS operator (controlled by ModLiOp = 0)	BOOL	1
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Monitor	1 = Feedback monitoring	BOOL	1

Parameter	Description	Type	Default
MonSafePos	1 = Go to neutral position in the event of monitoring errors	BOOL	1
MonTiP0Dynamic*	Monitoring time for position 0 after operation in [s]	REAL	3.0
MonTiV0Dynamic*	Monitoring time for feedback errors FdbV0 after operation in [s]	REAL	3.0
MonTiV1Dynamic*	Monitoring time for feedback errors FdbV1 after operation in [s]	REAL	3.0
MonTiV2Dynamic*	Monitoring time for feedback errors FdbV2 after operation in [s]	REAL	3.0
MonTiStatic*	Monitoring time for feedback errors without operation in [s]	REAL	3.0
MS_RelOp*	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NoFbkP0	1 = Feedback for position 0 not present	BOOL	0
NoFbkV0	1 = Feedback for control output CtrlV0 not present	BOOL	0
NoFbkV1	1 = Feedback for control output CtrlV1 not present	BOOL	0
NoFbkV2	1 = Feedback for control output CtrlV2 not present	BOOL	0
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 1030)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
Permit	1 = Enable for opening / closing from neutral position 0 = Valve activation not enabled on OS	STRUCT • Value:BOOL • ST:BYTE	- • 1 • 16#FF
Perm_En	1 = Activation enable (enable, Permit parameter) is active	BOOL	1
Pos0Aut*	1 = Select position 0 in "automatic mode"	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Pos0Force	1 = Force position 0	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos0Local	1 = Select position 0 in "local mode"	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos0Man*	1 = Select position 0 in "manual mode"	BOOL	0
Pos1Aut*	1 = Select position 1 in "automatic mode"	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos1Force	1 = Force position 1	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos1Local	1 = Select position 1 in "local mode"	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos1Man*	1 = Select position 1 in "manual mode"	BOOL	0
Pos2Aut*	1 = Select position 2 in "automatic mode"	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos2Force	1 = Force position 2	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos2Local	1 = Select position 2 in "local mode"	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos2Man*	1 = Select position 2 in "manual mode"	BOOL	0
Protect	0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block 1 = Protective interlocking not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Prot_En	1 = Protective interlock (protection, Protect parameter) is active	BOOL	1
PulseWidth*	Pulse width of control signal [s]	REAL	3.0
RstLi*	1 = Reset via interconnection	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3

Parameter	Description	Type	Default
SafeV0	Neutral position for valve V0 (CtrlV0): 1= Open 0 = Closed	BOOL	0
SafeV1	Neutral position for valve V1 (CtrlV1): 1= Open 0 = Closed	BOOL	0
SafeV2	Neutral position for valve V2 (CtrlV2): 1= Open 0 = Closed	BOOL	0
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
StepNo	Batch step number	DWORD	16#00000000
UserAna1	Analog auxiliary value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UserAna2	Analog auxiliary value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00
WarnTiAut	Prewarning for valve movement into position 1 or position 2 in "automatic mode" in [s]	REAL	0.0
WarnTiMan	Prewarning for valve movement into position 1 or position 2 in "manual mode" in [s]	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" enabled	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
CtrlV0	Control output V0	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
CtrlV1	Control output V1	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
CtrlV2	Control output V2	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Vlv2WayL error handling (Page 1037)	INT	-1
FbkP0Out	Feedback from position 0	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
FbkV0Out	Control output feedback CtrlV0	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
FbkV1Out	Control output feedback CtrlV1	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
FbkV2Out	Control output feedback CtrlV2	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
LockAct	1 = Interlock (Intlock, Permit or Protect) is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ManAct	1 = "Manual mode" enabled	STRUCT • Value:BOOL • ST:BYTE	- • 1 • 16#80
MonDynP0	1 = Feedback error for position 0 due to a control change	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
MonDynV0	1 = Feedback error for FdbV0 due to control change	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
MonDynV1	1 = Feedback error for FdbV1 due to control change	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
MonDynV2	1 = Feedback error for FdbV2 due to control change	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
MonStaP0	1 = Feedback error for position 0 due to an unexpected feedback change	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
MonStaV0	1 = Feedback error FdbV0 due to unexpected feedback change	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
MonStaV1	1 = Feedback error FdbV1 due to unexpected feedback change	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
MonStaV2	1 = Feedback error FdbV2 due to unexpected feedback change	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
OosAct	1 = Block is "out of service"	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
P_CtrlP0	1 = Pulse signal for moving the valve to position 0	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
P_CtrlV0	1 = Pulse signal for moving the valve to route 0 (V0)	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
P_CtrlV1	1 = Pulse signal for moving the valve to route 1 (V1)	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
P_CtrlV2	1 = Pulse signal for moving the valve to route 2 (V2)	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Pos0	1 = Pos0 is reached	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos1	1 = Pos1 is reached	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos2	1 = Pos2 is reached	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80
Pos0Out	1 = Position 0 is active	BOOL	0
Pos1Out	1 = Position 1 is active	BOOL	0
Pos2Out	1 = Position 2 is active	BOOL	0
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1025)	DWORD	16#00000000
Status2	Status word 2 (Page 1025)	DWORD	16#00000000
Status3	Status word 3 (Page 1025)	DWORD	16#00000000
Status4	Status word 4 (Page 1025)	DWORD	16#00000000
WarnAct	1 = Prewarning for valve movement to position 1 or position 2 enabled (parameter WarnTiAut and WarnTiMan)	STRUCT • Value:BOOL • ST:BYTE	- • 0 • 16#80

See also

Vlv2WayL messaging (Page 1038)

Vlv2WayL block diagram (Page 1048)

Vlv2WayL modes (Page 1029)

6.8.7 Vlv2WayL block diagram

Vlv2WayL block diagram

A block diagram is not provided for this block.

See also

Vlv2WayL I/Os (Page 1040)

Vlv2WayL messaging (Page 1038)

Vlv2WayL error handling (Page 1037)

Vlv2WayL functions (Page 1030)

Vlv2WayL modes (Page 1029)

Description of Vlv2WayL (Page 1025)

6.8.8 Operator control and monitoring

6.8.8.1 Vlv2WayL views

Views of the Vlv2WayL block

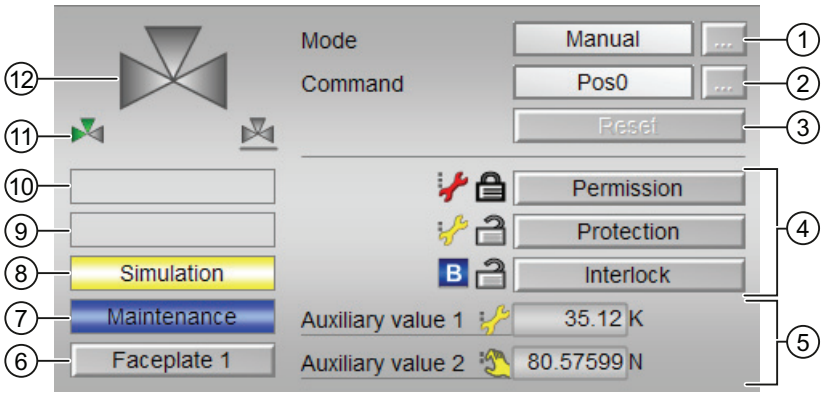
The block Vlv2WayL provides the following views:

- Vlv2WayL standard view (Page 1049)
- Alarm view (Page 250)
- Trend view (Page 253)
- Vlv2WayL parameter view (Page 1053)
- Vlv2WayL preview (Page 1055)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for Vlv2WayL (Page 1058)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.8.8.2 Vlv2WayL standard view

Vlv2WayL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Selecting the position for 2-way valve

This area shows you the default operating state for the valve. The following states can be shown and executed here:

- "Pos0"
- "Pos1"
- "Pos2"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(4) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocking functions (Page 85) section.

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

  If there is a bypass of one of the interlock signals, the symbol for the bypass is shown instead of the signal status.

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(5) Display of auxiliary values

This display is only visible when the corresponding block input is connected.

You can use this area to display two auxiliary values that have been configured in the Engineering System (ES). You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(6) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(7) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(8) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"
- "Delay"

You will find more detailed information on this in the chapters Simulating signals (Page 47) and Display of delay times (Page 31).

(9) Display area for block states

This area provides additional information on the operating state of the block:

- "Runtime error"
- "Control deviation"
- "Invalid signal"
- "Changeover error"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error") and Motor protection function (Page 85).

(10) Display area for block states

This area provides additional information on the operating state of the block:

- "Force Pos0"
- "Force Pos1"
- "Force Pos2"
- "Request 0/1": A reset to "automatic mode" is expected.

You can find additional information on this in the Forcing operating modes (Page 31) section.

(11) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the valve would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

(12) Status display of the valve

You can find additional information on this in the Block icon for Vlv2WayL (Page 1058) section.

(13) Neutral position of the valve

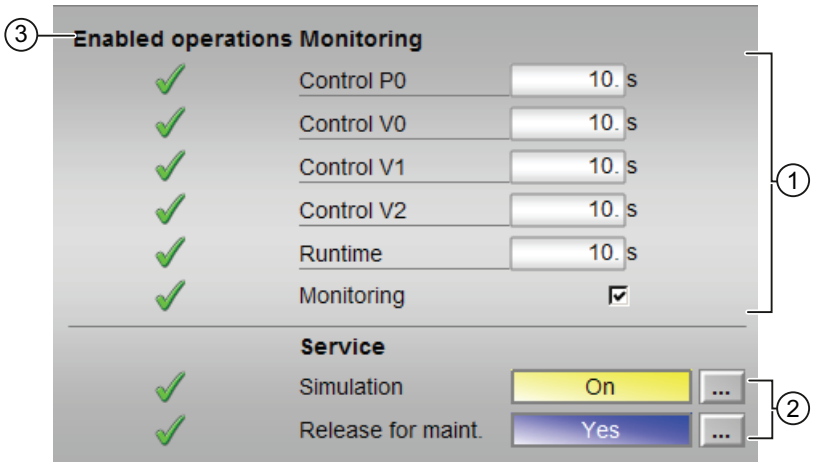
The neutral position of the valve is shown here.

If the neutral position of the valve is "Closed" (SafePos = 0), a gray valve is shown.

If the neutral position of the valve is "Open" (SafePos = 0), a green valve is shown.

6.8.8.3 Vlv2WayL parameter view

Parameter view of Vlv2WayL



(1) Monitoring

In this area, you change parameters and therefore influence the valve. Refer to the Changing values (Page 210) section for more on this.

You can influence the following parameters:

- "Control V0": Monitoring time while "opening"/"closing" the valve
- "Control V1": Monitoring time while "opening"/"closing" the valve
- "Control V2": Monitoring time while "opening"/"closing" the valve
- "Runtime": Monitoring time for maintaining the valve position

Enable monitoring

You can enable monitoring by clicking the check box (☑)

You can find additional information on this in the Monitoring the feedbacks (Page 83) section.

(2) Service

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance"

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

(3) Enabled operations

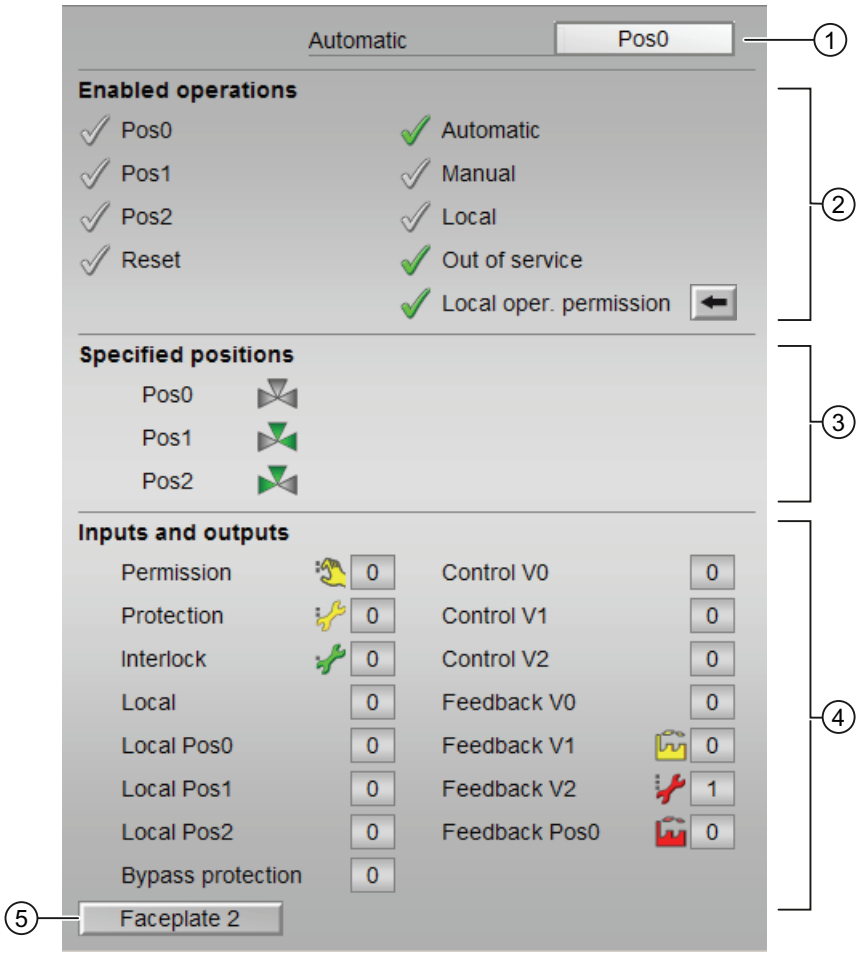
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

6.8.8.4 Vlv2WayL preview

Preview of Vlv2WayL



(1) Automatic preview

This area shows you the status of a block after its has switched to "automatic mode".

If the block is in "automatic mode", the current block state is displayed.

(2)Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Pos0": You can set the valve to position 0.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Pos1": You can set the valve to position 1.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Pos2": You can set the valve to position 2.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Reset": You can reset the valve if errors occur.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Local": You can switch to "local mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Specified Position

Preview of the valve positions, as configured in the engineering system (ES).

(4) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Permission":

  This display is only visible when the corresponding block input is connected.

  – 0 = Valve activation not enabled on OS

  – 1 =Enable for "starting"/"stopping" from the neutral position

- "Protection":

  This display is only visible when the corresponding block input is connected.

  – 0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block

  – 1 = "Good" state

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Local": 1 = "Local mode" is active
- "Local Pos0": 1 = Block was set to position 0 in "local mode"
- "Local Pos1": 1 = Block was set to position 1 in "local mode"
- "Local Pos2": 1 = Block was set to position 2 in "local mode"
- "Interlock deact.":

  – 0 = Bypass disabled

  – 1 = Bypassing interlock in "local mode" and in "simulation"

- "Control V0": 1 = Control signal for the valve 0
- "Control V1": 1 = Control signal for the valve 1
- "Control V2": 1 = Control signal for the valve 2
- "Feedback V0": 1 = Feedback if valve 0 was opened
- "Feedback V1": 1 = Feedback if valve 1 was opened
- "Feedback V2": 1 = Feedback if valve 2 was opened
- "Feedback Pos0": 1 = Valve is in position 0

(5) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

6.8.8.5 Block icon for Vlv2WayL

Properties of the Vlv2WayLblock icon

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault `CSF`
- Operating modes
- Signal status, release for maintenance
- Forcing states
- Displays for bypassing interlocks
- Interlocks
- Memo display
- Valve status display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	

Icons	Selection of the block icon in CFC	Special features
	6	
	7	
	8	
	9	
	10	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	
	3	
	4	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)
-

Valve status display

The following valve states are shown here:

Icon	Meaning
	Valve open
	Error at valve
	Valve is opening
	Valve is closing

6.9 VlvL - valve (Large)

6.9.1 Description of VlvL

Object name (type + number) and family

Type + number: FB 1899

Family: Drives

Area of application for VlvL

The block is used for the following applications:

- Controlling a valve in two positions ("open"/"closed") with adjustable neutral position

Note

This block is also available as a small block. A comparison of the VlvL and VlvS blocks is available in the section: VlvL compared to VlvS (Page 837)

How it works

The valve is opened or closed by a control signal. The signal 0 corresponds to the de-energized state (neutral position) of the valve.

The control is monitored by the "open"/"closed" (feedback) signals. The block can derive missing feedback from the control.

Various inputs are available for control purposes. The next sections provide additional detailed information on configuration, operating principles, visualization and operation.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the VlvL block, the Advanced Process Library contains a template for process tag types as an example with an application scenario for this block.

Example of process tag types:

- Valve (ValveLean) (Page 1824)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section VlvL I/Os (Page 1073).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutoAct.Value`
6	`LocalAct.Value`
7	0: Open padlock in the block icon 1: Closed padlock in the block icon
8	"Open"/"Closed" command (1 = "Open")
9	`FbkOpenOut.Value`
10	`FbkCloseOut.Value`
11	Feedback error without control change
12	Feedback error due to control change
13	`BypProt`

Status bit	Parameter
14	Invalid signal status
15	Mode switchover error
16	1 = `Intlock` is active
17	1 = `Permit` is active
18	1 = `Protect` is active
19	`OpenForce.Value`
20	`CloseForce.Value`
21	`Force`
22	Automatic preview (1 = "Open")
23	Bumpless switchover to "automatic mode" enabled
24	`SafePos`
25	`UserAna1` interconnected
26	`UserAna2` interconnected
27	`WarnAct.Value`
28 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock`
1	Not used
2	Display for interlocks in block icon
3 - 15	Not used
16	1 = Input parameter `FbkClose` is connected
17	1 = Input parameter `FbkOpen` is connected
18	Reset request in automatic
19	1 = No impact of input signals on "local mode" with `LocalSetting` = 2 and `LocalSetting` = 4
20	1 = Valve open
21	1 = Valve closed
22	1 = Valve opens
23	1 = Valve closes
24 - 29	Not used
30	Bypass information from previous function block
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8	"Interlock" button is enabled
9	"Permission" button is enabled
10	"Protection" button is enabled
11 - 25	Not used
26	Show automatic preview in the standard view
27	Not used
28	`GrpErr.Value`
29	`RdyToStart.Value`
30 - 31	Not used

See also

VlvL functions (Page 1065)

VlvL messaging (Page 1071)

Overview of the modes (Page 56)

VlvL block diagram (Page 1080)

VlvL error handling (Page 1070)

VlvL modes (Page 1064)

Resetting the block in case of interlocks or errors (Page 33)

6.9.2 VlvL modes

VlvL operating modes

The block supports all standard modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Valve actions you can control in "local mode":

- "Open" (`OpenLocal` = 1)
- "Close" (`CloseLocal` = 1)

A block operated in "local mode" is controlled either by "local" signals or by feedback signals (input parameters `FbkOpen` and `FbkClose`; if no position can be assigned, the last valid position is accepted). Configuration takes place via the input parameter `LocalSetting`.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Valve actions you can control in "automatic mode":

- "Open" (`OpenAut` = 1)
- "Close" (`CloseAut` = 1)

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Valve actions you can control in "manual mode":

- "Open" (`OpenMan` = 1)
- "Close" (`CloseMan` = 1)

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of VlvL (Page 1060)

VlvL block diagram (Page 1080)

VlvL I/Os (Page 1073)

VlvL messaging (Page 1071)

VlvL error handling (Page 1070)

VlvL functions (Page 1065)

6.9.3 VlvL functions

Functions of VlvL

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can open the valve
5	1 = Operator can close the valve
6	1 = Operator can reset the valve
7	1 = Operator can define the monitoring time for startup
8	1 = Operator can define the monitoring time for runtime
9	1 = Operator can activate the monitoring time function (Bit 7 - 8)
10	Not used
11	1 = Operator can activate the Release for maintenance function
12 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Interlocks

This block provides the following interlocks:

- Activation enable
- Interlock without reset ("Interlock")
- Interlock with reset ("Protection")

Refer to the Interlocks (Page 85) section for more on this.

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Resetting the block in case of interlocks

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `MonDynErr`
- `MonStaErr`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status ST_Worst for the block is formed by the following parameters:

- `FbkOpenOut.ST`
- `FbkCloseOut.ST`
- `LocalLi.ST`
- `OpenLocal.ST`
- `CloseLocal.ST`

Forcing operating modes

This block provides the standard function Forcing operating modes (Page 31). Inputs `OpenForce` and `CloseForce` force the block to open or close.

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83). Startup characteristics are monitored by setting parameter`MonTiDynamic`. The parameter `MonTiStatic` monitors compliance with the position.

Disabling feedback

This block provides the standard function Disabling feedback for valves (Page 85). Feedback monitoring can be deactivated separately for each feedback with `NoFbkOpen` or `NoFbkClose` as required.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Specify warning times for control functions

This block provides the standard function Specifying warning times for control functions at motors and valves (Page 39). The warning signal is output before the valve moves away from the neutral position. No signal is output for movement to the neutral position.

You can generate warning signals when, for example, valves open. Warning signals can be generated in the following modes:

- Manual mode (Page 63) (`WarnTiMan` input parameter)
- Automatic mode (Page 63) (`WarnTiAut` input parameter)

You specify the warning times in seconds using the input parameters `WarnTiMan` and `WarnTiAut`. If, for example, a valve opens then, this is displayed at the output parameter with `WarnAct` = 1. The valve then opens after the set warning time has expired and `WarnAct` then returns to 0.

A corresponding warning is not output if the warning times (`WarnTiMan` or `WarnTiAut`) are specified with a smaller value than the `SampleTime` parameter.

Simulating signals

This block provides the standard function Simulating signals (Page 47).

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37). The neutral position (de-energized state) is set using the `SafePos` parameter.

- `SafePos` = 0 means that at `Ctrl` = 0 the valve drive closes and at `Ctrl` = 1 it opens (de-energized state is "closed")
- `SafePos` = 1 means that at `Ctrl` = 0 the valve drive opens and at `Ctrl` = 1 it opens (de-energized state is "open")

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
4	Setting switch or button mode (Page 140)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

In pushbutton mode (Bit 4 = 0) the automatic commands in "automatic" mode are latching, in other words `OpenAut`, `CloseAut` can be reset to zero after changing the control. In "manual" and "local" modes, however, the automatic commands are not saved and in the absence of automatic commands the automatic control is tracked.

In switching mode (Bit 4 = 1), the control is selected with the static signal `OpenAut`. If input `OpenAut` is not set the valve is closed. Control via `CloseAut` is not needed. If the "Activate command reset for control" function (Bit 3 = 1) is also activated, the `OpenAut` input is reset to the neutral position after evaluation in the block.

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Output signal as a pulse signal or static signal

This block provides the standard function Output signal as a static signal or pulse signal (Page 40). In addition to the static control output `Out`, the block also has pulse outputs `P_Open`, `P_Close`, which are dependent on the static control output.

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `OpenMan`
- `CloseMan`

See also

Description of VlvL (Page 1060)

VlvL messaging (Page 1071)

VlvL I/Os (Page 1073)

VlvL modes (Page 1064)

VlvL error handling (Page 1070)

VlvL block diagram (Page 1080)

6.9.4 VlvL error handling

Error handling of VlvL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error
- Invalid input signals

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
41	The value for the `LocalSetting` I/O is not within the approved limit of 0 to 4..
42	`LocalSetting` = 0 or `LocalSetting` = 3 or `LocalSetting` = 4 and `LocalLi` = 1
51	`AutModLi` = 1 and `ManModLi` = 1 `OpenLocal` = 1 and `CloseLocal` = 1 `OpenAut` = 1 and `CloseAut` = 1 `OpenForce` = 1 and `CloseForce` = 1
52	`LocalAct` = 1 and `LocalSetting` = 2 or `4` and `SimOn` = 1

Mode switchover error

This error can be output by the block. Refer to the Error handling (Page 104) section for more on this.

Invalid input signals

This error can be output by the block. Refer to the Error handling (Page 104) section for more on this.

See also

Description of VlvL (Page 1060)

VlvL modes (Page 1064)

VlvL block diagram (Page 1080)

VlvL I/Os (Page 1073)

VlvL messaging (Page 1071)

VlvL functions (Page 1065)

6.9.5 VlvL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages

Process control fault

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ Feedback error
	SIG 2	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId1, SIG 2).

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 3	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 5	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	ExtVa104
5	ExtVa105
6	ExtVa106
7	ExtVa107
8	ExtVa108
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters ExtVa104 ... ExtVa108 and can be used. See the "Process Control System PCS 7 - Engineering System" manual.

See also

VlvL modes (Page 1064)

VlvL block diagram (Page 1080)

VlvL error handling (Page 1070)

6.9.6 VlvL I/Os

I/Os of VlvL

Input parameters

Parameter	Description	Type	Default
AutModLi*	1= "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 1)	BOOL	0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock is active in "local mode" and in simulation	BOOL	0
CloseAut*	1 = Select Close valve in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseForce	1 = Force valve closure	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseLocal	1 = Select Close valve in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseMan*	1 = Select Close valve in "manual mode"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1

Parameter	Description	Type	Default
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
FbkOpen	1 = Valve open feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkClose	1 = Valve closed feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
Feature	I/O for additional functions (Page 1065)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1
LocalLi	1 = Activate "local mode" via plant signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalOp*	1 = "Local mode" via operator	BOOL	0

Parameter	Description	Type	Default
LocalSetting	Properties for the Local mode (Page 66)	INT	0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1= "Manual mode" via: OS operator (controlled via ModLiOp = 0)	BOOL	1
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Monitor	1 = Feedback monitoring	BOOL	1
MonSafePos	1 = Go to neutral position in the event of monitoring errors	BOOL	1
MonTiDynamic*	Monitoring time after operation in [s]	REAL	3.0
MonTiStatic*	Monitoring time for feedback errors without operation in [s]	REAL	3.0
MS_RelOp*	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NoFbkClose	1 = No feedback present for "valve closed"	BOOL	0
NoFbkOpen	1 = No feedback present for "valve open"	BOOL	0
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpenAut*	1 = Select Open valve in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenForce	1 = Force valve opening	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenLocal	1 = Select Open valve in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenMan*	1 = Select Open valve in "manual mode"	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000

Parameter	Description	Type	Default
OS_Perm	I/O for operator control permissions (Page 1065)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
Permit	1 = Enable for opening / closing from neutral position 0 = Valve activation not enabled on OS	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Perm_En	1 = Activation enable (enable, Permit parameter) is active	BOOL	1
Protect	0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block 1 = Protective interlocking not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Prot_En	1 = Protective interlock (protection, Protect parameter) is active	BOOL	1
PulseWidth*	Pulse width of control signal [s]	REAL	3.0
RstLi*	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SafePos	Neutral position for valve: 1= Open 0 = Closed	BOOL	0
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
StepNo	Batch step number	DWORD	16#00000000
UserAna1	Analog auxiliary value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF

Parameter	Description	Type	Default
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UserAna2	Analog auxiliary value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00
WarnTiAut	Prewarning of valve movement from neutral position in "automatic mode" in [s]	REAL	0.0
WarnTiMan	Prewarning of valve movement from neutral position in "manual mode" in [s]	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Closed	1 = Valve is closed	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Closing	1 = Valve is closing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl	Control output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see VlvL error handling (Page 1070)	INT	-1
FbkCloseOut	Valve closed feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkOpenOut	Valve open feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LockAct	1 = Interlock (Intlock, Permit or Protect) is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
MonDynErr	1 = Feedback error due to control change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonStaErr	1 = Feedback error due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Opened	1 = Valve is opened	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Opening	1 = Valve is opening	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF

Parameter	Description	Type	Default
P_Close	1 = Pulse signal to close valve	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Open	1 = Pulse signal to open valve	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1060)	DWORD	16#00000000
Status2	Status word 2 (Page 1060)	DWORD	16#00000000
Status3	Status word 3 (Page 1060)	DWORD	16#00000000
WarnAct	1 = Prewarning for valve movement away from neutral position active (parameters WarnTiAut and WarnTiMan)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

VlvL messaging (Page 1071)

VlvL modes (Page 1064)

VlvL block diagram (Page 1080)

6.9.7 VlvL block diagram

VlvL block diagram

A block diagram is not provided for this block.

See also

Description of VlvL (Page 1060)

VlvL modes (Page 1064)

VlvL error handling (Page 1070)

VlvL messaging (Page 1071)

VlvL I/Os (Page 1073)

VlvL functions (Page 1065)

6.9.8 Operator control and monitoring

6.9.8.1 VlvL views

Views of the VlvL block

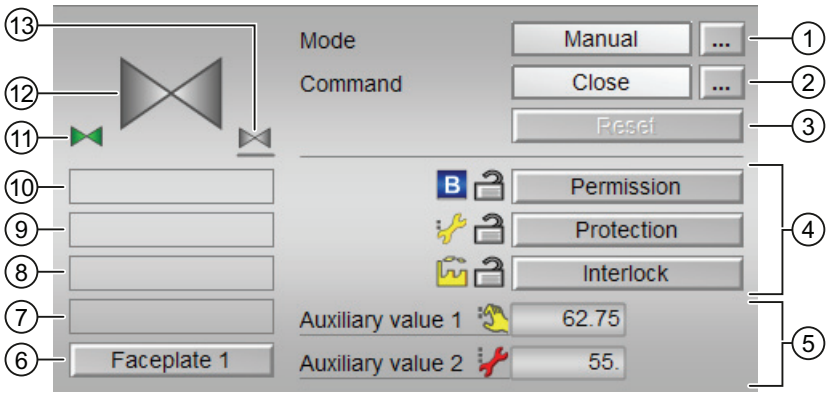
The block VlvL provides the following views:

- VlvL standard view (Page 1081)
- Alarm view (Page 250)
- Trend view (Page 253)
- Parameter view for motors and valves (Page 236)
- VlvL preview (Page 1084)
- Memo view (Page 252)
- Batch view (Page 251)
- VlvL block icon (Page 1087)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.9.8.2 VlvL standard view

VlvL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Opening and closing the valve

This area shows you the default operating state for the valve. The following states can be shown and executed here:

- "Open"
- "Close"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(4) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocking functions (Page 85) section.

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

  If there is a bypass of one of the interlock signals, the symbol for the bypass is shown instead of the signal status.

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(5) Display of auxiliary values

This display is only visible when the corresponding block input is connected.

You can use this area to display two auxiliary values that have been configured in the Engineering System (ES). You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(6) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(7) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(8) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"
- "Delay"

You will find more detailed information on this in the chapters Simulating signals (Page 47) and Display of delay times (Page 31).

(9) Display area for block states

This area provides additional information on the operating state of the block:

- "Runtime error"
- "Control deviation"
- "Invalid signal"
- "Changeover error"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error") and Motor protection function (Page 85).

(10) Display area for block states

This area provides additional information on the operating state of the block:

- "Forced open"
- "Forced close"
- "Request 0/1": A reset to "automatic mode" is expected.

You can find additional information on this in the Forcing operating modes (Page 31) section.

(11) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the valve would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

(12) Status display of the valve

The current status of the valve is graphically displayed here.

You can find more information about this in the section VlvL block icon (Page 1087).

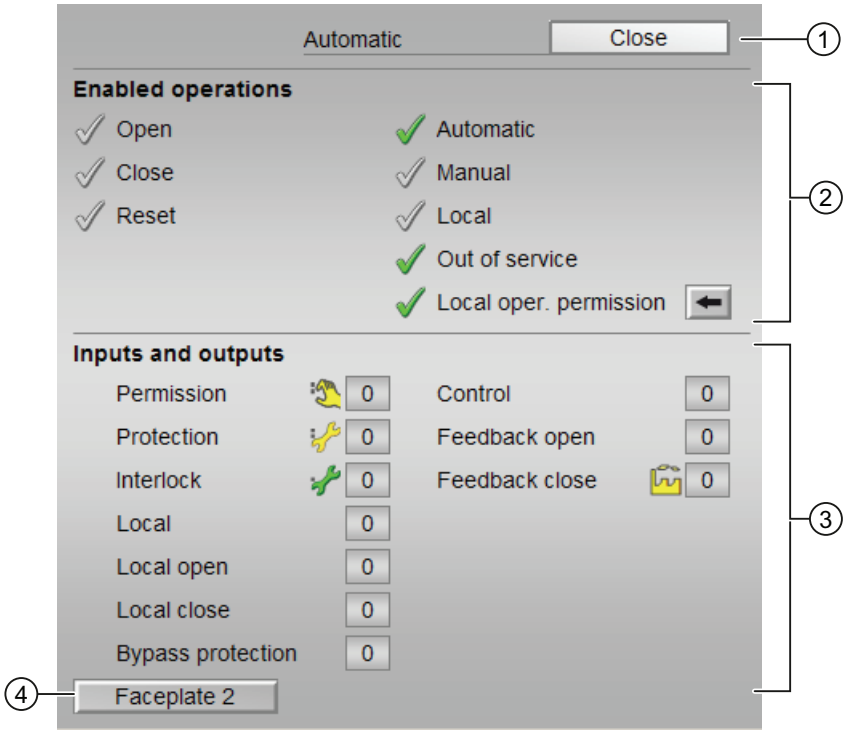
(13) Neutral position of the valve

Display the neutral position for the valve:

- If the neutral position of the valve is "Closed" (`SafePos` = 0), , a gray valve is shown.
- If the neutral position of the valve is "Open" (`SafePos` = 1), a green valve is shown.

6.9.8.3 VlvL preview

Preview of VlvL



(1) Automatic preview

This area shows you the block status after it has switched from "manual" to "automatic" mode.

If the block is in "automatic mode", the current block state is displayed.

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Open": You can open the valve.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Close": You can close the valve.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Reset": You can reset the valve if interlocks or errors occur.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Local": You can switch to "local mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Permission":

  This display is only visible when the corresponding block input is connected.

  – 0 = Valve activation not enabled on OS

  – 1 = Enable for "opening"/"closing" from the neutral position

- "Protection":

  This display is only visible when the corresponding block input is connected.

  – 0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block

  – 1 = "Good" state

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 =Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Local": 1 ="Local mode" is active
- "Local open": 1 = Opening the valve in "local mode"
- "Local close": 1 = Closing the valve in "local mode"
- "Interlock deact.":

  – 0 = Bypass disabled

  – 1 =Bypassing interlock in "local mode" and in "simulation"

- "Control": Display for valve control:

  – 0 = Valve is closed

  – 1 = Valve is opened

- "Feedback open": 1 = Valve is open
- "Feedback close": 1 = Valve is closed

(4) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

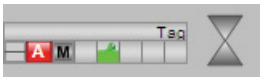
6.9.8.4 VlvL block icon

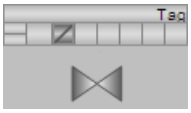
Block icons for VlvL

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault CSF
- Operating modes
- Signal status, release for maintenance
- Forcing states
- Displays for bypassing interlocks
- Interlocks
- Memo display
- Valve status display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	
	7	

Icons	Selection of the block icon in CFC	Special features
	8	
	9	
	10	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Valve status display

The following valve states are shown here:

Icon	Meaning
	Valve open
	Valve closed
	Error at valve
	Valve is opening
	Valve is closing
	Valve out of service

6.10 VlvS - valve (Small)

6.10.1 Description of VlvS

Object name (type + number) and family

Type + number: FB 1911

Family: Drives

Area of application for VlvS

The block is used for the following applications:

- Controlling a valve in two positions ("open"/"closed") with adjustable neutral position

Note

This block is also available as a large block. A comparison of the VlvL and VlvS blocks is available in the section: VlvL compared to VlvS (Page 837)

How it works

The valve is opened or closed by a control signal. The signal 0 corresponds to the de-energized state (neutral position) of the valve.

The control is monitored by the "open"/"closed" (feedback) signals. The block can derive missing feedback from the control.

Various inputs are available for control purposes. The next sections provide additional detailed information on configuration, operating principles, visualization and operation.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section VlvS I/Os (Page 1100).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutoAct.Value = 1; ManAct.Value = 0`
6	`LocalAct.Value`
7	`LockAct.Value`
8	"Open"/"Closed" command (1 = "Open")
9	`FbkOpenOut.Value`
10	`FbkCloseOut.Value`
11	Feedback error without control change
12	Feedback error due to control change
13	`BypProt`
14	Invalid signal status
15	Not used
16	1 = `Intlock` is active
17 - 21	Not used
22	Automatic preview (1 = "Open")
23	Bumpless switchover to "automatic mode" enabled

Status bit	Parameter
24	SafePos
25 - 31	Not used

Status word allocation for Status2 parameter

Status bit	Parameter
0	MsgLock
1	Not used
2	Display for interlocks in block icon
3 - 15	Not used
16	1 = Input parameter FbkClose is interconnected
17	1 = Input parameter FbkOpen is interconnected
18	Reset request in automatic
19	1 = No impact of input signals on "local mode" when LocalSetting = 2
20	1 = Valve open
21	1 = Valve closed
22	1 = Valve opens
23	1 = Valve closes
24 - 29	Not used
30	Bypass information from previous function block
31	MS_RelOp

Status word allocation for Status3 parameter

Status bit	Parameter
0 - 7	Not used
8	"Interlock" button is enabled
9 - 25	Not used
26	Show automatic preview in the standard view
27	Not used
28	GrpErr.Value
29	RdyToStart.Value
30 - 31	Not used

See also

VlvS modes (Page 1092)

VlvS functions (Page 1094)

VlvS error handling (Page 1098)

VlvS reporting (Page 1099)

VlvS block diagram (Page 1105)

6.10.2 VlvS modes

VlvS operating modes

The block supports all standard modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Note

"Local mode" for the block VlvS

In contrast to the "Large" blocks, it is only possible to perform settings in this block `LocalSetting` with 0, 2 and 5.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Valve actions you can control in "automatic mode":

- "Open" (`OpenAut` = 1)
- "Close" (`CloseAut` = 1)

Note

Information about the "Small" block

This "Small" block works with pushbutton operation. The automatic commands are therefore latching, in other words, `OpenAut` and `CloseAut` can be reset to 0 after the control is changed. In "manual" and "local" modes, however, the automatic commands are not saved and in the absence of automatic commands the automatic control is tracked.

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Valve actions you can control in "manual mode":

- "Open" (`OpenMan` = 1)
- "Close" (`CloseMan` = 1)

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of VlvS (Page 1089)

VlvS functions (Page 1094)

VlvS error handling (Page 1098)

VlvS reporting (Page 1099)

VlvS I/Os (Page 1100)

VlvS block diagram (Page 1105)

6.10.3 VlvS functions

Functions of VlvS

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can open the valve
5	1 = Operator can close the valve
6	1 = Operator can reset the valve
7	1 = Operator can define the monitoring time for startup
8	Not used
9	1 = Operator can activate the monitoring time function (Bit 7)
11	1 = Operator can activate the Release for maintenance function
12 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `OpenMan`
- `CloseMan`

Interlocks

This block provides the following interlocks:

- Interlock without reset ("Interlock")

Refer to the Interlocks (Page 85) section for more on this.

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Resetting the block in case of interlocks

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Group error

This block provides the standard function Outputting group errors (Page 107)

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `MonDynErr`
- `MonStaErr`

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37). The neutral position (de-energized state) is set using the `SafePos` parameter.

- `SafePos = 0` means that at `Ctrl = 0` the valve drive closes and at `Ctrl = 1` it opens (de-energized state is "closed")
- `SafePos = 1` means that at `Ctrl = 0` the valve drive opens and at `Ctrl = 1` it opens (de-energized state is "open")

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status ST_Worst for the block is formed by the following parameters:

- `FbkOpenOut.ST`
- `FbkCloseOut.ST`
- `LocalLi.ST`

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83). Startup characteristics are monitored by setting parameter`MonTiDynamic`. The parameter `MonTiStatic` monitors compliance with the position.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Simulating signals

This block provides the standard function Simulating signals (Page 47).

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
30	Activating reset of interlocks in manual mode (Page 138)
31	Resetting depending on the operating mode (Page 137)

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of VlvS (Page 1089)

VlvS modes (Page 1092)

VlvS error handling (Page 1098)

VlvS reporting (Page 1099)

VlvS I/Os (Page 1100)

VlvS block diagram (Page 1105)

Disabling feedback for valves (Page 85)

Selecting a unit of measure (Page 168)

6.10.4 VlvS error handling

Error handling of VlvS

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error
- Invalid input signals

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	There is no error.
41	The value for the `LocalSetting` I/O is not within the valid limit of 0, 2 or 5
42	`LocalSetting` = 0 and `LocalLi` = 1
51	`AutModLi` = 1 and `ManModLi` = 1 `OpenAut` = 1 and `CloseAut` = 1
52	`LocalAct` = 1 and `LocalSetting` = 2 or 5 and `SimOn` = 1

Mode switchover error

This error can be output by the block, see section Error handling (Page 104).

Invalid input signals

This error can be output by the block, see the section Error handling (Page 104).

See also

Description of VlvS (Page 1089)

VlvS modes (Page 1092)

VlvS functions (Page 1094)

VlvS reporting (Page 1099)

VlvS I/Os (Page 1100)

VlvS block diagram (Page 1105)

6.10.5 VlvS reporting

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages

Process control fault

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ Feedback error
	SIG 2	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId1, SIG 2).

Instance-specific messages

You have the option to use two instance-specific messages for this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 3	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 4	AS process control message - fault	$$BlockComment$$ External message 2

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVa104`
5	`ExtVa105`
6 - 10	Reserved

The associated values 4 ... 5 are allocated to the parameters `ExtVa104` ... `ExtVa105` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of VlvS (Page 1089)

VlvS modes (Page 1092)

VlvS functions (Page 1094)

VlvS error handling (Page 1098)

VlvS I/Os (Page 1100)

VlvS block diagram (Page 1105)

6.10.6 VlvS I/Os

I/Os of VlvS

Input parameters

Parameter	Description	Type	Default
`AutModLi*`	1= "Automatic mode" via interconnection or SFC (controlled by `ModLiOp` = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
`AutModOp`	1 = "Automatic mode" via operator (controlled by `ModLiOp` = 1)	BOOL	0
`BatchEn`	1 = Enable allocation	BOOL	0
`BatchID`	Batch ID	DWORD	16#00000000
`BatchName`	Batch name	S7-String	
`BypProt`	1 = Bypassing interlock is active in "local mode" and in simulation	BOOL	0

Parameter	Description	Type	Default
CloseAut*	1 = Select Close valve in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseMan*	1 = Select Close valve in "manual mode"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
FbkOpen	1 = Valve open feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkClose	1 = Valve closed feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
Feature	I/O for additional functions (Page 1094)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1
LocalLi	1 = Activate "local mode" via plant signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalSetting	Properties for the Local mode (Page 66)	INT	0
ManModLi*	1 = Manual mode via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ManModOp*	1 = Manual mode via: OS operator (controlled via ModLiOp = 0)	BOOL	1
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Monitor	1 = Feedback monitoring	BOOL	1
MonSafePos	1 = Go to neutral position in the event of monitoring errors	BOOL	1
MonTiDynamic*	Monitoring time after operation in [s]	REAL	3.0
MS_RelOp*	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpenAut*	1 = Select Open valve in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenMan*	1 = Select Open valve in "manual mode"	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 1094)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
RstLi*	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SafePos	Neutral position for valve: 1= Open 0 = Closed	BOOL	0
SimOn	1 = Simulation on	BOOL	0

Parameter	Description	Type	Default
SelFp1	Call a block saved in this parameter as additional faceplate (Page 165) in standard view	ANY	-
StepNo	Batch step number	DWORD	16#00000000
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl	Control output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Closed	1 = Valve is closed	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Closing	1 = Valve is closing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see VlvS error handling (Page 1098)	INT	-1
FbkCloseOut	Valve closed feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkOpenOut	Valve open feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
LockAct	1 = Interlock is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
MonDynErr	1 = Feedback error due to control change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonStaErr	1 = Feedback error due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Opened	1 = Valve is opened	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Opening	1 = Valve is opening	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1089)	DWORD	16#00000000
Status2	Status word 2 (Page 1089)	DWORD	16#00000000
Status3	Status word 3 (Page 1089)	DWORD	16#00000000

See also

VlvS modes (Page 1092)

VlvS block diagram (Page 1105)

VlvS reporting (Page 1099)

6.10.7 VlvS block diagram

VlvS block diagram

A block diagram is not provided for this block.

See also

Description of VlvS (Page 1089)

VlvS modes (Page 1092)

VlvS functions (Page 1094)

VlvS error handling (Page 1098)

VlvS I/Os (Page 1100)

VlvS reporting (Page 1099)

6.10.8 Operator control and monitoring

6.10.8.1 VlvS views

Views of the VlvS block

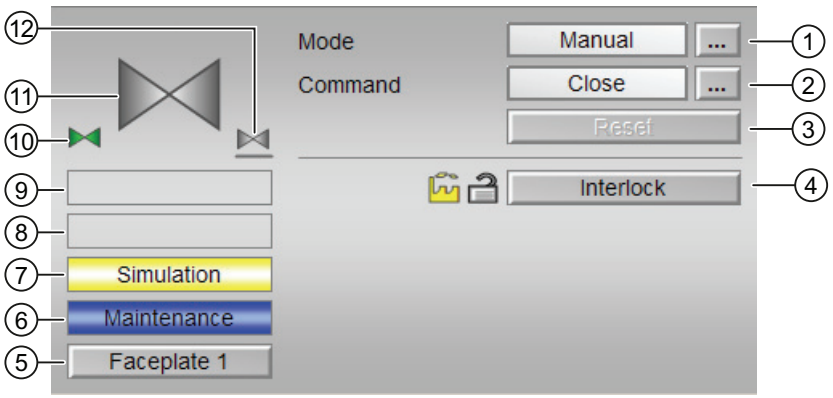
The block VlvS provides the following views:

- VlvS standard view (Page 1106)
- Alarm view (Page 250)
- Trend view (Page 253)
- Parameter view for motors and valves (Page 236)
- VlvS preview (Page 1110)
- Memo view (Page 252)
- Batch view (Page 251)
- VlvS block icon (Page 1112)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.10.8.2 VlvS standard view

VlvS standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Opening and closing the valve

This area shows you the default operating state for the valve. The following states can be shown and executed here:

- "Open"
- "Close"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167)

(3) Resetting the block

Click "Reset" for errors. Additional information is available in the section Resetting the block in case of interlocks or errors (Page 33).

(4) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. Additional information is available in the section Interlocks (Page 85).

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

  If there is a bypass of one of the interlock signals, the symbol for the bypass is shown instead of the signal status.

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(5) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

(6) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(7) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

Additional information is available in the section Simulating signals (Page 47).

(8) Display area for block states

This area provides additional information on the operating state of the block:

- "Runtime error"
- "Control deviation"
- "Invalid signal"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error") and Motor protection function (Page 85).

(9) Display area for block states

This area provides additional information on the operating state of the block:

- "Request 0/1": A reset to "automatic mode" is expected.

Additional information is available in the section Forcing operating modes (Page 31).

(10) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the valve would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

(11) Status display of the valve

The current status of the valve is graphically displayed here.

- Green: Valve is open
- Gray: Valve is closed
- Red: Fault at valve

You can find more information about this in the Section VlvS block icon (Page 1112)

(12) Neutral position of the valve

Display the neutral position for the valve:

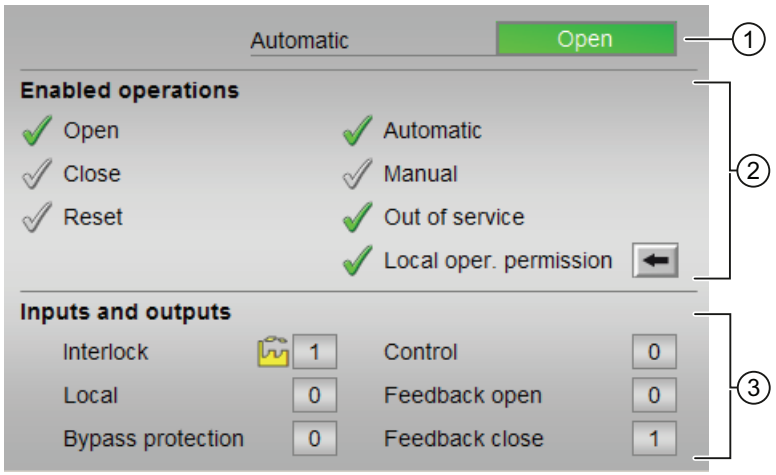
- If the neutral position of the valve is "Closed" (`SafePos` = 0), , a gray valve is shown.
- If the neutral position of the valve is "Open" (`SafePos` = 1), a green valve is shown.

See also

Displaying auxiliary values (Page 167)

6.10.8.3 VlvS preview

Preview of VlvS



(1) Automatic preview

This area shows you the block status after it has switched from "manual" to "automatic" mode.

If the block is in "automatic mode", the current block state is displayed.

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Open": You can open the valve.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the Section Labeling of buttons and text (Page 167)

- "Close": You can close the valve.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the Section Labeling of buttons and text (Page 167)

- "Reset": You can reset the valve if interlocks or errors occur.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Labeling of buttons and text (Page 167).

(3) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 =Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Local": 1 ="Local mode" is active
- "Interlock deact.":

  – 0 = Bypass disabled

  – 1 =Bypassing interlock in "local mode" and in "simulation"

- "Control": Display for valve control:

  – 0 = Valve is closed

  – 1 = Valve is opened

- "Feedback open": 1 = Valve is open
- "Feedback close": 1 = Valve is closed

See also

Operator control permissions (Page 205)

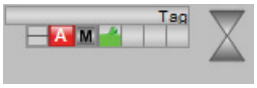
6.10.8.4 VlvS block icon

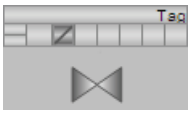
Block icons for VlvS

A variety of block icons are available with the following functions:

- Process tag type
- Violation of alarm, warning, and tolerance limits as well as the process control fault `CSF`
- Operating modes
- Signal status, release for maintenance
- Displays for bypassing interlocks
- Interlocks
- Memo display
- Valve status display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	

Icons	Selection of the block icon in CFC	Special features
	6	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Valve status display

The following valve states are shown here:

Icon	Meaning
	Valve open
	Valve closed
	Error at valve
	Valve is opening
	Valve is closing

6.11 VlvMotL - Motor valve

6.11.1 Description of VlvMotL

Object name (type + number) and family

Type + number: FB 1900

Family: Drives

Area of application for VlvMotL

The block is used for the following applications:

- Motor valve control

How it works

Various operating modes are available for controlling the motor-driven valve. This functionality allows you to set specific valve states. All changes of modes or states and faults occurring in this context are monitored, visualized in the faceplate and reported to the operator. Operators with suitable permissions can use the block icon and the faceplate to view the current states of the motor-driven valve and to operate it.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the VlvMotL block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Step controller with assigned actuator block and position feedback (StepControlActor) (Page 1805)
- Motor valve (ValveMotor) (Page 1825)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

After a start-up without control (`Open`, `Close` = 0)", no monitoring of the feedback signals `FbkOpen` and `FbkClose` takes place during the `V_MonTiStatic` time. Changes to `FbkOpen` and `FbkClose` are applied. This means that the feedback is monitored again, also in stop state.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section VlvMotL I/Os (Page 1131).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutoAct.Value`
6	`LocalAct.Value`
7	0: Open padlock in the block icon 1: Closed padlock in the block icon
8	`Open.Value`
9	Motor is stopped
10	`Close.Value`
11	Torque shutdown enabled (`TorqOpen` or `TorqClose` = 1)
12	`WarnAct.Value` or `IdleTime` active
13	Feedback error without control change
14	Feedback error due to control change
15	`Mode Switch Fail`
16	1 = `Intlock` is active

Status bit	Parameter
17	1 = `Permit` is active
18	1 = `Protect` is active
19	`Trip.Value`
20	`OpenForce.Value`
21	`StopForce.Value`
22	`CloseForce.Value`
23	"Interlock" button is enabled
24	0 = Display neutral position "Closed" 1 = Display neutral position "Open"
25	1 = Display neutral position "Stop"
26	Bypass information from previous function block
27	Bypass enabled (`BypProt` = 1) and `Local.Act` = 1 or `SimOn` = 1
28	Invalid signal status
29	0 = closed 1 = open
30	"Permission" button is enabled
31	"Protection" button is enabled

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock`
1	`AV_AH_Act.Value`
2	`AV_WH_Act.Value`
3	`AV_TH_Act.Value`
4	`AV_TL_Act.Value`
5	`AV_WL_Act.Value`
6	`AV_AL_Act.Value`
7	`AV_AH_En`
8	`AV_WH_En`
9	`AV_TH_En`
10	`AV_TL_En`
11	`AV_WL_En`
12	`AV_AL_En`
13	`AV_AH_MsgEn`
14	`AV_WH_MsgEn`
15	`AV_TH_MsgEn`
16	`AV_TL_MsgEn`
17	`AV_WL_MsgEn`
18	`AV_AL_MsgEn`

Status bit	Parameter
19	1 = No impact of input signals on "local mode" with `LocalSetting` = 2 and `LocalSetting` = 4
20	1 = Valve closes
21	1 = Valve closed
22	1 = Valve stopped
23	1 = Valve opens
24	1 = Valve open
25	Feedback error for valve closed
26	Feedback error for valve open
27	Automatic preview for "opening"
28	Automatic preview for "closing"
29	Automatic preview for "stopping"
30	Display for interlocks in block icon
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0	`M_MonStaErr.Value`
1	`M_MonDynErr.Value`
2	`V_MonStaErr.Value`
3	`V_MonDynErr.Value`
4 - 7	Not used
8	Reset request in automatic
9 - 10	Not used
11	Motor protection display (`Trip.Status` ≠ 16#FF)
12	1 = Input parameter `FbkClose` is connected
13	1 = Input parameter `FbkClosing` is connected
14	1 = Input parameter `FbkOpen` is connected
15	1 = Input parameter `FbkOpening` is connected
16	1 = Input parameter `TorOpen` is connected
17	1 = Input parameter `TorClose` is connected
18	`SimLiOp.Value`
19	1 = Enable for "rapid stop"(`Feature` Bit Enabling rapid stop via faceplate (Page 142))
20 - 22	Not used
23	Command for "rapid stop"
24	"Open" command output
25	"Close" command output
26	Show automatic preview in the standard view
27	Not used
28	`GrpErr.Value`

Status bit	Parameter
29	RdyToStart.Value
30	Auxiliary value 1 visible
31	Auxiliary value 2 visible

Status word allocation for Status4 parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via EventTsIn
1	Effective signal 2 of the message block connected via EventTsIn
2	Effective signal 3 of the message block connected via EventTsIn
3	Effective signal 4 of the message block connected via EventTsIn
4	Effective signal 5 of the message block connected via EventTsIn
5	Effective signal 6 of the message block connected via EventTsIn
6	Effective signal 7 of the message block connected via EventTsIn
7	Effective signal 8 of the message block connected via EventTsIn
8	AV not connected
9 - 31	Not used

See also

VlvMotL functions (Page 1120)

VlvMotL messaging (Page 1129)

VlvMotL block diagram (Page 1140)

VlvMotL error handling (Page 1128)

VlvMotL modes (Page 1119)

6.11.2 VlvMotL modes

VlvMotL operating modes

The block supports all standard modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

Motor valve actions you can control in "local mode"

- "Open" (`OpenLocal` = 1)
- "Close" (`CloseLocal` = 1)
- "Stop" (`StopLocal` = 1).

A block operated in "local mode" is controlled either by "local" signals or by feedback signals (input parameters `FbkOpen` and `FbkClose`; if no position can be assigned, the last valid position is accepted). Configuration takes place via the input parameter `LocalSetting`.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

Motor valve actions you can control in "automatic mode":

- "Open" (`OpenAut` = 1)
- "Close" (`CloseAut` = 1)
- "Stop" (`StopAut` = 1)

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

Motor valve actions you can control in "manual mode":

- "Open" (`OpenMan` = 1)
- "Close" (`CloseMan` = 1)
- "Stop" (`StopMan` = 1)

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

VlvMotL block diagram (Page 1140)

VlvMotL I/Os (Page 1131)

VlvMotL error handling (Page 1128)

VlvMotL functions (Page 1120)

VlvMotL messaging (Page 1129)

Description of VlvMotL (Page 1114)

6.11.3 VlvMotL functions

Functions of VlvMotL

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can stop the motor
5	1 = Operator can open the valve
6	1 = Operator can close the valve
7	1 = Operator can reset the valve
8	1 = Operator can define the monitoring time for the valve startup
9	1 = Operator can define the monitoring time for the valve runtime
10	1 = Operator can enable the monitoring time function of the valve (Bit 8 - 9)
11	1 = Operator can define the monitoring time for the motor startup
12	1 = Operator can define the monitoring time for the runtime of the motor
13	1 = Operator can enable the monitoring time function of the motor (Bit 8 - 9)
14	Not used
15	1 = Operator can activate the Release for maintenance function
16	1 = Operator can change the limit (`AV`) for high alarm
17	1 = Operator can change the limit (`AV`) for high warning
18	1 = Operator can change the limit (`AV`) for high tolerance
19	1 = Operator can change the limit (`AV`) for hysteresis
20	1 = Operator can change the limit (`AV`) for low alarm
21	1 = Operator can change the limit (`AV`) for low warning
22	1 = Operator can change the limit (`AV`) for low tolerance
23 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Restart lock after changing direction of rotation or switching off the motor

Use the input parameter `IdleTime` to enter a restart lock for changing the direction of rotation or restarting the motor. When the "Stop" command is given, the motor goes immediately into "Stop" mode, and `IdleTime` starts after the feedback (`FbkOpening` and `FbkClosing` = 0) is given. The motor cannot be started again (open or close) until the `IdleTime` has expired.

Limit monitoring of an additional analog value

This block provides the standard function Limit monitoring of an additional analog value (Page 77).

Limit monitoring with hysteresis

This block provides the standard function Limit monitoring with hysteresis (Page 82). It is performed via the input parameter `AV_Hyst`.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Interlocks

This block provides the following interlocks:

- Activation enable
- Interlock without reset ("Interlock")
- Interlock with reset ("Protection")

Refer to the section Interlocks (Page 85) as well as Influence of the signal status on the interlock (Page 88).

Motor protection function

This block provides the standard function Motor protection function (Page 85).

Rapid stop for motors

This block provides the standard function Rapid stop for motors (Page 91).

Torque monitoring

The block provides torque monitoring.

The signals of the torque monitoring switches are interconnected to input parameters `TorqOpen` and `TorqClose` for opening and closing the motor valve.

The Good state is indicated via this parameter by means of the value 1. In this case, the signal status cannot be `16#00` or `16#28` .

If the torque shutdown is active, the motor is stopped. You have the option of moving the valve in the opposite direction.

If, for example, the torque shutdown is active when the valve opens, you can still close the valve.

Disabling interlocks

This block provides the standard function Disabling interlocks (Page 88).

Resetting the block in case of interlocks

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `Trip`
- `V_MonDynErr`
- `V_MonStaErr`
- `M_MonDynErr`
- `M_MonStaErr`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status for the block is formed by the following parameters:

- `FbkClsgOut.ST`
- `FbkOpngOut.ST`
- `FbkOpenOut.ST`
- `FbkCloseOut.ST`
- `LocalLi.ST`
- `OpenLocal.ST`
- `StopLocal.ST`
- `TorqClose.ST`
- `CloseLocal.ST`
- `Trip.ST`
- `TorqOpen.ST`
- `AV_Out.ST`

Forcing operating modes

This block provides the standard function Forcing operating modes (Page 31). Inputs `OpenForce` and `CloseForce` and `StopForce`force the block to open, close or stop.

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83).

The `FbkOpen` and `FbkClose` feedback is monitored for the valve; the `FbKOpening` and `FbkClosing` feedback is monitored for the motor.

The monitoring of the feedback for the valve will not be active if it was stopped during opening or closing.

Monitoring valve feedback

The monitoring of valve feedback is set using the parameter `V_Monitor`.

Startup characteristics are monitored by setting parameter`V_MonTiDynamic`. The parameter `V_MonTiStatic` monitors compliance with the position.

Feedback errors are displayed at the corresponding parameters `V_MonDynErr` and/or `V_MonStaErr`.

Note

After the motor valve stops in the intermediate position or end position or after a start-up without control (`Open`, `Close` = 0)" no monitoring of the feedback signals `FbkOpen` and `FbkClose` takes place during the `V_MonTiStatic` time. Changes to `FbkOpen` and `FbkClose` are applied. This means that the feedback is monitored again, also in stop state.

Monitoring the motor feedback

The monitoring of motor feedback is set using the parameter `M_Monitor`.

Startup characteristics are monitored by setting parameter`M_MonTiDynamic`. The parameter `M_MonTiStatic` monitors compliance with the position.

Feedback errors are displayed at the corresponding parameters `M_MonDynErr` and/or `M_MonStaErr`.

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Specify warning times for control functions

This block provides the standard function Specifying warning times for control functions at motors and valves (Page 39).

You can generate warning signals when, for example, valves open. Warning signals can be generated in the following modes:

- Manual mode (Page 63) (`WarnTiMan` input parameter)
- Automatic mode (Page 63) (`WarnTiAut` input parameter)

You specify the warning times in seconds using the input parameters `WarnTiMan` and `WarnTiAut`. If, for example, a valve opens then, this is displayed at the output parameter with `WarnAct` = 1. The valve then opens after the set warning time has expired and `WarnAct` then returns to 0.

A corresponding warning is not output if the warning times (`WarnTiMan` or `WarnTiAut`) are specified with a smaller value than the `SampleTime` parameter.

Simulating signals

This block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Additional value (`SimAV`, `SimAV_Li`)

In the case of internal simulation with immediate tracking of feedback, it is possible to simulate a position between the open and closed state (`FbkOpenOut` = `FbkCloseOut` = 0) by means of a stop command.

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37).

Output signal as a pulse signal or static signal

This block provides the standard function Output signal as a static signal or pulse signal (Page 40). In addition to the static control outputs `Open` and `Close`, the block also has pulse outputs `P_Open`, `P_Close`, and `P_Stop`, which are dependent on the static control output.

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
4	Setting switch or button mode (Page 140)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
14	Enabling rapid stop via faceplate (Page 142)
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)

Bit	Function
19	Reset even with locked state (Page 138)
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

In switching mode (Bit 4 = 1), control is selected with the static signals `OpenAut` and `CloseAut`. If the `OpenAut` and `CloseAut` inputs are not set, the motor is stopped. Control via `StopAut` is not needed. If the "Activate command reset for control" function (Bit 3 = 1) is activated, the inputs `OpenAut` and `CloseAut` are reset to 0 after evaluation in the block.

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Disabling feedback

This block provides the standard function Disabling feedback for valves (Page 85). Feedback monitoring can be deactivated separately for each feedback with `NoFbkOpen` or `NoFbkClose` as required.

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `OpenMan`
- `CloseMan`
- `StopMan`
- `RapidStp`

See also

Description of VlvMotL (Page 1114)

VlvMotL messaging (Page 1129)

VlvMotL I/Os (Page 1131)

VlvMotL block diagram (Page 1140)

VlvMotL error handling (Page 1128)

VlvMotL modes (Page 1119)

6.11.4 VlvMotL error handling

Error handling of VlvMotL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error
- Invalid input signals

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
41	The value for the `LocalSetting` I/O is not within the approved limit of 0 to 4..
42	`LocalSetting` = 0 or `LocalSetting` = 3 or `LocalSetting` = 4 and `LocalLi` = 1
51	`OpenLocal` = `1` and `StopLocal` = 1 `CloseLocal` = `1` and `StopLocal` = 1 `OpenLocal` = `1` and `CloseLocal` = 1 `OpenAut` = `1` and `StopAut` = 1 `CloseAut` = `1` and `StopAut` = 1 `OpenAut` = `1` and `CloseAut` = 1 `AutModLi` = `1` and `ManModLi` = 1 `OpenForce` = `1` and `StopForce` = 1 `CloseForce` = `1` and `StopForce` = 1 `OpenForce` = `1` and `CloseForce` = 1
52	`LocalAct` = `1` and `LocalSetting` = 2 or 4 and `SimOn` = 1

Mode switchover error

This error can be output by the block, see the section Error handling (Page 104).

Invalid input signals

This error can be output by the block, see the section Error handling (Page 104).

See also

VlvMotL block diagram (Page 1140)

VlvMotL I/Os (Page 1131)

VlvMotL functions (Page 1120)

VlvMotL modes (Page 1119)

Description of VlvMotL (Page 1114)

6.11.5 VlvMotL messaging

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages

Process control fault

The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ Motor feedback error
	SIG 2	AS process control message - fault	$$BlockComment$$ Motor protection triggered
	SIG 3	AS process control message - fault	$$BlockComment$$ Valve feedback error
	SIG 4	AS process control message - fault	$$BlockComment$$ External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvId1, SIG 4).

Instance-specific messages

You can use up to three instance-specific messages with this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 5	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 6	AS process control message - fault	$$BlockComment$$ External message 2
	SIG 7	AS process control message - fault	$$BlockComment$$ External message 3

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance MsgEvId1

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID
4	ExtVa104
5	ExtVa105
6	ExtVa106
7	ExtVa107
8	ExtVa108
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters ExtVa104 ... ExtVa108 , and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

VlvMotL block diagram (Page 1140)

VlvMotL modes (Page 1119)

6.11.6 VlvMotL I/Os

I/Os of VlvMotL

Input parameters

Parameter	Description	Type	Default
AutModLi*	1= "Automatic mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AutModOp*	1 = "Automatic mode" via operator (controlled by ModLiOp = 1)	BOOL	0
AV	Input additional analog value, to be connected to AV_Tech of the AV block	ANY	
AV_AH_Lim	Limit high alarm	REAL	95.0
AV_AL_Lim	Limit low alarm	REAL	5.0
AV_Hyst	Hysteresis for alarm, warning and tolerance limits	REAL	1.0
AV_TH_Lim	Limit high tolerance	REAL	85.0
AV_TL_Lim	Limit low tolerance	REAL	15.0
AV_WH_Lim	Limit high warning	REAL	90.0
AV_WL_Lim	Limit low warning	REAL	10.0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock is active in "local mode" and in simulation	BOOL	0
CloseAut*	1 = Select Close valve in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseForce	1 = Force valve closure	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseLocal	1 = Select Close valve in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseMan*	1 = Select Close valve in "manual mode"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1

Parameter	Description	Type	Default
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg3	Binary input for freely selectable message 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
FbkClose	1 = Valve closed feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkClosing	1 = Valve closing feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkOpen	1 = Valve open feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkOpening	1 = Valve opening feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
Feature	I/O for additional functions (Page 1120)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
IdleTime*	Wait time for change of direction or restart in [s]	REAL	5.0

Parameter	Description	Type	Default
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1
LocalLi	1 = Activate "local mode" via plant signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalOp*	1 = "Local mode" via operator	BOOL	0
LocalSetting	Properties for the Local mode (Page 66)	INT	0
ManModLi*	1 = Manual mode via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1= "Manual mode" via: OS operator (controlled via ModLiOp = 0)	BOOL	1
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonSafePos	1 = Go to neutral position in the event of monitoring errors	BOOL	1
M_Monitor	1 = Motor feedback monitoring	BOOL	1
M_MonTiDynamic*	Motor monitoring time after operation in [s]	REAL	3.0
M_MonTiStatic*	Monitoring time for feedback errors without operation in [s]	REAL	3.0
MS_RelOp*	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp	1 = Release for maintenance via OS operator	BOOL	0
NoFbkClose	1 = No feedback present for "valve closed"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NoFbkOpen	1 = No feedback present for "valve open"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpenAut*	1 = Select Open valve in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenForce	1 = Force valve opening	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenLocal	1 = Select Open valve in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenMan*	1 = Select Open valve in "manual mode"	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 1120)	STRUCT • Bit 0: BOOL • Bit 20: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
Permit	1 = Enable for opening / closing from neutral position 0 = Valve activation not enabled on OS	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Perm_En	1 = Activation enable (enable, Permit parameter) is active	BOOL	1
Protect	0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block 1 = Protective interlocking not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Prot_En	1 = Protective interlock (protection, Protect parameter) is active	BOOL	1
PulseWidth*	Pulse width of control signal [s]	REAL	3.0
RapidStp*	Rapid stop for the motor 0 = Motor On 1 = Motor Off	BOOL	0
RstLi*	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3

Parameter	Description	Type	Default
SafePos	Neutral position for valve: 0 = Closed 1 = Open 2 = stop	INT	2
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SimAV*	Additional value used for SimOn = 1	REAL	0.0
SimAV_Li	Additional analog value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1= Simulation per interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
StepNo	Batch step number	DWORD	16#00000000
StopAut*	1 = Stopping the motor in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopForce	1 = Force motor stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopLocal	1 = Stopping the motor in "local mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StopMan*	1 = Stopping the motor in "manual mode"	BOOL	0
TorqOpen	0 = Torque shutdown active when opening 1 = Good state	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
TorqClose	0 = Torque shutdown active when closing 1 = Good state	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF

Parameter	Description	Type	Default
Trip	1 = Motor is in "good" state	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#FF
UserAna1	Analog auxiliary value 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UserAna2	Analog auxiliary value 2	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00
V_Monitor	1 = Valve feedback monitoring	BOOL	1
V_MonTiDynamic*	Valve monitoring time after operation in [s]	REAL	5.0
V_MonTiStatic*	Monitoring time for valve feedback errors without operation in [s]	REAL	5.0
WarnTiAut*	Prewarning of valve movement from neutral position in "automatic mode" in [s]	REAL	0.0
WarnTiMan*	Prewarning of valve movement from neutral position in "manual mode" in [s]	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode" is enabled	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
AV_OpScale	Limit for scale in AV bar graph of faceplate	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0
AV_Out	Output additional analog value	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
AV_Unit	Unit of measure for additional analog value	INT	0
CascaCut	Cascade connection: 1 = Control chain from master controller to secondary valve is interrupted	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

Parameter	Description	Type	Default
Close	Control output 1= Close valve	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Closed	1 = Valve is closed	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Closing	1 = Valve is closing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see VlvMotL error handling (Page 1128)	INT	-1
FbkCloseOut	Valve closed feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkClsgOut	Valve closing feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkOpenOut	Valve open feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkOpngOut	Valve opening feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LockAct	1 = Interlock (Intlock, Permit, Protect) or Trip is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80

Parameter	Description	Type	Default
M_MonDynErr	1 = Motor feedback error due to control change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
M_MonStaErr	1 = Motor feedback error due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Open	Control output: 1 = Open the valve	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Opened	1 = Valve is opened	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Opening	1 = Valve is opening	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
P_Close	1 = Pulse signal to close valve	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Open	1 = Pulse signal to open valve	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
P_Stop	0 = Pulse signal for stopping the valve	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
R_StpAct	1 = Rapid stop of the motor is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1114)	DWORD	16#00000000
Status2	Status word 2 (Page 1114)	DWORD	16#00000000
Status3	Status word 3 (Page 1114)	DWORD	16#00000000
Status4	Status word 4 (Page 1114)	DWORD	16#00000000
Stop	1 = Motor stopped and valve is in intermediate position	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
V_MonDynErr	1 = Valve feedback error due to control change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
V_MonStaErr	1 = Valve feedback error due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
WarnAct	1 = Prewarning for valve movement away from neutral position active (parameters WarnTiAut and WarnTiMan)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

VlvMotL messaging (Page 1129)

VlvMotL block diagram (Page 1140)

VlvMotL modes (Page 1119)

6.11.7 VlvMotL block diagram

VlvMotL block diagram

A block diagram is not provided for this block.

See also

VlvMotL I/Os (Page 1131)
VlvMotL messaging (Page 1129)
VlvMotL error handling (Page 1128)
VlvMotL functions (Page 1120)
VlvMotL modes (Page 1119)
Description of VlvMotL (Page 1114)

6.11.8 Operator control and monitoring

6.11.8.1 VlvMotL views

Views of the VlvMotL block

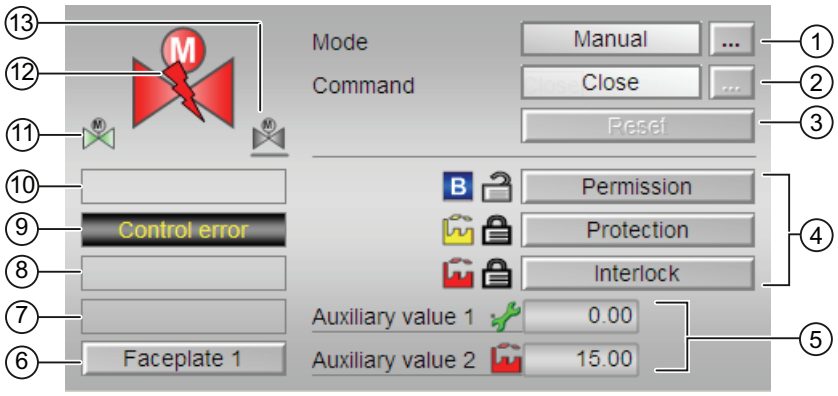
The VlvMotL block provides the following views:

- VlvMotL standard view (Page 1141)
- Limit value view of motors (Page 243)
- Alarm view (Page 250)
- Trend view (Page 253)
- VlvMotL parameter view (Page 1144)
- VlvMotL preview (Page 1146)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for VlvMotL (Page 1149)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

6.11.8.2 VlvMotL standard view

VlvMotL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Open, close and stop the motor valve

This area shows you the default operating state for the motor valve. The following states can be shown and executed here:

- "Open"
- "Close"
- "Stop"
- "Rapid stop"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the section Labeling of buttons and text (Page 167).

(3) Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(4) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocking functions (Page 85) section.

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

  If there is a bypass of one of the interlock signals, the symbol for the bypass is shown instead of the signal status.

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(5) Display of auxiliary values

This display is only visible when the corresponding block input is connected.

You can use this area to display two auxiliary values that have been configured in the engineering system. You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(6) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(7) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(8) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"
- "Delay"

You will find more detailed information on this in the chapters Simulating signals (Page 47) and Display of delay times (Page 31).

(9) Display area for block states

This area provides additional information on the operating state of the block:

- "Motor protection"
- "Runtime error"
- "Control deviation"
- "Invalid signal"
- "Changeover error"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error") and Motor protection function (Page 85).

(10) Display area for block states

This area provides additional information on the operating state of the block:

- "Forced open"
- "Forced close"
- "Forced stop"
- "Request 0/1": A reset to "automatic mode" is expected.

You can find additional information on this in the Forcing operating modes (Page 31) section.

(11) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the valve would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

(12) Status display of the motor valve

The current status of the motor valve is graphically displayed here.

You can find more information about this in the section Block icon for VlvMotL (Page 1149).

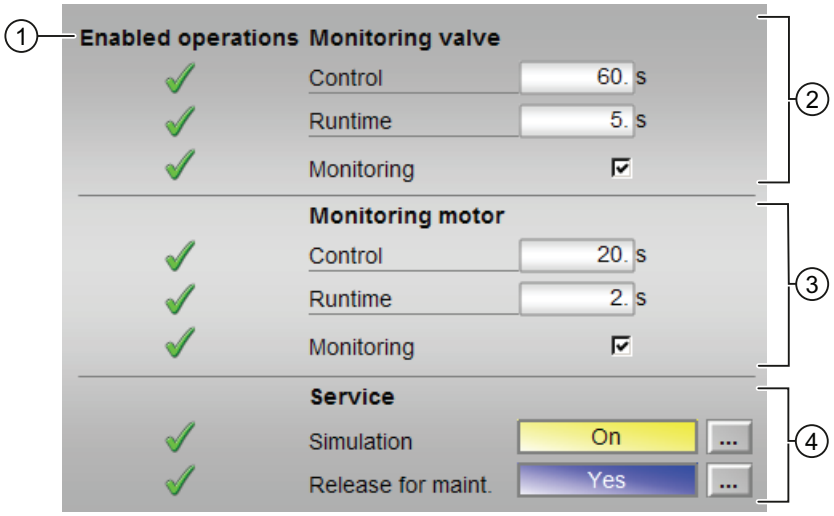
(13) Neutral position of the valve

This representation shows the neutral position for the valve:

- Green: Neutral position is "Open"
- Gray: Neutral position is "Closed"
- Light green: Neutral position is "Stop"

6.11.8.3 VlvMotL parameter view

Parameter view of VlvMotL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(2) Monitoring valve

In this area, you change parameters and therefore influence the valve. Additional information is available in the section Changing values (Page 210).

You can influence the following parameters:

- "Control": Monitoring time for the valve run time (dynamic)
- "Runtime": Monitoring time for maintaining the valve position (static)

Enable monitoring

You can enable monitoring by clicking the check box (☑)

Additional information is available in the section Monitoring the feedbacks (Page 83).

(3) Monitoring motor

In this area, you change parameters and therefore influence the motor. Additional information is available in the section Changing values (Page 210).

You can influence the following parameters:

- "Control": Monitoring time for the motor start and stop characteristics (dynamic)
- "Runtime": Monitoring time for the motor operation characteristics (static)

Enable monitoring

You can enable monitoring by clicking the check box (☑)

Additional information is available in the section Monitoring the feedbacks (Page 83).

(4) Service

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance" (with display for a maintenance request)

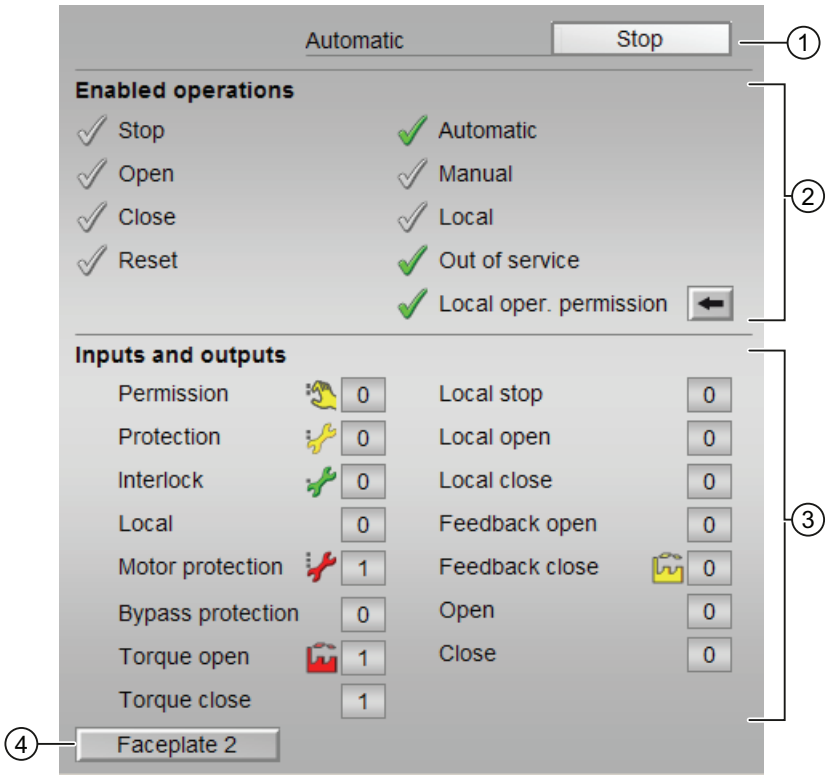
Additional information is available in the section Switching operating states and operating modes (Page 208).

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

6.11.8.4 VlvMotL preview

Preview of VlvMotL



(1) Automatic preview

This area shows you the block status after its has switched from "manual" to "automatic" mode.

If the block is in "automatic mode", the current block state is displayed.

(2)Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Stop": You can stop the motor of the valve.

  If text is configured for this command, it is also displayed in brackets. Additional information is available in the section Labeling of buttons and text (Page 167).

- "Open": You can open the motor valve.

  If text is configured for this command, it is also displayed in brackets. Additional information is available in the section Labeling of buttons and text (Page 167).

- "Close": You can close the motor valve.

  If text is configured for this command, it is also displayed in brackets. Additional information is available in the section Labeling of buttons and text (Page 167).

- "Reset": You can reset the motor valve if interlocks or errors occur.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Local": You can switch to "local mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Displaying current control signals

This area shows the most important parameters for this block with the current selection:

- "Permission":

  This display is only visible when the corresponding block input is connected.

  – 0 = Motor valve activation not enabled on OS

  – 1 = Enable for "opening"/"closing" from the neutral position

- "Protection":

  This display is only visible when the corresponding block input is connected.

  – 0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block

  – 1 = "Good" state

- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 =Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state

- "Local": 1 = Block is operated in "local mode"
- "Interlock deact.":

  – 0 = Bypass disabled

  – 1 = Bypassing interlock in "local mode" and in "simulation"

- "Torque opening": 0 = Torque shutdown when opening
- "Torque closing": 0 = Torque shutdown when closing
- "Local stop": 1 = Stopping the motor valve in "local mode"
- "Local open": 1 = Opening the motor valve in "local mode"
- "Local close": 1 = Closing the motor valve in "local mode"
- "Feedback open": 1 = Motor valve is open
- "Feedback close": 1 = Motor valve is closed
- "Open": 1 = Motor valve is opened
- "Close": 1 = Motor valve is closed

(4) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

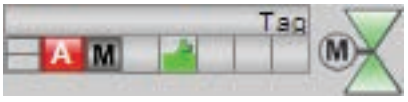
6.11.8.5 Block icon for VlvMotL

Block icons for VlvMotL

A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits as well as the process control fault CSF
- Operating modes
- Signal status, release for maintenance
- Displays for bypassing interlocks
- Interlocks
- Memo display
- Valve status display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	

Icons	Selection of the block icon in CFC	Special features
	6	
	7	
	8	
	9	
	10	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Valve status display

The following valve states are shown here:

Icon	Meaning
	Valve open
	Valve closed
	Error at valve
	Valve is opening
	Valve is closing
	Valve stop

6.12 VlvAnL - control valve

6.12.1 Description of VlvAnL

Object name (type + number) and family

Type + number: FB 1896

Family: Drives

Area of application for VlvAnL

The block is used for the following applications:

- Control of an analog control valve and positioner with adjustable neutral position
- Control of an optional auxiliary valve for regulating the auxiliary power of the control valve

How it works

The control valve is brought to a specified position using and analog activation signal. The activation signal can be formed by a ramp function in this case.

The block forms the manipulated variable error from the difference between the activation signal and the acquired position feedback and can monitor it for adherence to high and low limits.

The control valve is monitored for the "Open"/"Closed" position. The block can be connected with a digital limit switch for this purpose. The block can generate the digital position signals itself through the adjustable limits for the "Open"/"Closed" position.

The block can derive missing feedback from the control.

Various inputs are available for control purposes. The next sections provide additional detailed information on configuration, operating principles, visualization and operation.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

For the VlvAnL block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Control valve (VlvAnL) (Page 1826)
- Control value for PA/FF devices (ValveAnalog_Fb) (Page 1826)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

If `Feature` Bit Setting the startup characteristics (Page 116) = 0, the following applies to the startup characteristics:

- `Feature` Bit 16 = 0 closes the main valve
- With `Feature` Bit 16 = 1 the main valve is moved into the neutral position

Status word allocation for `Status1` parameter

You can find a description for each parameter in section VlvAnL I/Os (Page 1173).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	`AutoAct.Value`
6	`LocalAct.Value`
7	0: Open padlock in the block icon 1: Closed padlock in the block icon
8	Control valve "Open"/"Closed" command (0 = "Closed", 1 ="Open")
9	`FbkOpenOut.Value` control valve
10	`FbkCloseOut.Value` control valve
11	1 = Feedback error control valve without control change
12	1 = Feedback error control valve due to control change
13	`BypProt`
14	1 = Invalid signal status
15	1 = Mode switchover error
16	1 = `Intlock` is active
17	1 = `Permit` is active
18	1 = `Protect` is active
19	`OpenForce.Value` control valve
20	`CloseForce.Value` control valve
21	1 = `Force`
22	Automatic preview (1 = "Open")
23	1 = Bumpless switchover to "automatic mode" enabled
24	1 = Actuator active (`PosDiClose` < `MV` <`PosDiOpen`)
25	`UserAna1` interconnected
26	`UserAna2` interconnected
27	Auxiliary valve "Open"/"Closed" command (0 =" Closed", 1 = "Open")
28	`FbkOpenAuxVOut.Value` (auxiliary valve)
29	`FbkCloseAuxVOut.Value` (auxiliary valve)
30	1 = Feedback error auxiliary valve without control change
31	1 = Feedback error auxiliary valve due to control change

Status word allocation for `Status2` parameter

Status bit	Parameter
0	1 = `MsgLock` message suppression active
1	1 = "Open" and "Close" commands deactivated (command line not visible)
2	1 = Display for interlocks in block icon
3	1 = Neutral position control valve "Open"
4	1 = Neutral position control valve "Closed"
5	1 = Neutral position control valve "Stop"
6	1 = Operator can reset the valve
7	`WarnAct.Value`
8	1 = External manipulated variable active (`MV_ExtAct.Value`)
9	1 = Forced manipulated variable (`MV_Forced`) is output without limit at output `MV`
10	1 = Tracking of manipulated variables `MV`, `MV_TrkOn.Value` = 1 and `MV_ForOn.Value` = 0
11	1 = Manipulated variable greater than limit (low) for manipulated variable `MV` (`MV.Value` > `ManLoLim`)
12	1 = Input parameter `Rbk` is not interconnected (`RbkOut.ST` = 16#FF)
13	1 = Input parameter `FbkAuxVClose` is connected
14	1 = Input parameter `FbkAuxVOpen` is connected
15	1 = Input parameter `FbkClose` is connected
16	1 = Input parameter `FbkOpen` is connected
17	Not used
18	Reset request in automatic
19	1 = No impact of input signals on "local mode" with `LocalSetting` = 2 and `LocalSetting` = 4
20	1 = Control valve open
21	1 = Control valve closed
22	1 = Control valve opening
23	1 = Control valve closing
24	1 = Control valve in intermediate position ("Stop")
25	1 = Control valve has reached the intermediate position
26 - 29	Not used
30	1 = Bypass information from previous function block
31	`MS_RelOp`

Status word allocation for `Status3` parameter

Status bit	Parameter
0	Effective signal 1 of the message block connected via `EventTsIn`
1	Effective signal 2 of the message block connected via `EventTsIn`
2	Effective signal 3 of the message block connected via `EventTsIn`
3	Effective signal 4 of the message block connected via `EventTsIn`
4	Effective signal 5 of the message block connected via `EventTsIn`
5	Effective signal 6 of the message block connected via `EventTsIn`
6	Effective signal 7 of the message block connected via `EventTsIn`
7	Effective signal 8 of the message block connected via `EventTsIn`
8	1 = "Interlock" button is enabled
9	1 = "Permission" button is enabled
10	1 = "Protection" button is enabled
11	1 = Manipulated variable difference high limit violated (`ER_AH_Act.Value`)
12	1 = Manipulated variable difference low limit violated (`ER_AL_Act.Value`)
13	1 = Monitor manipulated variable difference high limit (`ER_AH_En`)
14	1 = Monitor manipulated variable difference low limit (`ER_AL_En`)
15	1 = Report manipulated variable difference high limit violation (`ER_AH_MsgEn`)
16	1 = Report manipulated variable difference low limit violation (`ER_AL_MsgEn`)
17	1 = Readback value high limit violated (`RbkWH_Act.Value`)
18	1 = Readback value low limit violated (`RbkWL_Act.Value`)
19	1 = Monitor readback value high limit (`RbkWH_En`)
20	1 = Monitor readback value low limit (`RbkWL_En`)
21	1 = Report readback value high limit violation (`RbkWH_MsgEn`)
22	1 = Report readback value low limit violation (`RbkWL_MsgEn`)
23	1 = Automatic preview control valve "Open"
24	1 = Automatic preview control valve "Closed"
25	1 = Automatic preview control valve "Stop"
26	1 = Show automatic preview in the standard view
27	1 = Auxiliary valve present
28	`GrpErr.Value`
29	`RdyToStart.Value`
30	`MV_UpRaAct`, `MV_DnRaAct` limits enabled for gradient mode (`MV_RateOn = 1`)
31	`SimLiOp.Value`

See also

Operating modes of VlvAnL (Page 1156)

Functions of VlvAnL (Page 1158)

VlvAnL error handling (Page 1170)

Messaging of VlvAnL (Page 1171)

VlvAnL block diagram (Page 1185)

6.12.2 Operating modes of VlvAnL

VlvAnL operating modes

The block can be operated using the following modes:

- Local mode (Page 66)
- Automatic mode (Page 63)
- Manual mode (Page 63)
- Out of service (Page 58)

The next section provides additional block-specific information relating to the general descriptions.

"Local mode"

The block supports the local modes 2 and 4. Therefore, the control settings for the block are also made based on internal adjustment of the feedback value.

You can find general information on "Local mode", switching modes and Bumpless switchover in the Local mode (Page 66) section.

"Automatic mode"

You can find general information on "Automatic mode", switching modes and Bumpless switchover in the Manual and automatic mode for motors, valves and dosers (Page 63) section.

With auxiliary valve

In "automatic mode", the automatic commands affect the auxiliary valve, which you can

- "Open" (`OpenAut` = 1)
- "Close" (`CloseAut` = 1)

Without auxiliary valve

In "automatic mode", the automatic commands affect the control valve, which you can

- "Open" (`OpenAut` = 1)
- "Close" (`CloseAut` = 1)

Note

If no auxiliary valve is configured, no internal manipulated variable specifications can be made in "automatic mode". Manipulated variable specification is set to external when the mode is switched to "automatic".

"Manual mode"

You can find general information on "Manual mode", switching modes and bumpless switchover in the section Manual and automatic mode for motors, valves and dosers (Page 63).

With auxiliary valve:

In "manual mode", the operator actions affect the auxiliary valve, which you can:

- "Open" (`OpenMan` = 1)
- "Close" (`CloseMan` = 1)

Without auxiliary valve:

In "manual mode", the operator actions affect the control valve, which you can:

- "Open" (`OpenMan` = 1)
- "Close" (`CloseMan` = 1)

Note

If no auxiliary valve is configured, no external manipulated variable specifications can be made in the manual operating mode. Manipulated variable specification is set to internal when the mode is switched to manual.

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of VlvAnL (Page 1151)
Functions of VlvAnL (Page 1158)
VlvAnL error handling (Page 1170)
Messaging of VlvAnL (Page 1171)
VlvAnL I/Os (Page 1173)
VlvAnL block diagram (Page 1185)

6.12.3 Functions of VlvAnL

Functions of VlvAnL

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Interlocks

This block provides the following interlocks:

- Activation enable ("Permission")
- Interlock without reset ("Interlock")
- Interlock with reset ("Protection")

Refer to the section Interlocks (Page 85) as well as Influence of the signal status on the interlock (Page 88).

Resetting the block in case of interlocks or errors

This block provides the standard function Resetting the block in case of interlocks or errors (Page 33).

Group error

This block provides the standard function Outputting group errors (Page 107).

The following parameters are taken into consideration when forming the group error:

- `CSF`
- `MonDynErr`
- `MonStaErr`
- `MonDynAuxVErr`
- `MonStaAuxVErr`

Outputting a signal for start readiness

This block provides the standard function Outputting a signal for start readiness (Page 43).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

Simulating signals

This block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Position feedback (`SimRbk`, `SimRbkLi`)

Using a manipulated variable ramp

The block provides the standard function Using a manipulated variable ramp (Page 110)

This function is ignored with tracking and forced tracking.

Gradient limiting of the manipulated variable

This block provides the standard function Gradient limiting of the manipulated variable (Page 111)

Note

This function is ignored with tracking, forced tracking, forced operating states and travel to the neutral position.

Tracking and limiting a manipulated variable

You can correct the manipulated variable output to the tracking value `MV_Trk` or the manipulated variable feedback `Rbk` to realize Bumpless switchover. To track the manipulated variable output, you have to set the parameter `MV_TrkOn` = 1.

If the parameter is `MV_TrkRbk` = 0, the manipulated variable output is corrected to the tracking value `MV_Trk`. The manipulated variable output `MV` is limited to the `MV_HiLim` and `MV_LoLim` parameters.

If the parameter is `MV_TrkRbk` = 1, the manipulated variable output is tracked to the tracking feedback `Rbk`. There are no limits here.

The "Tracking" text is displayed additionally in the standard view of the faceplate.

Tracking has a higher priority than interlock for a control valve.

Forming the group status for interlocks

This block provides the standard function Forming the group status for interlock information (Page 90).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The signal status of the output for the manipulated variable feedback `RbkOut` always corresponds to the signal status of the `Rbk` input or when the block is in simulation, the signal status of the 16#60 output.

The signal status of the `FbkCloseOut` and `FbkOpenOut` outputs is fetched and sent from the worst signal status from the `RbkOut` output and the corresponding feedback signal inputs `FbkClose` and `FbkOpen`.

The signal status of the manipulated variable output `MV` always corresponds to the signal status of the input parameter `MV_Ext` or `MV_Int`, depending on how the setpoint is specified. If the internal manipulated variable `MV_Int` is used, the signal status is always output as 16#80.

The signal status of manipulated variable difference `ER` is fetched and sent from the worst signal status of the two outputs `RbkOut` and `MV`.

The worst signal status `ST_Worst` for the block is formed by the following parameters:

- `FbkOpenOut.ST`
- `FbkCloseOut.ST`
- `FbkAuxVOpenOut.ST`
- `FbkAuxVCloseOut.ST`
- `RbkOut.ST`
- `LocalLi.ST`

Forcing operating modes

This block provides the standard function Forcing operating modes (Page 31).

Note

If the block is operated with a auxiliary valve, the `OpenForce` and `CloseForce` commands also affect the auxiliary valve.

The high range limit (`MV_HiLim`) and the low range limit (`MV_LoLim`) are output at `MV` for `OpenForce` and `CloseForce` respectively.

With `CloseForce`, the auxiliary valve is closed, thereby triggering the neutral position of the control valve regardless of the `MV` output.

A configured ramp limit has no effect.

Feedback monitoring

This block provides the standard function Monitoring the feedbacks (Page 83).

Digital feedback signals for the "Open" and "Closed" positions are formed from the position feedback:

- Feedback for "Open" position: `Rbk` ≥ `PosDiOpen`
- Feedback for "Closed" position: `Rbk` ≤ `PosDiClose`

Specifying control valve positions:

There are the positions:

- Valve closed ("Closed")
- Valve closes
- Valve open ("Open")
- Valve opens
- Valve has reached defined position

Valve closed ("Closed")

When the control valve reaches the "Closed" position, the output is `FbkCloseOut.Value` = 1:

- With a binary limit switch for the "Closed" position (`NoFbkClose` = 0):

  The valve is considered closed when `FbkCloseOut` is set. `FbkCloseOut` is set when `Rbk` ≤ `PosDiClose` and `FbkClose` = 1.

- Without a binary limit switch for the "Closed" position (`NoFbkClose` = 1):

  The valve is considered closed when `FbkCloseOut` is set. `FbkCloseOut` is set when `Rbk` ≤ `PosDiClose`.

Valve closes

If the control valve travels in the direction of the "Closed" position, the output is FbkClsgOut = 1:

- FbkClsgOut is set when MV.Value < RbkOut.Value and not when PosReached.Value = 1 .

Valve open ("Open")

When the control valve reaches the "Open" position, the output is FbkOpenOut.Value = 1:

- With a binary limit switch for the "Open" position (NoFbkOpen = 0):

  The valve is considered open when FbkOpenOut is set. FbkOpenOut is set when Rbk ≥ PosDiOpen and FbkOpen = 1.

- Without a binary limit switch for the "Open" position (NoFbkOpen = 1):

  The valve is considered open when FbkOpenOut is set. FbkOpenOut is set, when Rbk ≥ PosDiOpen.

Valve opens

If the control valve travels in the direction of the "Open" position, the output is FbkOpngOut = 1:

- FbkOpngOut is set when MV.Value > RbkOut.Value and is not PosReached.Value = 1.

Valve has reached defined position

If the control valve is sent to a specified intermediate position (MV > PosDiClose and MV < PosDiOpen), the targeted position is reached when the difference MV.Value - RbkOut.Value is within the configured tolerance range ± PosDeadBand and therefore ER.Value = 0.0.

If the control valve is set to the end position "Open" (MV.Value >= PosDiOpen), this position is reached when ER.Value = 0.0 and also FbkOpenOut.Value = 1.

If the control valve is set to the end position "Closed" (MV.Value <= PosDiClose), this position is reached when ER.Value = 0.0 and also FbkCloseOut.Value = 1.

When the control valve reaches the specified position, the PosReached = 1 output is set.

Dynamic monitoring

The monitoring is based on the effective feedback signals FbkOpenOut and FbkCloseOut and not directly on the feedback inputs FbkOpen and FbkClose.

The monitoring is only active if the control valve is within the operating range. The operating range is determined by the limits PosDiClose and PosDiOpen (PosDiClose < Rbk < PosDiOpen).

When the control valve is within the operating range, to reach one of the two end positions (MV ≥ PosDiOpen or MV ≤ PosDiClose), the targeted end position must be reached within the time defined by MonTiDynamic.

If there are binary signals for the feedback of the control valve, the monitoring time for reaching the configured values for the "Open" (PosDiOpen) or "Closed" (PosDiClose) position of the manipulated variable is started (start MonTiDynamic if MV ≤ PosDiClose or MV ≥ PosDiOpen).

A dynamic monitoring error is generated if:

- The "Closed" end position is targeted (MV ≤ PosDiClose) and this position (FbkCloseOut) is not reached within the monitoring time MonTiDynamic.
- The "Closed" end position is targeted (MV ≤ PosDiClose) and the feedback of the binary limit switch FbkClose is already within the operating range.
- The "Open" position is targeted (MV ≥ PosDiOpen) and this position (FbkOpenOut) is not reached within the monitoring time MonTiDynamic.
- The "Open" end position is targeted (MV ≥ PosDiOpen) and the feedback for the binary limit switch FbkOpen is already within the operating range.

Static monitoring

The monitoring is based on the effective feedback signals FbkOpenOut and FbkCloseOut and not on the feedback inputs FbkOpen and FbkClose.

Monitoring is only active if the control valve is in the "Closed" or "Open" position and not in the neutral position. The "Closed" position is determined by the PosDiClose parameter and the "Open" position by the PosDiOpen parameter.

A static monitoring error is generated if:

- The "Closed" end position (FbkCloseOut = 1) is abandoned without a command having been issued beforehand, and the monitoring time MonTiStatic has expired.
- The "Closed" end position is reached (FbkCloseOut = 1), the feedback of the binary limit switch FbkClose is gone, and monitoring time MonTiStatic has expired.
- The "Open" end position (FbkOpenOut = 1) is abandoned without a command having been issued beforehand and the monitoring time MonTiStatic has expired.
- The "Open" end position is reached (FbkOpenOut = 1), the feedback of the binary limit switch FbkOpen is gone, and monitoring time MonTiStatic has expired.

Disabling feedback

This block provides the standard function Disabling feedback for valves (Page 85). Feedback monitoring can be deactivated separately for each feedback with NoFbkOpen or NoFbkClose as required.

Suppressing messages using the MsgLock parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Monitoring the feedback for the auxiliary valve

The auxiliary valve provides dynamic and static monitoring of the feedback. No special monitoring time can be configured for overseeing the retention of the end position of the auxiliary valve. If the end position is exited without the corresponding command, a "monitoring runtime error" is reported after expiration of the time configured under "Control".

Monitoring is disabled by default and no connections are displayed.

The following parameters can be used to monitor the auxiliary valve

Parameter	Function
FbkAuxVOpen	1 = Auxiliary valve open feedback signal
FbkAuxVClose	1 = Auxiliary valve closed feedback signal
NoFbkAuxVOpen	1 = No feedback present for Auxiliary valve open (default = 1)
NoFbkAuxVClose	1 = No feedback present for Auxiliary valve closed (default = 1)
MonitorAuxV	1 = Feedback monitoring of the auxiliary valve (default = 0)
MonAuxVTime	Monitoring time after auxiliary valve operation in [s]
MonDynAuxVErr	Dynamic monitoring error pending
MonStaAuxVErr	Static monitoring error pending

Otherwise, the monitoring works like the monitoring function of the control valve.

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Neutral position

This block provides the standard function Neutral position for motors, valves and controllers (Page 37).

The neutral position (de-energized state) for the auxiliary valve is set using the `SafePosAux` parameter.

- `SafePosAux` = 0 means that the auxiliary valve closes with `Ctrl` = 0 and opens with `Ctrl` = 1.
- `SafePosAux` = 1 means that the auxiliary valve opens with `Ctrl` = 0 and closes with `Ctrl` = 1 .

The setting is made with the `SafePos` parameter for the control valve.

- `SafePos` = 0 means that the control valve closes in the de-energized state (`MV` is set to `MV_OpScale.Low`)
- `SafePos` = 1 means that the control valve opens in the de-energized state (`MV` is set to `MV_OpScale.High`)
- `SafePos` = 2 means that the control valve retains its position in the de-energized state. (`MV` remains unchanged)

The control valve is brought to the neutral position when the `FbkAuxVCloseOut` = 1 control valve is closed.

Generating instance-specific messages

This block provides the standard function Generating instance-specific messages (Page 162).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
3	Enabling resetting of commands for the control settings (Page 136)
4	Setting switch or button mode (Page 140)
5	Control via auxiliary valve (Page 143)
6	Disabling opening and closing (Page 130)
9	Resetting via input signals in the event of interlocking (Protection) or errors (Page 136)
10	Exiting local mode (Page 149)
11	Activating the run time of feedback signals (Page 126)
15	Neutral position manipulated variable takes effect with "out of service" operating mode (Page 139)
16	Neutral position manipulated variable takes effect at startup (Page 139)
17	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 145)
21	Enabling bumpless switchover to automatic mode for valves, motors, and dosers (Page 144)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
27	Interlock display with LocalSetting 2 or 4 (Page 149)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)
30	Resetting depending on the operating mode (Page 137)
31	Activating reset of interlocks in manual mode (Page 138)

In pushbutton mode (Bit 4 = 0) the automatic commands in automatic mode are latching, in other words `OpenAut`, and `CloseAut`, can be reset to 0 after changing the control. In manual and local modes, however, the automatic commands are not saved and in the absence of automatic commands the automatic control is tracked.

In switching mode (Bit 4 = 1), control is selected with the static signals `OpenAut`. If input `OpenAut` is not set the valve is closed. Control via `CloseAut` is not needed. If the "Activate command reset for control" function (Bit 3 = 1) is also activated, the inputs `OpenAut` are reset to the neutral position after evaluation in the block.

Note

Switching mode can only be used for configuration with the auxiliary valve.

Displaying auxiliary values

This block provides the standard function Displaying auxiliary values (Page 167).

Alarm delays with two time values per limit pair

This block has the standard function alarm delay Two time values per limit pair (Page 158) for limit monitoring of the feedback and limit monitoring of the manipulated variable difference.

The function here relates solely to the limits of the manipulated variable difference.

Digital feedback from the readback value

This block forms a digital position feedback for "Closed" and "Open" from the configured operating points of the position feedback values `PosDiClose` and `PosDiOpen`.

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can switch to "automatic mode"
1	1 = Operator can switch to "manual mode"
2	1 = Operator can switch to "local mode"
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can open the valve
5	1 = Operator can close the valve
6	1 =
7	1 = Operator can define the monitoring time for startup
8	1 = Operator can define the monitoring time for runtime
9	1 = Operator can enable the monitoring the control valve feedback function (Bit 7 - 8)
10	Not used
11	1 = Operator can activate the Release for maintenance function
12	1 = Operator can change the simulation value SimRbk

Bit	Function
13 - 23	Not used
24	1 = Operator can define the monitoring time of the auxiliary valve for startup
25	Not used
26	1 = Operator can enable the monitoring the auxiliary valve feedback function (Bit 24)
27 - 31	Not used

The block has the following operator control permissions for the `OS1Perm` parameter:

Bit	Function
0 - 3	Not used
4	1 = Operator can switch the manipulated variable to "external" `MV_ExtOp`
5	1 = Operator can switch the manipulated variable to "internal" `MV_IntOp`
6	Not used
7	1 = Operator can change the manual manipulated variable `MV_Int`
8 - 9	Not used
10	1 = Operator can change the operation high limit of the manipulated variable `MV_HiLim`
11	1 = Operator can change the operation low limit of the manipulated variable `MV_LoLim`
12	1 = Operator can enable the manipulated variable's gradient limitation function `MV_RateOn`
13	1 = Operator can change the manipulated variable's high limit for the ramp `MV_UpRaLim`
14	1 = Operator can change the manipulated variable's low limit for the ramp `MV_DnRaLim`
15	1 = Operator can switch between the time value or the value for the ramp (`MV_RmpModTime`)
16	1 = Operator can change the ramp time `MV_RmpTime`
17	1 = Operator can change the target manipulated variable `MV_RmpTarget` for the manipulated variable ramp
18	1 = Operator can enable the manipulated variable ramp function `MV_RmpOn`
19	Not used
20	1 = Operator can enable the track manipulated variable function in tracking mode `MV_TrkRbk`
21	1 = Operator can enable the bumpless switchover from external to internal `MV_TrkExt`
22 - 25	Not used
26	1 = Operator can change the limit (manipulated variable difference) for the high alarm `ER_AH_Lim`
27	1 = Operator can change the hysteresis (manipulated variable difference) `ER_Hyst`
28	1 = Operator can change the limit (manipulated variable difference) for the low alarm `ER_AL_Lim`
29	1 = Operator can change the limit (position feedback) for the high warning `RbkWH_Lim`
30	1 = Operator can change the hysteresis (position feedback) `RbkHyst`
31	1 = Operator can change the hysteresis (position feedback) for low warning `RbkWL_Lim`

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Generation of manipulated variables

The manipulated variable `MV` is formed as follows:

MV_ForOn	CloseForce	OpenForce	ManAct	AutAct	LocalAct	MV_TrkOn	MV_TrkRbk	MV_ExtAct	MV =	Limit	State
1	0	0	-	-	-	-	-	-	MV_Forced	none	Forced tracking without limit
-	1	0	-	-	-	-	-	-	MV_OpScale.Low	MV_OpScale.Low	Forced close
-	0	1	-	-	-	-	-	-	MV_OpScale.High	MV_OpScale.High	Forced open
0	0	0	1	0	0	0	-	0	MV_Int	MV_HiLim MV_LoLim	Manual mode with internal manipulated variable
0	0	0	1	0	0	0	-	1	MV_ExtOut	MV_HiLim MV_LoLim	Manual mode with external manipulated variable and limit
0	0	0	0	1	0	0	-	1	MV_Int	MV_HiLim MV_LoLim	Automatic with external manipulated variable and limit
0	0	0	0	1	0	0	-	1	MV_ExtOut	MV_HiLim MV_LoLim	Automatic with external manipulated variable and limit
0	0	0	-	-	0	1	0	-	MV_Trk	MV_HiLim MV_LoLim	Tracking with limitation
0	0	0	0	-	0	1	1	-	Rbk	none	Tracking to position feedback without limit
0	0	0	0	0	1	-	-	-	Rbk	None	Local mode with tracking to position feedback without limit

"Actuator active" information

- The following applies for `PosReached.Value` = 0:

  With `PosDiClose` < `MV` < `PosDiOpen` the control valve is detected as active and Bit 24 is set in `Status1`.

- The following applies for `PosReached.Value` = 1:

  `Status1.Bit 24` = 0

This status can be used to indicate, for example, a customized icon in the process image and is saved in the status word (see Status word section in Description of VlvAnL (Page 1151)).

General function "MV difference"

The manipulated variable difference is sent to the ER output and is calculated with the following formula:

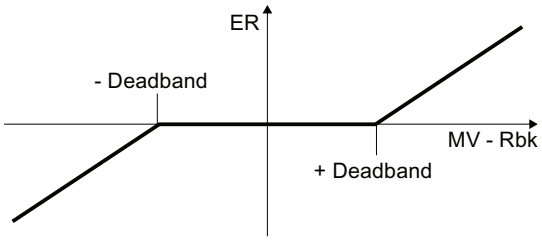
ER = MV - Rbk

If ER is within the dead band, ER = 0 is set and the manipulated variable is considered reached.

Manipulated value difference generation and dead band

The manipulated variable difference is formed by the effective manipulated variable MV and the position feedback Rbk, and sent to the ER output. A dead band can be set at the PosDeadBand input:

- PosDeadBand = 0 Dead band is disabled
- PosDeadBand ≠ 0 Dead band is enabled



Limit monitoring of manipulated variable and control deviation

The block provides the standard function Limit monitoring of setpoint, manipulated variable and control deviation (Page 81)

Monitoring is disabled in the following situations:

- The auxiliary valve is closed
- The control valve is in the neutral position

Specifying warning times for control functions at motors and valves

This block provides the standard function Specifying warning times for control functions at motors and valves (Page 39)

The warning time affect the analog manipulated variable MV. The output is updated only with the specification of a new manipulated variable after the warning time has expired.

Warning time is ignored with tracking MV_TrkOn = 1 and in forced tracking MV_ForOn.

Disabling feedback

This block provides the standard function Disabling feedback for valves (Page 85).

This function is available for both the control valve and auxiliary valve. The feedback for the auxiliary valve is disabled by default, connections are not displayed.

The disable setting is made with the `NoFbkOpen` and `NoFbkClose` parameters for the control valve.

The disable setting is made with the `NoFbkAuxVOpen` and `NoFbkAuxVClose` parameters for the auxiliary valve.

Time stamp

This block receives a time stamp value via the `EventTSIn` input parameter. Refer to EventTs functions (Page 1289) for more information.

Button labels

This block provides the standard function Labeling of buttons and text (Page 167)

Instance-specific text can be configured for the following parameters:

- `OpenMan`
- `CloseMan`

See also

Operating modes of VlvAnL (Page 1156)

VlvAnL error handling (Page 1170)

Messaging of VlvAnL (Page 1171)

VlvAnL I/Os (Page 1173)

VlvAnL block diagram (Page 1185)

6.12.4 VlvAnL error handling

Error handling of VlvAnL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Mode switchover error
- Invalid input signals

Overview of error numbers

The ErrorNum I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	No active fault
41	The value of the LocalSetting connection is outside the valid range. Valid values are 0, 2 and 4
42	LocalSetting = 0 or LocalSetting = 4 and LocalLi = 1
51	AutModLi = 1 and ManModLi = 1 OpenAut = 1 and CloseAut = 1 OpenForce = 1 and CloseForce = 1
52	LocalSetting = 2 or 4 and SimOn = 1

Mode switchover error

This error can be output by the block, see the section Error handling (Page 104).

Invalid input signals

This error can be output by the block, see the section Error handling (Page 104).

See also

Messaging of VlvAnL (Page 1171)

Description of VlvAnL (Page 1151)

Operating modes of VlvAnL (Page 1156)

Functions of VlvAnL (Page 1158)

VlvAnL I/Os (Page 1173)

VlvAnL block diagram (Page 1185)

6.12.5 Messaging of VlvAnL

Messaging

The following messages can be generated for this block:

- Process control fault
- Instance-specific messages
- Process messages

Process control fault

- The following control system error messages can be output:

Message instance	Message identifier	Message class	Event
MsgEvld1	SIG 1	AS process control message - fault	$$BlockComment$$ Feedback error
	SIG 6	AS process control message - fault	External error has occurred

Explanation:

$$BlockComment$$: Content of the instance-specific comment

You can interconnect an external fault (signal) to input parameter CSF. If it changes to CSF = 1, a process control fault is triggered (MsgEvld1, SIG 6).

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 2	Alarm - high	$$BlockComment$$ ER - high alarm limit violated
	SIG 3	Alarm - low	$$BlockComment$$ ER - low alarm limit violated
	SIG 4	Warning - high	$$BlockComment$$ Rbk - high warning limit violated
	SIG 5	Warning - low	$$BlockComment$$ Rbk - low warning limit violated

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Instance-specific messages

You have the option to use one or two instance-specific messages for this block.

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 7	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 8	AS process control message - fault	$$BlockComment$$ External message 2

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVal04`
5	`ExtVal05`
6	`ExtVal06`
7	`ExtVa107`
8	`ExtVa108`
9	Reserved
10	Reserved

The associated values 4 ... 8 are allocated to the parameters `ExtVa104` ... `ExtVa108` and can be used. Additional information is available in the "Process Control System PCS 7 - Engineering System" manual.

See also

Description of VlvAnL (Page 1151)

Functions of VlvAnL (Page 1158)

VlvAnL I/Os (Page 1173)

Operating modes of VlvAnL (Page 1156)

VlvAnL error handling (Page 1170)

VlvAnL block diagram (Page 1185)

6.12.6 VlvAnL I/Os

I/Os of VlvAnL

Input parameter master

Parameter	Description	Type	Default
`AutModLi*`	1= "Automatic mode" via interconnection or SFC (controlled by `ModLiOp` = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
`AutModOp*`	1 = "Automatic mode" via operator (controlled by `ModLiOp` = 0)	BOOL	0
`BatchEn`	1 = Enable allocation	BOOL	0

Parameter	Description	Type	Default
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
BypProt	1 = Bypassing interlock is active in "local mode" and in simulation	BOOL	0
CloseAut*	1 = Select Close valve in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseForce	1 = Force valve closure	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CloseMan*	1 = Select Close valve in "manual mode"	BOOL	0
CSF	1 = External error (control system error)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1
ER_A_DC*	Delay for incoming alarms during manipulated variable difference monitoring	REAL	0.0
ER_A_DG*	Delay for outgoing alarms during manipulated variable difference monitoring	REAL	0.0
ER_AH_En	1 = Activate alarm (high) for manipulated variable difference monitoring	BOOL	1
ER_AH_Lim	Alarm limit (high) for manipulated variable difference monitoring	REAL	100.0
ER_AH_MsgEn	1 = Activate messages for alarm (high) for manipulated variable difference monitoring	BOOL	1
ER_AL_Lim	Alarm limit (low) for manipulated variable difference monitoring	REAL	-100.0
ER_AL_En	1 = Activate alarm (low) for manipulated variable difference monitoring	BOOL	1
ER_AL_MsgEn	1 = Activate messages for alarm (low) for manipulated variable difference monitoring	BOOL	1
ER_Hyst	Alarm hysteresis for manipulated variable difference monitoring	REAL	1.0
EventTsIn	For wiring the signal status of an EventTs message block. The EventTsIn input parameter serves to interconnect the EventTsOut output parameter of the EventTs block. When this interconnection is configured, the messages of the EventTs block are displayed on the OS in the alarm view of the technologic block and can also be acknowledged there.	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#FF
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
ExtVa106	Associated value 6 for messages (MsgEvID1)	ANY	
ExtVa107	Associated value 7 for messages (MsgEvID1)	ANY	
ExtVa108	Associated value 8 for messages (MsgEvID1)	ANY	
FbkAuxVClose	1 = Auxiliary valve closed feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkAuxVOpen	1 = Auxiliary valve open feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkClose	1 = Valve closed feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
FbkOpen	1 = Valve open feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
Feature	I/O for additional functions (Page 1158)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
Intl_En	1 = Interlock without reset (interlock, Intlock parameter) is active	BOOL	1
Intlock	0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared 1 = Interlock not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
LocalLi	1 = Activate "local mode" via plant signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalOp*	1 = "Local mode" via operator	BOOL	0
LocalSetting	Properties for the Local mode (Page 66)	INT	0
ManModLi*	1 = "Manual mode" via interconnection or SFC (controlled by ModLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManModOp*	1= "Manual mode" via: OS operator (controlled via ModLiOp = 0)	BOOL	1

Parameter	Description	Type	Default
ModLiOp	Switchover of operating mode between: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonAuxVTime*	Monitoring time for feedback monitoring of the auxiliary valve	REAL	3.0
Monitor	1 = Monitoring of control valve feedback	BOOL	1
MonitorAuxV	1 = Monitoring of auxiliary valve feedback	BOOL	1
MonSafePos	1 = Go to neutral position in the event of monitoring errors	BOOL	1
MonTiDynamic*	Monitoring time after operation in [s]	REAL	3.0
MonTiStatic*	Monitoring time for feedback errors without operation in [s]	REAL	3.0
MS_RelOp*	1= Release for maintenance via OS operator	BOOL	0
MsgEvId1	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_DnRaLim	Gradient limit (low) for manipulated variable MV_Unit	REAL	100.0
MV_Ext	External manipulated variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_ExtLi	Select external manipulated variable (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_ExtOp*	Select external manipulated variable (via operator)	BOOL	0
MV_Forced	Forced manipulated variable that is not limited and assumes top priority	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_ForOn	1 = Forced manipulated variable MV_Forced output unlimited at output MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_HiLim	Limit (high) for manipulated variable MV	REAL	100.0
MV_Int*	Internal manipulated variable	REAL	0.0
MV_IntLi	Select internal manipulated variable (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_IntOp*	Select internal manipulated variable (via operator)	BOOL	1

Parameter	Description	Type	Default
MV_LiOp	Select manipulated variable source (internal/external): 1 = Via interconnection 0 = Via operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_LoLim	Limit (low) for manipulated variable MV	REAL	0.0
MV_OpScale	OS display range for manipulated variable MV	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
MV_RateOn*	Change of manipulated variable is limited by MV_UpRaLim and MV_DnRaLim	BOOL	0
MV_RmpModTime	1 = Use time (MV_RmpTime) for manipulated variable ramp 0 = Use gradient	BOOL	0
MV_RmpOn*	1 = Activate manipulated variable ramp to target value MV_RmpTarget	BOOL	0
MV_RmpTarget	Time value for manipulated variable ramp	REAL	0.0
MV_RmpTime*	Time for manipulated variable ramp [s] from current MV up to MV_RmpTarget	REAL	0.0
MV_Trk	Tracking value for the manipulated variable MV	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_TrkExt	1 = Bumpless switchover from external to internal manipulated variable active	BOOL	0
MV_TrkOn	1 = Tracking of manipulated variable MV	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_TrkRbk	1 = Bumpless switchover of manipulated variable tracking active (track manipulated variable to position feedback)	BOOL	0
MV_Unit	Unit of measure for manipulated variable	INT	1342
MV_UpRaLim	Gradient limit (high) for manipulated variable MV_Unit	REAL	100.0
NoFbkAuxVClose	1 = No "closed" feedback for auxiliary valve present	BOOL	1
NoFbkAuxVOpen	1 = No "open" feedback for auxiliary valve present	BOOL	1
NoFbkClose	1 = No feedback present for "control valve closed"	BOOL	0
NoFbkOpen	1 = No feedback present for "control valve open"	BOOL	0
Occupied	1 = In use by a batch	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpenAut*	1 = Select Open valve in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
OpenForce	1 = Forced open of control valve	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpenMan*	1 = Select Open valve in "manual mode"	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for Operator control permissions (Page 205)	STRUCT • Bit 0: BOOL • Bit 12: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
OS1Perm	I/O for Operator control permissions (Page 205)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
Perm_En	1 = Activation enable (enable, Permit parameter) is active	BOOL	1
Permit	1 = Enable for opening / closing from neutral position 0 = No activation enable for the valve	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
PosDeadBand	Dead band for forming manipulated variable difference	REAL	0.1
PosDiClose	Limit for control valve position "closed"	REAL	5.0
PosDiOpen	Limit for control valve position "open"	REAL	95.0
Prot_En	1 = Protective interlock (protection, Protect parameter) is active	BOOL	1
Protect	0 = Protective interlocking is effective; once the interlocking condition has disappeared, you will have to reset the block 1 = Protective interlocking not activated	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#FF
Rbk	Position feedback for display on OS	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RbkHyst	Alarm hysteresis for position feedback	REAL	1.0
RbkW_DC*	Delay time for incoming warnings [s]	REAL	0.0
RbkW_DG*	Delay time for outgoing warnings [s]	REAL	0.0
RbkWH_En	1 = Enable warning (high) for position feedback	BOOL	0
RbkWH_Lim	Limit for position feedback of warning (high)	REAL	90.0
RbkWH_MsgEn	1 = Enable messages for warning (high) for position feedback	BOOL	1
RbkWL_En	1 = Enable warning (low) for position feedback	BOOL	0
RbkWL_Lim	Limit for position feedback of warning (low)	REAL	10.0

Parameter	Description	Type	Default
RbkWL_MsgEn	1 = Enable messages for warning (low) for position feedback	BOOL	1
RstLi*	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SafePos	Neutral position for control valve: 0 = Closed 1 = Open 2 = Stop	INT	0
SafePosAux	Neutral position for auxiliary valve: 1= Open 0 = Closed	BOOL	0
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimRbk*	Position feedback used for SimOn = 1	REAL	0.0
SimRbkLi	Position feedback used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
StepNo	Batch step number	DWORD	16#00000000
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
UA1unit	Unit of measure for analog auxiliary value 1	INT	0
UA2unit	Unit of measure for analog auxiliary value 2	INT	0
UserAna1	Analog auxiliary value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF

Parameter	Description	Type	Default
UserAna2	Analog auxiliary value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00
WarnTiAut	Prewarning of valve movement in automatic mode in [s]	REAL	0.0
WarnTiMan	Prewarning of valve movement in manual mode in [s]	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AutAct	1 = "Automatic mode" enabled 0 = "Manual mode", "Local mode" or "Out of service" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AuxClosed	1 = Auxiliary valve is closed	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AuxClsing	1 = Auxiliary valve is closing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AuxOpened	1 = Valve is opened	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AuxOpning	1 = Auxiliary valve is opening	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CascaCut	Cascade connection: 1 = Control chain from master controller to secondary valve is interrupted	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl	Control output for auxiliary valve (depends on SafePosAuxV)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Closed	1 = Valve is closed	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Closing	1 = Valve is closing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ER	Manipulated value difference	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ER_AH_Act	1 = Alarm limit (high) for manipulated variable difference violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ER_AL_Act	1 = Alarm limit (low) for manipulated variable difference violated. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ErrorNum	Output of current error number. For error numbers that can be output by this block, see VlvAnL error handling (Page 1170)	INT	-1
FbkAuxVCloseOut	1 = Auxiliary valve is closed	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkAuxVOpenOut	1 = Auxiliary valve open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkCloseOut	1 = Control valve is open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkClsgOut	Control valve closing feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkOpenOut	1 = Control valve is open	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FbkOpngOut	Control valve opening feedback	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
GrpErr	1 = Group error pending	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LocalAct	1 = "Local mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LockAct	1 = Interlock (Intlock, Permit or Protect) is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManAct	1 = "Manual mode" enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
MonDynAuxVErr	1 = Feedback error auxiliary valve due to output change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonDynErr	1 = Feedback error control valve due to control change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonStaAuxVErr	1 = Feedback error from auxiliary valve due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MonStaErr	1 = Feedback error from control valve due to unexpected feedback change	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn1	Alarm acknowledgement status 1 (output STATUS of first ALARM_8P)	WORD	16#0000
MsgErr1	Alarm error 1 (output ERROR of first ALARM_8P)	BOOL	0
MsgStat1	Alarm status 1 (output ERROR of first ALARM_8P)	WORD	16#0000
MV	Manipulated variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_DnRaAct	Positive limit (low) for manipulated variable is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
MV_ExtAct	1 = External manipulated variable active 0 = Internal manipulated variable active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_ExtOut	Output for external manipulated variable	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
MV_HiAct	1 = Limit (high) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_LoAct	1 = Limit (low) of manipulated variable violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MV_RateTarget	Target manipulated value for the gradient limitation	REAL	0.-0
MV_UnitOut	Unit of measure for manipulated variable	INT	0
MV_UpRaAct	Positive limit (high) for manipulated variable is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Opened	1 = Valve is opened	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Opening	1 = Valve is opening	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS1PermLog	Display of OS1Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS1PermOut	Display of OS1Perm	DWORD	16#FFFFFFFF
P_Rst	1= Pulse output for reset The parameter persists for one cycle after a reset.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
PosReached	1 = Control valve has reached specified position	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkOut	Position feedback output	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RbkWH_Act	1 = Warning (high) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkWL_Act	1 = Warning (low) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToReset	1 = Ready for reset via RstLi input or commands in "automatic mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyToStart	1 = Active start readiness	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1151)	DWORD	16#00000000
Status2	Status word 2 (Page 1151)	DWORD	16#00000000
Status3	Status word 3 (Page 1151)	DWORD	16#00000000
Status4	Status word 3 (Page 1151)	DWORD	16#00000000
WarnAct	1 = Prewarning for control valve movement away from neutral position active (parameters WarnTiAut and WarnTiMan))	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Operating modes of VlvAnL (Page 1156)
Messaging of VlvAnL (Page 1171)
VlvAnL block diagram (Page 1185)

6.12.7 VlvAnL block diagram

VlvAnL block diagram

A block diagram is not provided for this block.

See also

Description of VlvAnL (Page 1151)

Operating modes of VlvAnL (Page 1156)

Functions of VlvAnL (Page 1158)

VlvAnL error handling (Page 1170)

Messaging of VlvAnL (Page 1171)

VlvAnL I/Os (Page 1173)

6.12.8 Operator control and monitoring

6.12.8.1 VlvAnL views

Views of the VlvAnL block

The VlvAnL block provides the following views:

- Standard view with auxiliary valve of VlvAnL (Page 1186)
- Standard view without auxiliary valve of VlvAnL (Page 1191)
- Limit value view of VlvAnL (Page 1196)
- Alarm view (Page 250)
- Trend view (Page 253)
- Parameter view of VlvAnL (Page 1202)
- Preview of VlvAnL (Page 1198)
- Memo view (Page 252)
- Batch view (Page 251)
- Ramp view (Page 248)
- Block icon for VlvAnL (Page 1204)

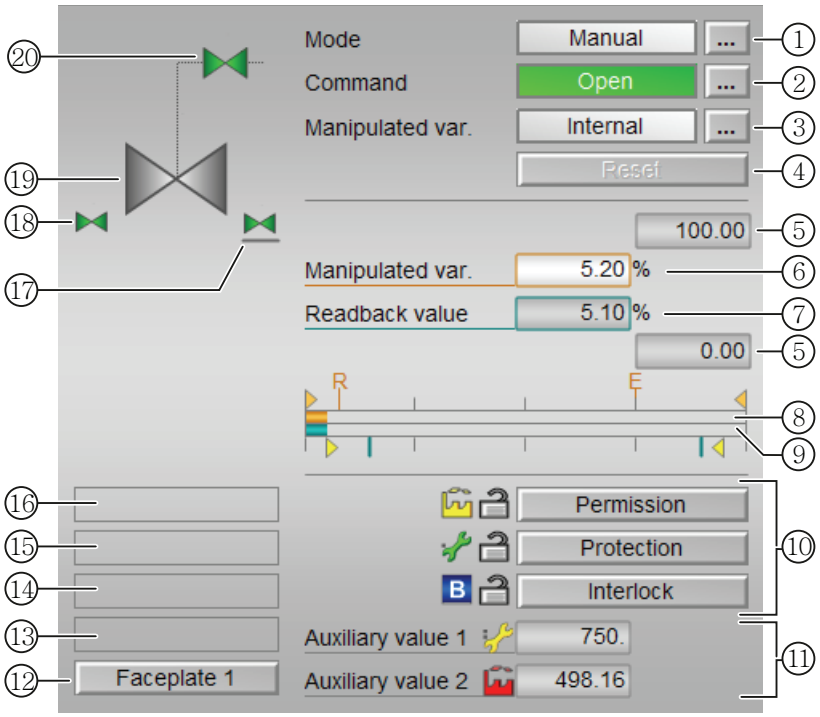
Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

See also

Parameter view for motors and valves (Page 236)

6.12.8.2 Standard view with auxiliary valve of VlvAnL

Standard view with auxiliary valve of VlvAnL



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Opening, closing and stopping the control valve

This area shows you the default operating state for the valve. The following states can be shown and executed here:

- "Open"
- "Close"
- "Stop" (display only, no operation possible)

"Close"/"open" command relates to the auxiliary valve. If no auxiliary valve is required for controlling the control valve, the "Open" and "Close" commands affect the control valve.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167).

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

(3) Displaying and switching the default manipulated variable

This area shows how to specify the manipulated variable. The manipulated variable can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

(4) Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(5) High and low scale range for the manipulated variable

These values provide information on the display range for the bar graph of the manipulated variable. The scale range is defined in the engineering system.

(6) Displaying and changing the manipulated variable including signal status:

This area shows the current manipulated variable with the corresponding signal status.

The manipulated variable can only be changed by

- Setting the internal manipulated variable (`MV_ExtAct` = 0) and
- An opened auxiliary valve (due to the dependency on the standard function Neutral position for motors, valves and controllers (Page 37))

For more information on changing the manipulated variable, refer to the Changing values (Page 210) section.

(7) Display of the position feedback including signal status

This area shows the current feedback of the manipulated variable with the corresponding signal status.

(8) Bar graph for the manipulated variable

This area shows the current manipulated variable in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

When the ramp function is enabled, the ramp target value is indicated by the letter "R".

The external manipulated variable is identified with the letter "E".

(9) Bar graph for position feedback

This area shows the current position feedback in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

The limits for the "open" and "closed" position are shown with 2 green lines.

(10) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocking functions (Page 85) section.

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(11) Display of auxiliary values

This display is only visible when the corresponding block input is connected.

You can use this area to display two auxiliary values that have been configured in the Engineering System (ES). You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(12) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

Refer also to the Opening additional faceplates (Page 165) section for more on this.

(13) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(14) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

You can find additional information on this in the Simulating signals (Page 47) section.

(15) Display area for block states

This area provides additional information on the operating state of the block:

- "Runtime error"
- "Control deviation"
- "Invalid signal"
- "Changeover error"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error").

(16) Display area for block states

This area provides additional information on the operating state of the block:

- "Forced open" (`OpenForce`)
- "Forced close" (`CloseForce`)
- "Forced tracking" (`MV_ForOn`)
- "Tracking" (`MV_TrkOn`)
- "Request 0/1": A reset to "automatic mode" is expected.

You can find additional information on this in the Forcing operating modes (Page 31) section.

(17) Representation of neutral position

This representation shows the neutral position for the control valve:

- Green: Neutral position is "Open"
- Gray: Neutral position is "Closed"
- Light green: Neutral position is "Stop"

(18) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the valve would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

(19) Status display of the control valve

You can find more information about this in the section Block icon for VlvAnL (Page 1204).

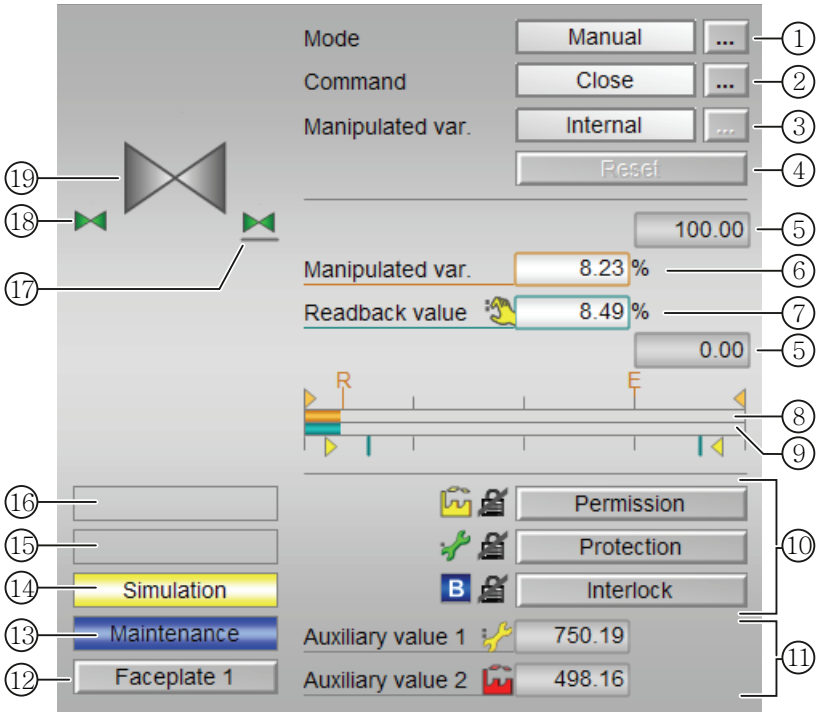
(20) Picture of auxiliary valve

The small auxiliary valve and the associated line are only shown when the control valve has an additional auxiliary valve and it can be controlled. This can be configured with `Feature` Bit 5 on the block.

The current status of the auxiliary valve is graphically displayed here.

6.12.8.3 Standard view without auxiliary valve of VlvAnL

Standard view without auxiliary valve of VlvAnL



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- Manual mode (Page 63)
- Automatic mode (Page 63)
- Local mode (Page 66)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Opening, closing and stopping the control valve

This area shows you the default operating state for the valve. The following states can be shown and executed here:

- "Open"
- "Close"
- "Stop" (display only, no operation possible)

"Close"/"Open" command relates to the control valve.

The "Open" command sets the manipulated variable equal to the high limit of the range (`MV_OpScale.High`).

The "Close" command sets the manipulated variable equal to the low limit of the range (`MV_OpScale.Low`)

If there is no auxiliary valve (`Feature` Bit 5 = 0), the command line can be completely hidden with `Feature` Bit 6.

- 0: (default) line is displayed
- 1: Command line hidden.

If text is configured for these commands, it is displayed as status text and as button labels for command selection. You can find more information about this in the Section Labeling of buttons and text (Page 167).

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

(3) Displaying and switching the default manipulated variable

This area shows how to specify the manipulated variable. The manipulated variable can specified as follows:

- By the application ("External", CFC/SFC)
- By the user directly in the faceplate ("Internal").

If there is no auxiliary valve, the specification of the manipulated variable depends on the mode, "manual" or "automatic". You cannot switch between "internal" and "external" here in this case.

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the setpoint specification.

(4)Resetting the block

Click "Reset" for interlocks or errors. You can find additional information on this in the Resetting the block in case of interlocks or errors (Page 33) section.

(5) High and low scale range for the manipulated variable

These values provide information on the display range for the bar graph of the manipulated variable. The scale range is defined in the engineering system.

(6) Displaying and changing the manipulated variable including signal status:

This area shows the current manipulated variable with the corresponding signal status.

The manipulated variable can only be changed by internal setting of the manipulated variable (`MV_ExtAct` = 0).

For more information on changing the manipulated variable, refer to the Changing values (Page 210) section.

(7) Display of the position feedback including signal status

This area shows the current feedback of the manipulated variable with the corresponding signal status.

(8) Bar graph for the manipulated variable

This area shows the current manipulated variable in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

When the ramp function is enabled, the ramp target value is indicated by the letter "R".

The external manipulated variable is identified with the letter "E".

(9) Bar graph for position feedback

This area shows the current position feedback in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

The limits for the "open" and "closed" position are shown with 2 green lines.

(10) Operating range for the interlock functions of the block

This display is only visible when the corresponding block input is connected.

You can use this button to control the interlock functions of the block. You can find additional information on this in the Interlocking functions (Page 85) section.

The following is displayed in addition to the buttons:

- Interlock status (see Forming the group status for interlock information (Page 90)), e.g.:

- Signal status (see Forming and outputting the signal status for technologic blocks (Page 93)), e.g.:

- Bypass information:

  If there is a bypass, it is displayed instead of the signal status.

(11) Display of auxiliary values

This display is only visible when the corresponding block input is connected.

You can use this area to display two auxiliary values that have been configured in the Engineering System (ES). You can find additional information on this in the Displaying auxiliary values (Page 167) section.

(12) Navigation button for switching to the standard view of any faceplate

This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

Refer also to the Opening additional faceplates (Page 165) section for more on this.

(13) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

Additional information on the display area for states of the block is available in section Release for maintenance (Page 52).

(14) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"
- "Delay"

You will find more detailed information on this in the chapters Simulating signals (Page 47) and Display of delay times (Page 31).

(15) Display area for block states

This area provides additional information on the operating state of the block:

- "Runtime error"
- "Control deviation"
- "Invalid signal"
- "Changeover error"

Additional information on these errors is available in the sections Monitoring the feedbacks (Page 83) , Error handling (Page 104) (section "Invalid input signals" and "Mode switchover error").

(16) Display area for block states

This area provides additional information on the operating state of the block:

- "Forced open" (`OpenForce`)
- "Forced close" (`CloseForce`)
- "Forced tracking" (`MV_ForOn`)
- "Tracking" (`MV_TrkOn`)
- "Request 0/1": A reset to automatic mode is expected.

You can find additional information on this in the Forcing operating modes (Page 31) section.

(17) Representation of neutral position

This representation shows the neutral position for the control valve:

- Green: Neutral position is "Open"
- Gray: Neutral position is "Closed"
- Light green: Neutral position is "Stop"

(18) Automatic preview

This display is only visible in "manual mode", in "local mode", or with a reset request in "automatic mode", when the current output signals are not identical to the control in "automatic mode".

The display shows what state the valve would assume if you switched from "manual" or "local" mode to "automatic mode", or performed a reset to "automatic mode".

(19) Picture of control valve

The current status of the control valve is graphically displayed here.

You can find more information about this in the section Block icon for VlvAnL (Page 1204).

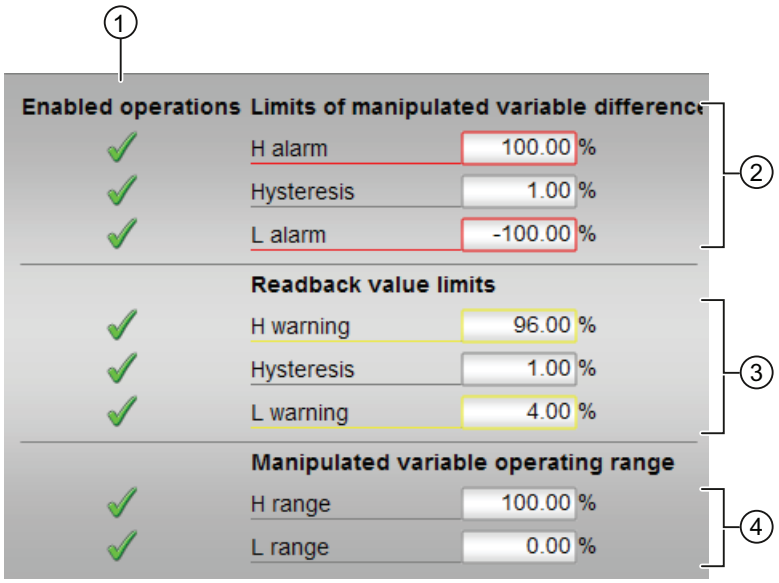
6.12.8.4 Limit value view of VlvAnL

Limit value view of VlvAnL

Several values are set in this view by default:

- Manipulated variable difference limits
- Readback value limits
- Manipulated variable operating range

The toolbars of the faceplate and the block icon indicate when the limit(s) is reached or exceeded.



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

(2) Manipulated variable difference limits

In this area, you can enter the limits for the manipulated variable error. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "Hysteresis"
- "L alarm": Alarm low

(3) Readback value limits (MV)

In this area, you can enter the limits for the readback value (position feedback). Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H warning": Warning high
- "Hysteresis"
- "L warning": Warning low

(4) Manipulated variable operating range (MV)

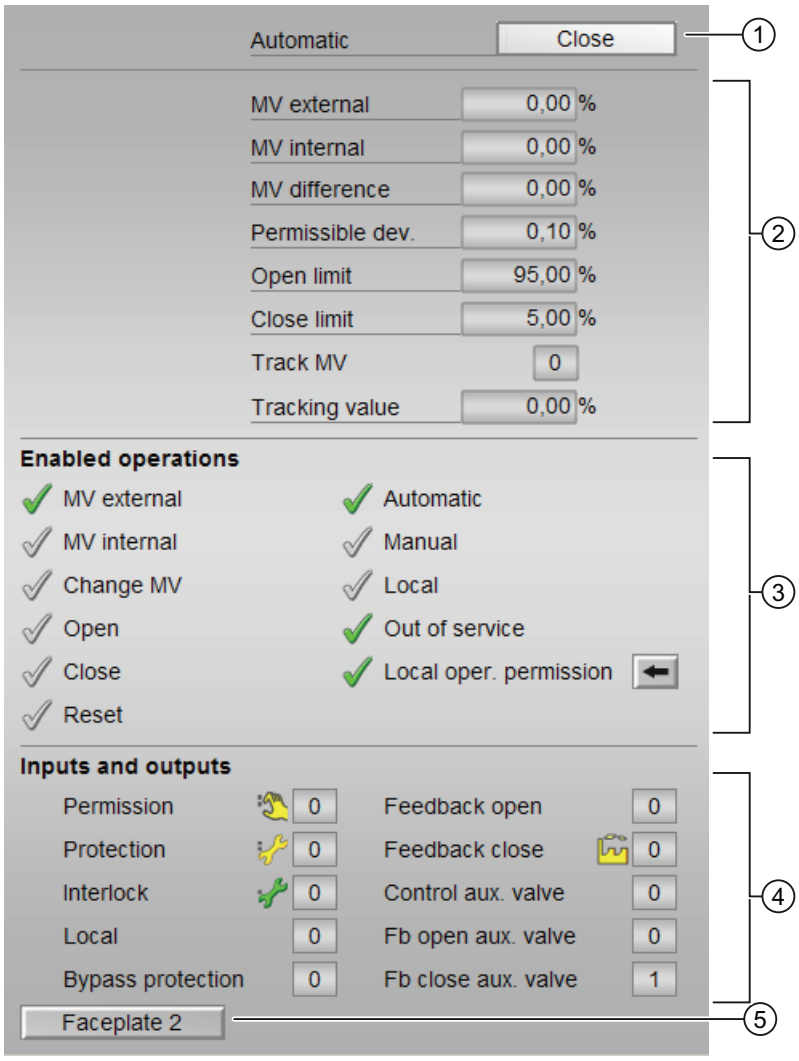
In this area, you can enter the limits for the manipulated variable operation range. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H range": Range limit high
- "L range": Range limit low

6.12.8.5 Preview of VlvAnL

Preview of VlvAnL



(1) Automatic preview

This shows the operating status of the control valve after it has switched from "manual" to "automatic" mode. If the block is in "automatic mode", the current block state is displayed.

(2) Preview area

- "Manipulated variable external": Display current external manipulated variable (MV_ExtOut).
- "Manipulated variable internal": Display current internal manipulated variable (MV_Int).
- "Manipulated variable difference": Current manipulated value error (ER)
- "Permissible dev.": Permissible ± deviation (PosDeadBand) of manipulated variable that is output. If the manipulated variable feedback Rbk is within this range, the manipulated variable is considered reached.
- "Limit Open": Limit (PosDiOpen) for forming the "Control valve Open" signal (FbkOpenOut). If the position feedback reaches this limit, the control valve is open.
- "Limit Closed": Limit (PosDiClose) for forming the "Control valve Closed" signal (FbkCloseOut). If the position feedback reaches this limit, the control valve is closed.
- "Manipulated variable tracking": (MV_TrkOn = 1) manipulated variable is corrected to the tracking value. Tracking value for the effective manipulated variable for "Track manipulated variable"

With MV_TrkRbk = 1, Rbk is displayed here, with MV_TrkRbk = 0, MV_Trk is displayed.

(3) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (OS_Perm or OS1Perm)

The following enabled operations are shown here:

- "Manipulated variable external": You can enable external manipulated value specification
- "Manipulated variable internal": You can enable internal manipulated value specification
- "Change MV": You can change the manipulated variable
- "Open": You can open the valve. The display always relates to the auxiliary valve and control valve. Neither the auxiliary valve nor the control valve can be opened if there is no enable.

  For the control valve this means: If a new manipulated variable is greater than the current valve position, this new manipulated variable take effect.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).

- "Close": You can close the valve. The display always relates to the auxiliary valve and control valve. Neither the auxiliary valve nor the control valve can be closed if there is no enable.

  For the control valve this means: If a new manipulated variable is less than the current valve position, this new manipulated variable does not take effect and the control valve retains its position.

  If text is configured for this command, it is also displayed in brackets. You can find more information about this in the section Labeling of buttons and text (Page 167).
- "Reset": You can reset the valve if interlocks or errors occur.
- "Automatic": You can switch to "automatic mode".
- "Manual": You can switch to "manual mode".
- "Local": You can switch to "local mode".
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(4) Inputs and outputs

This area shows the most important parameters for this block with the current selection.

- "Permission":

  This display is only visible when the corresponding block input is connected.

  – 0 = Valve activation not enabled on OS

  – 1 = Enable for "opening"/"closing" from the neutral position
- "Protection":

  This display is only visible when the corresponding block input is connected.

  – 0 = Protective interlocking is in effect; once the interlocking condition in automatic mode has disappeared, you will have to reset the block

  – 1 = "Good" state
- "Interlock":

  This display is only visible when the corresponding block input is connected.

  – 0 = Interlocking without reset is active; you can operate the block without reset once the interlocking condition has disappeared

  – 1 = "Good" state
- "Local": 1 = "Local mode" is active

- "Interlock deact.":
  - 0 = Bypass disabled
  - 1 = Bypassing interlock in "local mode" and in "simulation"

Since, depending on the configuration, the block itself forms the digital feedback signals internally via the "Open" and "Closed" positions, the following reaction results from the "Feedback open" and "Feedback closed" signals.

- Control valve:
  - "Feedback open": The display is derived from the `FbkOpenOut` output. However, this output is formed from the configured limit for the "Open" position.
  - "Feedback close": The display is derived from the `FbkCloseOut` output. However, this output is formed from the configured limit for the "Closed" position.
- "Control auxiliary valve": only visible when there is a auxiliary valve
  - Control binary control `Ctrl.Out`
  - "Feedback open auxiliary valve": `FbkAuxVOpenOut`.
  - "Feedback closed auxiliary valve": `FbkAuxCloseOut`.

(5) Navigation button for switching to the standard view of any faceplate

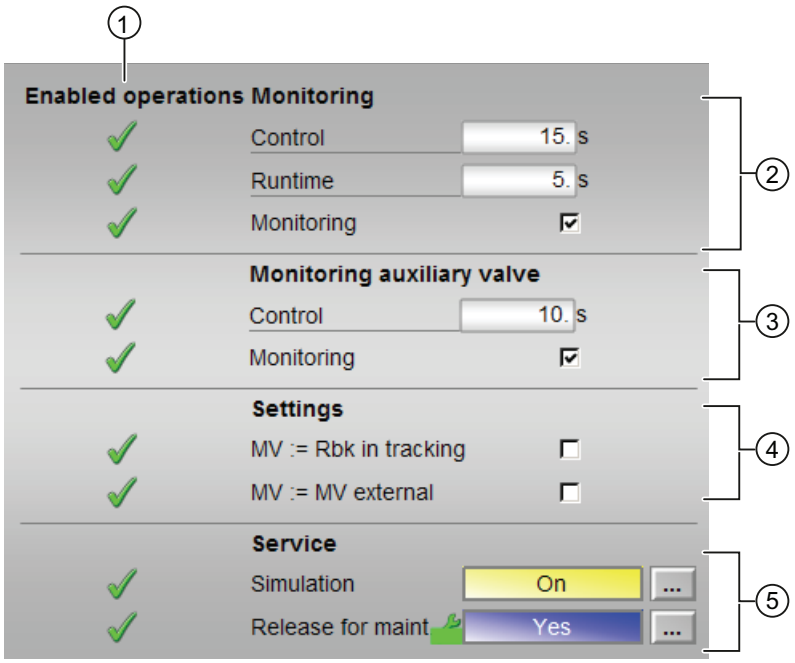
This display is only visible when the corresponding block input is connected.

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

6.12.8.6 Parameter view of VlvAnL

Parameter view of VlvAnL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(2) Monitoring

In this area, you change parameters and therefore influence the control valve. Refer to the Changing values (Page 210) section for more on this.

You can influence the following parameters:

- "Control": Monitoring time during opening and closing of the control valve (dynamic)
- "Runtime": Monitoring time of the end position of the control valve (static)

Enable monitoring

You can enable monitoring by clicking the check box (☑)

You can find additional information on this in the Monitoring the feedbacks (Page 83) section.

(3) Monitoring auxiliary valve

As under **(2)** Monitoring, but only visible when there is an auxiliary valve. Only one common monitoring time can be entered for dynamic and static monitoring.

(4) Settings

- `MV` = `Rbk` in tracking mode: Correction is performed with the position feedback `Rbk` instead of the `MV_Trk` tracking value. The switchover from "Track manipulated variable" (`MV_TrkOn` = 1) to "Do not track manipulated variable" is bumpless (`MV_TrkOn` = 0).

  Set `MV_TrkRbk` parameter.
- `MV` = `MV` extern: Bumpless switchover of manipulated variable from external to internal. The internal manipulated variable is tracked to the external one.

  Set `MV_TrkExt` parameter.

(5) Service

You can select the following functions in this area:

- "Simulation"
- "Release for maintenance" (with display for a maintenance request)

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the section:

- Simulating signals (Page 47)
- Release for maintenance (Page 52)

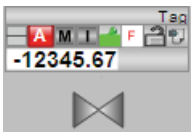
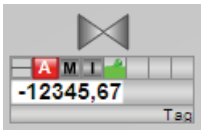
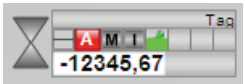
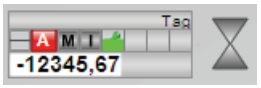
6.12.8.7 Block icon for VlvAnL

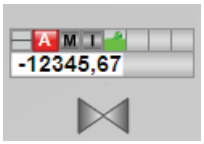
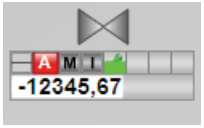
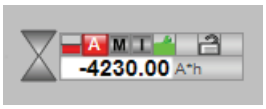
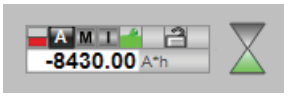
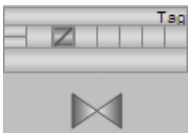
Block icons for VLvAnL

A variety of block icons are available with the following functions:

- Limits (high/low)
- Alarm violation. Warning and tolerance limits as well as the process control fault `CSF`
- Operating modes
- Signal status, release for maintenance
- Forcing states
- Displays for bypassing interlocks
- Interlocks
- Valve status display
- Display of feedback value (white, with decimal places)
- Operation of the manipulated variable
- Process tag type
- External/internal manipulated variable specification
- Memo display

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	

Icons	Selection of the block icon in CFC	Special features
	5	
	6	
	7	
	8	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193)

Valve status display

The following valve states are shown here:

Icon	Meaning
	Valve open
	Valve closed
	Error at valve
	Valve is opening
	Valve is closing
	Valve stopped

Interlock blocks

7

7.1 Intlk02 - Interlock display with 2 input signals

7.1.1 Description of Intlk02

Object name (type + number) and family

Type + number: FB 1824

Family: Interlck

Area of application for Intlk02

The block is used for the following applications:

- Standardized interlock with display

How it works

The block is used to calculate a standardized interlock that can be displayed on the OS. A maximum of 2 input signals can be supplied to the block. They are linked using selectable binary logic. The signal status of the output signal is also determined. You can assign an analog value with the signal status and unit to each input value for display in the faceplate.

The current state is displayed at the `Out` output parameter:

- `Out` = 0: Interlock
- `Out` = 1: "Good" state

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Intlk02 block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Dosing (DoseLean) (Page 1819)
- Dosing with PA/FF devices (DoseLean_Fb) (Page 1820)
- Two-speed motor (Motor2Speed) (Page 1821)
- Reversing motor (MotorReversible) (Page 1822)
- Reversing motor with controllable speed (MotorSpeedControlled) (Page 1822)
- Two-way valve (Valve2Way) (Page 1825)
- Motor valve (ValveMotor) (Page 1825)
- Control valve (VlvAnL) (Page 1826)
- Control value for PA/FF devices (ValveAnalog_Fb) (Page 1826)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section Intlk02 I/Os (Page 1215).

Status bit	Parameter
0	1 = `Logic` = OR
1	1 = `Logic` = AND
2	Not used
3	Result of logic operation `Out.Value`
4	1 = At least one input value is excluded. See the section Excluding input values in Intlk02 functions (Page 1210).
5	1 = All input values are excluded
6	1 = No input value is interconnected or `NotUsed.Value`
7 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`In01.Value`
1	`In02.Value`
2 - 31	Not used

Status word allocation for `Status3` parameter

Status bit	Parameter
0	`InvIn01`
1	`InvIn02`
2 - 31	Not used

Status word allocation for `Status4` parameter

Status bit	Parameter
0	`In01` with inversion
1	`In02` with inversion
2 - 31	Not used

Status word allocation for `Status5` parameter

Status bit	Parameter
0	`BypIn01`
1	`BypIn02`
2 - 31	Not used

Status word allocation for `Status6` parameter

Status bit	Parameter
0	`In01` not connected
1	`In02` not connected
2 - 31	Not used

Status word allocation for `Status7` parameter

Status bit	Parameter
0	`AV01` not connected
1	`AV02` not connected
2 - 31	Not used

Status word allocation for `Status8` parameter

Identical to `FirstIn`.

See also

Intlk02 messaging (Page 1214)

Intlk02 block diagram (Page 1217)

Intlk02 error handling (Page 1213)

Intlk02 modes (Page 1210)

7.1.2 Intlk02 modes

Intlk02 modes

This block does not have any modes.

See also

Intlk02 block diagram (Page 1217)

Intlk02 I/Os (Page 1215)

Intlk02 messaging (Page 1214)

Intlk02 error handling (Page 1213)

Intlk02 functions (Page 1210)

Description of Intlk02 (Page 1207)

7.1.3 Intlk02 functions

Functions of Intlk02

The functions for this block are listed below.

Logic operators

Use the `Logic` input to specify the logic operator that the block should employ when determining the interlock state. Make the following settings:

- `Logic` = 0: OR
- `Logic` = 1: AND

Inversion of logic signals

You can invert the input signals by setting the input parameter `InvInx` for the input concerned to `Inx` = 1, e.g. for input `In01` set the I/O `InvIn01`.

The inversion is displayed in the faceplate. If you invert signals using any other method, this is not shown in the faceplate.

Bypass

Note

Bypassing the interlock means that the interlock signal (input signal) is excluded from the logic of the interlock block, in other words, this signal is ignored in the logic operation.

This function can only be executed in the faceplate with "high-level operator control permission".

You can exclude input signals that are temporarily not to be used for the calculation in the block by setting the corresponding I/O `BypInx` = 1. The I/O is shown in the faceplate by the following icon:

Special situation: If all input parameters are excluded, the output value is defined using the `DefaultOut` parameter.

Handling non-connected inputs

Inputs which are not interconnected are not evaluated. They are not displayed in the faceplate either.

Special situation: If no inputs are connected, the output value is defined using the `DefaultOut` parameter. The signal status is set to "Simulation".

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165). However only one additional faceplate can be called up using `SelFp1 = 1`.

Recording the first signal for interlock blocks

This block provides the standard function Recording the first signal for interlock blocks (Page 42). Note that a signal status change only has an effect on the acquisition of the first signal when the `Feature` Bit Evaluation of signal status (Page 119) and the input FirstInEn is set.

Note

This function can only be executed in the faceplate with "process control" operator control permission.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for interlock blocks (Page 100).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `Out.ST`

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can exclude values
1	1 = Operator can reset the exclusion of input values
2	1 = Operator can reset the recording of the first signal
3 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
23	Evaluation of signal status (Page 119)
24	Activating local operating permission (Page 130)
31	Activating recording of the first signal (Page 125)

See also

Description of Intlk02 (Page 1207)

Intlk02 messaging (Page 1214)

Intlk02 I/Os (Page 1215)

Intlk02 block diagram (Page 1217)

Intlk02 error handling (Page 1213)

Intlk02 modes (Page 1210)

7.1.4 Intlk02 error handling

Error handling of Intlk02

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
13	The parameter `Logic` has not been set to 0 or 1.

See also

Intlk02 block diagram (Page 1217)
Intlk02 I/Os (Page 1215)
Intlk02 messaging (Page 1214)
Intlk02 functions (Page 1210)
Intlk02 modes (Page 1210)
Description of Intlk02 (Page 1207)

7.1.5 Intlk02 messaging

Messaging

This block does not offer messaging.

See also

Description of Intlk02 (Page 1207)
Intlk02 functions (Page 1210)
Intlk02 I/Os (Page 1215)
Intlk02 block diagram (Page 1217)
Intlk02 error handling (Page 1213)
Intlk02 modes (Page 1210)

7.1.6 Intlk02 I/Os

I/Os of Intlk02

Input parameters

Parameter	Description	Type	Default
AV01	Analog value of In01	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
AV02	Analog value of In02	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
AV01_Unit	Unit of measure for AV01	INT	0
AV02_Unit	Unit of measure for AV02	INT	0
BypIn01*	1 = Input In01 is not used	BOOL	0
BypIn02*	1 = Input In02 is not used	BOOL	0
DefaultOut	Output value for cases where all inputs are excluded or not interconnected. Refer to the Intlk02 functions (Page 1210) section of the block.	BOOL	1
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1210)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
FirstInEn	Recording the first signal	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In01	Input In01	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In02	Input In02	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
InvIn01	Invert input In01	BOOL	0
InvIn02	Invert input In02	BOOL	0
Logic	Logical operation: 0 = Logical OR 1 = Logical AND	INT	0

Parameter	Description	Type	Default
NotUsed	1 = Block is not used (only for display in the faceplate)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OS_Perm	I/O for operator control permissions (Page 1210)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
RstBypOp*	1 = Reset via BypIn01and BypIn02	BOOL	0
RstLi	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
SelFp1	Call a block saved in this parameter as additional faceplate (Page 165) in the standard view	ANY	-
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Data type	Default
BypAct	1 = Bypass active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Intlk02 error handling (Page 1213).	INT	-1
FirstIn	Bit-coded number of the first signal that has resulted in a change at the output	DWORD	16#00000000
OpSt_Out	Value of the OpSt_In input parameter for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF

Parameter	Description	Data type	Default
Out	Output	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1207)	DWORD	16#00000000
Status2	Status word 2 (Page 1207)	DWORD	16#00000000
Status3	Status word 3 (Page 1207)	DWORD	16#00000000
Status4	Status word 4 (Page 1207)	DWORD	16#00000000
Status5	Status word 5 (Page 1207)	DWORD	16#00000000
Status6	Status word 6 (Page 1207)	DWORD	16#00000000
Status7	Status word 7 (Page 1207)	DWORD	16#00000000
Status8	Status word 8 (Page 1207)	DWORD	16#00000000

See also

Intlk02 messaging (Page 1214)

Intlk02 block diagram (Page 1217)

Intlk02 modes (Page 1210)

7.1.7 Intlk02 block diagram

Intlk02 block diagram

A block diagram is not provided for this block.

See also

Intlk02 I/Os (Page 1215)

Intlk02 messaging (Page 1214)

Intlk02 error handling (Page 1213)

Intlk02 functions (Page 1210)

Intlk02 modes (Page 1210)

Description of Intlk02 (Page 1207)

7.1.8 Operator control and monitoring

7.1.8.1 Interlock block views

Views of the blocks Intlk02, Intlk04, Intlk08, Intlk16

The blocks provide the following views:

- Interlock blocks standard view (Page 228)
- Preview of interlock blocks (Page 248)
- Block icon for interlock blocks (Page 196)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

7.2 Intlk04 - Interlock display with 4 input signals

7.2.1 Description of Intlk04

Object name (type + number) and family

Type + number: FB 1825

Family: Interlck

Area of application for Intlk04

The block is used for the following applications:

- Standardized interlock with display

How it works

The block is used to calculate a standardized interlock that can be displayed on the OS. A maximum of 4 input signals can be supplied to the block. They are linked using selectable binary logic. The signal status of the output signal is also determined. You can assign an analog value with the signal status and unit to each input value for display in the faceplate.

The current state is displayed at the `Out` output parameter:

- `Out` = 0:Interlock
- `Out` = 1: "Good" state

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Intlk02 (Intlk04) block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Refer to Description of Intlk02 (Page 1207) for more information.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section Intlk04 I/Os (Page 1226).

Status bit	Parameter
0	1= `Logic` = OR
1	1 = `Logic` = AND
2	Not used
3	Result of logic operation `Out.Value`
4	1 = At least one input value is excluded. See the section Excluding input values in Intlk04 functions (Page 1222).
5	1 = All input values are connected
6	1 = No input value is interconnected or `NotUsed.Value`
7 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`In01.Value`
1	`In02.Value`
2	`In03.Value`
3	`In04.Value`
4 - 31	Not used

Status word allocation for `Status3` parameter

Status bit	Parameter
0	`InvIn01`
1	`InvIn02`
2	`InvIn03`
3	`InvIn04`
4 - 31	Not used

Status word allocation for `Status4` parameter

Status bit	Parameter
0	`In01` with inversion
1	`In02` with inversion
2	`In03` with inversion
3	`In04` with inversion
4 - 31	Not used

Status word allocation for `Status5` parameter

Status bit	Parameter
0	`BypIn01`
1	`BypIn02`
2	`BypIn03`
3	`BypIn04`
4 - 31	Not used

Status word allocation for `Status6` parameter

Status bit	Parameter
0	`In01` not connected
1	`In02` not connected
2	`In03` not connected
3	`In04` not connected
4 - 31	Not used

Status word allocation for `Status7` parameter

Status bit	Parameter
0	`AV01` not connected
1	`AV02` not connected
2	`AV03` not connected
3	`AV04` not connected
4 - 31	Not used

Status word allocation for `Status8` parameter

Identical to `FirstIn`.

See also

Intlk04 messaging (Page 1225)

Intlk04 block diagram (Page 1229)

Intlk04 error handling (Page 1224)

Intlk04 modes (Page 1221)

7.2.2 Intlk04 modes

Intlk04 modes

This block does not have any modes.

See also

Intlk04 block diagram (Page 1229)

Intlk04 I/Os (Page 1226)

Intlk04 messaging (Page 1225)

Intlk04 error handling (Page 1224)

Intlk04 functions (Page 1222)

Description of Intlk04 (Page 1218)

7.2.3 Intlk04 functions

Functions of Intlk04

The functions for this block are listed below.

Logic operators

Use the `Logic` input to specify the logic operator that the block should employ when determining the interlock state. Make the following settings:

- `Logic` = 0: OR
- `Logic` = 1: AND

Inversion of logic signals

You can invert the input signals by setting the input parameter `InvInx` for the input concerned to `Inx` = 1, e.g. for input `In01` set the I/O `InvIn01`.

The inversion is displayed in the faceplate. If you invert signals using any other method this is not shown in the faceplate.

Bypass

Note

Bypassing the interlock means that the interlock signal (input signal) is excluded from the logic of the interlock block, in other words, this signal is ignored in the logic operation.

This function can only be executed in the faceplate with "high-level operator control permission".

You can exclude input signals that are temporarily not to be used for the calculation in the block by setting the corresponding I/O `BypInx` = 1. The I/O is shown in the faceplate by the following icon:

Special situation: If all input parameters are excluded, the output value is defined using the `DefaultOut` parameter.

Handling non-connected inputs

Inputs which are not interconnected are not evaluated. They are not displayed in the faceplate either.

Special situation: If no inputs are connected, the output value is defined using the `DefaultOut` parameter. The signal status is set to "Simulation".

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165). However only one additional faceplate can be called up using `SelFp1` = 1.

Recording the first signal for interlock blocks

This block provides the standard function Recording the first signal for interlock blocks (Page 42). Note that a signal status change only has an effect on the acquisition of the first signal when the `Feature` Bit Evaluation of signal status (Page 119) and the input FirstInEn is set.

Note

This function can only be executed in the faceplate with "process control" operator control permission.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for interlock blocks (Page 100).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `Out.ST`

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can exclude values
1	1 = Operator can reset the exclusion of input values
2	1 = Operator can reset the recording of the first signal
3 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
23	Evaluation of signal status (Page 119)
24	Activating local operating permission (Page 130)
31	Activating recording of the first signal (Page 125)

See also

Description of Intlk04 (Page 1218)

Intlk04 messaging (Page 1225)

Intlk04 I/Os (Page 1226)

Intlk04 block diagram (Page 1229)

Intlk04 error handling (Page 1224)

Intlk04 modes (Page 1221)

7.2.4 Intlk04 error handling

Error handling of Intlk04

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
13	The parameter `Logic` has not been set to 0 or 1.

See also

Intlk04 block diagram (Page 1229)
Intlk04 I/Os (Page 1226)
Intlk04 messaging (Page 1225)
Description of Intlk04 (Page 1218)
Intlk04 modes (Page 1221)
Intlk04 functions (Page 1222)

7.2.5 Intlk04 messaging

Messaging

This block does not offer messaging.

See also

Description of Intlk04 (Page 1218)
Intlk04 functions (Page 1222)
Intlk04 I/Os (Page 1226)
Intlk04 block diagram (Page 1229)
Intlk04 error handling (Page 1224)
Intlk04 modes (Page 1221)

7.2.6 Intlk04 I/Os

I/Os of Intlk04

Input parameters

Parameter	Description	Type	Default
AV01	Analog value of In01	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
AV02	Analog value of In02	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
AV03	Analog value of In03	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
AV04	Analog value of In04	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
AV01_Unit	Unit of measure for AV01	INT	0
AV02_Unit	Unit of measure for AV02	INT	0
AV03_Unit	Unit of measure for AV03	INT	0
AV04_Unit	Unit of measure for AV04	INT	0
BypIn01*	1 = Input In01 is not used	BOOL	0
BypIn02*	1 = Input In02 is not used	BOOL	0
BypIn03*	1 = Input In03 is not used	BOOL	0
BypIn04*	1 = Input In04 is not used	BOOL	0
DefaultOut	Output value for the case that all inputs are excluded or not connected. Refer to the section Intlk04 functions (Page 1222) of the block.	BOOL	1
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1222)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
FirstInEn	Recording the first signal	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF

Parameter	Description	Type	Default
In01	Input In01	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In02	Input In02	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In03	Input In03	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In04	Input In04	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
InvIn01	Invert input In01	BOOL	0
InvIn02	Invert input In02	BOOL	0
InvIn03	Invert input In03	BOOL	0
InvIn04	Invert input In04	BOOL	0
Logic	Logical operation: 0 = Logical OR 1 = Logical AND	INT	0
NotUsed	1 = Block is not used (only for display in the faceplate)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 1222)	STRUCT • Bit 0: BOOL • .... • Bit 31: BOOL	- • 1 • 1 • 1
RstBypOp*	1 = Reset inputs BypIn01 to BypIn04	BOOL	0
RstLi	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
BypAct	1 = Bypass active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Intlk04 error handling (Page 1224)	INT	-1
FirstIn	Bit-coded number of the first signal that has resulted in a change at the output	DWORD	16#00000000
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
Out	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1218)	DWORD	16#00000000
Status2	Status word 2 (Page 1218)	DWORD	16#00000000
Status3	Status word 3 (Page 1218)	DWORD	16#00000000
Status4	Status word 4 (Page 1218)	DWORD	16#00000000
Status5	Status word 5 (Page 1218)	DWORD	16#00000000
Status6	Status word 6 (Page 1218)	DWORD	16#00000000
Status7	Status word 7 (Page 1218)	DWORD	16#00000000
Status8	Status word 8 (Page 1218)	DWORD	16#00000000

See also

Intlk04 messaging (Page 1225)

Intlk04 block diagram (Page 1229)

Intlk04 modes (Page 1221)

7.2.7 Intlk04 block diagram

Intlk04 block diagram

A block diagram is not provided for this block.

See also

Intlk04 I/Os (Page 1226)

Intlk04 messaging (Page 1225)

Intlk04 error handling (Page 1224)

Intlk04 functions (Page 1222)

Intlk04 modes (Page 1221)

Description of Intlk04 (Page 1218)

7.2.8 Operator control and monitoring

7.2.8.1 Interlock block views

Views of the blocks Intlk02, Intlk04, Intlk08, Intlk16

The blocks provide the following views:

- Interlock blocks standard view (Page 228)
- Preview of interlock blocks (Page 248)
- Block icon for interlock blocks (Page 196)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

7.3 Intlk08 - Interlock display with 8 input signals

7.3.1 Description of Intlk08

Object name (type + number) and family

Type + number: FB 1826

Family: Interlck

Area of application of Intlk08

The block is used for the following applications:

- Standardized interlock with display

How it works

The block is used to calculate a standardized interlock that can be displayed on the OS. A maximum of 8 input signals can be supplied to the block. They are linked using selectable binary logic. The signal status of the output signal is also determined. You can assign an analog value with the signal status and unit to each input value for display in the faceplate.

The current state is displayed at the `Out` output parameter:

- `Out` = 0:Interlock
- `Out` = 1: "Good" state

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Intlk02 (Intlk08) block, the Advanced Process Library contains process tag type templates; these serve as examples by providing various application scenarios for this block.

Refer to Description of Intlk02 (Page 1207) for more information.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section Intlk08 I/Os (Page 1237).

Status bit	Parameter
0	1 = `Logic` = OR
1	1 = `Logic` = AND
2	Not used
3	Result of logic operation `Out.Value`
4	1 = At least one input value is excluded. See the section Excluding input values in Intlk08 functions (Page 1233).
5	1 = All input values are excluded
6	1 = No input value is interconnected or `NotUsed.Value`
7 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`In01.Value`
1	`In02.Value`
2	`In03.Value`
3	`In04.Value`
4	`In05.Value`
5	`In06.Value`
6	`In07.Value`
7	`In08.Value`
8 - 31	Not used

Status word allocation for `Status3` parameter

Status bit	Parameter
0	`InvIn01`
1	`InvIn02`
2	`InvIn03`
3	`InvIn04`
4	`InvIn05`
5	`InvIn06`
6	`InvIn07`
7	`InvIn08`
8 - 31	Not used

Status word allocation for `Status4` parameter

Status bit	Parameter
0	`In01` with inversion
1	`In02` with inversion
2	`In03` with inversion
3	`In04` with inversion
4	`In05` with inversion
5	`In06` with inversion
6	`In07` with inversion
7	`In08` with inversion
8 - 31	Not used

Status word allocation for `Status5` parameter

Status bit	Parameter
0	`BypIn01`
1	`BypIn02`
2	`BypIn03`
3	`BypIn04`
4	`BypIn05`
5	`BypIn06`
6	`BypIn07`
7	`BypIn08`
8 - 31	Not used

Status word allocation for `Status6` parameter

Status bit	Parameter
0	`In01` not connected
1	`In02` not connected
2	`In03` not connected
3	`In04` not connected
4	`In05` not connected
5	`In06` not connected
6	`In07` not connected
7	`In08` not connected
8 - 31	Not used

Status word allocation for `Status7` parameter

Status bit	Parameter
0	`AV01` not connected
1	`AV02` not connected
2	`AV03` not connected
3	`AV04` not connected
4	`AV05` not connected
5	`AV06` not connected
6	`AV07` not connected
7	`AV08` not connected
8 - 31	Not used

Status word allocation for `Status8` parameter

Identical to `FirstIn`.

See also

Intlk08 messaging (Page 1237)
Intlk08 block diagram (Page 1241)
Intlk08 error handling (Page 1236)
Intlk08 modes (Page 1233)

7.3.2 Intlk08 modes

Intlk08 modes

This block does not have any modes.

See also

Intlk08 block diagram (Page 1241)
Intlk08 I/Os (Page 1237)
Intlk08 messaging (Page 1237)
Intlk08 error handling (Page 1236)
Intlk08 functions (Page 1233)
Description of Intlk08 (Page 1229)

7.3.3 Intlk08 functions

Functions of Intlk08

The functions for this block are listed below.

Logic operators

Use the `Logic` input to specify the logic operator that the block should employ when determining the interlock state. Make the following settings:

- `Logic` = 0: OR
- `Logic` = 1: AND

Inversion of logic signals

You can invert the input signals by setting the input parameter `InvInx` for the input concerned to `Inx` = 1 , e.g. for input `In01` set the I/O `InvIn01`.

The inversion is displayed in the faceplate. If you invert signals using any other method, this is not shown in the faceplate.

Bypass

Note

Bypassing the interlock means that the interlock signal (input signal) is excluded from the logic of the interlock block, in other words, this signal is ignored in the logic operation.

This function can only be executed in the faceplate with "high-level operator control permission".

You can exclude input signals that are temporarily not to be used for the calculation in the block by setting the corresponding I/O `BypInx` = 1. The I/O is shown in the faceplate by the following icon:

Special situation: If all input parameters are excluded, the output value is defined using the `DefaultOut` parameter.

Handling non-connected inputs

Inputs which are not interconnected are not evaluated. They are not displayed in the faceplate either.

Special situation: If no inputs are connected, the output value is defined using the `DefaultOut` parameter. The signal status is set to "Simulation".

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165). However only one additional faceplate can be called up using `SelFp1` = 1 .

Recording the first signal for interlock blocks

This block provides the standard function Recording the first signal for interlock blocks (Page 42). Note that a signal status change only has an effect on the acquisition of the first signal when the `Feature` Bit Evaluation of signal status (Page 119) and the input FirstInEn is set.

Note

This function can only be executed in the faceplate with "process control" operator control permission.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for interlock blocks (Page 100).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `Out.ST`

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can exclude values
1	1 = Operator can reset the exclusion of input values
2	1 = Operator can reset the recording of the first signal
3 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
23	Evaluation of signal status (Page 119)
24	Activating local operating permission (Page 130)
31	Activating recording of the first signal (Page 125)

See also

Description of Intlk08 (Page 1229)

Intlk08 messaging (Page 1237)

Intlk08 I/Os (Page 1237)

Intlk08 block diagram (Page 1241)

Intlk08 error handling (Page 1236)

Intlk08 modes (Page 1233)

7.3.4 Intlk08 error handling

Error handling of Intlk08

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	No active fault
13	The parameter `Logic` has not been set to 0 or 1

See also

Intlk08 block diagram (Page 1241)
Intlk08 I/Os (Page 1237)
Intlk08 messaging (Page 1237)
Intlk08 functions (Page 1233)
Intlk08 modes (Page 1233)
Description of Intlk08 (Page 1229)

7.3.5 Intlk08 messaging

Messaging

This block does not offer messaging.

See also

Description of Intlk08 (Page 1229)
Intlk08 functions (Page 1233)
Intlk08 I/Os (Page 1237)
Intlk08 block diagram (Page 1241)
Intlk08 error handling (Page 1236)
Intlk08 modes (Page 1233)

7.3.6 Intlk08 I/Os

I/Os of Intlk08

Input parameters

Parameter	Description	Type	Default
AV01	Analog value of In01	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV02	Analog value of In02	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF

Parameter	Description	Type	Default
AV03	Analog value of In03	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV04	Analog value of In04	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV05	Analog value of In05	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV06	Analog value of In06	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV07	Analog value of In07	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV08	Analog value of In08	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV01_Unit	Unit of measure for AV01	INT	0
AV02_Unit	Unit of measure for AV02	INT	0
AV03_Unit	Unit of measure for AV03	INT	0
AV04_Unit	Unit of measure for AV04	INT	0
AV05_Unit	Unit of measure for AV05	INT	0
AV06_Unit	Unit of measure for AV06	INT	0
AV07_Unit	Unit of measure for AV07	INT	0
AV08_Unit	Unit of measure for AV08	INT	0
BypIn01*	1 = Input In01 is not used	BOOL	0
BypIn02*	1 = Input In02 is not used	BOOL	0
BypIn03*	1 = Input In03 is not used	BOOL	0
BypIn04*	1 = Input In04 is not used	BOOL	0
BypIn05*	1 = Input In05 is not used	BOOL	0
BypIn06*	1 = Input In06 is not used	BOOL	0
BypIn07*	1 = Input In07 is not used	BOOL	0
BypIn08*	1 = Input In08 is not used	BOOL	0
DefaultOut	Output value for cases where all inputs are excluded or not interconnected. Refer to the block's Intlk08 functions (Page 1233) section.	BOOL	1
EN	1 = Called block will be processed	BOOL	1

Parameter	Description	Type	Default
Feature	I/O for additional functions (Page 1233)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
FirstInEn	Recording the first signal	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In01	Input In01	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In02	Input In02	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In03	Input In03	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In04	Input In04	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In05	Input In05	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In06	Input In06	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In07	Input In07	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In08	Input In08	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
InvIn01	Invert Input In01	BOOL	0
InvIn02	Invert Input In02	BOOL	0
InvIn03	Invert Input In03	BOOL	0
InvIn04	Invert Input In04	BOOL	0
InvIn05	Invert Input In05	BOOL	0
InvIn06	Invert Input In06	BOOL	0
InvIn07	Invert Input In07	BOOL	0

Parameter	Description	Type	Default
InvIn08	Invert Input In08	BOOL	0
Logic	Logical operation: 0 = Logical OR 1 = Logical AND	INT	0
NotUsed	1 = Block is not used (only for display in the faceplate)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 1233)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
RstBypOp*	1 = Reset inputs BypIn01to BypIn08	BOOL	0
RstLi	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
BypAct	1 = Bypass active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Intlk08 error handling (Page 1236)	INT	-1
FirstIn	Bit-coded number of the first signal that has resulted in a change at the output	DWORD	16#00000000
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF

Parameter	Description	Type	Default
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
Out	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1229)	DWORD	16#00000000
Status2	Status word 2 (Page 1229)	DWORD	16#00000000
Status3	Status word 3 (Page 1229)	DWORD	16#00000000
Status4	Status word 4 (Page 1237)	DWORD	16#00000000
Status5	Status word 5 (Page 1229)	DWORD	16#00000000
Status6	Status word 6 (Page 1229)	DWORD	16#00000000
Status7	Status word 7 (Page 1229)	DWORD	16#00000000
Status8	Status word 8 (Page 1229)	DWORD	16#00000000

See also

Intlk08 block diagram (Page 1241)

Intlk08 modes (Page 1233)

7.3.7 Intlk08 block diagram

Intlk08 block diagram

A block diagram is not provided for this block.

See also

Intlk08 I/Os (Page 1237)

Intlk08 messaging (Page 1237)

Intlk08 error handling (Page 1236)

Intlk08 functions (Page 1233)

Intlk08 modes (Page 1233)

Description of Intlk08 (Page 1229)

7.3.8 Operator control and monitoring

7.3.8.1 Interlock block views

Views of the blocks Intlk02, Intlk04, Intlk08, Intlk16

The blocks provide the following views:

- Interlock blocks standard view (Page 228)
- Preview of interlock blocks (Page 248)
- Block icon for interlock blocks (Page 196)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

7.4 Intlk16 - Interlock display with 16 input signals

7.4.1 Description of Intlk16

Object name (type + number) and family

Type + number: FB 1827

Family: Interlck

Area of application for Intlk16

The block is used for the following applications:

- Standardized interlock with display

How it works

The block is used to calculate a standardized interlock that can be displayed on the OS. A maximum of 16 input signals can be supplied to the block. They are linked using selectable binary logic. The signal status of the output signal is also determined. You can assign an analog value with the signal status and unit to each input value for display in the faceplate.

The current state is displayed at the `Out` output parameter:

- `Out` = 0:Interlock
- `Out` = 1: "Good" state

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Intlk02 (Intlk16) block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Refer to Description of Intlk02 (Page 1207) for more information.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section Intlk16 I/Os (Page 1251).

Status bit	Parameter
0	1 = `Logic` = OR
1	1 = `Logic` = AND
2	Not used
3	Result of logic operation `Out.Value`
4	1 = At least one input value is excluded. See the section Excluding input values in Intlk16 functions (Page 1247).
5	1 = All input values are excluded
6	1 = No input value is interconnected or `NotUsed.Value`
7 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`In01.Value`
1	`In02.Value`
2	`In03.Value`
3	`In04.Value`
4	`In05.Value`
5	`In06.Value`
6	`In07.Value`
7	`In08.Value`
8	`In09.Value`
9	`In10.Value`
10	`In11.Value`
11	`In12.Value`
12	`In13.Value`
13	`In14.Value`

Status bit	Parameter
14	`In15.Value`
15	`In16.Value`
16 - 31	Not used

Status word allocation for `Status3` parameter

Status bit	Parameter
0	`InvIn01`
1	`InvIn02`
2	`InvIn03`
3	`InvIn04`
4	`InvIn05`
5	`InvIn06`
6	`InvIn07`
7	`InvIn08`
8	`InvIn09`
9	`InvIn10`
10	`InvIn11`
11	`InvIn12`
12	`InvIn13`
13	`InvIn14`
14	`InvIn15`
15	`InvIn16`
16 - 31	Not used

Status word allocation for `Status4` parameter

Status bit	Parameter
0	`In01` with inversion
1	`In02` with inversion
2	`In03` with inversion
3	`In04` with inversion
4	`In05` with inversion
5	`In06` with inversion
6	`In07` with inversion
7	`In08` with inversion
8	`In09` with inversion
9	`In10` with inversion
10	`In11` with inversion
11	`In12` with inversion

Status bit	Parameter
12	`In13` with inversion
13	`In14` with inversion
14	`In15` with inversion
15	`In16` with inversion
16 - 31	Not used

Status word allocation for `Status5` parameter

Status bit	Parameter
0	`BypIn01`
1	`BypIn02`
2	`BypIn03`
3	`BypIn04`
4	`BypIn05`
5	`BypIn06`
6	`BypIn07`
7	`BypIn08`
8	`BypIn09`
9	`BypIn10`
10	`BypIn11`
11	`BypIn12`
12	`BypIn13`
13	`BypIn14`
14	`BypIn15`
15	`BypIn16`
16 - 31	Not used

Status word allocation for `Status6` parameter

Status bit	Parameter
0	`In01` not connected
1	`In02` not connected
2	`In03` not connected
3	`In04` not connected
4	`In05` not connected
5	`In06` not connected
6	`In07` not connected
7	`In08` not connected
8	`In09` not connected
9	`In10` not connected

Status bit	Parameter
10	`In11` not connected
11	`In12` not connected
12	`In13` not connected
13	`In14` not connected
14	`In15` not connected
15	`In16` not connected
16 - 31	Not used

Status word allocation for `Status7` parameter

Status bit	Parameter
0	`AV01` not connected
1	`AV02` not connected
2	`AV03` not connected
3	`Av04` not connected
4	`AV05` not connected
5	`AV06` not connected
6	`AV07` not connected
7	`AV08` not connected
8	`AV09` not connected
9	`AV10` not connected
10	`AV11` not connected
11	`AV12` not connected
12	`AV13` not connected
13	`AV14` not connected
14	`AV15` not connected
15	`AV16` not connected
16 - 31	Not used

Status word allocation for `Status8` parameter

Identical to `FirstIn`.

See also

Intlk16 block diagram (Page 1257)

Intlk16 error handling (Page 1250)

Intlk16 modes (Page 1247)

Intlk16 messaging (Page 1250)

7.4.2 Intlk16 modes

Intlk16 modes

This block does not have any modes.

See also

Intlk16 block diagram (Page 1257)

Intlk16 I/Os (Page 1251)

Intlk16 messaging (Page 1250)

Intlk16 functions (Page 1247)

Intlk16 error handling (Page 1250)

Description of Intlk16 (Page 1242)

7.4.3 Intlk16 functions

Functions of Intlk16

The functions for this block are listed below.

Logic operators

Use the `Logic` input to specify the logic operator that the block should employ when determining the interlock state. Make the following settings:

- `Logic` = 0: OR
- `Logic` = 1: AND

Inversion of logic signals

You can invert the input signals by setting the input parameter `InvInx` for the input concerned to `Inx` = 1, e.g. for input `In01` set the I/O `InvIn01`.

The inversion is displayed in the faceplate. If you invert signals using any other method, this is not shown in the faceplate.

Bypass

Note

Bypassing the interlock means that the interlock signal (input signal) is excluded from the logic of the interlock block, in other words, this signal is ignored in the logic operation.

This function can only be executed in the faceplate with "high-level operator control permission".

You can exclude input signals that are temporarily not to be used for the calculation in the block by setting the corresponding I/O `BypInx` = 1. The I/O is shown in the faceplate by the following icon:

Special situation: If all input parameters are excluded, the output value is defined using the `DefaultOut` parameter.

Handling non-connected inputs

Inputs which are not interconnected are not evaluated. They are not displayed in the faceplate either.

Special situation: If no inputs are connected, the output value is defined using the `DefaultOut` parameter. The signal status is set to "Simulation".

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165). However only one additional faceplate can be called up using `SelFp1` = 1 .

Recording the first signal for interlock blocks

This block provides the standard function Recording the first signal for interlock blocks (Page 42). Note that a signal status change only has an effect on the acquisition of the first signal when the `Feature` Bit Evaluation of signal status (Page 119) and the input FirstInEn is set.

Note

This function can only be executed in the faceplate with "process control" operator control permission.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for interlock blocks (Page 100).

The worst signal status `ST_Worst` for the block is formed from the following parameter:

- `OUT.ST`

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	1 = Operator can exclude values
1	1 = Operator can reset the exclusion of input values
2	1 = Operator can reset the recording of the first signal
3 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
23	Evaluation of signal status (Page 119)
24	Activating local operating permission (Page 130)
31	Activating recording of the first signal (Page 125)

See also

Intlk16 block diagram (Page 1257)

Intlk16 error handling (Page 1250)

Intlk16 modes (Page 1247)

Description of Intlk16 (Page 1242)

Intlk16 I/Os (Page 1251)

Intlk16 messaging (Page 1250)

7.4.4 Intlk16 error handling

Error handling of Intlk16

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
13	The parameter `Logic` has not been set to 0 or 1.

See also

Intlk16 block diagram (Page 1257)

Intlk16 I/Os (Page 1251)

Intlk16 messaging (Page 1250)

Intlk16 functions (Page 1247)

Intlk16 modes (Page 1247)

Description of Intlk16 (Page 1242)

7.4.5 Intlk16 messaging

Messaging

This block does not offer messaging.

See also

Intlk16 block diagram (Page 1257)

Intlk16 error handling (Page 1250)

Intlk16 modes (Page 1247)

Description of Intlk16 (Page 1242)

Intlk16 I/Os (Page 1251)

Intlk16 functions (Page 1247)

7.4.6 Intlk16 I/Os

I/Os of Intlk16

Input parameters

Parameter	Description	Type	Default
AV01	Analog value of In01	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV02	Analog value of In02	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV03	Analog value of In03	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV04	Analog value of In04	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV05	Analog value of In05	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV06	Analog value of In06	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV07	Analog value of In07	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV08	Analog value of In08	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV09	Analog value of In09	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV10	Analog value of In10	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF

Parameter	Description	Type	Default
AV11	Analog value of In11	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV12	Analog value of In12	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV13	Analog value of In13	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV14	Analog value of In14	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV15	Analog value of In15	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV16	Analog value of In16	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV01_Unit	Unit of measure for AV01	INT	0
AV02_Unit	Unit of measure for AV02	INT	0
AV03_Unit	Unit of measure for AV03	INT	0
AV04_Unit	Unit of measure for AV04	INT	0
AV05_Unit	Unit of measure for AV05	INT	0
AV06_Unit	Unit of measure for AV06	INT	0
AV07_Unit	Unit of measure for AV07	INT	0
AV08_Unit	Unit of measure for AV08	INT	0
AV09_Unit	Unit of measure for AV09	INT	0
AV10_Unit	Unit of measure for AV10	INT	0
AV11_Unit	Unit of measure for AV11	INT	0
AV12_Unit	Unit of measure for AV12	INT	0
AV13_Unit	Unit of measure for AV13	INT	0
AV14_Unit	Unit of measure for AV14	INT	0
AV15_Unit	Unit of measure for AV15	INT	0
AV16_Unit	Unit of measure for AV16	INT	0
BypIn01*	1 = Input In01 is not used	BOOL	0
BypIn02*	1 = Input In02 is not used	BOOL	0
BypIn03*	1 = Input In03 is not used	BOOL	0
BypIn04*	1 = Input In04 is not used	BOOL	0
BypIn05*	1 = Input In05 is not used	BOOL	0

Parameter	Description	Type	Default
BypIn06*	1 = Input In06 is not used	BOOL	0
BypIn07*	1 = Input In07 is not used	BOOL	0
BypIn08*	1 = Input In08 is not used	BOOL	0
BypIn09*	1 = Input In09 is not used	BOOL	0
BypIn10*	1 = Input In10 is not used	BOOL	0
BypIn11*	1 = Input In11 is not used	BOOL	0
BypIn12*	1 = Input In12 is not used	BOOL	0
BypIn13*	1 = Input In13 is not used	BOOL	0
BypIn14*	1 = Input In14 is not used	BOOL	0
BypIn15*	1 = Input In15 is not used	BOOL	0
BypIn16*	1 = Input In16 is not used	BOOL	0
DefaultOut	Output value for cases where all inputs are excluded or not interconnected. Refer to the block's Intlk16 functions (Page 1247) section.	BOOL	1
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1247)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
FirstInEn	Recording the first signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In01	Input In01	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In02	Input In02	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In03	Input In03	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In04	Input In04	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In05	Input In05	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF

Parameter	Description	Type	Default
In06	Input In06	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In07	Input In07	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In08	Input In08	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In09	Input In09	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In10	Input In10	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In11	Input In11	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In12	Input In12	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In13	Input In13	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In14	Input In14	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In15	Input In15	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In16	Input In16	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
InvIn01	Invert input In01	BOOL	0
InvIn02	Invert input In02	BOOL	0
InvIn03	Invert input In03	BOOL	0
InvIn04	Invert input In04	BOOL	0
InvIn05	Invert input In05	BOOL	0

Parameter	Description	Type	Default
InvIn06	Invert input In06	BOOL	0
InvIn07	Invert input In07	BOOL	0
InvIn08	Invert input In08	BOOL	0
InvIn09	Invert input In09	BOOL	0
InvIn10	Invert input In10	BOOL	0
InvIn11	Invert input In11	BOOL	0
InvIn12	Invert input In12	BOOL	0
InvIn13	Invert input In13	BOOL	0
InvIn14	Invert input In14	BOOL	0
InvIn15	Invert input In15	BOOL	0
InvIn16	Invert input In16	BOOL	0
Logic	Logical operation: 0 = Logical OR 1 = Logical AND	INT	0
NotUsed	1 = Block is not used (only for display in the faceplate)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 1247)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
RstBypOp*	1 = Reset inputs BypIn01 to BypIn16	BOOL	0
RstLi	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset via operator	BOOL	0
SelFp1	Call a block saved in this parameter as Opening additional faceplates (Page 165) in standard view	ANY	-
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
BypAct	1 = Bypass active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Intlk16 error handling (Page 1250)	INT	-1
FirstIn	Bit-coded number of the first signal that has resulted in a change at the output	DWORD	16#00000000
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Prem with settings changed by the block algorithm	DWORD	16#FFFFFFFF
Out	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1242)	DWORD	16#00000000
Status2	Status word 2 (Page 1242)	DWORD	16#00000000
Status3	Status word 3 (Page 1242)	DWORD	16#00000000
Status4	Status word 4 (Page 1242)	DWORD	16#00000000
Status5	Status word 5 (Page 1242)	DWORD	16#00000000
Status6	Status word 6 (Page 1242)	DWORD	16#00000000
Status7	Status word 7 (Page 1242)	DWORD	16#00000000
Status8	Status word 8 (Page 1242)	DWORD	16#00000000

See also

Intlk16 block diagram (Page 1257)

Intlk16 modes (Page 1247)

Intlk16 messaging (Page 1250)

7.4.7 Intlk16 block diagram

Intlk16 block diagram

A block diagram is not provided for this block.

See also

Intlk16 I/Os (Page 1251)

Intlk16 messaging (Page 1250)

Intlk16 functions (Page 1247)

Intlk16 error handling (Page 1250)

Intlk16 modes (Page 1247)

Description of Intlk16 (Page 1242)

7.4.8 Operator control and monitoring

7.4.8.1 Interlock block views

Views of the blocks Intlk02, Intlk04, Intlk08, Intlk16

The blocks provide the following views:

- Interlock blocks standard view (Page 228)
- Preview of interlock blocks (Page 248)
- Block icon for interlock blocks (Page 196)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

Message blocks

8

8.1 Event - Creating messages

8.1.1 Description of Event

Object name (type + number) and family

Type + number: FB 1811

Family: Report

Area of application for Event

The block is used for the following applications:

- Generation of messages requiring acknowledgment

How it works

The block is used to simultaneously output up to eight different messages that require acknowledgment.

The individual messages are assigned to the monitored signals via the inputs and the messages released or blocked depending on the process status data. If a change is made to one or more of the monitored signals enabled for reporting, a message is output.

The signals to be monitored are interconnected with inputs `In1` ... `In8`. Each `Inx` signal can also be inverted via input `InvInx`. A message is output if a signal value is changed (but taking inversion into account).

Each input is assigned a separate message text. A message received at input `In5`, for example, is output with the message text for the SIG 5 signal.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Further addressing is not required.

Startup characteristics

During startup, the message block suppresses all messages. The duration (number of cycles) of message suppression is set at the `RunUpCyc` parameter. During restart (OB100) an internal counter that is initialized with this value decrements each time the block is executed. Messages are not generated if the counter value does not equal zero.

Messages whose alarm delay has not elapsed during this period are then output.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section Event I/Os (Page 1268).

Status bit	Parameter
0	`In1.Value`
1	`In2.Value`
2	`In3.Value`
3	`In4.Value`
4	`In5.Value`
5	`In6.Value`
6	`In7.Value`
7	`In8.Value`
8	`InvIn1`
9	`InvIn2`
10	`InvIn3`
11	`InvIn4`
12	`InvIn5`
13	`InvIn6`
14	`InvIn7`
15	`InvIn8`
16	`In1` with inversion
17	`In2` with inversion
18	`In3` with inversion
19	`In4` with inversion
20	`In5` with inversion
21	`In6` with inversion
22	`In7` with inversion
23	`In8` with inversion
24	`In1` not connected
25	`In2` not connected
26	`In3` not connected
27	`In4` not connected
28	`In5` not connected
29	`In6` not connected

Status bit	Parameter
30	`In7` not connected
31	`In8` not connected

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`In1MsgEn`
1	`In2MsgEn`
2	`In3MsgEn`
3	`In4MsgEn`
4	`In5MsgEn`
5	`In6MsgEn`
6	`In7MsgEn`
7	`In8MsgEn`
8	`AV1` not connected
9	`AV2` not connected
10	`AV3` not connected
11	`AV4` not connected
12	`AV5` not connected
13	`AV6` not connected
14	`AV7` not connected
15	`AV8` not connected
16	Active signal 1 for messages
17	Active signal 2 for messages
18	Active signal 3 for messages
19	Active signal 4 for messages
20	Active signal 5 for messages
21	Active signal 6 for messages
22	Active signal 7 for messages
23	Active signal 8 for messages
24	`MsgLock`
25	`Occupied`
26	`BatchEn`
27	Batch - parameter exists
28 - 31	Not used

See also

Event functions (Page 1262)

Event messaging (Page 1265)

Event block diagram (Page 1272)

Event error handling (Page 1265)

Event modes (Page 1262)

8.1.2 Event modes

Event operating modes

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

You can find general information about the "On" mode in the On (Page 58) section.

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Event block diagram (Page 1272)

Event I/Os (Page 1268)

Event messaging (Page 1265)

Event error handling (Page 1265)

Event functions (Page 1262)

Description of Event (Page 1259)

8.1.3 Event functions

Functions of Event

The functions for this block are listed below.

Activation and deactivation of messages

Set the I/Os `In1MsgEn` to `In8MsgEn` accordingly to activate or deactivate the messages applied to inputs `In1` to `In8`. All messages are activated by default.

To deactivate messages received at I/O `In4`, for example, you set I/O `In4MsgEn` = 0 accordingly.

You can deactivate all messages via I/O `MsgLock` = 1 .

Delay of alarms

You can delay the alarms indicating signal changes.

For incoming alarms (signal change 0 - 1), set the delay at parameter `AlmOnDly`; for outgoing alarms (signal change 1 - 0) set it at parameter `AlmOffDly`.

Enter 0 or a negative value to deactivate the delay.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Operator control permissions

The block has the following Operator control permissions (Page 205) for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4 - 31	Not used

This block does not have a faceplate yet; the operator control permissions have already been assigned in the planning phase for these faceplates.

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
1	Reaction to the out of service mode (Page 148)
8	Reporting with BATCH parameters (Page 129)
22	Update acknowledgment and error status of the message call (Page 135)
27	Selecting values associated with messages (Page 128)

Forming the signal status for blocks

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The block determines the worst signal status via all interconnected binary and analog inputs, and outputs this value at `ST_Worst`.

- `In1`

etc. to

- `In8`
- `AV1`

etc. to

- `AV8`

See also

Description of Event (Page 1259)

Event messaging (Page 1265)

Event I/Os (Page 1268)

Event block diagram (Page 1272)

Event error handling (Page 1265)

Event modes (Page 1262)

8.1.4 Event error handling

Error handling of Event

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.

See also

Event block diagram (Page 1272)

Event I/Os (Page 1268)

Event messaging (Page 1265)

Event functions (Page 1262)

Event modes (Page 1262)

Description of Event (Page 1259)

8.1.5 Event messaging

Messaging

Messages which can be acknowledged are generated using ALARM_8P. The block uses the PMC communication channel and has 8 digital inputs and 8 associated values.

Every edge transition detected for one or more digital inputs results in a message. The associated values are assigned consistently to the message at the time of edge evaluation. All 8 signals are assigned a common message number, which is split at the OS into 8 messages. The Engineering System (ES) assigns the message number automatically by calling the message server.

Process messages

Message instance	Message identifier	Message class	Event
`MsgEvId`	SIG 1	AS process control message - error	Text 1
	SIG 2	AS process control message - error	Text 2
	SIG 3	AS process control message - error	Text 3
	SIG 4	AS process control message - error	Text 4
	SIG 5	AS process control message - error	Text 5
	SIG 6	AS process control message - error	Text 6
	SIG 7	AS process control message - error	Text 7
	SIG 8	AS process control message - error	Text 8

You can change the message class and the event to meet your needs at the block type and/or block instance.

Depending on FeatureBit 27 "Select message associated values", either the signal status or the associated analog value is written as message associated value (FeatureBit 8 = 0).

Associated values for message instance `MsgEvId` (Featurebit 27 = 0)

Associated value	Block parameters
1	`In1.ST`
2	`In2.ST`
3	`In3.ST`
4	`In4.ST`
5	`In5.ST`
6	`In6.ST`
7	`In7.ST`
8	`In8.ST`
9	Not allocated
10	Not allocated

Associated values for message instance `MsgEvId` (Featurebit 27 = 1)

Associated value	Block parameters
1	`AV1.Value`
2	`AV2.Value`
3	`AV3.Value`
4	`AV4.Value`
5	`AV5.Value`
6	`AV6.Value`
7	`AV7.Value`
8	`AV8.Value`
9	Not allocated
10	Not allocated

The batch information is transmitted with FeatureBit 8 =1:

The first three associated values are described as follows and are followed by the signal status of the input signal or the associated analog value, depending on FeatureBit 27 "Selecting message associated values":

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchId
4	In1.ST / AV1.Value
5	In2.ST / AV2.Value
6	In3.ST / AV3.Value
7	In4.ST / AV4.Value
8	In5.ST / AV5.Value
9	In6.ST / AV6.Value
10	In7.ST / AV7.Value

Enter the batch ID @1%s@ under "Properties - Block - Special properties - Messages extended - Message texts block".

See also

Description of Event (Page 1259)
Event functions (Page 1262)
Event I/Os (Page 1268)
Event block diagram (Page 1272)
Event error handling (Page 1265)
Event modes (Page 1262)
Selecting values associated with messages (Page 128)

8.1.6 Event I/Os

I/Os of Event

Input parameters

Parameter	Description	Type	Default
AlmOnDly	Alarm delay time [s] for signal transition 0 → 1	REAL	0.0
AlmOffDly	Alarm delay time [s] for signal transition 1 → 0	REAL	0.0
AV1	Message associated value for In1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV1_Unit	Unit for AV1	INT	0
AV2	Message associated value for In2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV2_Unit	Unit for AV2	INT	0
AV3	Message associated value for In3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV3_Unit	Unit for AV3	INT	0
AV4	Message associated value for In4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV4_Unit	Unit for AV4	INT	0
AV5	Message associated value for In5	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV5_Unit	Unit for AV5	INT	0
AV6	Message associated value for In6	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV6_Unit	Unit for AV6	INT	0
AV7	Message associated value for In7	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV7_Unit	Unit for AV7	INT	0

Parameter	Description	Type	Default
AV8	Message associated value for In8	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
AV8_Unit	Unit for AV8	INT	0
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00
BatchName	Batch name	S7-String	
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1262)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
In1	Input In1	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In1MsgEn	1 = Activate message for input In1	BOOL	1
In2	Input In2	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In2MsgEn	1 = Activate message for input In2	BOOL	1
In3	Input In3	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In3MsgEn	1 = Activate message for input In3	BOOL	1
In4	Input In4	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In4MsgEn	1 = Activate message for input In4	BOOL	1
In5	Input In5	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In5MsgEn	1 = Activate message for input In5	BOOL	1
In6	Input In6	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In6MsgEn	1 = Activate message for input In6	BOOL	1
In7	Input In7	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF

Parameter	Description	Type	Default
In7MsgEn	1 = Activate message for input In7	BOOL	1
In8	Input In8	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In8MsgEn	1 = Activate message for input In8	BOOL	1
InvIn1	1 = Invert input In1	BOOL	0
InvIn2	1 = Invert input In2	BOOL	0
InvIn3	1 = Invert input In3	BOOL	0
InvIn4	1 = Invert input In4	BOOL	0
InvIn5	1 = Invert input In5	BOOL	0
InvIn6	1 = Invert input In6	BOOL	0
InvIn7	1 = Invert input In7	BOOL	0
InvIn8	1 = Invert input In8	BOOL	0
MS_RelOp	1 = Release for maintenance by OS operator	BOOL	0
MsgEvId	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = In use by a batch	BOOL	0
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OS_Perm	I/O for operator control permissions (Page 1262)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
StepNo	Batch step number	DWORD	16#00
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Event error handling (Page 1265)	INT	-1
MsgAckn	Message acknowledgment status (output ACK_STATE of ALARM_8P)	WORD	16#0000
MsgErr	1 = Alarm error (output ERROR of ALARM_8)	BOOL	0
MsgStat	Alarm status (output STATUS of ALARM_8P)	WORD	16#0000
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1259)	DWORD	16#00000000
Status2	Status word 2 (Page 1259)	DWORD	16#00000000

See also

Event messaging (Page 1265)

Event block diagram (Page 1272)

Event modes (Page 1262)

8.1.7 Event block diagram

Event block diagram

A block diagram is not provided for this block.

See also

Event I/Os (Page 1268)
Event messaging (Page 1265)
Event error handling (Page 1265)
Event functions (Page 1262)
Event modes (Page 1262)
Description of Event (Page 1259)

8.2 EventNck - Generating messages without acknowledgment

8.2.1 Description of EventNck

Object name (type + number) and family

Type + number: FB 1904
Family: Report

Area of application for EventNck

The block is used for the following applications:

- Generation of messages not requiring acknowledgment

How it works

The block is used to simultaneously output up to eight different messages that do not require acknowledgment.

The individual messages are assigned to the monitored signals via the inputs and the messages released or blocked depending on the process status data. If a change is made to one or more of the monitored signals enabled for reporting, a message is output.

The signals to be monitored are interconnected with inputs `In1` to `In8`. Each `Inx` signal can also be inverted via input `InvInx`. A message is output if a signal value is changed (but taking inversion into account).

Each input is assigned a separate message text. A message received at input `In5`, for example, is output with the message text for the SIG 5 signal.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Further addressing is not required.

Startup characteristics

During startup, the message block suppresses all messages. The duration (number of cycles) of message suppression is set at the `RunUpCyc` parameter. During restart (OB100) an internal counter that is initialized with this value decrements each time the block is executed. Messages are not generated if the counter value does not equal zero.

Messages whose alarm delay has not elapsed during this period are then output.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section EventNck I/Os (Page 1281).

Status bit	Parameter
0	`In1.Value`
1	`In2.Value`
2	`In3.Value`
3	`In4.Value`
4	`In5.Value`
5	`In6.Value`
6	`In7.Value`
7	`In8.Value`
8	`InvIn1`
9	`InvIn2`
10	`InvIn3`
11	`InvIn4`
12	`InvIn5`

Status bit	Parameter
13	InvIn6
14	InvIn7
15	InvIn8
16	In1 with inversion
17	In2 with inversion
18	In3 with inversion
19	In4 with inversion
20	In5 with inversion
21	In6 with inversion
22	In7 with inversion
23	In8 with inversion
24	In1 not connected
25	In2 not connected
26	In3 not connected
27	In4 not connected
28	In5 not connected
29	In6 not connected
30	In7 not connected
31	In8 not connected

Status word allocation for Status2 parameter

Status bit	Parameter
0	In1MsgEn
1	In2MsgEn
2	In3MsgEn
3	In4MsgEn
4	In5MsgEn
5	In6MsgEn
6	In7MsgEn
7	In8MsgEn
8	AV1 not connected
9	AV2 not connected
10	AV3 not connected
11	AV4 not connected
12	AV5 not connected
13	AV6 not connected
14	AV7 not connected
15	AV8 not connected
16	Active signal 1 for messages
17	Active signal 2 for messages

Status bit	Parameter
18	Active signal 3 for messages
19	Active signal 4 for messages
20	Active signal 5 for messages
21	Active signal 6 for messages
22	Active signal 7 for messages
23	Active signal 8 for messages
24	`MsgLock`
25 - 31	Not used

See also

EventNck modes (Page 1275)
EventNck functions (Page 1276)
EventNck error handling (Page 1278)
EventNck messaging (Page 1279)
EventNck block diagram (Page 1285)

8.2.2 EventNck modes

EventNck modes

The block provides the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of EventNck (Page 1272)
EventNck functions (Page 1276)
EventNck error handling (Page 1278)
EventNck messaging (Page 1279)
EventNck I/Os (Page 1281)
EventNck block diagram (Page 1285)

8.2.3 EventNck functions

Functions of EventNck

The functions for this block are listed below.

Activation and deactivation of messages

Set the I/Os `In1MsgEn` ... `In8MsgEn` accordingly to enable or disable the messages applied to inputs `In1` ... `In8`. All messages are activated by default.

To deactivate messages received at I/O `In4`, for example, you set I/O `In4MsgEn` = 0 accordingly.

You can deactivate all messages via I/O `MsgLock` = 1.

Delay of alarms

You can delay the alarms indicating signal changes.

For incoming alarms (signal change 0 - 1), set the delay at parameter `AlmOnDly`; for outgoing alarms (signal change 1 - 0) set it at parameter `AlmOffDly`.

Enter 0 or a negative value to deactivate the delay.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Operator control permissions

The block has the following Operator control permissions (Page 205) for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4 - 31	Not used

This block does not have a faceplate yet; the operator control permissions have already been assigned in the planning phase for these faceplates.

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Configurable reactions using the parameter `Feature`

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
1	Reaction to the out of service mode (Page 148)
22	Update acknowledgment and error status of the message call (Page 135)
27	Selecting values associated with messages (Page 128)

Forming the signal status for blocks

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The block determines the worst signal status via all interconnected binary and analog inputs, and outputs this value at `ST_Worst`.

- `In1`

etc. to

- `In8`
- `AV1`

etc. to

- `AV8`

See also

Description of EventNck (Page 1272)

EventNck modes (Page 1275)

EventNck error handling (Page 1278)

EventNck messaging (Page 1279)

EventNck I/Os (Page 1281)

EventNck block diagram (Page 1285)

8.2.4 EventNck error handling

Error handling of EventNck

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.

See also

Description of EventNck (Page 1272)

EventNck modes (Page 1275)

EventNck functions (Page 1276)

EventNck messaging (Page 1279)

EventNck I/Os (Page 1281)

EventNck block diagram (Page 1285)

8.2.5 EventNck messaging

Messaging

Messages not requiring acknowledgment are generated with NOTIFY_8P . The block uses the PMC communication channel and has 8 digital inputs and 10 associated values.

Every edge transition detected for one or more digital inputs results in a message. The associated values are assigned consistently to the message at the time of edge evaluation. All 8 signals are assigned a common message number, which is split at the OS into 8 messages. The Engineering System (ES) assigns the message number automatically by calling the message server.

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId	SIG 1	Operating message – without acknowledgment	Text 1
	SIG 2	Operating message – without acknowledgment	Text 2
	SIG 3	Operating message – without acknowledgment	Text 3
	SIG 4	Operating message – without acknowledgment	Text 4
	SIG 5	Operating message – without acknowledgment	Text 5
	SIG 6	Operating message – without acknowledgment	Text 6
	SIG 7	Operating message – without acknowledgment	Text 7
	SIG 8	Operating message – without acknowledgment	Text 8

You can change the message class and the event to meet your needs at the block type and/or block instance.

Associated values for message instance `MsgEvId`

You can use the `Feature` Bit Selecting values associated with messages (Page 128) to define whether the signal status of the signal or the associated analog value is to be used as the associated value for the message.

Associated value	Block parameters
1	`In1.ST`
2	`In2.ST`
3	`In3.ST`
4	`In4.ST`
5	`In5.ST`
6	`In6.ST`
7	`In7.ST`
8	`In8.ST`
9	Not allocated
10	Not allocated

Associated values for message instance `MsgEvId`

Associated value	Block parameters
1	`AV1.Value`
2	`AV2.Value`
3	`AV3.Value`
4	`AV4.Value`
5	`AV5.Value`
6	`AV6.Value`
7	`AV7.Value`
8	`AV8.Value`
9	Not allocated
10	Not allocated

See also

Description of EventNck (Page 1272)

EventNck modes (Page 1275)

EventNck functions (Page 1276)

EventNck error handling (Page 1278)

EventNck I/Os (Page 1281)

EventNck block diagram (Page 1285)

8.2.6 EventNck I/Os

I/Os of EventNck

Input parameters

Parameter	Description	Type	Default
AlmOnDly	Alarm delay time [s] for signal transition 0 → 1	REAL	0.0
AlmOffDly	Alarm delay time [s] for signal transition 1 → 0	REAL	0.0
AV1	Message associated value for In1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV1_Unit	Unit for AV1	INT	0
AV2	Message associated value for In2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV2_Unit	Unit for AV2	INT	0
AV3	Message associated value for In3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV3_Unit	Unit for AV3	INT	0
AV4	Message associated value for In4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV4_Unit	Unit for AV4	INT	0
AV5	Message associated value for In5	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV5_Unit	Unit for AV5	INT	0
AV6	Message associated value for In6	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV6_Unit	Unit for AV6	INT	0
AV7	Message associated value for In7	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
AV7_Unit	Unit for AV7	INT	0

Parameter	Description	Type	Default
AV8	Message associated value for In8	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
AV8_Unit	Unit for AV8	INT	0
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1276)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
In1	Input In1	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In1MsgEn	1 = Activate message for input In1	BOOL	1
In2	Input In2	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In2MsgEn	1 = Activate message for input In2	BOOL	1
In3	Input In3	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In3MsgEn	1 = Activate message for input In3	BOOL	1
In4	Input In4	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In4MsgEn	1 = Activate message for input In4	BOOL	1
In5	Input In5	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In5MsgEn	1 = Activate message for input In5	BOOL	1
In6	Input In6	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In6MsgEn	1 = Activate message for input In6	BOOL	1
In7	Input In7	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In7MsgEn	1 = Activate message for input In7	BOOL	1

Parameter	Description	Type	Default
In8	Input In8	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#FF
In8MsgEn	1 = Activate message for input In8	BOOL	1
InvIn1	1 = Invert input In1	BOOL	0
InvIn2	1 = Invert input In2	BOOL	0
InvIn3	1 = Invert input In3	BOOL	0
InvIn4	1 = Invert input In4	BOOL	0
InvIn5	1 = Invert input In5	BOOL	0
InvIn6	1 = Invert input In6	BOOL	0
InvIn7	1 = Invert input In7	BOOL	0
InvIn8	1 = Invert input In8	BOOL	0
MS_RelOp	1 = Release for maintenance by OS operator	BOOL	0
MsgEvId	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OS_Perm	I/O for operator control permissions (Page 1276)	STRUCT	-
		• Bit 0: BOOL	• 1
		• ...	• 1
		• Bit 31: BOOL	• 1
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see EventNck error handling (Page 1278).	INT	-1
MsgErr	1 = Alarm error (output ERROR of NOTIFY_8P)	BOOL	0
MsgStat	Alarm status (output STATUS of NOTIFY_8P)	WORD	16#0000
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1272)	DWORD	16#00000000
Status2	Status word 2 (Page 1272)	DWORD	16#00000000

See also

EventNck modes (Page 1275)

EventNck messaging (Page 1279)

EventNck block diagram (Page 1285)

Configurable functions with the Feature I/O (Page 131)

8.2.7 EventNck block diagram

EventNck block diagram

A block diagram is not provided for this block.

See also

Description of EventNck (Page 1272)
EventNck modes (Page 1275)
EventNck functions (Page 1276)
EventNck error handling (Page 1278)
EventNck messaging (Page 1279)
EventNck I/Os (Page 1281)

8.3 EventTs - Creating messages with time stamp

8.3.1 Description of EventTs

Object name (type + number) and family

Type + number: FB 1812

Family: Report

Area of application for EventTs

The block is used for the following applications:

- Generating messages which have to be acknowledged for time-stamped signals

How it works

The block must be linked to a channel block and monitors up to eight different binary signals. From these, it generates time-stamped messages requiring acknowledgment that appear in the alarm view of the technologic block to which it is connected.

The individual messages are assigned to the monitored signals via the inputs and the messages released or blocked depending on the process status data. If a change is made to one or more of the monitored signals enabled for reporting, a message is output containing a time stamp for the signal change.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100) and in OB1 because of the time stamp.

In CFC interconnect the `EventTsOut` output parameter of the EventTs block to the `EventTsIn` input parameter of the technologic block.

Depending on how the time stamp is generated, the signals to be monitored for this are interconnected at inputs `In1` ... `In8` or `InTS1` ... `InTS8`. Each `Inx` or `InTSx` signal can also be inverted via input `Invx`. A message is output if a signal value is changed (but taking inversion into account).

Each input is assigned a separate message text. A message received at input `InTS5`, for example, is output with the message text for the SIG 5 signal.

Configuration of the alarms for negative edges 1 → 0 in HW Config only effects the signal inputs `InTS1` ... `InTS8` of EventTs.

If `TimeStrampOn` = 0 , meaning the inputs `In1` ... `In8` are used, you will have to set the input `Invx` = 1 to generate an alarm 1 → 0 at input `Inx` for a negative edge.

Note

Interconnection of the block to multiple technologic blocks is not permitted.

For the EventTs block, the Advanced Process Library contains process tag type templates; these serve as examples by providing various application scenarios for this block.

Examples of process tag types:

- Motor with an additional analog value and time-stamped signals (Motor_AV_EventTs) (Page 1823)

Startup characteristics

During startup, the message block suppresses all messages. The duration (number of cycles) of message suppression is set at the `RunUpCyc` parameter. During restart (OB100) an internal counter that is initialized with this value decrements each time the block is executed. Messages are not generated if the counter value does not equal zero.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section EventTs I/Os (Page 1296).

Status bit	Parameter
0	Active signal 1
1	Active signal 2
2	Active signal 3
3	Active signal 4
4	Active signal 5
5	Active signal 6
6	Active signal 7
7	Active signal 8
8	`InvIn1`
9	`InvIn2`
10	`InvIn3`
11	`InvIn4`
12	`InvIn5`
13	`InvIn6`
14	`InvIn7`
15	`InvIn8`
16	Active signal 1 with inversion
17	Active signal 2 with inversion
18	Active signal 3 with inversion
19	Active signal 4 with inversion
20	Active signal 5 with inversion
21	Active signal 6 with inversion
22	Active signal 7 with inversion
23	Active signal 8 with inversion
24	Active signal 1 not connected
25	Active signal 2 not connected
26	Active signal 3 not connected
27	Active signal 4 not connected
28	Active signal 5 not connected
29	Active signal 6 not connected
30	Active signal 7 not connected
31	Active signal 8 not connected

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`In1MsgEn`
1	`In2MsgEn`
2	`In3MsgEn`
3	`In4MsgEn`
4	`In5MsgEn`
5	`In6MsgEn`
6	`In7MsgEn`
7	`In8MsgEn`
8	Effective signal 1 for message
9	Effective signal 2 for message
10	Effective signal 3 for message
11	Effective signal 4 for message
12	Effective signal 5 for message
13	Effective signal 6 for message
14	Effective signal 7 for message
15	Effective signal 8 for message
16	`MsgLock`
17 - 24	Not used
25	`Occupied`
26	`BatchEn`
27	Batch - parameter exists
28 - 31	Not used

See also

EventTs block diagram (Page 1299)
EventTs messaging (Page 1292)
EventTs error handling (Page 1292)
EventTs functions (Page 1289)
EventTs modes (Page 1289)

8.3.2 EventTs modes

EventTs operating modes

The block provides the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

EventTs block diagram (Page 1299)

EventTs I/Os (Page 1296)

EventTs messaging (Page 1292)

EventTs error handling (Page 1292)

EventTs functions (Page 1289)

Description of EventTs (Page 1285)

8.3.3 EventTs functions

Functions of EventTs

The functions for this block are listed below.

Activation and deactivation of messages

You can set the I/Os `InMsgEn1` ... `InMsgEn8` to individually enable or disable the messages applied to inputs `In1` ... `In8` or `InTS1` ... `InTS8`. All messages are activated by default.

To deactivate messages received at I/O `InTS4`, for example, you set I/O `InMsgEn4` = 0 accordingly.

You can deactivate all messages via I/O `MsgLock` = 1 .

Suppressing messages using the MsgLock parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Time stamp as associated value of a message

You can use input TimeStampOn to select how the time stamp for the signals of EventTs will be generated:

- If you want to use the high-precision time stamp from the I/O devices, set TimeStampOn = 1. Interconnect one of the InTSx inputs with output TS_Out of block Pcs7DiIT.
- If you want to use the time stamp from the CPU, set TimeStampOn = 0. Interconnect one of the Inx inputs with output PV_Out of block Pcs7DiIT or with an appropriate output of a different block.

For additional time stamp properties, refer to the description of the standard function Time stamp (Page 163).

Signal status as associated value of a message

The signal status as an associated value of the message is output for every signal, as is the time stamp.

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Operator control permissions

The block has the following Operator control permissions (Page 205) for the OS_Perm parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4 - 31	Not used

This block does not have a faceplate yet; the operator control permissions have already been assigned in the planning phase for these faceplates.

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Configurable functions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
1	Reaction to the out of service mode (Page 148)
8	Reporting with BATCH parameters (Page 129)
22	Update acknowledgment and error status of the message call (Page 135)

Displaying and outputting the signal status

The block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The block determines the worst signal status via all interconnected binary inputs (according to `TimeStampOn`) and outputs this value at `ST_Worst`.

- `TimeStampOn` = 0
  - `In1`

  etc. to

  - `In8`
- `TimeStampOn` = 1
  - `InTS1`

  etc. to

  - `InTS8`

See also

EventTs block diagram (Page 1299)

EventTs I/Os (Page 1296)

EventTs messaging (Page 1292)

EventTs error handling (Page 1292)

EventTs modes (Page 1289)

Description of EventTs (Page 1285)

8.3.4 EventTs error handling

Error handling of EventTs

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.

See also

EventTs block diagram (Page 1299)

EventTs I/Os (Page 1296)

EventTs messaging (Page 1292)

EventTs functions (Page 1289)

EventTs modes (Page 1289)

Description of EventTs (Page 1285)

8.3.5 EventTs messaging

Messaging

Messages which can be acknowledged are generated using ALARM_8P. The ALARM_8P has 8 digital inputs and 10 associated values. Every edge transition detected for one or more digital inputs results in a message. The associated values are assigned consistently to the message at the time of edge evaluation. All 8 signals are assigned a common message number, which is split at the OS into 8 messages. The Engineering System (ES) assigns the message number automatically by calling the message server.

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ InTS1 Status 16#@1%x@
	SIG 2	AS process control message - fault	$$BlockComment$$ InTS2 Status 16#@2%x@
	SIG 3	AS process control message - fault	$$BlockComment$$ InTS3 Status 16#@3%x@
	SIG 4	AS process control message - fault	$$BlockComment$$ InTS1 Status 16#@4%x@
	SIG 5	AS process control message - fault	$$BlockComment$$ InTS5 Status 16#@5%x@
	SIG 6	AS process control message - fault	$$BlockComment$$ InTS6 Status 16#@6%x@
	SIG 7	AS process control message - fault	$$BlockComment$$ InTS7 Status 16#@7%x@
	SIG 8	AS process control message - fault	$$BlockComment$$ InTS8 Status 16#@8%x@

Explanation:

$$BlockComment$$: Content of the instance-specific comment

The following applies for TimeStampOn = 0 : 16#@n%x@ (n = 1 ... 8): The value contains the signal status of In1 ... In8

The following applies for TimeStampOn = 1 : 16#@n%x@ (n = 1 ... 8): Statement on the validity of the time stamp from InTS0 ... InTS8. If the value is 80, the time stamp is formed by the I/O. If the value is ≠ 80, the time stamp of the I/O is invalid; the time stamp is generated by the CPU as a substitute and is therefore not exact.

You can change the message class and the event to meet your needs at the block type and/or block instance.

Associated values for message instance `MsgEvId`

Associated value	Block parameters
1	`TimeStampOn` = 0: `In1.ST`
2	`TimeStampOn` = 0: `In2.ST`
3	`TimeStampOn` = 0: `In3.ST`
4	`TimeStampOn` = 0: `In4.ST`
5	`TimeStampOn` = 0: `In5.ST`
6	`TimeStampOn` = 0: `In6.ST`
7	`TimeStampOn` = 0: `In7.ST`
8	`TimeStampOn` = 0: `In8.ST`
9	Not allocated
10	Not allocated

Associated values for message instance `MsgEvId`

Associated value	Block parameters
1	`TimeStampOn` = 1: `InTS1.ST`
2	`TimeStampOn` = 1: `InTS2.ST`
3	`TimeStampOn` = 1: `InTS3.ST`
4	`TimeStampOn` = 1: `InTS4.ST`
5	`TimeStampOn` = 1: `InTS5.ST`
6	`TimeStampOn` = 1: `InTS6.ST`
7	`TimeStampOn` = 1: `InTS7.ST`
8	`TimeStampOn` = 1: `InTS8.ST`
9	Not allocated
10	Not allocated

The batch information is transmitted with FeatureBit 8 =1:

The first three associated values are described as follows and are followed by the signal status of the input signals or the validity of the time stamp depending on TimeStampOn:

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchId
4	In1.ST / InTS1.ST
5	In2.ST / InTS2.ST
6	In3.ST / InTS3.ST
7	In4.ST / InTS4.ST

Associated value	Block parameters
8	In5.ST / InTS5.ST
9	In6.ST / InTS6.ST

The tenth associated value is not available.

Enter the batch ID @1%s@ under "Properties - Block - Special properties - Messages extended - Message texts block".

The associated values in the process messages (event) must be incremented by 3:

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	AS process control message - fault	$$BlockComment$$ InTS1 Status 16#@4%x@
	SIG 2	AS process control message - fault	$$BlockComment$$ InTS2 Status 16#@5%x@
	SIG 3	AS process control message - fault	$$BlockComment$$ InTS3 Status 16#@6%x@
	SIG 4	AS process control message - fault	$$BlockComment$$ InTS1 Status 16#@7%x@
	SIG 5	AS process control message - fault	$$BlockComment$$ InTS5 Status 16#@8%x@
	SIG 6	AS process control message - fault	$$BlockComment$$ InTS6 Status 16#@9%x@
	SIG 7	AS process control message - fault	$$BlockComment$$ InTS7 Status[1]
	SIG 8	AS process control message - fault	$$BlockComment$$ InTS8 Status[1]

[1] You cannot specify a separate associated value here.

See also

EventTs block diagram (Page 1299)

EventTs I/Os (Page 1296)

EventTs error handling (Page 1292)

EventTs functions (Page 1289)

EventTs modes (Page 1289)

Description of EventTs (Page 1285)

Selecting values associated with messages (Page 128)

8.3.6 EventTs I/Os

I/Os of EventTs

Inputs

Parameter	Description	Type	Default
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00
BatchName	Batch name	S7-string	
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 131)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
In1	Signal 1 for CPU time stamp	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In2	Signal 2 for CPU time stamp	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In3	Signal 3 for CPU time stamp	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In4	Signal 4 for CPU time stamp	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In5	Signal 5 for CPU time stamp	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In6	Signal 6 for CPU time stamp	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In7	Signal 7 for CPU time stamp	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF
In8	Signal 8 for CPU time stamp	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#FF

Parameter	Description	Type	Default
InTS1	Signal 1 with I/O-device time stamp	ANY	-
InTS2	Signal 2 with I/O-device time stamp	ANY	-
InTS3	Signal 3 with I/O-device time stamp	ANY	-
InTS4	Signal 4 with I/O-device time stamp	ANY	-
InTS5	Signal 5 with I/O-device time stamp	ANY	-
InTS6	Signal 6 with I/O-device time stamp	ANY	-
InTS7	Signal 7 with I/O-device time stamp	ANY	-
InTS8	Signal 8 with I/O-device time stamp	ANY	-
Inv1	1 = Invert input In1 or InTS1	BOOL	0
Inv2	1 = Invert input In2 or InTS2	BOOL	0
Inv3	1 = Invert input In3 or InTS3	BOOL	0
Inv4	1 = Invert input In4 or InTS4	BOOL	0
Inv5	1 = Invert input In5 or InTS5	BOOL	0
Inv6	1 = Invert input In6 or InTS6	BOOL	0
Inv7	1 = Invert input In7 or InTS7	BOOL	0
Inv8	1 = Invert input In8 or InTS8	BOOL	0
MsgEn1	1 = Activate message for input In1 or InTS1	BOOL	1
MsgEn2	1 = Activate message for input In2 or InTS2	BOOL	1
MsgEn3	1 = Activate message for input In3 or InTS3	BOOL	1
MsgEn4	1 = Activate message for input In4 or InTS4	BOOL	1
MsgEn5	1 = Activate message for input In5 or InTS5	BOOL	1
MsgEn6	1 = Activate message for input In6 or InTS6	BOOL	1
MsgEn7	1 = Activate message for input In7 or InTS7	BOOL	1
MsgEn8	1 = Activate message for input In8 or InTS8	BOOL	1
MsgEvId	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp	1 = Release for maintenance by OS operator	BOOL	0
Occupied	1 = In use by a batch	BOOL	0
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OS_Perm	I/O for operator control permissions (Page 1289)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1

Parameter	Description	Type	Default
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	1 = Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
StepNo	Batch step number	DWORD	16#00
TimeStampOn	0 = Use time stamp of the CPU 1 = Use time stamp of the I/O devices	BOOL	0
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Outputs

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see EventTs error handling (Page 1292)	INT	-1
EventTsOut	For wiring the input signals of a technologic block	STRUCT • Value: BYTE • ST: BYTE	- • 16#00 • 16#80
MS_Release	Release for maintenance: 1 = Release for OS operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn	Message acknowledgment status (output ACK_STATE of ALARM_8P)	WORD	16#0000
MsgErr	1 = Alarm error (output ERROR of ALARM_8P)	BOOL	0
MsgStat	Alarm status (output STATUS of ALARM_8P)	WORD	16#0000
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
ST_Worst	Worst signal status	BYTE	16#80

Parameter	Description	Type	Default
Status1	Status word 1 (Page 1285)	DWORD	16#00000000
Status2	Status word 2 (Page 1285)	DWORD	16#00000000

See also

EventTs block diagram (Page 1299)
EventTs messaging (Page 1292)
EventTs modes (Page 1289)

8.3.7 EventTs block diagram

EventTs block diagram

A block diagram is not provided for this block.

See also

EventTs I/Os (Page 1296)
EventTs messaging (Page 1292)
EventTs error handling (Page 1292)
EventTs functions (Page 1289)
EventTs modes (Page 1289)
Description of EventTs (Page 1285)

Counter blocks

9

9.1 CountScL - Counter with up and down counting direction

9.1.1 Description of CountScL

Object name (type + number) and family

Type + number: FB 1806

Family: Count

Area of application for CountScL

The block is used for the following applications:

- Count up or count down with rising edge of the binary input signal.

How it works

Positive edges at the binary input signal In increment or decrement the count value at Out, depending on settings.

1. Count up (`UpOp` = 1 or `UpLi` =1)

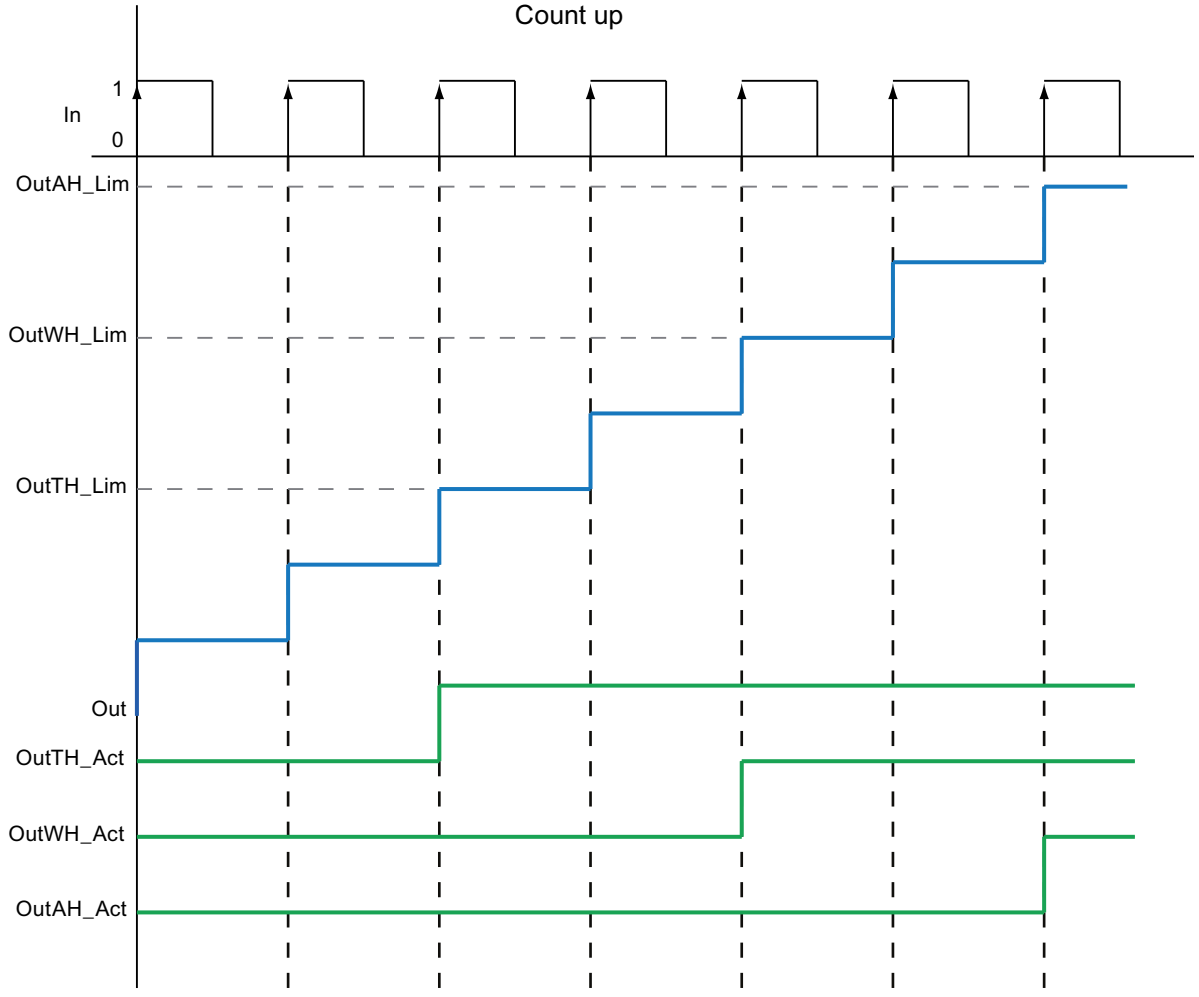
   The block counts up for each rising edge of `In`. (Output parameter `CountMode` = 1)

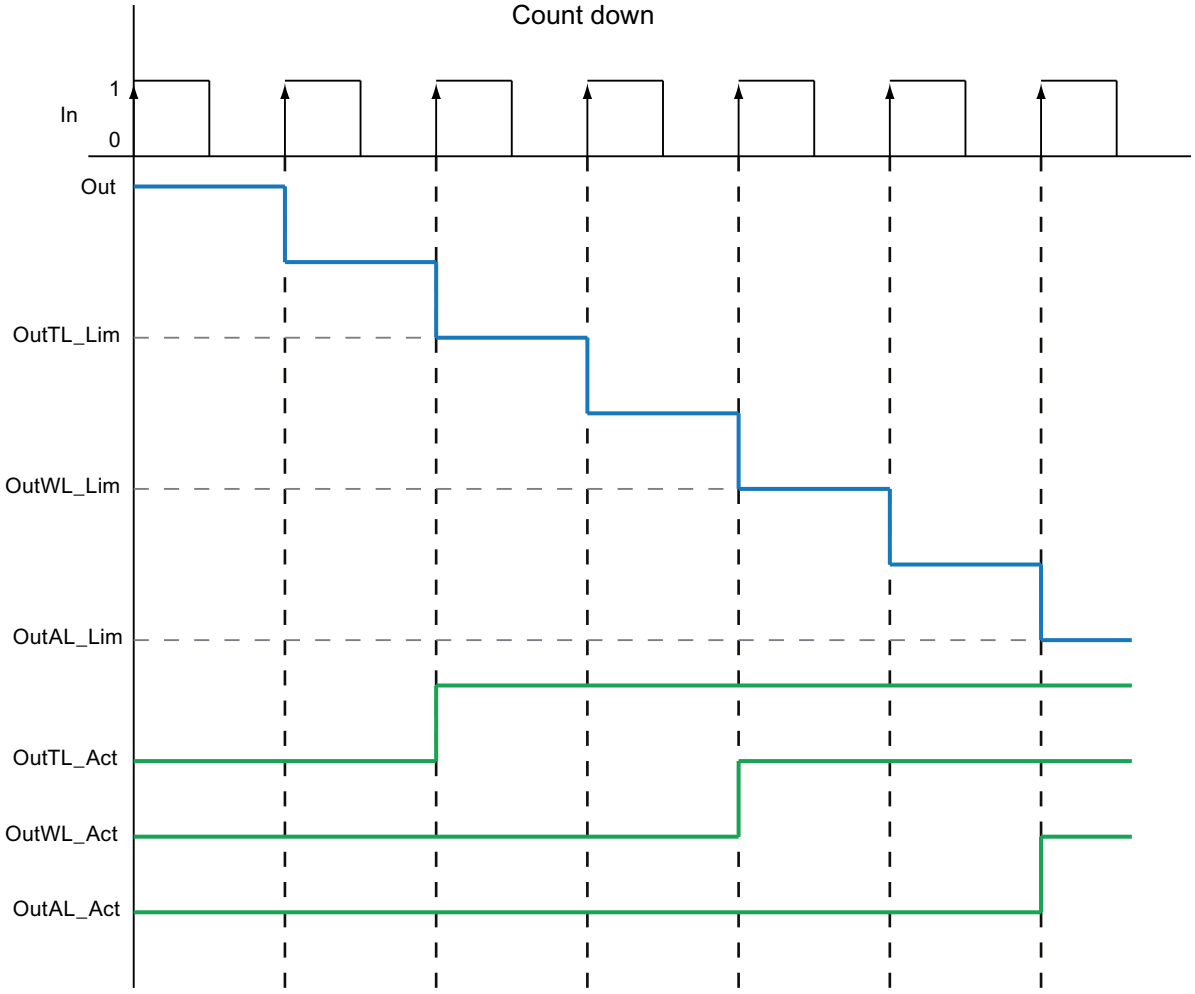
2. Count down (`DnOp` = 1 or `DnLi` = 1)

   The block counts down for each rising edge of `In`. (Output parameter `CountMode` = 2)

3. Off (`OffOp` = 1 or `OffLi` = 1)

   The block is disabled (output parameter `CountMode` = 0). No counting takes place.





Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Define the startup characteristics for this block via two `Feature` Bits:

Bit 0: Setting the startup characteristics (Page 116)

Bit 5: Use the last value following a complete download as the current value during startup of the block (Page 127)

Time response

The block does not have any time response.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section CountScL I/Os (Page 1311).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7 - 10	Not used
11	`LiOp`
12 - 13	Not used
14	1 = Invalid signal status
15 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock.Value`
1	`OutAH_Act.Value`
2	`OutWH_Act.Value`
3	`OutTH_Act.Value`
4	`OutTL_Act.Value`
5	`OutWL_Act.Value`
6	`OutAL_Act.Value`
7	`OutAH_En`
8	`OutWH_En`
9	`OutTH_En`
10	`OutTL_En`
11	`OutWL_En`
12	`OutAL_En`
13	`OutAH_MsgEn`
14	`OutWH_MsgEn`
15	`OutTH_MsgEn`
16	`OutTL_MsgEn`
17	`OutWL_MsgEn`
18	`OutAL_MsgEn`
19	Not used
20	Count up
21	Counter off

Status bit	Parameter
22	Count down
23 - 30	Not used
31	MS_RelOp

See also

CountScL functions (Page 1306)

CountScL messaging (Page 1309)

CountScL block diagram (Page 1315)

CountScL error handling (Page 1309)

CountScL modes (Page 1305)

9.1.2 CountScL modes

CountScL operating modes

This block provides the following operating modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

CountScL block diagram (Page 1315)

CountScL I/Os (Page 1311)

CountScL messaging (Page 1309)

CountScL error handling (Page 1309)

Description of CountScL (Page 1301)

CountScL functions (Page 1306)

9.1.3 CountScL functions

Functions of CountScL

The functions for this block are listed below.

Limit monitoring of the count value

This block provides the standard function Limit monitoring of the count value (Page 75).

Read back the last counted value

When counting (visible at the `Out` output parameter), this count value is passed directly to the `OldOut` input parameter:

`OldOut` = `Out`If a warm restart is performed at this point, the (`Out`) count value is automatically reset to the default value, if the `Feature` Bit Setting the startup characteristics (Page 116) is set accordingly (= 0) (`OldOut` ≠ `Out`). In this case, the value from `OldOut` is only updated when the (`Out`) count value is changed again by a pulse. Now `OldOut` = `Out` applies again.

Reset counter to zero

The counted value at the `Out` output parameter is reset with the interconnectable `ResetCount` parameter. The reset is made with a 0 - 1 edge.

The count cannot be reset to zero from the faceplate.

Setting the count to the default setting

You can use the `PresetVal` input parameter to enter a value at which the count should start, if the command has been given for setting the count to the default via the `PresetEn` input parameter with 1. This can also be done with the faceplate.

In this case, the `Out` output parameter is set to the `PresetVal` value.

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameter:

- `In.ST`

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` I/O in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
5	Use the last value following a complete download as the current value during startup of the block (Page 127)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can stop counting
5	1 = Operator can switch to incrementing mode
6	1 = Operator can switch to decrementing mode
7 - 11	Not used
12	1 = Operator can activate the Release for maintenance function
13	1 = Operator can change the limit (`OutAH_Lim`) for high alarm
14	1 = Operator can change the limit (`OutWH_Lim`) for high warning
15	1 = Operator can change the limit (`OutTH_Lim`) for high tolerance
16	Not used
17	1 = Operator can change the limit (`OutAL_Lim`) for low alarm

Bit	Function
18	1 = Operator can change the limit (`OutWL_Lim`) for low warning
19	1 = Operator can change the limit (`OutTL_Lim`) for low tolerance
20	Not used
21	1 = Operator can set the count to the default value (`PresetEn`)
22	1 = Operator can specify the default value (`PresetTime`)
23 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of CountScL (Page 1301)

CountScL messaging (Page 1309)

CountScL I/Os (Page 1311)

CountScL block diagram (Page 1315)

CountScL error handling (Page 1309)

CountScL modes (Page 1305)

9.1.4 CountScL error handling

Error handling of CountScL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
51	Invalid signal at `LiOp` = 1: • `OffLi` = 1 and `UpLi` = 1 and/or `DnLi` = 1 • `OffLi` = 0 and `UpLi` = 1 and `DnLi` = 1

See also

CountScL block diagram (Page 1315)

CountScL I/Os (Page 1311)

CountScL messaging (Page 1309)

Description of CountScL (Page 1301)

CountScL modes (Page 1305)

CountScL functions (Page 1306)

9.1.5 CountScL messaging

Messaging

The following messages can be generated for this block:

- Functions for displaying measured limits

Messages generated as a reaction to limit violations, can be suppressed by the settings `MsgEn` and `MsgLock`.

Associated values for message instance `MsgEvId`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`

Process messages

Message instance	Message identifier	Message class	Event
`MsgEvId`	SIG 1	Alarm - high	$$BlockComment$$ High alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ High warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ High tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ Low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ Low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ Low alarm limit violated
	SIG 7	Reserved	$$BlockComment$$
	SIG 8	Reserved	$$BlockComment$$

Explanation:

$$BlockComment$$: Content of the instance-specific comment

See also

Description of CountScL (Page 1301)

CountScL functions (Page 1306)

CountScL I/Os (Page 1311)

CountScL block diagram (Page 1315)

CountScL modes (Page 1305)

CountScL error handling (Page 1309)

9.1.6 CountScL I/Os

I/Os of CountScL

Input parameters

Parameter	Description	Type	Default
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
DnLi	1 = Down counter, via interconnection	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
DnOp*	1 = Down counter, via operator	BOOL	0
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1306)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
In	Binary input value	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
LiOp	1 = Interconnection 0 = Operator	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
MsgEvId	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
MS_RelOp*	Operator can switch release for maintenance	BOOL	0
Occupied	1 = In use by a batch	BOOL	0
OffLi	1 = Counter disabled via interconnection	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OffOp*	1 = Counter disabled via operator	BOOL	1
OldOut*	Previous output value	DINT	0
OnOp*	1 = "On" mode via operator	BOOL	0

Parameter	Description	Type	Default
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 1306)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
OutAH_En	1 = Enable alarm (high) for count	BOOL	1
OutAH_Lim	Limit for count alarm (high)	DINT	95
OutAH_MsgEn	1 = Enable message for count alarm (high)	BOOL	1
OutAL_En	1 = Enable alarm (low) for count	BOOL	1
OutAL_Lim	Limit for count alarm (low)	DINT	0
OutAL_MsgEn	1 = Enable message for count alarm (low)	BOOL	1
OutOpHiScale	High limit for scale in count bar graph of faceplate	DINT	100
OutOpLoScale	Low limit for scale in count bar graph of faceplate	DINT	0
OutTH_En	1 = Enable tolerance message (high)	BOOL	0
OutTH_Lim	Count tolerance limit message (high)	DINT	85
OutTH_MsgEn	1 = Enable message for count tolerance message (high)	BOOL	1
OutTL_En	1 = Enable count tolerance message (low)	BOOL	0
OutTL_Lim	Count tolerance message limit (low)	DINT	0
OutTL_MsgEn	1 = Enable message for count tolerance message (low)	BOOL	1
OutUnit	Unit of measure for count Out	INT	0
OutWH_En	1 = Enable count warning (high)	BOOL	1
OutWH_Lim	Count warning limit (high)	DINT	90
OutWH_MsgEn	1 = Enable message for count warning (high)	BOOL	1
OutWL_En	1 = Enable count warning (low)	BOOL	1
OutWL_Lim	Count warning limit (low)	DINT	0
OutWL_MsgEn	1 = Enable message for count warning (low)	BOOL	1
PresetEn*	1 = Set block to default count (PresetVal)	BOOL	0
PresetVal	Default setting for the count	DINT	0
ResetCount	1 = Counter restart	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RunUpCyc	Number of operating cycles for which all messages are suppressed	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1

Parameter	Description	Type	Default
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
StepNo	Batch step number	DWORD	16#00000000
UpLi	1 = Forward counter, via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
UpOp*	1 = Forward counter, via operator	BOOL	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
CountMode	0 = Counter off 1 = Count up 2 = Count down	INT	0
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see CountScL error handling (Page 1309)	INT	-1
MsgAckn	ALARM_8P: Output ACK_STATE message acknowledgment state	WORD	16#0000
MsgErr	1 = Message processing error occurred	BOOL	0
MsgStat	ALARM_8P: Output STATUS Error information of the ALARM_8P	WORD	16#0000
MS_Release	Release for maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF

Parameter	Description	Type	Default
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
Out	Count	DINT	0
OutAH_Act	1 = Count alarm (high) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OutAL_Act	1 = Count alarm (low) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OutTH_Act	1 = Count tolerance message (high) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OutTL_Act	1 = Count tolerance message (low) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OutWH_Act	1 = Count warning (high) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OutWL_Act	1 = Count warning (low) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1301)	DWORD	16#00000000
Status2	Status word 2 (Page 1301)	DWORD	16#00000000

See also

CountScL messaging (Page 1309)

CountScL block diagram (Page 1315)

CountScL modes (Page 1305)

9.1.7 CountScL block diagram

CountScL block diagram

A block diagram is not provided for this block.

See also

Description of CountScL (Page 1301)

CountScL modes (Page 1305)

CountScL functions (Page 1306)

CountScL error handling (Page 1309)

CountScL messaging (Page 1309)

CountScL I/Os (Page 1311)

9.1.8 Operator control and monitoring

9.1.8.1 CountScL views

Views of the CountScL block

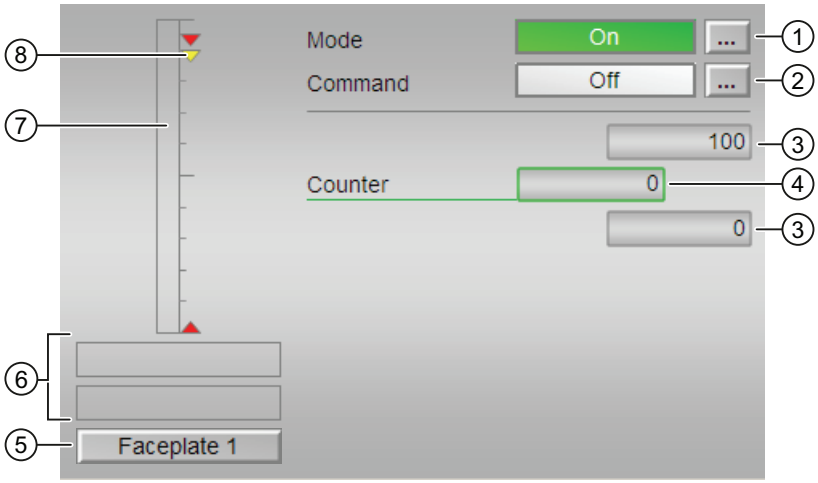
The block CountScL provides the following views:

- CountScL standard view (Page 1316)
- Alarm view (Page 250)
- CountScL limit value view (Page 1318)
- Trend view (Page 253)
- CountScL parameter view (Page 1319)
- CountScL preview (Page 1320)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for CountScL (Page 1321)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

9.1.8.2 CountScL standard view

CountScL standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Enabling and disabling the counter

This area shows you the default operating state for the counter. The following states can be shown and executed here:

- "On ⇑"
- "On ⇓"
- "Off"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

(3) High and low scale range for the count value

These values provide information on the display range for the bar graph of the count. The scale range is defined in the engineering system.

(4) Display of the count value

This area shows the current count value.

The name for the current count value can be set using the `s7_shortcut` attribute at the corresponding output parameter. The default text is displayed if nothing is specified.

Additional information is available in the section Labeling of buttons and text (Page 167).

(5) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

(6) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"
- "Invalid signal"

(7) Graphic display of the current count value

This area shows you the current count in form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

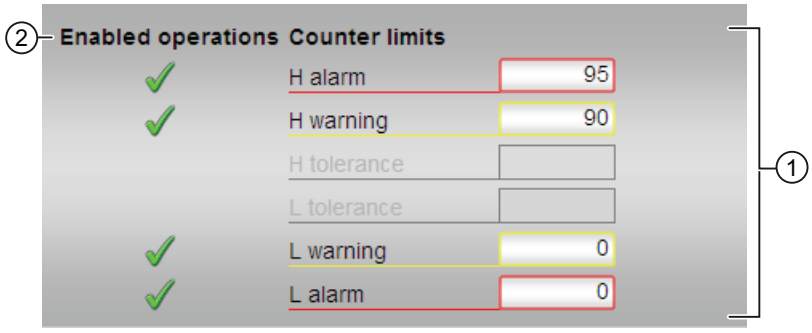
(8) Limit display

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning
- Blue: Tolerance

9.1.8.3 CountScL limit value view

Limit value view of CountScL



(1) Limits for the counter

In this area, you can enter the limits for the counter. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high
- "H tolerance": Tolerance high
- "L tolerance": Tolerance low
- "L warning": Warning low
- "L alarm": Alarm low

(2) Enabled operations

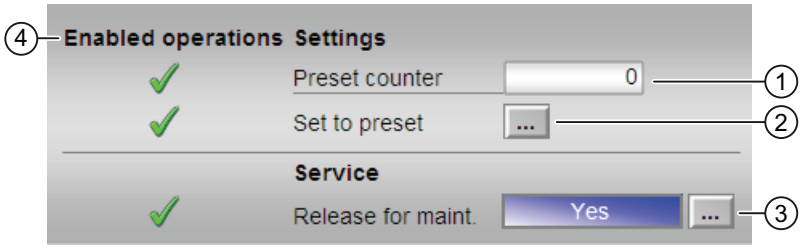
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

9.1.8.4 CountScL parameter view

Parameter view of CountScL



(1) Preset counter

Enter the default setting here, where the counter should start. You can find additional information on this in the Changing values (Page 210) section.

(2) Set to default

Set the counter to the default value here. You can find additional information on this in the Switching operating states and operating modes (Page 208) section.

(3) Service

You can select the following function in this area:

- "Release for maintenance"

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the Release for maintenance (Page 52) section.

(4) Enabled operations

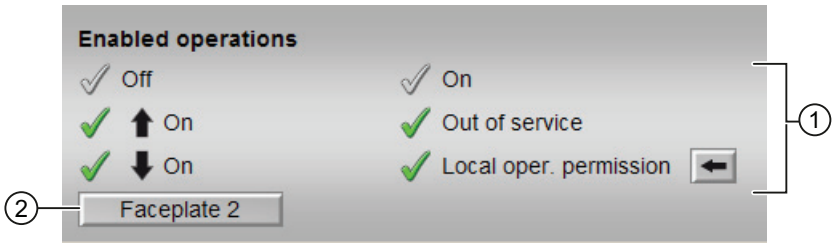
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

9.1.8.5 CountScL preview

Preview of CountScL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Off": You can disable the counter.
- "On ⇑": You can operate the incremental counter.
- "On ⇓": You can operate the decremental counter.
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

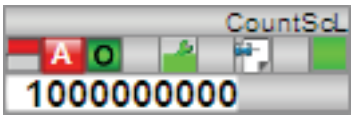
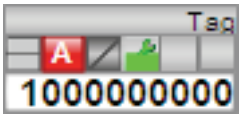
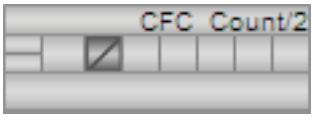
9.1.8.6 Block icon for CountScL

Block icons for CountScL

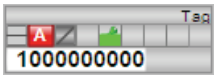
A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits
- Operating modes
- Signal status, release for maintenance
- Memo display
- Display counter running

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in the CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

9.2 CountOh - determining runtime

9.2.1 Description of CountOh

Object name (type + number) and family

Type + number: FB 1864

Family: Count

Area of application for CountOh

The block is used for the following applications:

- Calculating the runtime of a unit

How it works

The block calculates the operating time of a unit.

1. Off (`OffOp` = 1 or `OffLi` = 1)

   The block is disabled (output parameter `CountMode` = 0). No counting takes place.

2. Count up (`UpOp` = 1 or `UpLi` = 1)

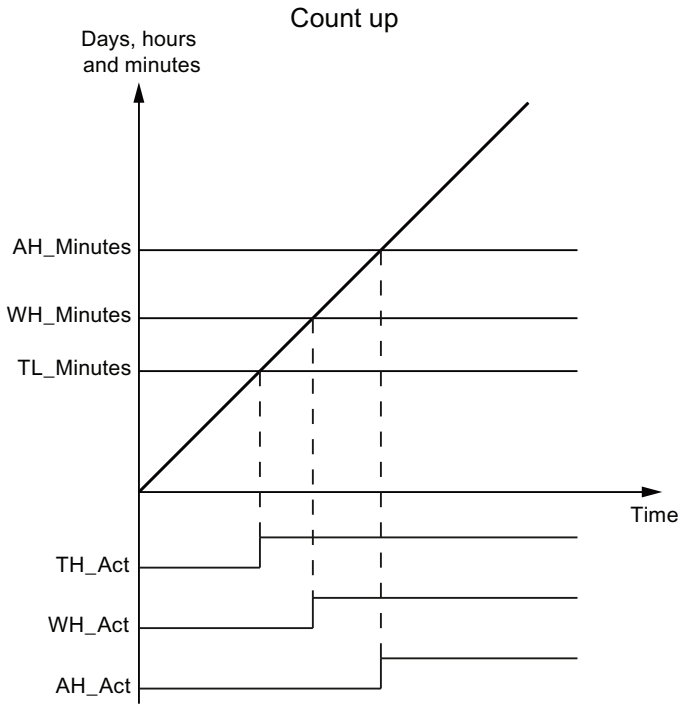
   The operating time of the connected unit is incremented (output parameter `CountMode` = 1).

3. Count down (`DnOp` = 1 or `DnLi` = 1)

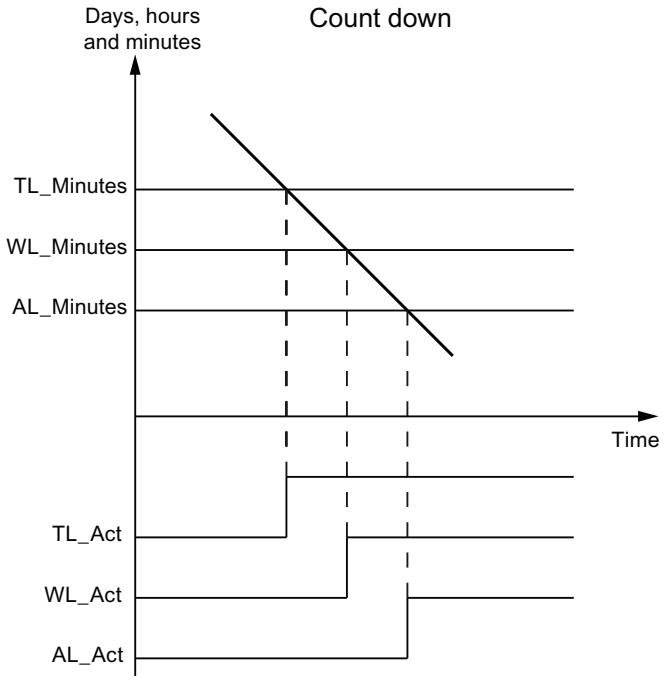
   The operating time of the connected unit is decremented (output parameter `CountMode` = 2).

The operating time is shown depending on the course of days, hours, minutes and seconds.

If the operating time exceeds the configured limits, an alarm is triggered.



When the block counts up and the total operating time `(TimeMin)` of the connected unit is greater than or equal to the limits (`TH_Minutes`, `WH_Minutes` and `AH_Minutes`), the alarms `TH_Act`, `WH_Act` and `AH_Act` are set.



When the block counts up and the total operating time `(TimeMin)` of the connected unit is greater than or equal to the limits (`TL_Minutes`, `WL_Minutes` and `AL_Minutes`), the alarms `TL_Act`, `WL_Act` and `AL_Act` are set.

The operating time can be preset. The value can be specified by the operator. The operator can set values for days, hours and minutes to begin counting, if the required operator control permission has been issues for this.

The maximum configurable value for the operating time is 24855 days, 3 hours and 14 minutes.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is first installed automatically in the startup OB (OB 100).

Startup characteristics

Define the startup characteristics for this block via two `Feature` Bits:

Bit 0: Setting the startup characteristics (Page 116)

Bit 5: Use the last value following a complete download as the current value during startup of the block (Page 127)

When `Feature` bit 5 is set to 1, then:

- `Days := OldDays`
- `Hours := OldHours`
- `Minutes := OldMinutes`
- `Seconds := OldSeconds`

When you set `Feature` bit 5 and `Feature` bit 0 to 1, then:

- `TotalTime := PresetTime`

The output parameters `Days`, `Hours`, `Minutes` are converted accordingly based on `PresetTime`.

When you set `Feature` bit 5 to 0 and `Feature` bit 0 to 1, no preset is made.

Time response

The block only functions properly in a cyclic interrupt OB. To ensure correct time acquisition, it should be installed (if configured in CFC) in the same runtime group as the control block of the monitored unit.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section CountOh I/Os (Page 1333).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7 - 10	Not used
11	`LiOp`
12 - 13	Not used
14	1 = Invalid signal status
15 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	MsgLock.Value
1	AH Act.Value
2	WH_Act.Value
3	TH_Act.Value
4	TL_Act.Value
5	WL_Act.Value
6	AL_Act.Value
7	AH_En
8	WH_En
9	TH_En
10	TL_En
11	WL_En
12	AL_En
13	AH_MsgEn
14	WH_MsgEn
15	TH_MsgEn
16	TL_MsgEn
17	WL_MsgEn
18	AL_MsgEn
19	Not used
20	Count up
21	Counter off
22	Count down
23 - 30	Not used
31	MS_RelOp

See also

CountOh functions (Page 1327)
CountOh messaging (Page 1331)
CountOh block diagram (Page 1338)
CountOh error handling (Page 1331)
CountOh modes (Page 1327)

9.2.2 CountOh modes

CountOh operating modes

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

You can find general information about the "On" mode in the On (Page 58) section.

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

CountOh block diagram (Page 1338)

CountOh I/Os (Page 1333)

CountOh messaging (Page 1331)

CountOh error handling (Page 1331)

Description of CountOh (Page 1322)

CountOh functions (Page 1327)

9.2.3 CountOh functions

Functions of CountOh

The block provides the following functions:

Limit monitoring of the operating time

The total time in minutes `(TimeIn)` is displayed for the following limits:

1. Alarm (`AH_Minutes` and `AL_Minutes`)
2. Warning (`WH_Minutes` and `WL_Minutes`)
3. Tolerance (`TH_Minutes` and `TL_Minutes`)

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
5	Use the last value following a complete download as the current value during startup of the block (Page 127)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Read back the last counted value

When counting (`DeviceOn.Value = 1` and `CountMode = 1` or `2`), the inputs of the most recently valid operating time are updated:

- `OldDays := Days`
- `OldHours := Hours`
- `OldMinutes := Minutes`
- `OldSeconds := Seconds`

The inputs `OldDays`, `OldHours`, `OldMinutes`, `OldSeconds` are reset with a complete download.

After a warm restart, the outputs of the operating time are set depending on the configuration of the `Feature` parameter.

When `Feature` bit 5 is set to 1, then:

- `Days := OldDays`
- `Hours := OldHours`
- `Minutes := OldMinutes`
- `Seconds := OldSeconds`

When you set `Feature` bit 5 and `Feature` bit 0 to 1, then:

- `TotalTime := PresetTime`

The output parameters `Days`, `Hours`, `Minutes` are converted accordingly based on `PresetTime`.

When you set `Feature` bit 5 to 0 and `Feature` bit 0 to 1, no preset is made.

Display and operator input area for process values and setpoints

This block provides the standard function Display and operator input area for process values and setpoints (Page 164).

Reset counter to zero

The output parameters of the operating time are reset via the interconnectable `Reset` parameter. The reset is made with a 0 - 1 edge.

The count cannot be reset to zero from the faceplate.

Setting the count to the default setting

You can enter the operating time at which counting should begin with the input parameters `PresetTime` and `PresetEn`.

When `PresetEn` is set, the following applies:

- `TotalTime := PresetTime`

The outputs `Days`, `Hours`, `Minutes` are converted accordingly based on `PresetTime`. This can also be done with the faceplate.

The `PresetTime` time value is always indicated in seconds.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameter:

- `In.ST`

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can start the block
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can stop the block
5	1 = Operator can switch to incrementing mode

Bit	Function
6	1 = Operator can switch to decrementing mode
7 - 11	Not used
12	1 = Operator can enable release for maintenance
13	1 = Operator can enter AH_Lim
14	1 = Operator can enter WH_Lim
15	1 = Operator can enter TH_Lim
16	Not used
17	1 = Operator can enter AL_Lim
18	1 = Operator can enter WL_Lim
19	1 = Operator can enter TL_Lim
20	Not used
21	1 = Operator can enable default
22	1 = Operator can apply configured time
23 - 31	Not used

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of CountOh (Page 1322)

CountOh messaging (Page 1331)

CountOh I/Os (Page 1333)

CountOh block diagram (Page 1338)

CountOh error handling (Page 1331)

CountOh modes (Page 1327)

9.2.4 CountOh error handling

Error handling of CountOh

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
51	Invalid signal at `LiOp` = 1 • `OffLi` = 1 and `UpLi` = 1 and/or `DnLi` = 1 • `OffLi` = 0 and `UpLi` = 1 and `DnLi` = 1

See also

CountOh block diagram (Page 1338)

CountOh I/Os (Page 1333)

CountOh messaging (Page 1331)

CountOh functions (Page 1327)

CountOh modes (Page 1327)

Description of CountOh (Page 1322)

9.2.5 CountOh messaging

Messaging

The following messages can be generated for this block:

- Functions for displaying measured limits

Messages generated as a reaction to limit violations, can be suppressed by the settings `xx_MsgEn` and `MsgLock`.

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId1	SIG 1	Alarm - high	$$BlockComment$$ High alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ High warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ High tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ Low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ Low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ Low alarm limit violated
	SIG 7	Reserved	$$BlockComment$$ For internal use
	SIG 8	Reserved	$$BlockComment$$ For internal use

Explanation:

$$BlockComment$$: Content of the instance-specific comment

Associated values for message instance `MsgEvId1`

Associated value	Block parameters
1	BatchName
2	StepNo
3	BatchID

See also

Description of CountOh (Page 1322)

CountOh functions (Page 1327)

CountOh I/Os (Page 1333)

CountOh block diagram (Page 1338)

CountOh error handling (Page 1331)

CountOh modes (Page 1327)

9.2.6 CountOh I/Os

I/Os of CountOh

Input parameters

Parameter	Description	Type	Default
AH_En	High alarm enabled	BOOL	1
AH_MsgEn	Message for high alarm enabled	BOOL	1
AL_En	Low alarm enabled	BOOL	1
AL_MsgEn	Message for low alarm enabled	BOOL	1
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch number (Batch ID)	DWORD	16#00000000
BatchName	Batch name	S7-String	
DayOpHiScale*	Operating stage - High limit of bar display for OS	INT	100
DayOpLoScale*	Operating stage - Low limit of bar display for OS	INT	0
DaysAHLim*	Days - high limit alarm	INT	95
DaysALLim*	Days - low limit alarm	INT	0
DaysTHLim*	Days - high limit tolerance	INT	85
DaysTLLim*	Days - low limit tolerance	INT	0
DaysWHLim*	Days - limit for high warning	INT	90
DaysWLLim*	Days - limit for low warning	INT	0
DnLi	1 = Decrement via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DnOp*	1 = Decrement via OS operator	BOOL	0
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1327)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
HrsAHLim*	Hours - high limit alarm	INT	0
HrsALLim*	Hours - low limit alarm	INT	0
HrsOpHiScale*	Operating hours - high limit of bar display for OS	INT	23
HrsOpLoScale*	Operating hours - low limit of bar display for OS	INT	0
HrsTHLim*	Hours - high limit tolerance	INT	0
HrsTLLim*	Hours - low limit tolerance	INT	0
HrsWHLim*	Hours - high limit warning	INT	0
HrsWLLim*	Hours - low limit warning	INT	0

Parameter	Description	Type	Default
In	Device status: 1=On 0=Off	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LiOp	Switchover of operating mode between: 1 = Interconnection 0 = Operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MinOpHiScale*	Operating minutes - high limit of bar display for OS	INT	59
MinOpLoScale*	Operating minutes - low limit of bar display for OS	INT	0
MinsAHLim*	Minutes - high limit alarm	INT	0
MinsALLim*	Minutes - low limit alarm	INT	0
MinsTHLim*	Minutes - high limit tolerance	INT	0
MinsTLLim*	Minutes - low limit tolerance	INT	0
MinsWHLim*	Minutes - high limit warning	INT	0
MinsWLLim*	Minutes - low limit warning	INT	0
MS_RelOp*	Operator input for release for maintenance, 1: Release for maintenance demand	BOOL	0
MsgEvId	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1= Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Occupied	1 = In use by a batch	BOOL	0
OffLi	Counter disabled via interconnection: 1 = Off	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OffOp*	Counter disabled via operator: 1 = Off	BOOL	1
OldDays*	Previous day value	INT	0
OldHours*	Previous hour value	INT	0
OldMinutes*	Previous minute value	INT	0
OldSeconds*	Previous second value	INT	0
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000

Parameter	Description	Type	Default
OS_Perm	I/O for CountOh functions (Page 1327)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
PresetEn*	1 = Set block to default time time value (PresetTime)	BOOL	0
PresetTime*	Default setting for the time value [s]	DWORD	16#00000000
Reset	1 = Reset counter	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s]	REAL	0.1
SelFp1	Open faceplate 1	ANY	-
SelFp2	Open faceplate 2	ANY	-
StepNo	Batch step number	DWORD	16#00000000
TH_En	High tolerance enabled	BOOL	0
TH_MsgEn	Alarm for high tolerance enabled	BOOL	1
TL_En	Low tolerance enabled	BOOL	0
TL_MsgEn	Alarm for low tolerance enabled	BOOL	1
UpLi	1 = Increment (via interconnection)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
UpOp*	1 = Increment (via faceplate)	BOOL	0
WH_En	High warning enabled	BOOL	1
WH_MsgEn	Alarm for high warning enabled	BOOL	1
WL_En	Low warning enabled	BOOL	1
WL_MsgEn	Alarm for low warning enabled	BOOL	1

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
AH_Act	High alarm enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AH_Minutes	High alarm time [in min]	DINT	0

Parameter	Description	Type	Default
AL_Act	Low alarm enabled You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
AL_Minutes	Low alarm time [in min]	DINT	0
BarOpHiScale	High limit for bar display [min]	DINT	100
BarOpLoScale	Low limit for bar display [min]	DINT	0
CountMode	Count mode: 0 = Off 1 = Increment 2 = Count down	INT	0
Days	Operating stage	INT	0
DeviceOn	1 = Unit on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see CountOh error handling (Page 1331)	INT	-1
Hours	Operating hours	INT	0
Minutes	Operating minutes	INT	0
MS_Release	Release for maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgAckn	ALARM_8P: Output ACK_STATE message acknowledgment state	WORD	16#0000
MsgErr	1 = Message processing error occurred	BOOL	0
MsgStat	ALARM_8P: Output STATUS Error information of the ALARM_8P	WORD	16#0000
OnAct	Block running	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	Block is "out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Operator control permission: Output for OS	DWORD	16#FFFFFFFF
OS_PermOut	Operator control permission: Output for OS	DWORD	16#FFFFFFFF
Seconds	Operating time [in sec]	INT	0

Parameter	Description	Type	Default
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1322)	DWORD	16#00000000
Status2	Status word 2 (Page 1322)	DWORD	16#00000000
TH_Act	High tolerance enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
TH_Minutes	Tolerance high	DINT	0
TimeMin	Operating period [min]	DINT	0
TL_Act	Low tolerance enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
TL_Minutes	Low tolerance time [in min]	DINT	0
TotalTime	Total operating time	DWORD	16#00000000
WH_Act	High warning enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
WH_Minutes	High warning time [in min]	DINT	0
WL_Act	Low warning enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
WL_Minutes	Low alarm time [in min]	DINT	0

See also

CountOh messaging (Page 1331)

CountOh block diagram (Page 1338)

CountOh modes (Page 1327)

9.2.7 CountOh block diagram

CountOh block diagram

A block diagram is not provided for this block.

See also

CountOh I/Os (Page 1333)

CountOh messaging (Page 1331)

CountOh error handling (Page 1331)

CountOh functions (Page 1327)

CountOh modes (Page 1327)

Description of CountOh (Page 1322)

9.2.8 Operator control and monitoring

9.2.8.1 CountOh views

Views of the CountOh block

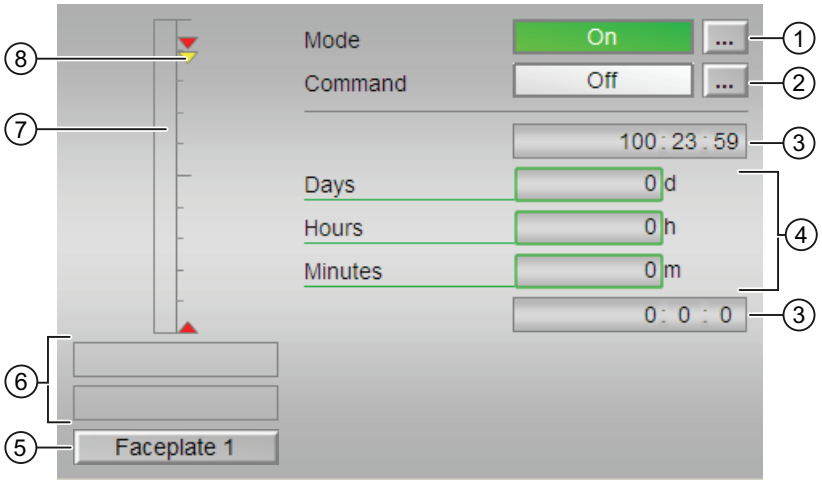
The block CountOh provides the following views:

- CountOh standard view (Page 1339)
- Alarm view (Page 250)
- CountOh limit value view (Page 1341)
- Trend view (Page 253)
- CountOh parameter view (Page 1342)
- CountOh preview (Page 1343)
- Memo view (Page 252)
- Batch view (Page 251)
- Block icon for CountOh (Page 1344)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

9.2.8.2 CountOh standard view

CountOh standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Enabling and disabling the counter

This area shows you the default operating state for the counter. The following states can be shown and executed here:

- "On ⇑"
- "On ⇓"
- "Off"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

(3) High and low scale range for the count value

These values provide information on the display range for the bar graph **(5)** of the count value. The scale range is defined in the engineering system.

(4) Displaying the counts values

The following counts are shown here:

- "Days"
- "Hours"
- "Minutes"

(5) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

(6) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"
- "Invalid signal"

(7) Graphic display of the current count value

This area shows you the current count in form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

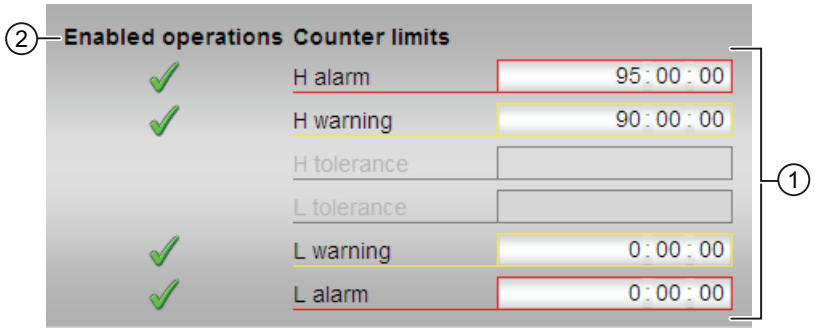
(8) Limits

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning
- Blue: Tolerance

9.2.8.3 CountOh limit value view

Limit value view of CountOh



(1) Limits for the counter

In this area, you can enter the limits for the counter. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high
- "H tolerance": Tolerance high
- "L tolerance": Tolerance low
- "L warning": Warning low
- "L alarm": Alarm low

(2) Enabled operations

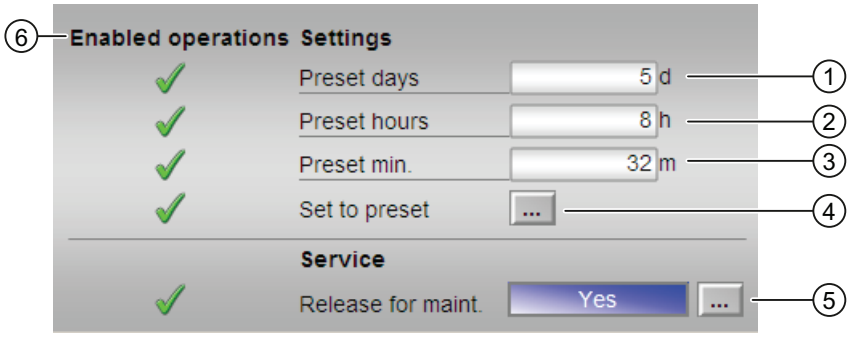
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

9.2.8.4 CountOh parameter view

Parameter view of CountOh



(1), (2) and (3) preset counter

Enter the default setting here, where the counter should start.

You can change the following presets:

- "Days"
- "Hours"
- "Minutes"

You can find additional information on this in the Changing values (Page 210) section.

(4) Set to default

Set the counter to the default value here. You can find additional information on this in the Switching operating states and operating modes (Page 208) section.

(5)Service

You can select the following function in this area:

- "Release for maintenance"

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the Release for maintenance (Page 52) section.

(6) Enabled operations

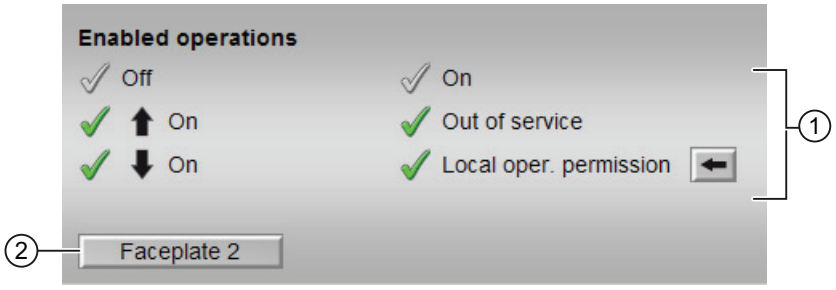
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

9.2.8.5 CountOh preview

Preview of CountOh



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Off": You can disable the counter.
- "On ⇑": You can operate the incremental counter.
- "On ⇓": You can operate the decremental counter.
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

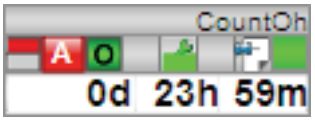
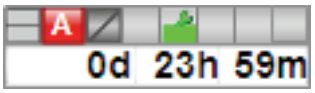
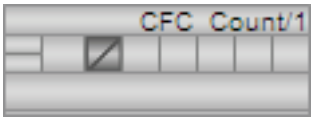
9.2.8.6 Block icon for CountOh

Block icons for CountOh

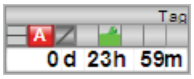
A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits
- Operating modes
- Signal status, release for maintenance
- Memo display
- Display counter running

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

9.3 TotalL - Adding counter with upward or downward counting direction (totalizer)

9.3.1 Description of TotalL

Object name (type + number) and family

Type + number: FB 1906

Family: Count

Area of application for TotalL

The block is used for the following applications:

- Triggered upward or downward summing
- Continuous upward or downward summing
- Upward or downward integration of an analog input value

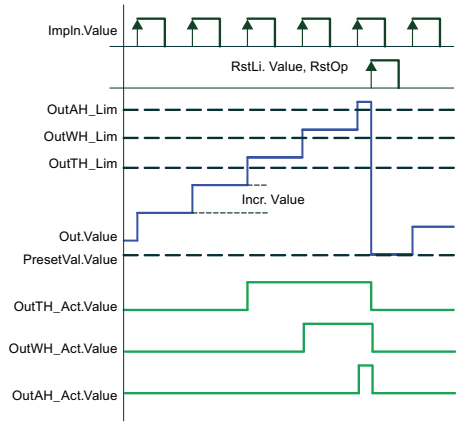
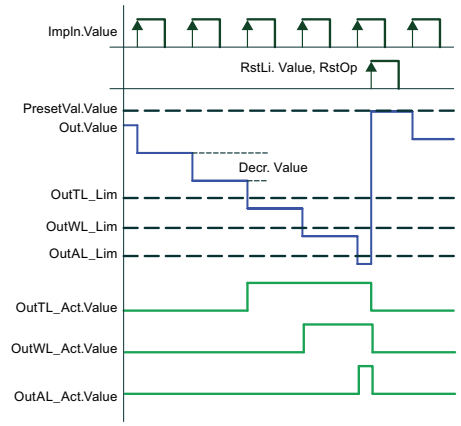
How it works

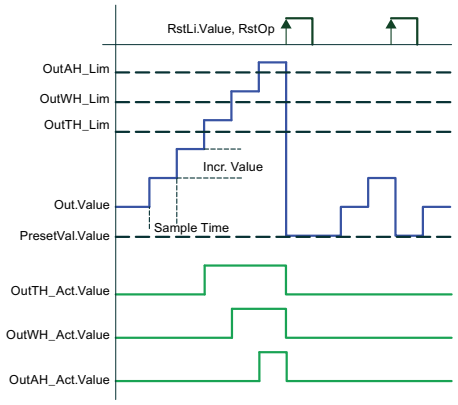
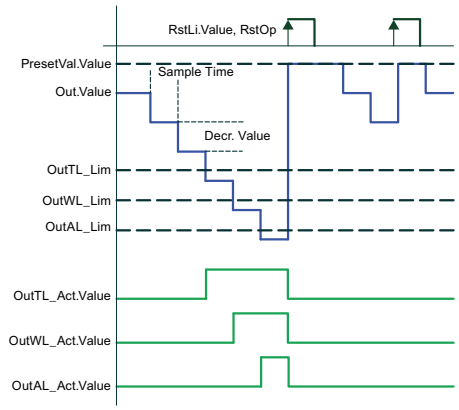
With a positive edge at the input parameter (pulse signal) `P_In` the output parameter `Out` is increased by a variable increment or reduced by a variable decrement.

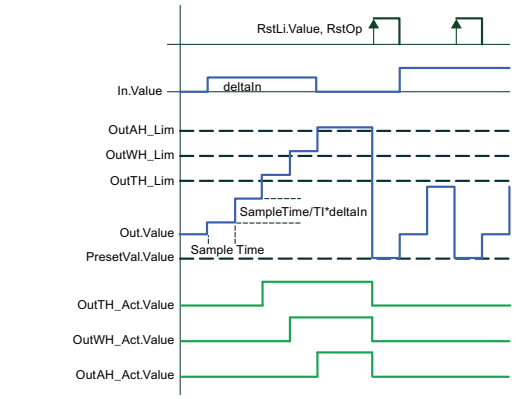
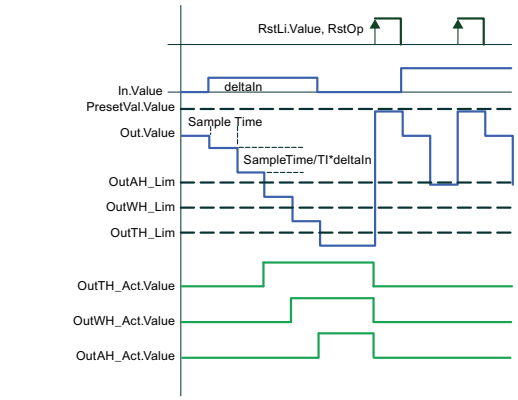
Configure how it works via the following `Feature` Bits:

- `Feature` Bit 6: Block as summing unit or integrator (Page 120)
- `Feature` Bit 7: Summing response continuous or triggered (Page 146)

Using this parameterization, determine whether the block is to operate as an edge-triggered adder or summer, continuous adder or summer or as an integrator:

<table>
<tr><th>Parameterization on the <code>Feature</code> Bit</th><th>How the block operates</th><th></th></tr>
<tr><td rowspan="3"><code>Feature</code> Bit 6 = 0
<code>Feature</code> Bit 7 = 0</td><td colspan="2">Block operates as an edge-triggered adder or summer.
The calculation at the output parameter <code>Out</code> is performed with a 0 - 1 edge at input parameter <code>P_In</code>.
The output parameter <code>Mode</code> shows whether the value is incremented or decremented.
The pulses counted at the input parameter <code>P_In</code> are output to the output parameter <code>CntOut</code>.</td></tr>
<tr><td>Triggered sum up
<code>Out.Value</code> = <code>Out.Value</code>$_{(n-1)}$ + <code>Incr.Value</code></td><td> 
</td></tr>
<tr><td>Triggered sum down
<code>Out.Value</code> = <code>Out.Value</code>$_{(n-1)}$ - <code>Decr.Value</code></td><td> 
</td></tr>
</table>

Parameterization on the `Feature` Bit	How the block operates	
`Feature` Bit 6 = 0 `Feature` Bit 7 = 1	Block operates as a continuous adder or summer. The calculation at the output parameter `Out` is performed continuously. The output parameter `Mode` shows whether the value is incremented or decremented. The result is output to the output parameter `Out`. The output parameter `CntOut` always includes the value 0.	
	Continuously sum up `Out.Value` = `Out.Value`$_{(n-1)}$ + `Incr.Value`	
	Continuously sum down `Out.Value` = `Out.Value`$_{(n-1)}$ - `Decr.Value`	

<table>
<tr><th>Parameterization on the Feature Bit</th><th>How the block operates</th><th></th></tr>
<tr><td rowspan="3">Feature Bit 6 = 1
Feature Bit 7 = non-operational</td><td colspan="2">Block operates as an continuous integrator.
The direction of integration depends on the operation in the faceplate or from the interconnection.
The input value In is integrated in accordance with the trapezoid rule dependent upon the counting direction according to the formula of the Integral block (Page 1429).
The output parameter Mode shows whether the value is integrated up or down.
The result is output to the output parameter Out.
The output parameter CntOut always includes the value 0.</td></tr>
<tr><td>Continuously integrate up
Mode = 1: Out.Value = Out.Value n-1 + SampleTime/TI * (In.Value + In.Value n-1)/2
Set direction of integration:
• Operation in the faceplate using the "On" command (UpOp = 1)
Requirement: LiOp.Value = 0
• Interconnection LiOp.Value = 1 and UpLi.Value = 1</td><td> 
</td></tr>
<tr><td>Continuously integrate down
Mode = 2: Out.Value = Out.Value n-1 - SampleTime/TI * (In.Value + In.Value n-1)/2
Set direction of integration:
• Operation in the faceplate using the "Off" command (DnOp = 1)
Requirement: LiOp.Value = 0
• Interconnection LiOp.Value = 1 and DnLi.Value = 1</td><td> 
</td></tr>
</table>

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Define the startup characteristics for this block via two `Feature` Bits:

Bit 0: Setting the startup characteristics (Page 116)

Bit 5: Use the last value following a complete download as the current value during startup of the block (Page 127)

The messages are suppressed after startup for the number of cycles specified in the `RunUpCyc` parameter.

Time response

The block does not have any time response.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section TotalL I/Os (Page 1359).

Status bit	Parameter
0	`Occupied`
1	`BatchEn`
2	`SimOn`
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7 - 9	Not used
10	`SimLiOp.Value`
11	`LiOp`
12 - 13	Not used
14	1 = Invalid signal status
15	Triggered summing; `Feature` Bit 6 = 0, Bit 7 = 0
16	Continuous summing; `Feature` Bit 6 = 0, Bit 7 = 1
17	Integrate; `Feature` Bit 6 = 1
18 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	`MsgLock.Value`
1	`OutAH_Act.Value`
2	`OutWH_Act.Value`
3	`OutTH_Act.Value`
4	`OutTL_Act.Value`
5	`OutWL_Act.Value`
6	`OutAL_Act.Value`
7	`OutAH_En`
8	`OutWH_En`
9	`OutTH_En`
10	`OutTL_En`
11	`OutWL_En`
12	`OutAL_En`
13	`OutAH_MsgEn`
14	`OutWH_MsgEn`
15	`OutTH_MsgEn`
16	`OutTL_MsgEn`
17	`OutWL_MsgEn`
18	`OutAL_MsgEn`
19	Not used
20	`Mode` = 1, upward summing or integration
21	`Mode` = 0, summer/integrator off
22	`Mode` = 2, downward summing or integration
23 - 30	Not used
31	`MS_RelOp`

See also

TotalL operating modes (Page 1352)
TotalL functions (Page 1352)
TotalL error handling (Page 1356)
TotalL messaging (Page 1357)
TotalL block diagram (Page 1364)

9.3.2 TotalL operating modes

TotalL operating modes

This block provides the following operating modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

Description of TotalL (Page 1346)

TotalL functions (Page 1352)

TotalL error handling (Page 1356)

TotalL messaging (Page 1357)

TotalL I/Os (Page 1359)

TotalL block diagram (Page 1364)

9.3.3 TotalL functions

Functions of TotalL

The functions for this block are listed below.

Limit monitoring of the count value

This block provides the standard function Limit monitoring of the count value (Page 75).

Suppressing messages using the `MsgLock` parameter

This block provides the standard function Suppressing messages using the MsgLock parameter (Page 162).

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

For In and Out different units of measure can be entered.

Simulating signals

The block provides the standard function Simulating signals (Page 47).

You can simulate the following values:

- Output value (SimOut, SimOutLi)

Note

Note on the simulation of the output value Out

For the presetting of the summing or integration value Out via the RstLi input, a 0 → 1 signal change at the input parameter RstLi is necessary during simulation.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status ST_Worst for the block is always formed from the following parameters:

- P_In.ST
- Incr.ST
- Decr.ST,
- PresetVal.ST
- In.ST

The worst signal status is first written to the status of the output parameter Out and then displayed using the ST_Worst parameter.

With internal simulation, ST_Worst and the status of Out become 16#60.

If there is a non-displayable floating-point number at one of the following parameters In, PresetVal, TI or Out when integrating Feature bit 6 = 1, the result is ST_Worst and the status of Out is set to 16#28, unless the internally calculated status of Out does not result in 16#0 or the block is in internal simulation.

In addition, the status of Out or ST_Worst is also written to the status of the output parameter UpDnAct.

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` I/O in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
2	Resetting the commands for changing the mode (Page 135)
5	Use the last value following a complete download as the current value during startup of the block (Page 127)
6	Block as summing unit or integrator (Page 120)
7	Summing response continuous or triggered (Page 146)
22	Update acknowledgment and error status of the message call (Page 135)
24	Activating local operating permission (Page 130)
25	Suppression of all messages (Page 146)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
28	Disabling operating points (Page 121)
29	Signaling limit violation (Page 142)

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 =Operator can switch to "On" mode
2	Not used
3	1 =Operator can switch to "Out of service" mode
4	1 = Operator can stop the summing or integration
5	1 = Operator can activate the upward summing or integration
6	1 = Operator can activate the downward summing or integration
7	1 = Operator can preset the sum value (`Out`)
8 - 10	Not used
11	1 =Operator can activate the Simulation function
12	1 =Operator can activate the Release for maintenance function
13	1 =Operator can change the limit (`OutAH_Lim`) for high alarm
14	1 =Operator can change the limit (`OutWH_Lim`) for high warning
15	1 =Operator can change the limit (`OutTH_Lim`) for high tolerance
16	Not used
17	1 =Operator can change the limit (`OutAL_Lim`) for low alarm
18	1 =Operator can change the limit (`OutWL_Lim`) for low warning

Bit	Function
19	1 =Operator can change the limit (OutTL_Lim) for low tolerance
20 - 21	Not used
22	1 =Operator can specify the default value (PresetVal.Value)
23	1 = Operator can specify the integration time constant (TI)
24	1 = Operator can specify the value for the increment (Incr.Value)
25	1 = Operator can specify the value for the decrement (Decr.Value)
26 - 31	Not used

Note

If you interconnect a parameter that is also listed in OS_Perm as a parameter, you have to reset the corresponding OS_Perm bit.

Readback of the most recently calculated sum

As long as the output parameter is Mode ≠ 0, the preceding sum value (OldOut) or the preceding count value (OldCntOut) is corrected to the current value:

- OldOut = Out.Value
- OldCntOut = CntOut.Value

After a warm restart, the sum value (Out) is automatically reset to the default value for the input parameter PresetVal if you have set the Feature Bit Setting the startup characteristics (Page 116) accordingly.

The count value CntOut in this case is always reset to 0.

Via the Feature Bit Use the last value following a complete download as the current value during startup of the block (Page 127) the current sum and/or count value is set to the predecessor values at startup by default.

- Old.Value = OldOut
- CntOut.Value = OldCntOut

Setting the summing/integrating value to the default

PresetVal is used to specify a summing/integrating value that is used in a warm restart.

As long as RstLi is set, the following applies:

Out.Value = PresetVal.Value.

When the input PresetVal is not interconnected (PresetVal.ST = FF), the default setting for the count value can also be made from the parameter view of the block.

Release for maintenance

This block provides the standard function Release for maintenance (Page 52).

SIMATIC BATCH functionality

This block provides the standard function SIMATIC BATCH functionality (Page 55).

See also

Description of TotalL (Page 1346)

TotalL operating modes (Page 1352)

TotalL error handling (Page 1356)

TotalL messaging (Page 1357)

TotalL I/Os (Page 1359)

TotalL block diagram (Page 1364)

9.3.4 TotalL error handling

Error handling of TotalL

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
11	The integration time constant `TI` is within the range: -`SampleTime` / 2 < `TI` < S`ampleTime` / 2. The integration is stopped.
15	`PresetVal.Value` > `OutOpScale.High` `PresetVal.Value` < `OutOpScale.Low`
30	The value of `In.Value` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out.Value` output.
31	The value of `Out` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.
32	The value of `PresetVal.Value` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out.Value` output.
33	The value of `TI` can no longer be displayed in the REAL number field. The integration is stopped.

Error number	Meaning of the error number
34	The value `Incr.Value` or `Decr.Value` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out.Value` output.
51	Invalid signal at `LiOp` = 1: `OffLi` = 1 and `UpLi` = 1 and/or `DnLi` = 1 `OffLi` = 0 and `UpLi` = 1 and `DnLi` = 1

See also

Description of TotalL (Page 1346)
TotalL operating modes (Page 1352)
TotalL functions (Page 1352)
TotalL messaging (Page 1357)
TotalL block diagram (Page 1364)
TotalL I/Os (Page 1359)

9.3.5 TotalL messaging

Messaging

The following messages can be generated for this block:

- Functions for displaying measured limits

Messages generated as a reaction to limit violations, can be suppressed by the settings `MsgEn` and `MsgLock`.

Associated values for message instance `MsgEvId`

Associated value	Block parameters
1	`BatchName`
2	`StepNo`
3	`BatchID`
4	`ExtVa104`
5	`ExtVa105`

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId	SIG 1	Alarm - high	$$BlockComment$$ High alarm limit violated
	SIG 2	Warning - high	$$BlockComment$$ High warning limit violated
	SIG 3	Tolerance - high	$$BlockComment$$ High tolerance limit violated
	SIG 4	Tolerance - low	$$BlockComment$$ Low tolerance limit violated
	SIG 5	Warning - low	$$BlockComment$$ Low warning limit violated
	SIG 6	Alarm - low	$$BlockComment$$ Low alarm limit violated
	SIG 7	AS process control message - fault	$$BlockComment$$ External message 1
	SIG 8	AS process control message - fault	$$BlockComment$$ External message 2

Explanation:

$$BlockComment$$: Content of the instance-specific comment

See also

Description of TotalL (Page 1346)
TotalL operating modes (Page 1352)
TotalL functions (Page 1352)
TotalL error handling (Page 1356)
TotalL I/Os (Page 1359)
TotalL block diagram (Page 1364)

9.3.6 TotalL I/Os

I/Os of TotalL

Input parameters

Parameter	Description	Type	Default
BatchEn	1 = Enable allocation	BOOL	0
BatchID	Batch ID	DWORD	16#00000000
BatchName	Batch name	S7-String	
Decr	Decrement for downward summing Decr.ST = FF via operator Decr.ST <> FF via interconnection	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
DnLi*	1 = Down counter, via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
DnOp*	1 = Down counter, via operator	BOOL	0
EN	1 = Called block will be processed	BOOL	1
ExtMsg1	Binary input for freely selectable message 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtMsg2	Binary input for freely selectable message 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ExtVa104	Associated value 4 for messages (MsgEvID1)	ANY	
ExtVa105	Associated value 5 for messages (MsgEvID1)	ANY	
Feature	I/O for additional functions (Page 1352)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
In	Input for integral value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Incr	Increment for upward summing Incr.ST = FF via operator Incr.ST <> FF via interconnection	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
InUnit	Unit of measure for the input parameter In	INT	1351

Parameter	Description	Type	Default
LiOp	1 = Interconnection 0 = Operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MsgEvId	Message number (assigned automatically)	DWORD	16#00000000
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_RelOp*	Operator can switch release for maintenance	BOOL	0
Occupied	1 = In use by a batch	BOOL	0
OffLi*	1 = Counter disabled via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OffOp*	1 = Counter disabled via operator	BOOL	1
OldCntOut*	Previous count value	DINT	0
OldOut*	Previous output value	REAL	0.0
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 1352)	STRUCT • Bit 0: BOOL • Bit 10: BOOL • Bit 31: BOOL	- • 1 • 1 • 1
OutAH_En	1 = Enable alarm (high) for count	BOOL	1
OutAH_Lim	Limit for count alarm (high)	REAL	95.0
OutAH_MsgEn	1 = Enable message for count alarm (high)	BOOL	1
OutAL_En	1 = Enable alarm (low) for count	BOOL	1
OutAL_Lim	Limit for count alarm (low)	REAL	0.0
OutAL_MsgEn	1 = Enable message for count alarm (low)	BOOL	1
OutOpScale	Limit for scale in Out bar graph of faceplate	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
OutTH_En	1 = Enable tolerance message (high)	BOOL	0
OutTH_Lim	Count tolerance limit message (high)	REAL	85.0
OutTH_MsgEn	1 = Enable message for count tolerance message (high)	BOOL	1
OutTL_En	1 = Enable count tolerance message (low)	BOOL	0

Parameter	Description	Type	Default
OutTL_Lim	Count tolerance message limit (low)	REAL	0.0
OutTL_MsgEn	1 = Enable message for count tolerance message (low)	BOOL	1
OutUnit	Unit of measure for count Out	INT	1038
OutWH_En	1 = Enable count warning (high)	BOOL	1
OutWH_Lim	Count warning limit (high)	REAL	90.0
OutWH_MsgEn	1 = Enable message for count warning (high)	BOOL	1
OutWL_En	1 = Enable count warning (low)	BOOL	1
OutWL_Lim	Count warning limit (low)	REAL	0.0
OutWL_MsgEn	1 = Enable message for count warning (low)	BOOL	1
P_In	Input for sum value (pulse input)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PresetVal*	Default setting for the count	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
RstLi	1 = Reset interlock via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RstOp*	1 = Reset interlock/flow monitoring via operator	BOOL	0
RunUpCyc	Number of cycles in startup; messages are suppressed during these cycles	INT	3
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SimLiOp	Activation/deactivation of the simulation by: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOnLi	1 = Simulation via interconnection or SFC (controlled by SimLiOp = 1)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn*	1 = Simulation on	BOOL	0
SimOut*	Output value used for SimOn = 1	REAL	0.0
SimOutLi	Output value that is used for SimOnLi.Value = 1 (SimLiOp.Value = 1)	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
StepNo	Batch step number	DWORD	16#00000000
TI*	Integral action time	REAL	1.0

Parameter	Description	Type	Default
UpLi*	1 = Forward counter, via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
UpOp*	1 = Forward counter, via operator	BOOL	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
CntOut	Number of counted pulses	DINT	0
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see TotalL error handling (Page 1356)	INT	-1
Mode	0 = Totalizer off 1 = Totalizer summed/integrated upward 2 = Totalizer summed/integrated downward	INT	0
MsgAckn	ALARM_8P: Output ACK_STATE message acknowledgment state	WORD	16#0000
MsgErr	1 = Message processing error occurred	BOOL	0
MsgStat	ALARM_8P: Output STATUS Error information of the ALARM_8P	WORD	16#0000
MS_Release	Release for maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF

Parameter	Description	Type	Default
Out	Count	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
OutAH_Act	1 = Count alarm (high) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OutAL_Act	1 = Count alarm (low) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OutTH_Act	1 = Count tolerance message (high) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OutTL_Act	1 = Count tolerance message (low) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OutWH_Act	1 = Count warning (high) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OutWL_Act	1 = Count warning (low) enabled. You can change the reaction for this parameter with Feature bit 28 (Disabling operating points (Page 121)) and with Feature bit 29 (Signaling limit violation (Page 142)).	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 1346)	DWORD	16#00000000
Status2	Status word 2 (Page 1346)	DWORD	16#00000000
UpDnAct	1 = Block counts/integrates 0 = Block has no activity	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

See also

TotalL operating modes (Page 1352)

TotalL messaging (Page 1357)

TotalL block diagram (Page 1364)

9.3.7 TotalL block diagram

TotalL block diagram

A block diagram is not provided for this block.

See also

Description of TotalL (Page 1346)

TotalL operating modes (Page 1352)

TotalL functions (Page 1352)

TotalL error handling (Page 1356)

TotalL I/Os (Page 1359)

TotalL messaging (Page 1357)

9.3.8 Operator control and monitoring

9.3.8.1 TotalL views

Views of the TotalL block

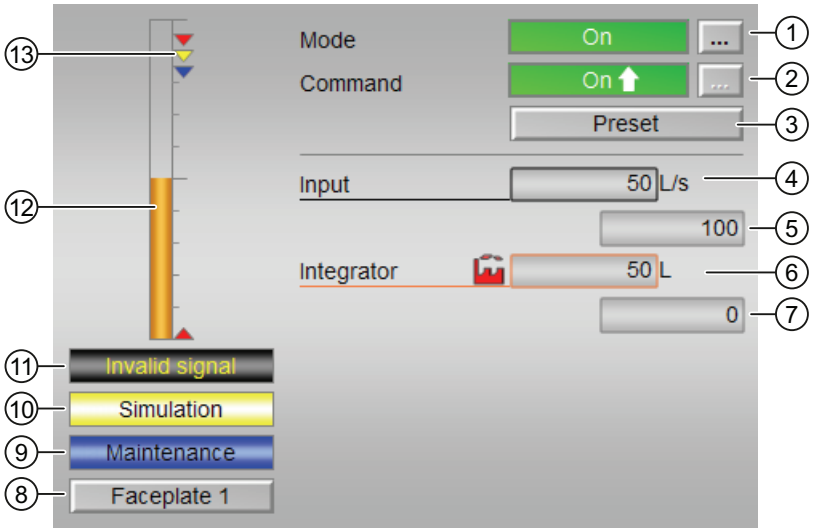
The block TotalL provides the following views:

- TotalL standard view (Page 1365)
- Alarm view (Page 250)
- TotalL limit value view (Page 1368)
- Trend view (Page 253)
- TotalL parameter view (Page 1369)
- TotalL preview (Page 1370)
- Memo view (Page 252)
- TotalL block icon (Page 1371)
- Batch view (Page 251)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

9.3.8.2 TotalL standard view

TotalL standard view



(1) Displaying and switching the operating mode

Operation of inputs `OosOp` and `OnOp`.

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58): `Status1` Bit 3 (`OosAct.Value`)
- Out of service (Page 58): `Status1` Bit 6 (`OnAct.Value`)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Enabling and disabling the counter

Operation of the inputs `UpOp`, `OffOp` and `DnOp`.

This area shows you the default operating state for the counter. The following states can be shown and executed here:

- "On ⇑": `Status2` Bit 20 (`Mode` = 1)
- "On ⇓": `Status2` Bit 22 (`Mode` = 2)
- "Off": `Status2` Bit 21 (`Mode` = 0)

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

(3) Default setting

Operation of the input `RstOp`.

This button activates the preset value.

(4) Display of the count value

The current count values are displayed here:

Display of input In

Depending on `Feature` Bit 6 and `Feature` Bit 7, either input `In` or an empty frame is displayed:

- "Input": `Feature` Bit 6 = 1, otherwise no display

The display is not operational. Format of `In` like display `Out`.

(5) High scale range for the count value

This value provides information on the display range for the bar graph (above) of the count value. The scale range is defined in the engineering system.

(6) Display of the count value

The current count values are displayed here:

Display Out

Depending on `Feature` Bit 6, the text for the display is switched over:

- "Counter": `Feature` Bit 6 = 0
- "Integrator": `Feature` Bit 6 = 1

The "Counter" display is not operational, not even in simulation. The format of `In` is like the `Out` display.

The "Integrator" display is only operational in simulation (operation input `SimOut`). The format corresponds to the block icon of `AnalogValueFormat1`.

(7) Low scale range for the count value

This value provides information on the display range for the bar graph (below) of the count value. The scale range is defined in the engineering system.

(8) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

(9) Display area for block states

This area provides additional information on the operating state of the block:

- "Maintenance"

You can find more information about this in the section Release for maintenance (Page 52).

(10) Display area for block states

This area provides additional information on the operating state of the block:

- "Simulation"

Additional information is available in the section Simulating signals (Page 47).

(11) Display area for block states

This area provides additional information on the operating state of the block:

- "Invalid signal"

Additional information is available in the section Error handling (Page 104).

(12) Graphic display of the current count value

This area shows you the current count in form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

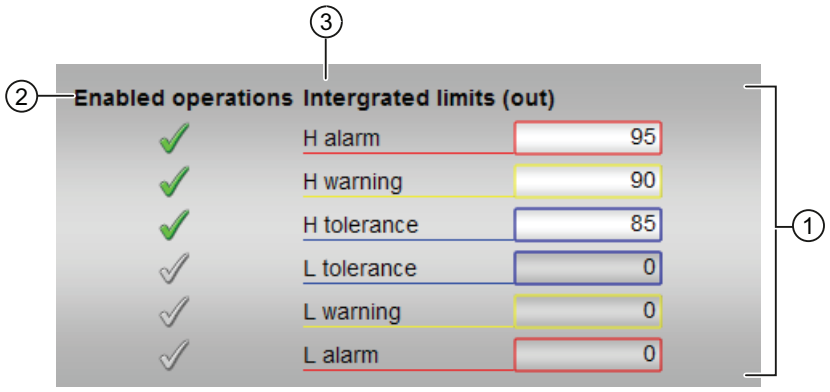
(13) Limit display

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning
- Blue: Tolerance

9.3.8.3 TotalL limit value view

Limit value view of TotalL



(1) Limits for the counter

In this area, you can enter the limits for the counter. Refer to the Changing values (Page 210) section for more on this.

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high
- "H tolerance": Tolerance high
- "L tolerance": Tolerance low
- "L warning": Warning low
- "L alarm": Alarm low

Format and unit is like the `Out` display in the standard view.

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

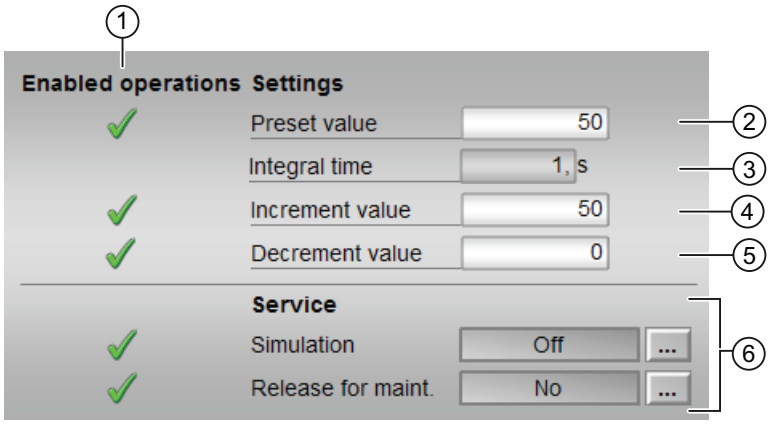
(3) Dynamic text

Depending on `Feature` Bit 6, the text is switched:

- "Integrator limits (out)": Display for `Feature` Bit 6 = 1
- "Summer limits (out)": Display for `Feature` Bit 6 = 0

9.3.8.4 TotalL parameter view

Parameter view of TotalL



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`).

(2) Default value

In this section you can enter the value from which the counting should begin. Additional information is available in the section Changing values (Page 210).

(3) Integral time

The currently integral time in seconds is displayed in this area.

- "Integral time" Display for `Feature` Bit 6 = 1, otherwise empty.

(4) Increment value

The increment value is displayed in this area.

- "Increment value": Display for `Feature` Bit 6 = 0, otherwise empty.

Decrement value

The decrement value is displayed in this area.

- "Decrement value": Display for `Feature` Bit 6 = 0, otherwise empty.

(5) Service

You can select the following function in this area:

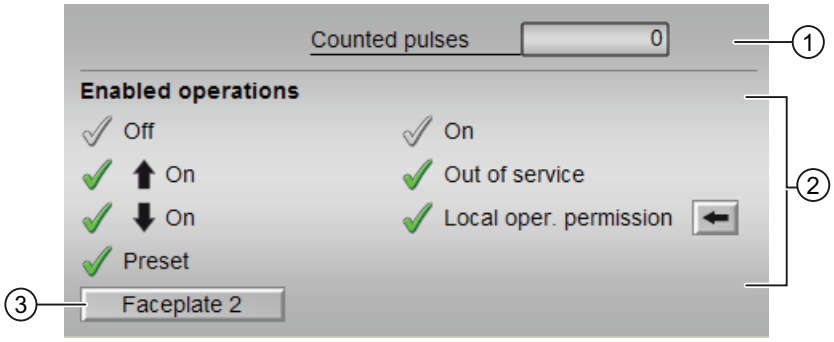
- "Simulation"
- "Release for maintenance"

Refer to the Switching operating states and operating modes (Page 208) section for more on this.

You can find information on this area in the Simulating signals (Page 47) section.

9.3.8.5 TotalL preview

Preview of TotalL



(1) Counted pulses

The number of pulses already counted is displayed in this area.

- "Counted pulses": `Feature` Bit 6 = 0 and `Feature` Bit 7 = 0, otherwise empty

(2) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- "Off": You can disable the counter.
- "On ⇑": You can operate the incremental counter.
- "On ⇓": You can operate the decremental counter.
- "Default": You can change the default setting.
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

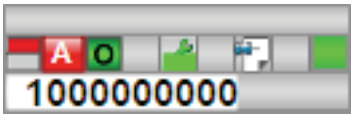
9.3.8.6 TotalL block icon

Block icons for TotalL

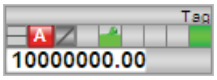
A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of alarm, warning, and tolerance limits
- Operating modes
- Signal status, release for maintenance
- Memo display
- Display counter running

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

9.4 CntOhSc - Runtime determination and counters with counting direction "up"

9.4.1 Description of CntOhSc

Object name (type + number) and family

Type + number: FB 1803

Family: Count

Area of application of CntOhSc

The block is used for the following applications:

- Incrementing of operating hours
- Incrementing a defined input value

How it works

The block determines the time in which a unit has been in operation and it counts a defined input value. The block can only count forwards.

1. Off (`OffOp = 1`)

   The block is disabled (output parameter `CountMode = 0`). No counting takes place.

2. Increment (`UpOp = 1`)

   The operating time of the connected unit is incremented (output parameter `CountMode = 1`).

The operating time is shown in days, hours, minutes and seconds. The maximum operating time is 32767 days and 23 hours.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is first installed automatically in the startup OB (OB 100).

Startup characteristics

Define the startup characteristics for this block via two feature bits:

Bit 0: Setting the startup characteristics (Page 116)

Bit 5: Use the last value following a complete download as the current value during startup of the block (Page 127)

When you set feature bit 5 to 1, then:

- `Days:= OldDays`
- `Hours:= OldHours`
- `Minutes:= OldMinutes`
- `Seconds:= OldSeconds`

Status word allocation for `Status1` parameter

Refer to the following section for a description of the individual parameters: I/Os of CntOhSc (Page 1377)

Status bit	Parameter
0 - 2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7 - 10	Not used
11	`LiOp`
12 - 13	Not used
14	1 = Invalid signal status
15 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	Not used
1	`HrsHiL1Act.Value`
2	`HrsHiL2Act.Value`
3	`CntHiL1Act.Value`
4	`CntHiL2Act.Value`
5 - 6	Not used
7	`HrsHiL1En`
8	`HrsHiL2En`
9	`CntHiL1En`
10	`CntHiL2En`

Status bit	Parameter
11 - 19	Not used
20	Count up
21	Counter off
22 - 31	Not used

9.4.2 Operating modes of CntOhSc

Operating modes of CntOhSc

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

General information on the "On" mode is available in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

9.4.3 Functions of CntOhSc

Functions of CntOhSc

The block provides the following functions:

Reset counter to zero

The output parameters of the operating time `Days`, `Hours`, `Minutes`, `Seconds` and `TimeHours` are reset via the interconnectable `ResetOh` parameter. The reset is made with a 0 - 1 edge.

The counted value at the `Cnt` output parameter is reset with the interconnectable `ResetCnt` parameter. The reset is made with a 0 - 1 edge.

The count value and the output parameters of the operating time can also be reset to zero together in the default view via the faceplate.

Configurable reactions using the Feature I/O

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
1	Reaction to the out of service mode (Page 148)
5	Use the last value following a complete download as the current value during startup of the block (Page 127)
24	Activating local operating permission (Page 130)
26	Reaction of the switching points in the "Out of service" operating mode (Page 148)
29	Signaling limit violation (Page 142)

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 = Operator can switch to "On" mode
2	Not used
3	1 = Operator can switch to "Out of service" mode
4	1 = Operator can stop counting
5	1 = Operator can switch to "Count up" mode
6	1 = Operator can reset the count
7 - 12	Not used
13	1 = Operator can change the limit (`HrsHi1Lim`) for high alarm
14	1 = Operator can change the limit (`HrsHi2Lim`) for the high warning
15	1 = Operator can change the limit (`CntHi1Lim`) for high alarm
16	1 = Operator can change the limit (`CntHi2Lim`) for the high warning
17 - 31	Not used

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for technologic blocks (Page 93).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `InOh.ST`
- `InCnt.ST`

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

9.4.4 Error handling of CntOhSc

Error handling of CntOhSc

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	No active fault
51	Invalid signal at `LiOp = 1`: • `OffLi = 1` and `UpLi = 1`

9.4.5 Messaging of CntOhSc

Messaging

This block does not offer messaging.

9.4.6 I/Os of CntOhSc

I/Os of CntOhSc

Input parameters

Parameter	Description	Type	Default
`CntHiL1En`	Limit 1 active	BOOL	0
`CntHiL2En`	Limit 2 active	BOOL	0

Parameter	Description	Type	Default
CntHi1Lim	Limit 1 reached	DINT	95
CntHi2Lim	Limit 2 reached	DINT	90
CntOpHiScale	High limit for scale in count bar graph of faceplate	DINT	100
CntOpLoScale	Low limit for scale in count bar graph of faceplate	DINT	0
CntUnit	Unit of measure for count Cnt	INT	0
Feature	I/O for additional functions (Page 1375)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
HrsHiL1En	Operating hours - limit 1 active	BOOL	0
HrsHiL2En	Operating hours - limit 2 active	BOOL	0
HrsHi1Lim	Hours - limit 1 reached	DINT	2280
HrsHi2Lim	Hours - limit 2 reached	DINT	2160
HrsOpHiScale	Operating hours - high limit of bar display for OS	DINT	2400
HrsOpLoScale	Operating hours - low limit of bar display for OS	DINT	0
HrsWHLim	Hours - high limit warning	INT	0
HrsWLLim	Hours - low limit warning	INT	0
InOh	Digital input value for operating hours counter	REAL	0
InCnt	Digital input value for up counter	REAL	0
LiOp	1= Interconnection 0 = Operator	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OffLi	Counter disabled via interconnection: 1 = Off	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OffOp*	Counter disabled via operator: 1 = Off	BOOL	1
OldCnt*	Previous count value	DINT	0
OldDays	Previous day value	INT	0
OldHours	Previous hour value	INT	0
OldMinutes	Previous minute value	INT	0
OldSeconds*	Previous second value	INT	0
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000

Parameter	Description	Type	Default
OS_Perm	I/O for Functions of CntOhSc (Page 1375)	STRUCT	-
		• Bit 0: BOOL	• 1
		• ...	• 1
		• Bit 31: BOOL	• 1
ResetCnt	1 = Input value Cnt reset	BOOL	0
ResetLi	1 = Counter reset via interconnection	BOOL	0
ResetOh	1 = Operating hours reset	BOOL	0
ResetOp*	1 = Counter reset by operator	BOOL	0
SampleTime	Sampling time [s]	REAL	0.1
SelFp1	Open faceplate 1	ANY	-
UpLi	1 = Increment (via interconnection)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
UpOp*	1 = Increment (via faceplate)	BOOL	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
CountMode	Count mode: 0 = Off 1 = Increment	INT	0
Cnt	Count	DINT	0
CntHiL1Act	1 = Limit 1 active	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
CntHiL2Act	1 = Limit 2 active	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
Days	Operating stage	INT	0
DeviceOn	1 = Unit on	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Error handling of CntOhSc (Page 1377)	INT	-1
Hours	Operating hours	INT	0
HrsHiL1Act	1 = Operating hours alarm limit 1	BOOL	0

Parameter	Description	Type	Default
HrsHiL2Act	1 = Operating hours alarm limit 2	BOOL	0
Minutes	Operating minutes	INT	0
OnAct	Block running	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	Block is "out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Operator control permission: Output for OS	DWORD	16#FFFFFFFF
OS_PermOut	Operator control permission: Output for OS	DWORD	16#FFFFFFFF
Seconds	Operating time [in sec]	INT	0
ST_Worst	Worst signal status	BYTE	16#80
Status1	Status word 1 (Page 304)	DWORD	16#00000000
Status2	Status word 2 (Page 304)	DWORD	16#00000000
TimeHours	Service life [h]	DINT	0

9.4.7 Block diagram of CntOhSc

Block diagram of CntOhSc

A block diagram is not provided for this block.

9.4.8 Operator control and monitoring

9.4.8.1 Views of CntOhSc

Views of the CntOhSc block

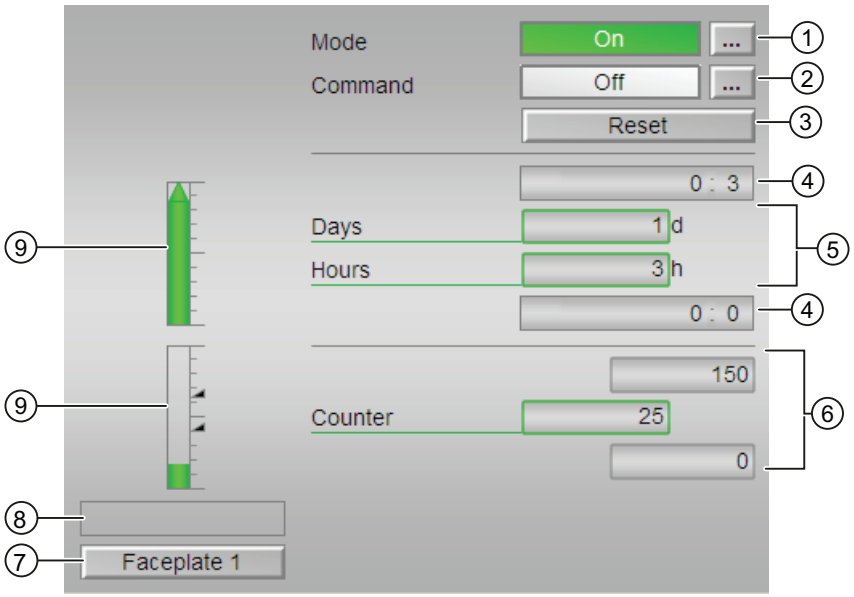
The CntOhSc block provides the following views:

- Standard view of CntOhSc (Page 1381)
- Limit value view of CntOhSc (Page 1383)
- Trend view (Page 253)
- Preview of CntOhSc (Page 1384)
- Memo view (Page 252)
- Block icon for CntOhSc (Page 1385)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

9.4.8.2 Standard view of CntOhSc

Standard view of CntOhSc



(1) Display and switch the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Enable and disable the counter

This area shows you the default operating state for the counter. The following states can be shown and executed here:

- "On ⇑"
- "Off"

Refer to the Switching operating states and operating modes (Page 208) section for information on changing the state.

(3) Reset

Operation of the input `RstOp`.

This button activates the preset value.

(4) High and low scale range for the count value

These values provide information on the display range for the bar graph of the count `HrsOpHiScale` or `HrsOpLoScale`. The scale range is defined in the engineering system.

(5) Display for counts

The following counts are shown here:

- "Days"
- "Hours"

(6) Counter

The following values are shown here:

- Current count value
- High and low scale range for the count

These values provide information on the display range for the bar graph of the count `CntOpHiScale` or `CntOpLoScale`. The scale range is defined in the engineering system.

(7) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the Engineering System (ES). The visibility of this navigation button depends on the configuration in the engineering system (ES).

Additional information is available in the section Opening additional faceplates (Page 165).

(8) Display area for states of the block

This area provides additional information on the operating state of the block:

- "Invalid signal"

Additional information is available in the section Error handling (Page 104).

(9) Graphic display for the current count

These areas show the`Cnt` and `TimeHours` counts in the form of a bar graph. The visible area in the bar graph depends on the configuration in the engineering system (ES).

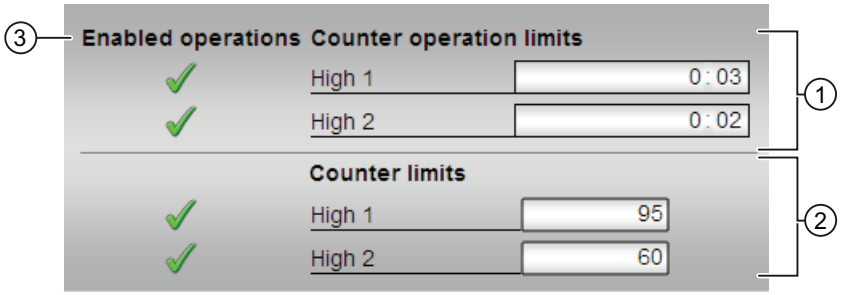
Limits

These colored triangles indicate the configured limits in the respective bar graph:

- Red: Alarm
- Yellow: Warning

9.4.8.3 Limit value view of CntOhSc

Limit value view of CntOhSc



(1) Operating limits of the counter

In this area, you can enter the limits for the counter. Additional information is available in the section Changing values (Page 210).

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high

(2) Counter limits

In this area, you can enter the limits for the counter. Additional information is available in the section Changing values (Page 210).

You can change the following limits:

- "H alarm": Alarm high
- "H warning": Warning high

(3) Enabled operations

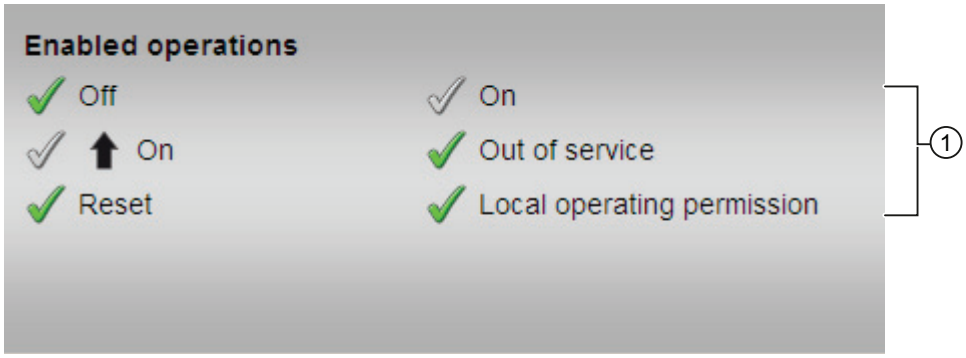
This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark:** the OS operator can control this parameter
- **Gray check mark:** the OS operator cannot control this parameter at this time due to the process
- **Red cross:** the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm`)

9.4.8.4 Preview of CntOhSc

Preview of CntOhSc



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark:** the OS operator can control this parameter
- **Gray check mark:** the OS operator cannot control this parameter at this time due to the process
- **Red cross:** the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm`)

The following enabled operations are shown here:

- "Off": You can disable the counter.
- "On ⇑": You can operate the counter.
- "Reset": You can reset the counter after interlocks or errors.
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

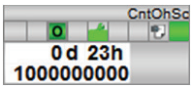
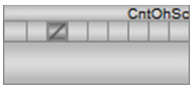
9.4.8.5 Block icon for CntOhSc

Block icons for CntOhSc

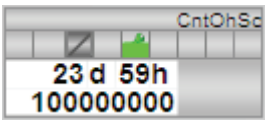
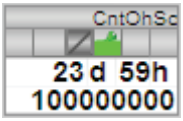
A variety of block icons are available with the following functions:

- Process tag type
- Limits (high/low)
- Violation of the alarm limits
- Operating modes
- Signal status
- Memo display
- Display counter running

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in the CFC	Special features
	1	Block icon in the full display
	2	
	-	Block icon in "Out of service" mode (example with type block icon type 1)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in the CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

Timers

10

10.1 TimerP - Time delays signal forwarding / pulse generator

10.1.1 Description of TimerP

Object name (type+number) and family

Type + number: FB 1810

Family: TIME

Area of application for TimerP

The block is used for the following fields of applications:

- Pulse generator
- Extended pulse
- ON delay
- ON delay with memory
- OFF delay

How it works

The TimerP block is used for delayed forwarding of start or stop actions through the `Out` output parameter.

New values at the `Ti` I/O are only applied when a change is made to the `In` I/O.

The inverted signal for `Out` is also provided at the `InvOut` output parameter.

Use the Mode input parameter to define how the block should be used. Refer to the Functions of TimerP (Page 1389) section for more on this.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Operating modes of TimerP (Page 1388)
Error handling for TimerP (Page 1391)
Messaging by TimerP (Page 1392)
TimerP I/Os (Page 1392)
TimerP block diagram (Page 1393)

10.1.2 Operating modes of TimerP

TimerP operating modes

This block does not have any modes.

See also

Description of TimerP (Page 1387)
Functions of TimerP (Page 1389)
Error handling for TimerP (Page 1391)
Messaging by TimerP (Page 1392)
TimerP I/Os (Page 1392)
TimerP block diagram (Page 1393)

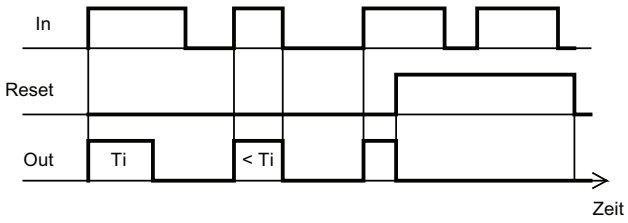
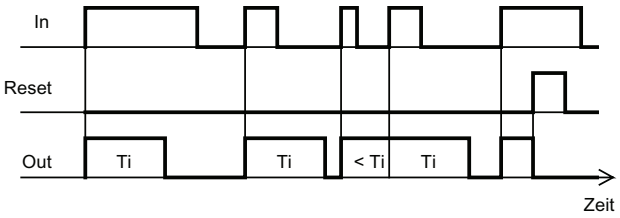
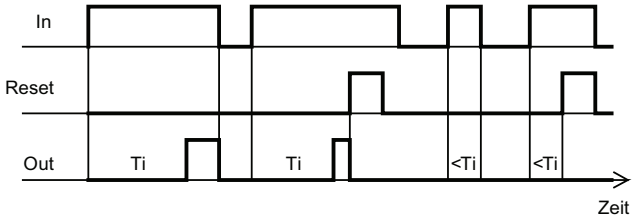
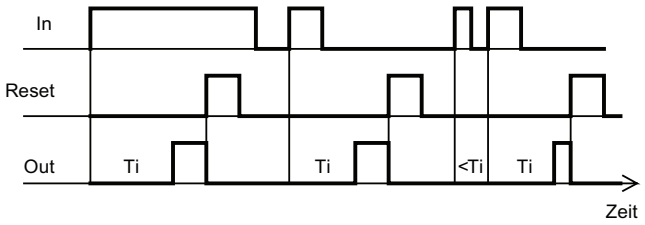
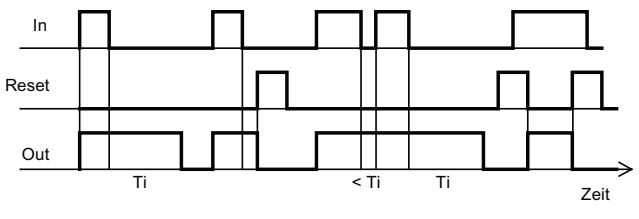
10.1.3 Functions of TimerP

Functions of TimerP

The functions for this block are listed below.

Specifying how TimerP works

Use the `Mode` input parameter to specify how the block should work:

Mode =	How the block works	Graphic representation
0	Start timer as pulse	
1	Start extended pulse timer	
2	Start ON delay timer	
3	Start ON delay timer with memory	
4	Start OFF delay timer	

Setting the time

You can use the `Ti` parameter to time for operating the block.

Note

Be aware when configuring this, that the time interval between `Ti` and `SampleTime` should not be more than 10^7.

Resetting the `Out` and `TimeRemaining` output parameters

Use the `Reset.Value` = 1 parameter to reset the output parameters `Out` and `TimeRemaining.Value` to 0.

Forming the signal status for blocks

The signal status for the block is formed using the following parameters and output at the `Out` and `InvOut` output parameters:

- `In.ST`

See also

Description of TimerP (Page 1387)

Operating modes of TimerP (Page 1388)

Error handling for TimerP (Page 1391)

Messaging by TimerP (Page 1392)

TimerP I/Os (Page 1392)

TimerP block diagram (Page 1393)

10.1.4 Error handling for TimerP

Error handling of TimerP

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
1	Invalid function type for the block set at the Mode input parameter
11	`Ti.Value` < `SampleTime` This error causes the `TimeRemaining` and `Out` output parameters to be set to 0.
33	The value of `Ti` can no longer be displayed in the REAL number field.

See also

Description of TimerP (Page 1387)

Operating modes of TimerP (Page 1388)

Functions of TimerP (Page 1389)

Messaging by TimerP (Page 1392)

TimerP I/Os (Page 1392)

TimerP block diagram (Page 1393)

10.1.5 Messaging by TimerP

Messaging

This block does not offer messaging.

See also

Description of TimerP (Page 1387)
Operating modes of TimerP (Page 1388)
Functions of TimerP (Page 1389)
Error handling for TimerP (Page 1391)
TimerP I/Os (Page 1392)
TimerP block diagram (Page 1393)

10.1.6 TimerP I/Os

I/Os of TimerP

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In	Input signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Mode	How the block works: 0 = Start timer as pulse 1 = Start timer as extended pulse 2 = Start timer with ON delay 3 = Start timer with latching ON delay 4 = Start timer with OFF delay	INT	2
Reset	1 = Reset output Out	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
Ti*	Time [s]	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Error handling for TimerP (Page 1391).	INT	-1
InvOut	Inverted output signal	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
Out	Output signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
TimeRemaining	Remaining time [s]	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

See also

Description of TimerP (Page 1387)
Operating modes of TimerP (Page 1388)
Functions of TimerP (Page 1389)
Messaging by TimerP (Page 1392)
TimerP block diagram (Page 1393)

10.1.7 TimerP block diagram

TimerP block diagram

A block diagram is not provided for this block.

See also

Description of TimerP (Page 1387)
Operating modes of TimerP (Page 1388)
Functions of TimerP (Page 1389)
Error handling for TimerP (Page 1391)
Messaging by TimerP (Page 1392)
TimerP I/Os (Page 1392)

Mathematical blocks 11

11.1 Add04 - Adder with 4 values

11.1.1 Description of Add04

Object name (type + number) and family

Type + number: FC 351

Family: Math

Area of application for Add04

The block is used for the following applications:

- Adding values
- Output of the total value for further processing

How it works

The Add04 block calculates the sum of up to 4 values:

`Out` = `In1` +...+ `Inn` (`n` ≤ 4),

Where:

`Out` = sum value

`In1` ... `In4=` values to be added

The sum of all input parameters and the worst input parameter signal status is always output.

The output value is checked to determine if it is within the value range of REAL. If it is outside the value range, the highest or lowest possible REAL value is output.

If the value is NAN, the last valid output value is output and the status of the output value is set to 16#28 (if none of the input statuses is worse).

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Add04 functions (Page 1396)
Add04 messaging (Page 1398)
Add04 I/Os (Page 1398)
Add04 block diagram (Page 1399)
Add04 error handling (Page 1397)
Add04 modes (Page 1396)

11.1.2 Add04 modes

Add04 operating modes

This block does not have any modes.

See also

Add04 block diagram (Page 1399)
Add04 I/Os (Page 1398)
Add04 messaging (Page 1398)
Add04 error handling (Page 1397)
Description of Add04 (Page 1395)
Add04 functions (Page 1396)

11.1.3 Add04 functions

Functions of Add04

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The worst signal status for the block is formed by the following parameters and output at the `Out` output parameter:

- `In1.ST`
- `In2.ST`
- `In3.ST`
- `In4.ST`

See also

Description of Add04 (Page 1395)

Add04 messaging (Page 1398)

Add04 I/Os (Page 1398)

Add04 block diagram (Page 1399)

Add04 error handling (Page 1397)

Add04 modes (Page 1396)

11.1.4 Add04 error handling

Add04 error handling

The block does not report any errors.

See also

Add04 block diagram (Page 1399)

Add04 I/Os (Page 1398)

Add04 messaging (Page 1398)

Description of Add04 (Page 1395)

Add04 modes (Page 1396)

Add04 functions (Page 1396)

11.1.5 Add04 messaging

Messaging

This block does not offer messaging.

See also

Description of Add04 (Page 1395)
Add04 functions (Page 1396)
Add04 I/Os (Page 1398)
Add04 block diagram (Page 1399)
Add04 modes (Page 1396)
Add04 error handling (Page 1397)

11.1.6 Add04 I/Os

Add04 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Value 1 to add	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In2	Value 2 to add	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In3	Value 3 to add	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In4	Value 4 to add	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output of the sum	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

See also

Description of Add04 (Page 1395)
Add04 functions (Page 1396)
Add04 messaging (Page 1398)
Add04 block diagram (Page 1399)
Add04 modes (Page 1396)
Add04 error handling (Page 1397)

11.1.7 Add04 block diagram

Add04 block diagram

A block diagram is not provided for this block.

See also

Description of Add04 (Page 1395)
Add04 modes (Page 1396)
Add04 functions (Page 1396)
Add04 error handling (Page 1397)
Add04 messaging (Page 1398)
Add04 I/Os (Page 1398)

11.2 Add08 - Adder with 8 values

11.2.1 Description of Add08

Object name (type + number) and family

Type + number: FC 352

Family: Math

Area of application for Add08

The block is used for the following applications:

- Adding values
- Output of the total value for further processing

How it works

The Add08 block calculates the sum of up to 8 values:

`Out` = `In1` +...+ `Inn (n` ≤ 8),

Where:

`Out` = sum value

`In1` ... `In8` = values to be added

The sum of all input parameters and the worst input parameter signal status is always output.

The output value is checked to determine if it is within the value range of REAL. If it is outside the value range, the highest or lowest possible REAL value is output.

If the value is NAN, the last valid output value is output and the status of the output value is set to 16#28 (if none of the input statuses is worse).

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Add08 functions (Page 1401)
Add08 messaging (Page 1403)
Add08 I/Os (Page 1403)
Add08 block diagram (Page 1405)
Add08 error handling (Page 1402)
Add08 modes (Page 1401)

11.2.2 Add08 modes

Add08 operating modes

This block does not have any modes.

See also

Description of Add08 (Page 1400)
Add08 functions (Page 1401)
Add08 error handling (Page 1402)
Add08 messaging (Page 1403)
Add08 I/Os (Page 1403)
Add08 block diagram (Page 1405)

11.2.3 Add08 functions

Functions of Add08

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The worst signal status for the block is formed by the following parameters and output at the `Out` output parameter:

- `In1.ST`
- `In2.ST`
- `In3.ST`
- `In4.ST`
- `In5.ST`
- `In6.ST`
- `In7.ST`
- `In8.ST`

See also

Description of Add08 (Page 1400)

Add08 messaging (Page 1403)

Add08 I/Os (Page 1403)

Add08 block diagram (Page 1405)

Add08 error handling (Page 1402)

Add08 modes (Page 1401)

11.2.4 Add08 error handling

Add08 error handling

The block does not report any errors.

See also

Add08 block diagram (Page 1405)

Add08 I/Os (Page 1403)

Add08 messaging (Page 1403)

Description of Add08 (Page 1400)

Add08 functions (Page 1401)

Add08 modes (Page 1401)

11.2.5 Add08 messaging

Messaging

This block does not offer messaging.

See also

Description of Add08 (Page 1400)
Add08 functions (Page 1401)
Add08 I/Os (Page 1403)
Add08 error handling (Page 1402)
Add08 modes (Page 1401)
Add08 block diagram (Page 1405)

11.2.6 Add08 I/Os

Add08 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Value 1 to add	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In2	Value 2 to add	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In3	Value 3 to add	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In4	Value 4 to add	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In5	Value 5 to add	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
In6	Value 6 to add	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
In7	Value 7 to add	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
In8	Value 8 to add	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output of the sum	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

See also

Description of Add08 (Page 1400)
Add08 functions (Page 1401)
Add08 messaging (Page 1403)
Add08 block diagram (Page 1405)
Add08 error handling (Page 1402)
Add08 modes (Page 1401)

11.2.7 Add08 block diagram

Add08 block diagram

A block diagram is not provided for this block.

See also

Description of Add08 (Page 1400)
Add08 functions (Page 1401)
Add08 error handling (Page 1402)
Add08 I/Os (Page 1403)
Add08 modes (Page 1401)
Add08 messaging (Page 1403)

11.3 Average - mean value calculation

11.3.1 Description of Average

Object name (type + number) and family

Type + number: FB1804

Family: Math

Area of application for Average

The block is used for the following applications:

- Calculation of a time-based mean value

How it works

The block calculates the time-based mean value of an analog value `In` based on the time which has expired since its start. The equation below is used:

$$Out = \frac{Out_{(n-1)} \cdot NumCycles + In}{NumCycles + 1}$$

Where:

`In` = input variable

`Out` = present average value

$Out_{(n-1)}$ = calculated average upon successful startup

`NumCycles` = Number of cycles for creating the mean value from the 0 - 1 edge transition of the Run input parameter.

The calculation is started by a 0 - 1 edge at the `Run` input parameter. The `Out` output parameter is overwritten by the `In` input parameter.

The result at output value `Out` is recalculated in the next cycles, and cycle counter `NumCycles` is incremented.

The `NumCycles` cycle counter has the DINT data type and can therefore assume the maximum value of 2147483647. When this value is reached, the `NumCycles` cycle counter is reset to 1. The formation of the mean is then started once again. At a cycle time of 100 ms, this case occurs every 6.8 years.

Calculation is terminated by resetting (1 - 0 edge) the `Run` input parameter. The last results set at `Out` and `NumCycles` are saved.

The parameter `Feature` can be used to specify the startup characteristics of the block.

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

Average functions (Page 1408)
Average messaging (Page 1409)
Average I/Os (Page 1410)
Average modes (Page 1407)
Average error handling (Page 1408)
Average block diagram (Page 1411)

11.3.2 Average modes

Average operating modes

This block does not have any modes.

See also

Description of Average (Page 1405)
Average functions (Page 1408)
Average error handling (Page 1408)
Average messaging (Page 1409)
Average I/Os (Page 1410)
Average block diagram (Page 1411)

11.3.3 Average functions

Functions of Average

The functions for this block are listed below.

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Functions
0	Setting the startup characteristics (Page 116)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The signal status for the block is formed using the following parameters and output at the `Out` output parameter:

- `In.ST`

See also

Description of Average (Page 1405)

Average messaging (Page 1409)

Average I/Os (Page 1410)

Average modes (Page 1407)

Average error handling (Page 1408)

Average block diagram (Page 1411)

11.3.4 Average error handling

Error handling of Average

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The ErrorNum I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Default value displayed after installation in the block.
0	No active fault
30	The In value can no longer be displayed in the REAL number field, the 16#28 status is also output. The last valid value is provided at the Out output and calculation is halted.
31	The Out value can no longer be displayed in the REAL number field, the 16#28 status is also output. The last valid value is provided at the Out output.

See also

Average modes (Page 1407)
Average functions (Page 1408)
Description of Average (Page 1405)
Average messaging (Page 1409)
Average I/Os (Page 1410)
Average block diagram (Page 1411)

11.3.5 Average messaging

Messaging

This block does not offer messaging.

See also

Description of Average (Page 1405)
Average functions (Page 1408)
Average I/Os (Page 1410)
Average modes (Page 1407)
Average error handling (Page 1408)
Average block diagram (Page 1411)

11.3.6 Average I/Os

I/Os of Average

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1408)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
In*	Analog input value for mean value calculation	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
Run	1 = Start time-based mean value calculation	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
EndTime	1 = Time for ending time-based mean value calculation	DT	1990-01-01-0:00:00
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Average error handling (Page 1408)	INT	-1
NumCycles	Cycle counter	DINT	1
Out	Output for average value	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
StartTime	1 = Time for starting time-based mean value calculation	DT	1990-01-01-0:00:00

See also

Description of Average (Page 1405)
Average messaging (Page 1409)
Average modes (Page 1407)
Average block diagram (Page 1411)

11.3.7 Average block diagram

Average block diagram

A block diagram is not provided for this block.

See also

Average modes (Page 1407)
Average functions (Page 1408)
Average error handling (Page 1408)
Average messaging (Page 1409)
Description of Average (Page 1405)
Average I/Os (Page 1410)

11.4 DeadTime - delayed signal output

11.4.1 Description of DeadTime

Object name (type + number) and family

Type + number: FB 1807
Family: Math

Area of application for DeadTime

The block provides the following functions:

- Delay [s] of signal output

How it works

This block delays the output of an input value by a time `DeadTime` [s] selected by the user.

Dead times up to 100 times the `SampleTime` can be realized. If you want to set a longer dead time, you need to connect several dead time blocks in sequence. You can also insert the dead time block in a runtime group with a longer sampling time or scale down the runtime group, but this would lead to loss of input values.

The block operates as follows:

`Out` = `In` (t - `DeadTime`)

Where:

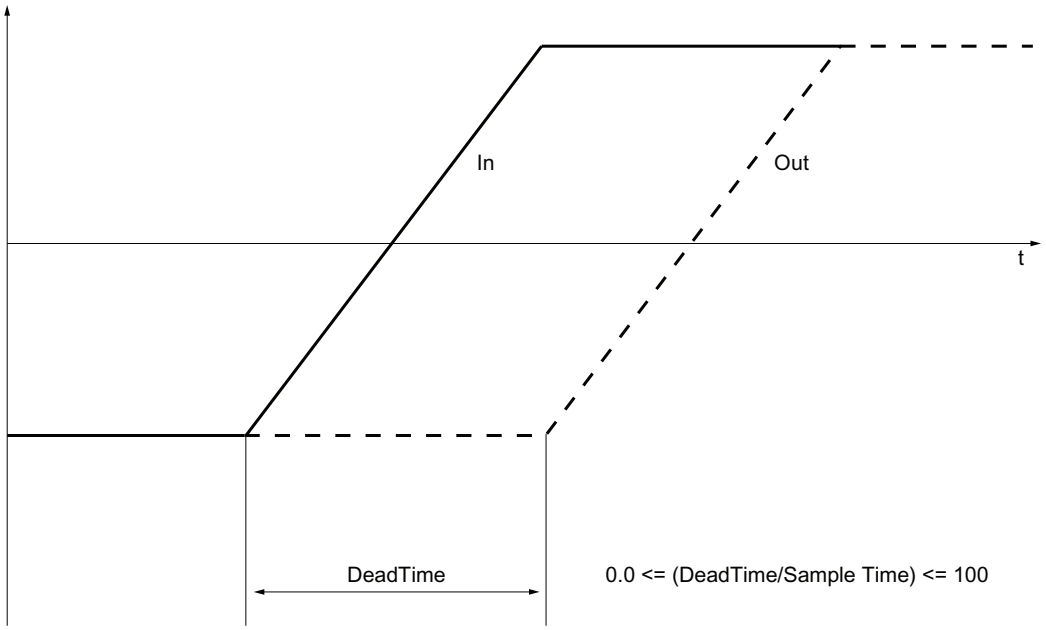
`Out` = output value

t = current time

`DeadTime` = `DeadT_Cyc` · `SampleTime` where:

`DeadT_Cyc` = Number of cycles [0...100], by which the analog input value is delayed

An analog value of input `In` is only output after the variable dead time at `DeadTime` has expired. It is output at `Out`.



You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Note

If you change the value for the dead time during the runtime of the block, the input value is written to the output. The change to the dead time then takes effect.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

The resulting sampling time of the block must be long enough for the desired dead time to be specified at the `DeadTime` parameter.

For the DeadTime block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

DeadTime functions (Page 1414)

DeadTime messaging (Page 1416)

DeadTime I/Os (Page 1416)

DeadTime block diagram (Page 1417)

DeadTime modes (Page 1413)

DeadTime error handling (Page 1415)

11.4.2 DeadTime modes

DeadTime operating modes

This block does not have any modes.

See also

DeadTime block diagram (Page 1417)

DeadTime I/Os (Page 1416)

DeadTime messaging (Page 1416)

DeadTime error handling (Page 1415)

DeadTime functions (Page 1414)

Description of DeadTime (Page 1411)

11.4.3 DeadTime functions

Functions of DeadTime

The functions for this block are listed below.

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Functions
0	Setting the startup characteristics (Page 116)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The signal status for the block is formed using the following parameters and output at the `Out` output parameter:

- `In.ST`

See also

Description of DeadTime (Page 1411)

DeadTime messaging (Page 1416)

DeadTime I/Os (Page 1416)

DeadTime block diagram (Page 1417)

DeadTime modes (Page 1413)

DeadTime error handling (Page 1415)

11.4.4 DeadTime error handling

Error handling of DeadTime

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed.
0	There is no error.
30	The value of `In` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.
32	The value of `DeadTime` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.
45	The value of `DeadTime` is within the permitted range `0` ≤ `INT` (`DeadTime` / `SampleTime`) ≤ 100 If the value of `DeadTime` is greater than 100 · `SampleTime`, the block works internally with the maximum dead time of 100 · `SampleTime`.

See also

DeadTime block diagram (Page 1417)

DeadTime I/Os (Page 1416)

DeadTime messaging (Page 1416)

DeadTime modes (Page 1413)

Description of DeadTime (Page 1411)

DeadTime functions (Page 1414)

11.4.5 DeadTime messaging

Messaging

This block does not offer messaging.

See also

Description of DeadTime (Page 1411)

DeadTime functions (Page 1414)

DeadTime I/Os (Page 1416)

DeadTime block diagram (Page 1417)

DeadTime modes (Page 1413)

DeadTime error handling (Page 1415)

11.4.6 DeadTime I/Os

I/Os of DeadTime

Input parameters

Parameter	Description	Type	Default
`DeadTime*`	Dead time [s]: Time by which the analog input value is delayed	REAL	1.0
`EN`	1 = Called block will be processed	BOOL	1
`Feature`	I/O for additional functions (Page 1414)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
`In*`	Analog input value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
`SampleTime`	Sampling time [s] (assigned automatically)	REAL	0.1

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see DeadTime error handling (Page 1415).	INT	-1
DeadT_Cyc	Number of cycles [0 to 100] by which the analog input value is delayed	INT	0
Out	Analog output value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

See also

Description of DeadTime (Page 1411)

DeadTime messaging (Page 1416)

DeadTime block diagram (Page 1417)

DeadTime modes (Page 1413)

11.4.7 DeadTime block diagram

DeadTime block diagram

A block diagram is not provided for this block.

See also

DeadTime I/Os (Page 1416)

DeadTime messaging (Page 1416)

DeadTime error handling (Page 1415)

DeadTime functions (Page 1414)

DeadTime modes (Page 1413)

Description of DeadTime (Page 1411)

11.5 Derivative - Obtaining a derivative

11.5.1 Description of Derivative

Object name (type + number) and family

Type + number: FB 1808

Family: Math

Area of application for Derivative

The block is used for the following applications:

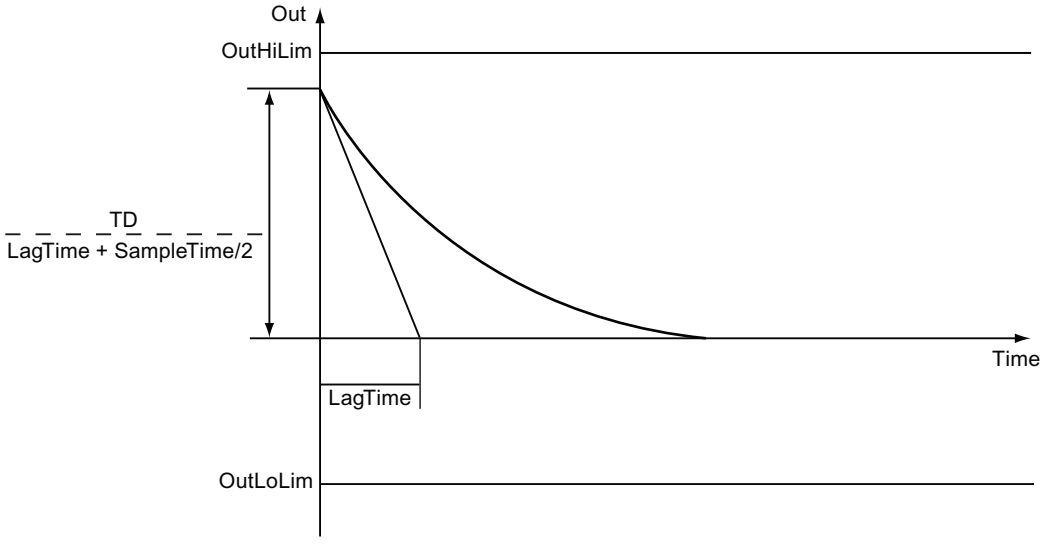
- Forming the D component for the controller design
- Forming a temporal derivative of the input signal

How it works

The block can be used as part of user-designed closed-loop controller. The block calculates a D component with delay. The derivative of the input signal is formed using the "trapezoid rule".

If only the derivative signal is to be calculated `TD` must be set as = 1 [s]. The speed signal is then formed from the travel signal.

The output signal can be damped using the `LagTime` parameter. Damping is disabled by configuring `LagTime` = 0. The following figure shows the step response from the unit step of the `In` input variable.



The block works according to the following formula:

$$Out = TD \cdot \left(LagTime + \frac{SampleTime}{2} \right) \cdot \left(In_{(n)} - In_{(n-1)} \right)$$

Where:

$$In_{(n)} = In_{(n-1)} + \frac{SampleTime \cdot Out}{TD}$$

The following applies for both formulas:

- `Out` = output value
- `TD` = Derivative time
- `In(n)` = Input value
- `In(n-1)` = Last input value from the I/O `In`
- `SampleTime` = Sampling time [s]
- `LagTime` = Delay time [s]

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB3x). The block is then installed automatically in startup OB (OB100).

Further addressing is not required.

For the Derivative block, the Advanced Process Library contains a template for process tag types as an example with an application scenario for this block.

Example of process tag types:

- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Derivative messaging (Page 1422)

Derivative error handling (Page 1421)

Derivative modes (Page 1420)

Derivative I/Os (Page 1423)

Derivative functions (Page 1420)

11.5.2 Derivative modes

Derivative operating modes

This block does not have any modes.

See also

Derivative block diagram (Page 1424)

Derivative I/Os (Page 1423)

Derivative messaging (Page 1422)

Derivative error handling (Page 1421)

Derivative functions (Page 1420)

Description of Derivative (Page 1418)

11.5.3 Derivative functions

Functions of Derivative

The functions for this block are listed below.

Monitoring the output parameter for limits

The `Out` output parameter can be checked for limit values:

- `OutHiLim`: High limit
- `OutLoLim`: Low limit

If the limits are infringed, this is indicated to you at the corresponding output parameters (output parameter `OutHiAct` or `OutLoAct` = 1).

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in section Configurable functions with the Feature I/O (Page 131). The following behavior patterns are available for this block at the relevant bits

Bit	Function
0	Setting the startup characteristics (Page 116)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The signal status for the block is formed using the following parameters and output at the `Out`, `OutHiAct` and `OutLoAct` output parameters:

- `In.ST`

See also

Description of Derivative (Page 1418)

Derivative messaging (Page 1422)

Derivative I/Os (Page 1423)

Derivative block diagram (Page 1424)

Derivative error handling (Page 1421)

Derivative modes (Page 1420)

11.5.4 Derivative error handling

Error handling of Derivative

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	There is no error.
30	The value of `In` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.
31	The value of `Out` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.
32	The value of `LagTime` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.
33	The value of `TD` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.

See also

Derivative block diagram (Page 1424)
Derivative I/Os (Page 1423)
Derivative messaging (Page 1422)
Description of Derivative (Page 1418)
Derivative modes (Page 1420)
Derivative functions (Page 1420)

11.5.5 Derivative messaging

Messaging

This block does not offer messaging.

See also

Description of Derivative (Page 1418)
Derivative functions (Page 1420)
Derivative I/Os (Page 1423)
Derivative block diagram (Page 1424)
Derivative modes (Page 1420)
Derivative error handling (Page 1421)

11.5.6 Derivative I/Os

I/Os of Derivative

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1420)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
In*	Analog input value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
LagTime*	Delay time [s]	REAL	10.0
OutHiLim	Limit (high) for output value	REAL	100.0
OutLoLim	Limit (low) for output value	REAL	0.0
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
TD*	Derivative time [s]	REAL	1.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Derivative error handling (Page 1421)	INT	-1
Out	Output value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
OutHiAct	1= Limit (high) violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OutLoAct	1= Limit (low) violated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Description of Derivative (Page 1418)
Derivative messaging (Page 1422)
Derivative block diagram (Page 1424)
Derivative modes (Page 1420)

11.5.7 Derivative block diagram

Derivative block diagram

A block diagram is not provided for this block.

See also

Description of Derivative (Page 1418)
Derivative modes (Page 1420)
Derivative functions (Page 1420)
Derivative error handling (Page 1421)
Derivative messaging (Page 1422)
Derivative I/Os (Page 1423)

11.6 Div02 - division of two values

11.6.1 Description of Div02

Object name (type + number) and family

Type + number: FC 358
Family: Math

Area of application for Div02

The block is used for the following applications:

- Dividing two values
- Output of the division for further processing

How it works

The block is used to divide two values as follows:

`Out` = `In1` / `In2`

If the input parameter is `In2` = 0, the last valid output value is retained until another division is permitted mathematically.

The worst signal status is also always output at the output parameter.

The output value is checked to determine if it is within the value range of REAL. If it is outside the value range, the highest or lowest possible REAL value is output.

If the value is NAN or divided by 0, the last valid output value is output and the status of the output value is set to 16#28 (if none of the input statuses is worse).

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

Div02 block diagram (Page 1429)

Div02 I/Os (Page 1428)

Div02 messaging (Page 1427)

Div02 error handling (Page 1427)

Div02 functions (Page 1426)

Div02 modes (Page 1426)

11.6.2 Div02 modes

Div02 operating modes

This block does not have any modes.

See also

Div02 block diagram (Page 1429)

Div02 I/Os (Page 1428)

Div02 messaging (Page 1427)

Div02 error handling (Page 1427)

Div02 functions (Page 1426)

Description of Div02 (Page 1424)

11.6.3 Div02 functions

Functions of Div02

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The worst signal status for the block is formed by the following parameters and output at the `Out` output parameter:

- `In1.ST`
- `In2.ST`

See also

Div02 block diagram (Page 1429)

Div02 I/Os (Page 1428)

Div02 messaging (Page 1427)

Div02 error handling (Page 1427)

Div02 modes (Page 1426)

Description of Div02 (Page 1424)

11.6.4 Div02 error handling

Error handling of Div02

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	There is no error.
30	It has been divided by 0.

See also

Div02 block diagram (Page 1429)

Div02 messaging (Page 1427)

Div02 functions (Page 1426)

Div02 modes (Page 1426)

Description of Div02 (Page 1424)

Div02 I/Os (Page 1428)

11.6.5 Div02 messaging

Messaging

This block does not offer messaging.

See also

Div02 block diagram (Page 1429)

Div02 I/Os (Page 1428)

Description of Div02 (Page 1424)

Div02 modes (Page 1426)

Div02 functions (Page 1426)

Div02 error handling (Page 1427)

11.6.6 Div02 I/Os

I/Os of Div02

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Dividend	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
In2	Divisor	STRUCT	-
		• Value: REAL	• 1.0
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Div02 error handling (Page 1427).	INT	-1
Out	Output of division	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

See also

Div02 block diagram (Page 1429)
Description of Div02 (Page 1424)
Div02 modes (Page 1426)
Div02 functions (Page 1426)
Div02 messaging (Page 1427)

11.6.7 Div02 block diagram

Div02 block diagram

A block diagram is not provided for this block.

See also

Div02 I/Os (Page 1428)
Div02 messaging (Page 1427)
Div02 error handling (Page 1427)
Div02 functions (Page 1426)
Div02 modes (Page 1426)
Description of Div02 (Page 1424)

11.7 Integral - Generating a time integral

11.7.1 Description of Integral

Object name (type + number) and family

Type + number: FB 1823
Family: Math

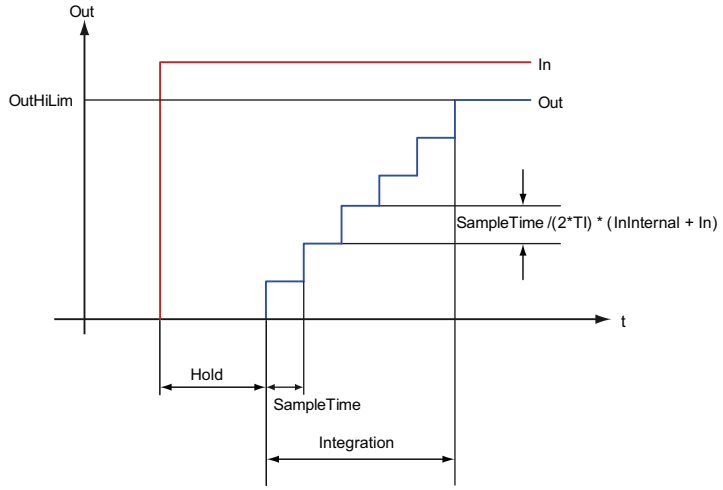
Area of application for Integral

The block is used for the following application:

- Forming the time integral of the connected input signal
- Forming the D component for the controller design

How it works

The block can be used as part of user-designed closed-loop controller. It integrates the input signal `In` based on the trapezoid rule and outputs the result, the integral action component, at `Out`. If the block should calculate the pure time integral, `TI` = 1 [s] must be set.



The block works according to the following formula:

$$Out = Out_{(n-1)} + \frac{SampleTime}{2 \cdot TI} \cdot In_{(n-1)} + In$$

Where:

- `Out` = Integrated value between high and low limits
- `SampleTime` = Sampling time [s]
- `TI` = Integration time constant [s]
- `In` = Input value
- `In(n-1)` = Last input value
- `Out(n-1)` = Last output value

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

There is an example project for the Integral block (APL_Example_xx, xx refers to the language variant) with an application scenario for this block, which explains how the block works.

Application scenario in the example project:

- Process simulation including noise generator (Page 1828)

Startup characteristics

Use the feature bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Integral functions (Page 1431)

Integral messaging (Page 1434)

Integral I/Os (Page 1435)

Integral block diagram (Page 1436)

Integral error handling (Page 1433)

Integral modes (Page 1431)

11.7.2 Integral modes

Integral modes

This block does not have any modes.

See also

Integral block diagram (Page 1436)

Integral I/Os (Page 1435)

Integral messaging (Page 1434)

Integral error handling (Page 1433)

Integral functions (Page 1431)

Description of Integral (Page 1429)

11.7.3 Integral functions

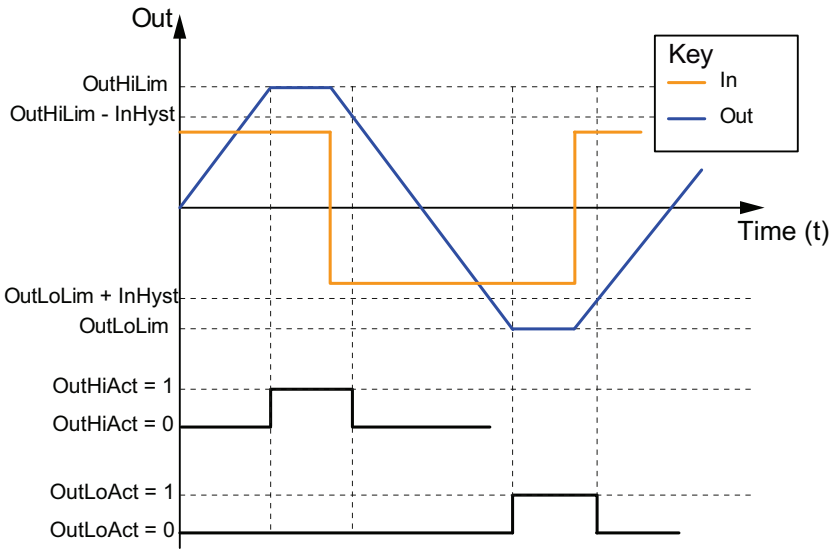
Functions of Integral

The functions for this block are listed below.

Monitoring limits

The `OutHiLim` and `OutLoLim` I/Os can be used to define the limits of the integrated value `Out`.

If limits are reached or exceeded (`OutHiAct` or `OutLoAct` = 1 I/Os), the output value is set to user-defined limits and output at `Out`.



Tracking values

You use input parameter `OutTrkOn` = 1 to activate tracking of a value, which is in turn defined at input parameter `OutTrk`.

After tracking mode has been terminated, the block uses the value currently set at `Out` as the value to be integrated.

Note

If the integration is stopped, the function(`Hold` = 1)has priority over the tracking.

Stopping integration

Set input parameter `Hold` = 1 if you want to stop the integration. Limits are no longer monitored and the updating of the `OutHiAct` and `OutLoAct` limit outputs stops. A change to the monitoring limits remains ineffective when integration is stopped. If you start the integration again, the value currently pending at `Out` output parameter is used for the integration process.

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The signal status for the block is formed using the following parameters and output at the `Out`, `OutHiAct` and `OutLoAct` output parameters:

- `In.ST`

See also

Description of Integral (Page 1429)

Integral messaging (Page 1434)

Integral I/Os (Page 1435)

Integral block diagram (Page 1436)

Integral error handling (Page 1433)

Integral modes (Page 1431)

11.7.4 Integral error handling

Error handling of Integral

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The ErrorNum I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
11	The integration time constant TI is within the range: -SampleTime / 2 < TI < SampleTime / 2. The integration is stopped.
15	OutTrk > OutHiLim OutTrk < OutLoLim
30	The value of In can no longer be displayed in the REAL number field. The last valid value is provided at the Out output.
32	The value of OutTrk can no longer be displayed in the REAL number field. The last valid value is provided at the Out output.
33	The value of TI can no longer be displayed in the REAL number field. The integration is stopped.

See also

Integral I/Os (Page 1435)
Integral messaging (Page 1434)
Integral functions (Page 1431)
Integral modes (Page 1431)
Description of Integral (Page 1429)
Integral block diagram (Page 1436)

11.7.5 Integral messaging

Messaging

This block does not offer messaging.

See also

Description of Integral (Page 1429)
Integral functions (Page 1431)
Integral I/Os (Page 1435)
Integral block diagram (Page 1436)
Integral error handling (Page 1433)
Integral modes (Page 1431)

11.7.6 Integral I/Os

I/Os of Integral

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1431)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
Hold	1 = Integration is held	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
In*	Analog input value	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
InHyst*	Hysteresis	REAL	0.0
OutHiLim	High limit of output value	REAL	100.0
OutLoLim	Low limit of output value	REAL	0.0
OutTrkOn	1 = Output Out tracks the set value (OutTrk I/O)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OutTrk*	Predefined value used for OutTrkOn = 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
TI*	Integral time constant [s]	REAL	1.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Integral error handling (Page 1433)	INT	-1
Out	Integral value output	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
OutHiAct	1 = High limit (OutHiLim) reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OutLoAct	1 = Low limit (OutLoLim) reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Description of Integral (Page 1429)

Integral messaging (Page 1434)

Integral block diagram (Page 1436)

Integral modes (Page 1431)

11.7.7 Integral block diagram

Integral block diagram

A block diagram is not provided for this block.

See also

Integral I/Os (Page 1435)

Integral messaging (Page 1434)

Integral functions (Page 1431)

Integral modes (Page 1431)

Description of Integral (Page 1429)

Integral error handling (Page 1433)

11.8 Lag - Low-pass filter

11.8.1 Description of Lag

Object name (type + number) and family

Type + number: FB 1828

Family: Math

Area of application for Lag

The block is used for the following application:

- Smoothing the Input value (low-pass filter)

How it works

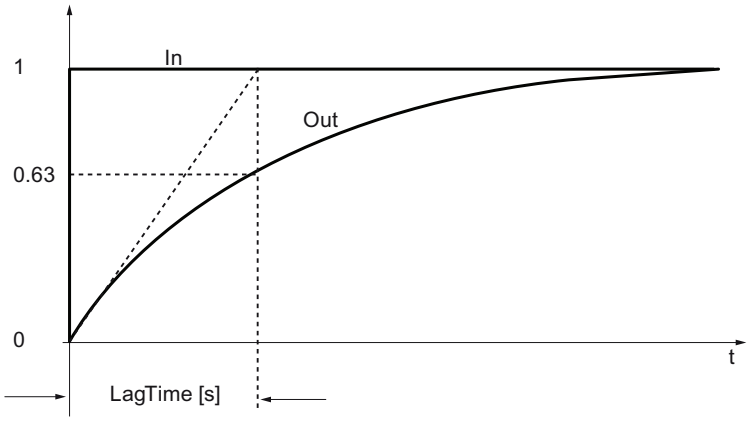
The block smoothes the input variable (`In` input) using a 1. order time delay. This delay time can be selected (`LagTime` connection). The block works according to the following formula:

$$Out = In + \left(Out - In\right) \cdot e^{\left(\frac{-SampleTime}{LagTime}\right)}$$

Where:

- `Out` = Output value
- `LagTime` = Delay time
- `SampleTime` = Sampling time
- `In` = Input value

The formula only applies to `LagTime` > 0. If `LagTime` = 0, the input is passed directly to the output. If the input value is outside the REAL range limits, the calculation is stopped. If the input value is outside the range limits again, the calculation is resumed automatically.



You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB3x). The block is also installed automatically in the startup OB (OB100).

Further addressing is not required.

For the Lag block, the Advanced Process Library contains templates for process tag types as examples and there is a example project (APL_Example_xx, xx designates the language variant) containing different application cases for this block. Several application cases are simulated in the example project and serve to explain how the block works.

Examples of process tag types:

- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)
- PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800)
- Model-based predictive control (ModPreCon) (Page 1816)
- PIDConR with safety logic and control loop monitoring (PIDConR_ConPerMon) (Page 1800)
- PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799)
- Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)
- Ratio control with PIDConR (RatioR) (Page 1809)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)
- Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810)
- Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806)

Application scenario in the example project:

- Process simulation including noise generator (Page 1828)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Lag functions (Page 1440)

Lag messaging (Page 1441)

Lag I/Os (Page 1442)

Lag block diagram (Page 1443)

Lag error handling (Page 1441)

Lag modes (Page 1439)

11.8.2 Lag modes

Lag modes

This block does not have any modes.

See also

Lag block diagram (Page 1443)

Lag I/Os (Page 1442)

Lag messaging (Page 1441)

Lag error handling (Page 1441)

Lag functions (Page 1440)

Description of Lag (Page 1437)

11.8.3 Lag functions

Functions of Lag

The functions for this block are listed below.

Hold and restart calculation

You can interrupt the calculation by setting `Hold` = 1 . The output value is frozen. Continue calculation by setting `Hold` = 0 . The calculation is continued with the last output value.

Reset values

You need to set the `Reset` = 1 I/O if you want to reset the output value back to the input value. The output is reset by a rising 0 - 1 edge.

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The signal status for the block is formed using the following parameters and output at the `Out` output parameter:

- `In.ST`

See also

Description of Lag (Page 1437)

Lag messaging (Page 1441)

Lag I/Os (Page 1442)

Lag block diagram (Page 1443)

Lag error handling (Page 1441)

Lag modes (Page 1439)

11.8.4 Lag error handling

Error handling of Lag

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	There is no error.
11	`LagTime` < 0
30	The value of `In` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.
32	The value of `LagTime` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.

See also

Lag block diagram (Page 1443)

Lag I/Os (Page 1442)

Lag messaging (Page 1441)

Lag functions (Page 1440)

Lag modes (Page 1439)

Description of Lag (Page 1437)

11.8.5 Lag messaging

Messaging

This block does not offer messaging.

See also

Description of Lag (Page 1437)

Lag functions (Page 1440)

Lag I/Os (Page 1442)

Lag block diagram (Page 1443)

Lag modes (Page 1439)

Lag error handling (Page 1441)

11.8.6 Lag I/Os

I/Os of Lag

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1440)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
Hold	1 = Hold calculation	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
In*	Analog input value	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
LagTime*	Delay time [s]	REAL	1.0
Reset	1 = Reset Out output to the value of the In input	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Lag error handling (Page 1441)	INT	-1
Out	Delayed value output	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

See also

Description of Lag (Page 1437)

Lag messaging (Page 1441)

Lag block diagram (Page 1443)

Lag modes (Page 1439)

11.8.7 Lag block diagram

Lag block diagram

A block diagram is not provided for this block.

See also

Lag I/Os (Page 1442)

Lag messaging (Page 1441)

Lag error handling (Page 1441)

Lag functions (Page 1440)

Lag modes (Page 1439)

Description of Lag (Page 1437)

11.9 MeanTime - Averaging

11.9.1 Description of MeanTime

Object name (type + number) and family

Type + number: FB 1832

Family: Math

Area of application for MeanTime

The block is used for the following applications:

- Averaging an analog value over a previous, definable period

How it works

The MeanTime block is used to calculate the time-based mean value of an analog input signal `In` over a previous, definable period (`TimeWindow` input), according to the formula:

`Out` = (`In1` + ... + `Inn`) / (`TimeWindow` / `SampleTime`)

Where:

- `In1` ... `Inn`n are the detected values used for averaging.
- The time window for the averaging is set at the `TimeWindow` parameter.
- The block determines the number of values to be saved based on the integer part of the `TimeWindow` / `SampleTime` quotient.
- The block can save up to 32 previous values in its internal memory. Data is reduced it the time window is longer.

If `SampleTime` or `TimeWindow` is changed, the mean time value is reset.

The signal status is passed from the input directly to the output.

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (all OB3x blocks). The block is also installed automatically in the startup OB (OB 100).

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

MeanTime functions (Page 1445)
MeanTime messaging (Page 1447)
MeanTime I/Os (Page 1448)
MeanTime block diagram (Page 1449)
MeanTime error handling (Page 1447)
MeanTime modes (Page 1445)

11.9.2 MeanTime modes

MeanTime operating modes

This block does not have any operating modes.

See also

MeanTime block diagram (Page 1449)
MeanTime I/Os (Page 1448)
MeanTime messaging (Page 1447)
MeanTime error handling (Page 1447)
MeanTime functions (Page 1445)
Description of MeanTime (Page 1444)

11.9.3 MeanTime functions

Functions of MeanTime

The functions for this block are listed below.

Stopping the caclulation of mean values

Mean value calculation can be stopped by setting the `Hold` input. To do this, make the following parameter settings:

- `Hold` = 1 and calculation is stopped. The output value is retained for the duration of this period.
- `Hold` = 0 and calculation is resumed.

Setting a mean value constant

You can set the mean value using the `Reset` input. To do this, make the following parameter settings:

- `Reset` = 1

The value at the `In` input is now set directly at the `Out` output. All internal values of the block are aslo adapted to the input value.

To restart the mean value calculation, you need to set `Reset` with 0.

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The signal status for the block is formed using the following parameters and output at the `Out` output parameter:

- `In.ST`

See also

Description of MeanTime (Page 1444)

MeanTime messaging (Page 1447)

MeanTime I/Os (Page 1448)

MeanTime block diagram (Page 1449)

MeanTime error handling (Page 1447)

MeanTime modes (Page 1445)

11.9.4 MeanTime error handling

Error handling of MeanTime

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of `In` can no longer be displayed in the REAL number field. The last valid value is provided at the `Out` output.
31	The value of `Out` can no longer be displayed in the REAL number field. The `In` value is output unmodified at the `Out` output.

See also

MeanTime block diagram (Page 1449)

MeanTime I/Os (Page 1448)

MeanTime messaging (Page 1447)

Description of MeanTime (Page 1444)

MeanTime modes (Page 1445)

MeanTime functions (Page 1445)

11.9.5 MeanTime messaging

Messaging

This block does not offer messaging.

See also

Description of MeanTime (Page 1444)
MeanTime functions (Page 1445)
MeanTime I/Os (Page 1448)
MeanTime block diagram (Page 1449)
MeanTime modes (Page 1445)
MeanTime error handling (Page 1447)

11.9.6 MeanTime I/Os

I/Os of MeanTime

Input parameters

Parameter	Description	Type	Default
`EN`	1 = Called block will be processed	BOOL	1
`Feature`	I/O for additional functions (Page 1445)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
`Hold`	1 = Hold calculation of mean value	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
`In*`	Analog input value	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
`Reset`	1 = Reset output `Out`	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
`SampleTime`	Sampling time [s] (assigned automatically)	REAL	0.1
`TimeWindow`	Size of the time window [s]	REAL	32.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see MeanTime error handling (Page 1447)	INT	-1
Out	Output for the average time	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

See also

Description of MeanTime (Page 1444)

MeanTime messaging (Page 1447)

MeanTime block diagram (Page 1449)

MeanTime modes (Page 1445)

11.9.7 MeanTime block diagram

MeanTime block diagram

This block is not provided a block diagram.

See also

Description of MeanTime (Page 1444)

MeanTime modes (Page 1445)

MeanTime functions (Page 1445)

MeanTime error handling (Page 1447)

MeanTime messaging (Page 1447)

MeanTime I/Os (Page 1448)

11.10 Mul04 - Multiplier with 4 values

11.10.1 Description of Mul04

Object name (type + number) and family

Type + number: FC 360

Family: Math

Area of application for Mul04

The block is used for the following applications:

- Multiplication of values
- Output of the product for further processing

How it works

The Mul04 block calculates the product of up to 4 values and returns the result at the `Out` output.

`Out` = `In1` ·...· `Inn` (`n` ≤ 4),

Where:

`Out` = Product

`In1` ... `In4` = values to be multiplied

The product of all input parameters and the worst input parameter signal status is always output.

The output value is checked to determine if it is within the value range of REAL. If it is outside the value range, the highest or lowest possible REAL value is output.

If the value is NAN, the last valid output value is output and the status of the output value is set to 16#28 (if none of the input statuses is worse).

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Mul04 block, the Advanced Process Library contains templates for process tag types as examples and there is a example project (APL_Example_xx, xx designates the language variant) containing an application case for this block. An application case is simulated in the example project and serves to explain how the block works.

Examples of process tag types:

- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)
- PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800)
- Model-based predictive control (ModPreCon) (Page 1816)
- PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799)
- PIDConR with safety logic and control loop monitoring (PIDConR_ConPerMon) (Page 1800)
- Ratio control with PIDConR (RatioR) (Page 1809)
- Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)
- Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810)
- Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806)

Application scenario in the example project:

- Process simulation including noise generator (Page 1828)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

Mul04 functions (Page 1452)

Mul04 messaging (Page 1453)

Mul04 I/Os (Page 1454)

Mul04 block diagram (Page 1455)

Mul04 error handling (Page 1453)

Mul04 modes (Page 1452)

11.10.2 Mul04 modes

Mul04 operating modes

This block does not have any modes.

See also

Mul04 block diagram (Page 1455)

Mul04 I/Os (Page 1454)

Mul04 messaging (Page 1453)

Mul04 error handling (Page 1453)

Mul04 functions (Page 1452)

Description of Mul04 (Page 1450)

11.10.3 Mul04 functions

Functions of Mul04

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The worst signal status for the block is formed by the following parameters and output at the `Out` output parameter:

- `In1.ST`
- `In2.ST`
- `In3.ST`
- `In4.ST`

See also

Description of Mul04 (Page 1450)

Mul04 messaging (Page 1453)

Mul04 I/Os (Page 1454)

Mul04 error handling (Page 1453)

Mul04 block diagram (Page 1455)

Mul04 modes (Page 1452)

11.10.4 Mul04 error handling

Mul04 error handling

The block does not report any errors.

See also

Mul04 functions (Page 1452)
Mul04 block diagram (Page 1455)
Mul04 I/Os (Page 1454)
Mul04 messaging (Page 1453)
Description of Mul04 (Page 1450)
Mul04 modes (Page 1452)

11.10.5 Mul04 messaging

Messaging

This block does not offer messaging.

See also

Description of Mul04 (Page 1450)
Mul04 functions (Page 1452)
Mul04 I/Os (Page 1454)
Mul04 block diagram (Page 1455)
Mul04 modes (Page 1452)
Mul04 error handling (Page 1453)

11.10.6 Mul04 I/Os

Mul04 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Value 1 to multiply	STRUCT	-
		• Value: REAL	• 1.0
		• ST: BYTE	• 16#80
In2	Value 2 to multiply	STRUCT	-
		• Value: REAL	• 1.0
		• ST: BYTE	• 16#80
In3	Value 3 to multiply	STRUCT	-
		• Value: REAL	• 1.0
		• ST: BYTE	• 16#80
In4	Value 4 to multiply	STRUCT	-
		• Value: REAL	• 1.0
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Product version	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

See also

Description of Mul04 (Page 1450)
Mul04 functions (Page 1452)
Mul04 messaging (Page 1453)
Mul04 block diagram (Page 1455)
Mul04 modes (Page 1452)
Mul04 error handling (Page 1453)

11.10.7 Mul04 block diagram

Mul04 block diagram

A block diagram is not provided for this block.

See also

Description of Mul04 (Page 1450)
Mul04 modes (Page 1452)
Mul04 functions (Page 1452)
Mul04 error handling (Page 1453)
Mul04 messaging (Page 1453)
Mul04 I/Os (Page 1454)

11.11 Mul08 - Multiplier with 8 values

11.11.1 Description of Mul08

Object name (type + number) and family

Type + number: FC 361

Family: Math

Area of application for Mul08

The block is used for the following applications:

- Multiplication of values
- Output of the product for further processing

How it works

The Mul08 block calculates the product of up to 8 values and returns the result at the Out output.

Out = In1 ·...· Inn (n ≤ 8),

Where:

Out = Product

In1 ... In8 = values to be multiplied

The product of all input parameters and the worst input parameter signal status is always output.

The output value is checked to determine if it is within the value range of REAL. If it is outside the value range, the highest or lowest possible REAL value is output.

If the value is NAN, the last valid output value is output and the status of the output value is set to 16#28 (if none of the input statuses is worse).

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Mul04 (Mul08) block, the Advanced Process Library contains process tag type templates; these serve as examples by providing various application scenarios for this block.

Refer to Description of Mul04 (Page 1450) for more information.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for Status1 parameter

This block does not have the Status parameter.

See also

Mul08 functions (Page 1457)

Mul08 messaging (Page 1458)

Mul08 I/Os (Page 1459)

Mul08 block diagram (Page 1460)

Mul08 error handling (Page 1458)

Mul08 modes (Page 1457)

11.11.2 Mul08 modes

Mul08 operating modes

This block does not have any modes.

See also

Mul08 block diagram (Page 1460)
Mul08 I/Os (Page 1459)
Mul08 messaging (Page 1458)
Mul08 error handling (Page 1458)
Description of Mul08 (Page 1455)
Mul08 functions (Page 1457)

11.11.3 Mul08 functions

Functions of Mul08

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The worst signal status for the block is formed by the following parameters and output at the `Out` output parameter:

- `In1.ST`
- `In2.ST`
- `In3.ST`
- `In4.ST`
- `In5.ST`
- `In6.ST`
- `In7.ST`
- `In8.ST`

See also

Description of Mul08 (Page 1455)
Mul08 messaging (Page 1458)
Mul08 I/Os (Page 1459)
Mul08 block diagram (Page 1460)
Mul08 error handling (Page 1458)
Mul08 modes (Page 1457)

11.11.4 Mul08 error handling

Mul08 error handling

The block does not report any errors.

See also

Mul08 block diagram (Page 1460)
Mul08 I/Os (Page 1459)
Mul08 messaging (Page 1458)
Mul08 modes (Page 1457)
Mul08 functions (Page 1457)
Description of Mul08 (Page 1455)

11.11.5 Mul08 messaging

Messaging

This block does not offer messaging.

See also

Description of Mul08 (Page 1455)
Mul08 functions (Page 1457)
Mul08 I/Os (Page 1459)
Mul08 block diagram (Page 1460)
Mul08 modes (Page 1457)
Mul08 error handling (Page 1458)

11.11.6 Mul08 I/Os

Mul08 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Value 1 to multiply	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
In2	Value 2 to multiply	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
In3	Value 3 to multiply	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
In4	Value 4 to multiply	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
In5	Value 5 to multiply	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
In6	Value 6 to multiply	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
In7	Value 7 to multiply	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80
In8	Value 8 to multiply	STRUCT • Value: REAL • ST: BYTE	- • 1.0 • 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Product output	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

See also

Description of Mul08 (Page 1455)
Mul08 functions (Page 1457)
Mul08 messaging (Page 1458)
Mul08 block diagram (Page 1460)
Mul08 modes (Page 1457)
Mul08 error handling (Page 1458)

11.11.7 Mul08 block diagram

Mul08 block diagram

A block diagram is not provided for this block.

See also

Mul08 I/Os (Page 1459)
Mul08 messaging (Page 1458)
Mul08 error handling (Page 1458)
Mul08 functions (Page 1457)
Mul08 modes (Page 1457)
Description of Mul08 (Page 1455)

11.12 Polygon - Converting the first signal (non-linear)

11.12.1 Description of Polygon

Object name (type + number) and family

Type + number: FB 1881

Family: Math

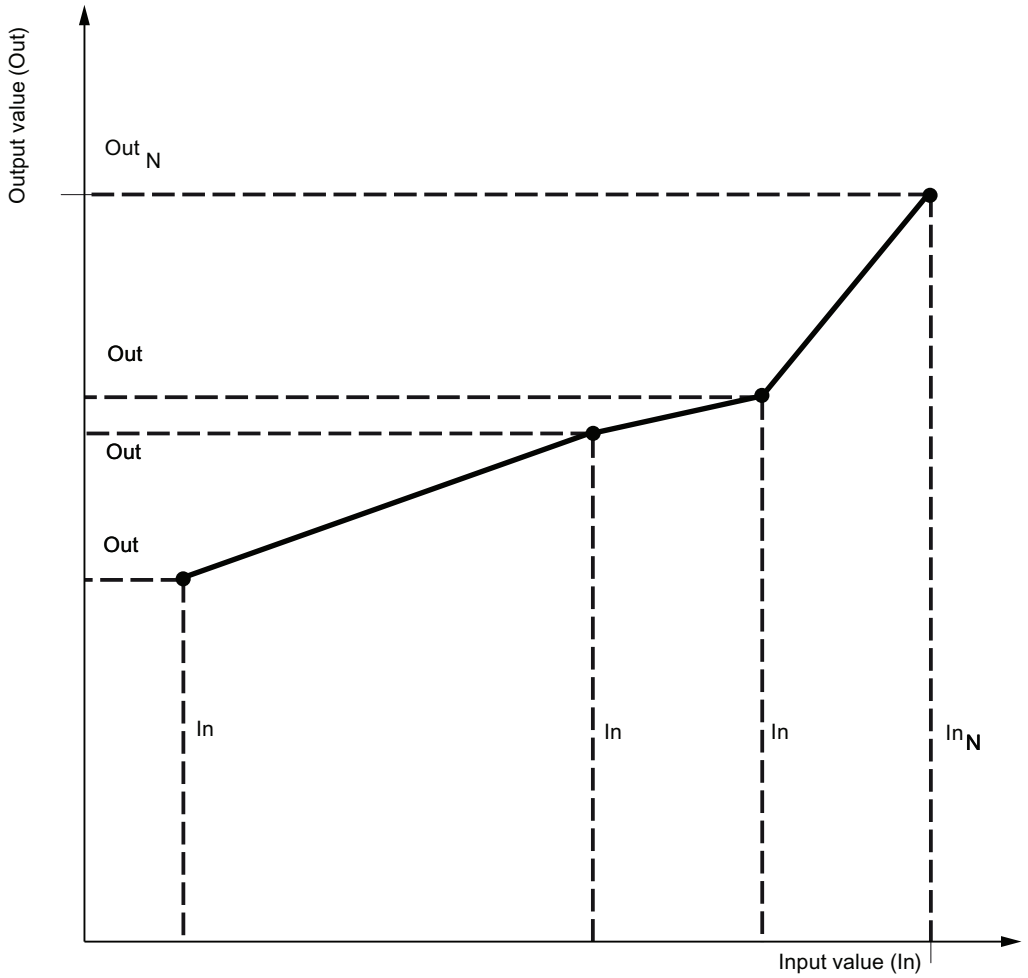
Area of application for Polygon

The block is used for the following applications:

- Conversion of the input signal according to a non-linear characteristic

How it works

An input `In` is converted to output `Out` based on a non-linear characteristic with up to 16 interpolation points per polygon block. The number of interpolation points can be increased by cascading multiple blocks. In cascade mode, the `Cascaded = 1` output is set.



Num (N)	- Number of intermediate points in the curve Minimum number of points = 2 Maximum number of points = 16
In	- Analog input value
Out	- Corresponding output value

After you have defined the N interpolation points (coordinate pairs In_i, Out_i with i = 1 ... N in a sequence with no gaps) and configured the number Num, the block operates as follows:

- Interpolation between the interpolation points is linear
- Beyond the end interpolation points, extrapolation is based on the first two or last two interpolation points.

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

The block is installed in the CFC editor in a cyclic interrupt OB (OB30 to OB38). The block is installed automatically in OB100.

Cascade mode

For the cascading of multiple polygon blocks, the `CasOut` output is interconnected to the `CasIn` input of the following block.

In cascade mode, the interpolation points in all polygon blocks must be configured in ascending order and without gaps. The cascaded polygon blocks must be configured in the same runtime group in ascending run sequence.

The analog input value `In` may only be interconnected at the first polygon block. The `In` input of the next block is tracked to this value.

For the Polygon block, the Advanced Process Library contains templates for process tag types as an example with various application scenarios for this block.

Example of process tag types:

- Source chart for GainSched function block (gain scheduling) (Page 1813)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Polygon functions (Page 1464)

Polygon messaging (Page 1467)

Polygon I/Os (Page 1467)

Polygon block diagram (Page 1471)

Polygon error handling (Page 1465)

Polygon modes (Page 1464)

11.12.2 Polygon modes

Polygon modes

This block does not have any modes.

See also

Polygon block diagram (Page 1471)

Polygon I/Os (Page 1467)

Polygon messaging (Page 1467)

Polygon error handling (Page 1465)

Polygon functions (Page 1464)

Description of Polygon (Page 1461)

11.12.3 Polygon functions

Functions of Polygon

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The signal status for the block is formed using the following parameters and output at the `Out` output parameter:

- `In.ST`

Configurable reactions using the Feature I/O

You can find an overview of all reactions provided by the Feature parameter in the section. The following functionality is available for this block at the relevant bits:

Bit	Function
5	Limit output `Out` 0 = Beyond the end interpolation points, the `Out` output is extrapolated based on the first two or last two interpolation points. 1 = The `Out` output is limited to the first and last interpolation point.
6	Substitute value switch in the event of an error 0 = No substitute value switch 1 = The substitute value `SubV_In` is output at `Out` for `ErrorNum` ≠

Cascading

- Specifying the number of interpolation points

  When n polygon blocks are cascaded, the interpolation points can be increased by the number set for the Num parameter. The configuration of the interpolation points over all cascaded blocks is subject to the same configuration rules as for an individual block, i.e. the interpolation points must be configured in sequence in ascending order and without gaps.

- Data communication

  The data communication 2 interconnected polygon blocks is made using an output -> input interconnection.

See also

Description of Polygon (Page 1461)

Polygon messaging (Page 1467)

Polygon I/Os (Page 1467)

Polygon block diagram (Page 1471)

Polygon error handling (Page 1465)

Polygon modes (Page 1464)

11.12.4 Polygon error handling

Error handling of Polygon

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The ErrorNum I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	There is no error.
30	The value In or SubV_In can no longer be displayed in the REAL- number field. The last valid value is provided at the Out output.
31	The calculation of the output Out leads to a result that can no longer be displayed in a REAL- numerical field. The last valid value is provided at the Out output.
48	No valid interconnection to CasIn. The last valid value is provided at the Out output.
49	Num < 2 or Num > 16 $In_{(N)} \leq In_{(N-1)}$, in the event of an error, the last valid value is output
≥ 1xx	Error in one of the upstream xx = ErrorNum block. The last valid value is provided at the Out output.

Note

The substitute value SubV_In can be output instead of the last valid value via the Feature bit 6 = 1 .

Substitute values that cannot be displayed in the REAL- number format have no effect. The last valid value is provided at the Out output in this case.

See also

Polygon block diagram (Page 1471)

Polygon I/Os (Page 1467)

Polygon messaging (Page 1467)

Description of Polygon (Page 1461)

Polygon modes (Page 1464)

Polygon functions (Page 1464)

11.12.5 Polygon messaging

Messaging

This block does not offer messaging.

See also

Description of Polygon (Page 1461)
Polygon functions (Page 1464)
Polygon I/Os (Page 1467)
Polygon block diagram (Page 1471)
Polygon error handling (Page 1465)
Polygon modes (Page 1464)

11.12.6 Polygon I/Os

I/Os of Polygon

Input parameters

Parameter	Description	Type	Default
`CasIn*`	Input for cascade, to be interconnected with the output parameter `CasOut` of the preceding polygon block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
`EN`	1 = Called block will be processed	BOOL	1
`Feature`	I/O for additional functions (Page 1464)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
`In*`	Analog input value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
`In1`	Interpolation point `In1`	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
In2	Interpolation point In2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In3	Interpolation point In3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In4	Interpolation point In4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In5	Interpolation point In5	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In6	Interpolation point In6	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In7	Interpolation point In7	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In8	Interpolation point In8	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In9	Interpolation point In9	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In10	Interpolation point In10	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In11	Interpolation point In11	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In12	Interpolation point In12	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In13	Interpolation point In13	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
In14	Interpolation point In14	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In15	Interpolation point In15	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In16	Interpolation point In16	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Num	Number of vertices	INT	16
Out1	Sampling point 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out2	Sampling point 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out3	Sampling point 3	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out4	Sampling point 4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out5	Sampling point 5	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out6	Sampling point 6	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out7	Sampling point 7	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out8	Sampling point 8	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out9	Sampling point 9	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Parameter	Description	Type	Default
Out10	Sampling point 10	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out11	Sampling point 11	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out12	Sampling point 12	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out13	Sampling point 13	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out14	Sampling point 14	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out15	Sampling point 15	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Out16	Sampling point 16	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SubV_In*	Substitute value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
Cascaded	1 = Block is cascaded	BOOL	0
CasOut	Output parameter for cascade formation, to be interconnected with the input parameter CasIn of the following polygon block	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Polygon error handling (Page 1465)	INT	-1
Out	Output value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

See also

Description of Polygon (Page 1461)

Polygon messaging (Page 1467)

Polygon block diagram (Page 1471)

Polygon modes (Page 1464)

11.12.7 Polygon block diagram

Polygon block diagram

A block diagram is not provided for this block.

See also

Polygon I/Os (Page 1467)

Polygon messaging (Page 1467)

Polygon error handling (Page 1465)

Polygon functions (Page 1464)

Polygon modes (Page 1464)

Description of Polygon (Page 1461)

11.13 Smooth - low pass filter

11.13.1 Description of Smooth

Object name (type + number) and family

Type + number: FB 1890

Family: Math

Area of application for Smooth

The block is used for the following applications:

- Butterworth low-pass filter, 2nd order with maverick detection

How it works

The block is used as a low pass filter. This filter allows the signal portions with frequencies below the cutoff frequency to pass practically unattenuated, whereas portions with high frequencies are attenuated. The enables you filter out high frequency interference in the signal (for example, signal noise) and smooth the signal.

In comparison to a first order low pass filter, the Butterworth filter has the advantage that the transition from the passing section to the blocking section is sharper in the Bode diagram. If the frequency area of the interference is known, it can be filtered out with minimal influence on the wanted signal.

The maverick (Page 1840) detection monitors adjacent signals. If signal mavericks are detected, they are not processed any further. The block outputs the last valid signal.

The signal status is passed from the input directly to the output.

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

You then set the filter time constant for the low pass filter to achieve the desired effect.

To set the filter time constant, it is helpful to observe the original and filtered signals in the CFC trend plotter. The filtered signal should be smoothed as required but not too delayed. An increase in the filter time constant increases the smoothing effect but also increases the delay. Typical starting values for the time constant are around ten times the sample rate of the signal.

There is a sample project for the Smooth block (APL_Example_xx, xx refers to the language variant) with an application case for this block:

- Filtering of noisy measured values in a control loop (Page 1835)

Startup characteristics

When OB100 is called, the state variables of the Butterworth filter are initialized based on the current process values.

Status word allocation for `Status1` parameter

The block does not have a status word allocation.

See also

Smooth functions (Page 1474)

Smooth messaging (Page 1476)

Smooth I/Os (Page 1476)

Smooth block diagram (Page 1477)

Smooth error handling (Page 1475)

Smooth modes (Page 1473)

11.13.2 Smooth modes

Smooth operating modes

This block does not have any modes.

See also

Smooth block diagram (Page 1477)

Smooth I/Os (Page 1476)

Smooth messaging (Page 1476)

Smooth error handling (Page 1475)

Smooth functions (Page 1474)

Description of Smooth (Page 1472)

11.13.3 Smooth functions

Smooth functions

The block provides the following functions:

- Restart low pass filter
- Activate and deactivate maverick detection

Restart low pass filter

You can recalculated the coefficients of the Butterworth filter. To do this, you must restart filter (`Restart` = 1).

The filter algorithm is then reinitialized, exactly as it is when the CPU is restarted or a change is made to the count value at the input parameter `TimeConstant`. The coefficients of the Butterworth filter are recalculated and the internal state memory of the filter is initialized so that the `CleanPV` output parameter is equal to the `PV` input parameter.

Activate and deactivate maverick detection

The maverick detection (`OutlDetOn` = 1) monitors the process value `PV` for the difference between two sequential sample values. These have to be within a tolerance range you have specified (`OutlTreshold`).

If the tolerance is violated, the maverick is set to the most recent valid value. The most recent valid measured value is then held constant by the block for a maximum of `OutlCycles` sample steps. If the maverick continues longer than this, it is accepted as a valid measured value.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The signal status for the block is formed using the following parameters and output at the `CleanPV` output parameter:

- `PV.ST`

See also

Description of Smooth (Page 1472)

Smooth messaging (Page 1476)

Smooth I/Os (Page 1476)

Smooth block diagram (Page 1477)

Smooth error handling (Page 1475)

Smooth modes (Page 1473)

11.13.4 Smooth error handling

Error handling of Smooth

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
2	`SampleTime` < 0.001 [s]
30	The value of `PV` can no longer be displayed in the REAL number field. The last valid value is provided at the `CleanPV` output.
61	`TimeConstant` < 5 · `SampleTime`

See also

Smooth block diagram (Page 1477)

Smooth I/Os (Page 1476)

Smooth messaging (Page 1476)

Smooth functions (Page 1474)

Smooth modes (Page 1473)

Description of Smooth (Page 1472)

11.13.5 Smooth messaging

Messaging

This block does not offer messaging.

See also

Description of Smooth (Page 1472)

Smooth functions (Page 1474)

Smooth I/Os (Page 1476)

Smooth block diagram (Page 1477)

Smooth error handling (Page 1475)

Smooth modes (Page 1473)

11.13.6 Smooth I/Os

I/Os of Smooth

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	This parameter currently has no use and is reserved for future functions.	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
FilterOn	1 = Filter active	BOOL	1
OutlCycles	Number of sampling steps to bridge mavericks	INT	3
OutlDetOn	1 = Maverick detection is activated	BOOL	0
OutlThreshold	Limit (trigger threshold) for maverick detection	REAL	10.0
PV*	Analog input (process value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
Restart*	Restart the filter algorithm	BOOL	1
SampleTime	Sampling time [s] (assigned automatically)	REAL	1.0
TimeConstant	Butterworth filter time constant [s]	REAL	10.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
CleanPV	Output of the corrected process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum*	Output of current error number. For error numbers that can be output by this block, see Smooth error handling (Page 1475).	INT	0
OutlDetected	1 = Maverick detected	BOOL	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

See also

Description of Smooth (Page 1472)

Smooth functions (Page 1474)

Smooth messaging (Page 1476)

Smooth block diagram (Page 1477)

Smooth modes (Page 1473)

11.13.7 Smooth block diagram

Smooth block diagram

A block diagram is not provided for this block.

See also

Smooth I/Os (Page 1476)

Smooth messaging (Page 1476)

Smooth error handling (Page 1475)

Smooth functions (Page 1474)

Smooth modes (Page 1473)

Description of Smooth (Page 1472)

11.14 Sub02 - subtracting two values

11.14.1 Description of Sub02

Object name (type + number) and family

Type + number: FC 381

Family: Math

Area of application for Sub02

The block is used for the following applications:

- Subtracting two values

How it works

The block subtracts one value from another and outputs the subtraction at the `Out` output parameter as follows:

- `Out` = `In1` - `In2`

The worst signal status is also always output at the output parameter.

The output value is checked to determine if it is within the value range of REAL. If it is outside the value range, the highest or lowest possible REAL value is output.

If the value is NAN, the last valid output value is output and the status of the output value is set to 16#28 (if none of the input statuses is worse).

You can find additional information on forming the signal status under Forming and outputting the signal status for mathematical blocks (Page 102)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Sub02 block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Source chart for GainSched function block (gain scheduling) (Page 1813)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)
- Override control (Page 1814)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

Sub02 block diagram (Page 1482)
Sub02 I/Os (Page 1481)
Sub02 messaging (Page 1481)
Sub02 error handling (Page 1480)
Sub02 functions (Page 1479)
Sub02 modes (Page 1479)

11.14.2 Sub02 modes

Sub02 operating modes

This block does not have any modes.

See also

Sub02 block diagram (Page 1482)
Sub02 I/Os (Page 1481)
Sub02 messaging (Page 1481)
Sub02 error handling (Page 1480)
Sub02 functions (Page 1479)
Description of Sub02 (Page 1478)

11.14.3 Sub02 functions

Functions of Sub02

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for mathematical blocks (Page 102).

The worst signal status for the block is formed by the following parameters and output at the `Out` output parameter:

- `In1.ST`
- `In2.ST`

See also

Sub02 block diagram (Page 1482)

Sub02 I/Os (Page 1481)

Sub02 messaging (Page 1481)

Sub02 error handling (Page 1480)

Sub02 modes (Page 1479)

Description of Sub02 (Page 1478)

11.14.4 Sub02 error handling

Sub02 error handling

The block does not report any errors.

See also

Sub02 block diagram (Page 1482)

Sub02 I/Os (Page 1481)

Sub02 messaging (Page 1481)

Sub02 functions (Page 1479)

Sub02 modes (Page 1479)

Description of Sub02 (Page 1478)

11.14.5 Sub02 messaging

Messaging

This block does not offer messaging.

See also

Sub02 block diagram (Page 1482)
Sub02 I/Os (Page 1481)
Sub02 error handling (Page 1480)
Sub02 functions (Page 1479)
Sub02 modes (Page 1479)
Description of Sub02 (Page 1478)

11.14.6 Sub02 I/Os

Sub02 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Value 1 to subtract	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In2	Value 2 to subtract	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Product version	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

See also

Sub02 block diagram (Page 1482)
Sub02 messaging (Page 1481)
Sub02 error handling (Page 1480)
Sub02 functions (Page 1479)
Sub02 modes (Page 1479)
Description of Sub02 (Page 1478)

11.14.7 Sub02 block diagram

Sub02 block diagram

A block diagram is not provided for this block.

See also

Sub02 I/Os (Page 1481)
Sub02 messaging (Page 1481)
Sub02 error handling (Page 1480)
Sub02 functions (Page 1479)
Sub02 modes (Page 1479)
Description of Sub02 (Page 1478)

Analog logic blocks

12

12.1 CompAn02 - comparison of two analog values

12.1.1 Description of CompAn02

Object name (type + number) and family

Type + number: FC 387

Family: LogicAn

Area of application for CompAn02

The block is used for the following applications:

- Comparison of the analog input values `In1` and `In2`

How it works

The block compares the two analog input values `In1` and `In2` to see if they are "less than", "less than or equal to", "greater than", "greater than or equal to" and "equal".

There is an independent result output parameter for every comparison operation.

These outputs are formed as follows.

- `GT.Value = 1`, if `In1` > `In2`
- `GE.Value = 1`, if `In1` ≥ `In2`
- `EQ.Value = 1`, if `In1` = `In2`
- `LT.Value = 1`, if `In1` < `In2`
- `LE.Value = 1`, if `In1` ≤ `In2`

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Further addressing is not required.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

CompAn02 modes (Page 1484)
CompAn02 functions (Page 1484)
CompAn02 error handling (Page 1485)
CompAn02 messaging (Page 1486)
CompAn02 I/Os (Page 1486)
CompAn02 block diagram (Page 1488)

12.1.2 CompAn02 modes

CompAn02 operating modes

This block does not have any modes.

See also

Description of CompAn02 (Page 1483)
CompAn02 functions (Page 1484)
CompAn02 messaging (Page 1486)
CompAn02 error handling (Page 1485)
CompAn02 I/Os (Page 1486)
CompAn02 block diagram (Page 1488)

12.1.3 CompAn02 functions

Functions of CompAn02

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status of analog logic blocks (Page 96).

See also

Description of CompAn02 (Page 1483)
CompAn02 modes (Page 1484)
CompAn02 error handling (Page 1485)
CompAn02 messaging (Page 1486)
CompAn02 I/Os (Page 1486)
CompAn02 block diagram (Page 1488)

12.1.4 CompAn02 error handling

CompAn02 error handling

The block does not report any errors.

Behavior of the block leaving the REAL number field

If one of the two input parameters `In1` or `In2` is outside the REAL number field, it is treated like a REAL number.

Example

- `In1 = #e+INF` and `In2 < #e+INF: GT/GE := 1`, the other output parameters are then 0
- `In1 = #e-INF` and `In2 > #e-INF: LT/LE := 1`, the other output parameters are then 0
- `In1 = #NAN#` or `In2 = #NAN#:` all output parameters are set to 0

See also

Description of CompAn02 (Page 1483)
CompAn02 modes (Page 1484)
CompAn02 functions (Page 1484)
CompAn02 messaging (Page 1486)
CompAn02 I/Os (Page 1486)
CompAn02 block diagram (Page 1488)

12.1.5 CompAn02 messaging

Messaging

This block does not offer messaging.

See also

Description of CompAn02 (Page 1483)
CompAn02 modes (Page 1484)
CompAn02 functions (Page 1484)
CompAn02 error handling (Page 1485)
CompAn02 block diagram (Page 1488)
CompAn02 I/Os (Page 1486)

12.1.6 CompAn02 I/Os

CompAn02 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Analog input value 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
In2	Analog input value 2	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
EQ	1= In1 = In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GE	1 = In1 ≥ In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
GT	1 = In1 > In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LE	1 = In1 ≤ In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
LT	1 = In1 < In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Description of CompAn02 (Page 1483)
CompAn02 modes (Page 1484)
CompAn02 functions (Page 1484)
CompAn02 error handling (Page 1485)
CompAn02 messaging (Page 1486)
CompAn02 block diagram (Page 1488)

12.1.7 CompAn02 block diagram

CompAn02 block diagram

A block diagram is not provided for this block.

See also

Description of CompAn02 (Page 1483)
CompAn02 modes (Page 1484)
CompAn02 functions (Page 1484)
CompAn02 error handling (Page 1485)
CompAn02 messaging (Page 1486)
CompAn02 I/Os (Page 1486)

12.2 Limit - Limiting an analog value

12.2.1 Description of Limit

Object name (type + number) and family

Type + number: FB 1829

Family: LogicAn

Area of application for Limit

The block is used for the following applications:

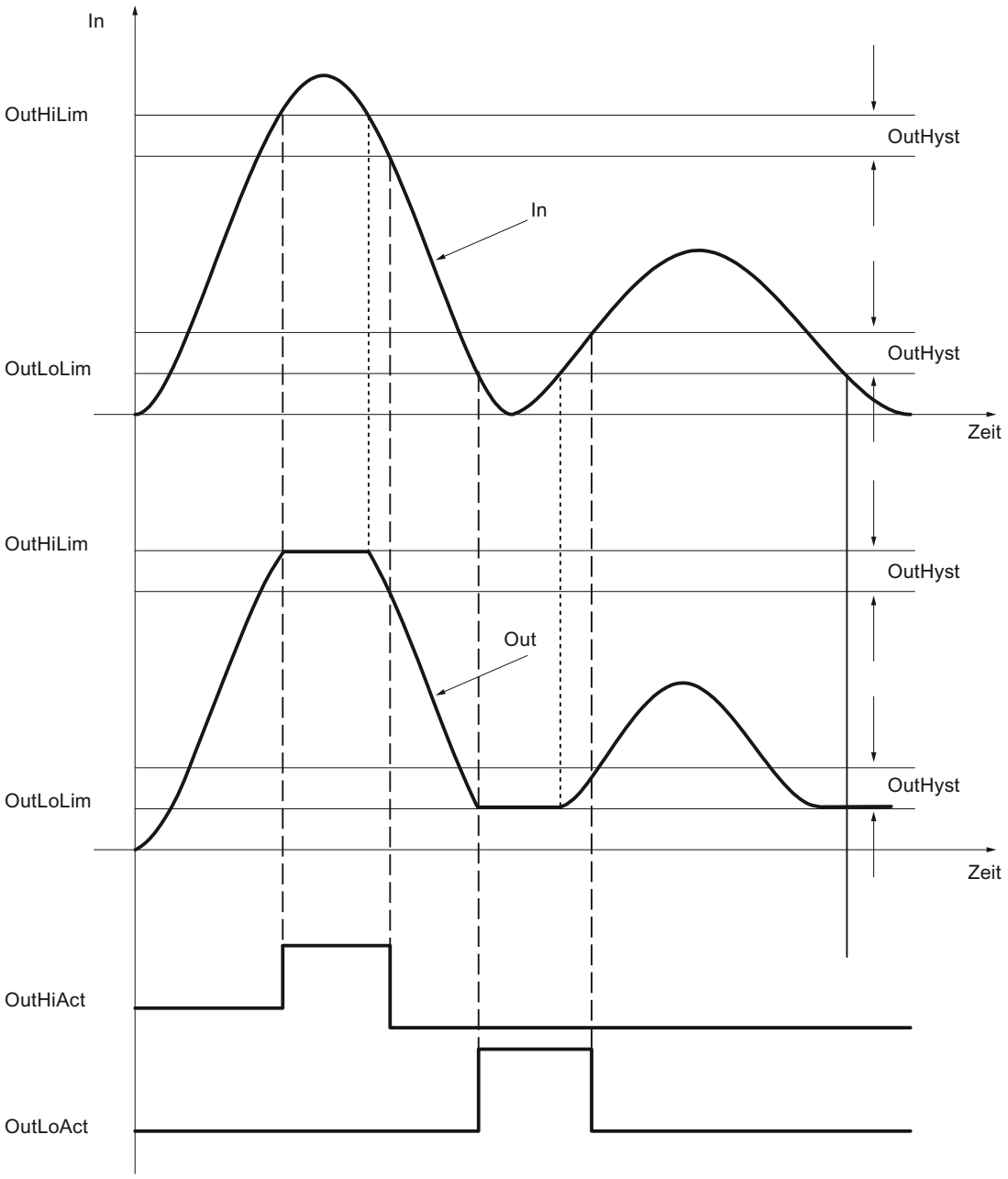
- Limiting of values

How it works

The Limit block is used to limit an analog value to an adjustable range.

The limits are set at the `OutHiLim` (high limit) and `OutLoLim` (low limit) input parameters. If a limit is violated, the limit you entered is output. The limit violation is also shown at the two output parameters `OutHiAct` (high) or `OutLoAct` (low).

You can configure hysteresis (`OutHyst` input parameter) to suppress signal flutters close to the limits.



Aktive Bedingungen zum Setzen von Grenzwerten	Aktive Bedingungen zum Rücksetzen von Grenzwerten
Grenze oben aktiv: In >= OutHiLim	Grenze oben aktiv: In < OutHiLim - OutHyst
Grenze unten aktiv: In <= OutLoLim	Grenze unten aktiv: In > OutLoLim + OutHyst

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Further addressing is not required.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

Limit block diagram (Page 1493)
Limit I/Os (Page 1492)
Limit messaging (Page 1491)
Limit error handling (Page 1491)
Limit functions (Page 1490)
Limit modes (Page 1490)

12.2.2 Limit modes

Limit modes

This block does not have any modes.

See also

Limit block diagram (Page 1493)
Limit I/Os (Page 1492)
Limit messaging (Page 1491)
Limit error handling (Page 1491)
Limit functions (Page 1490)
Description of Limit (Page 1488)

12.2.3 Limit functions

Functions of Limit

There are no other functions for this block.

See also

Limit block diagram (Page 1493)
Limit I/Os (Page 1492)
Limit messaging (Page 1491)
Limit error handling (Page 1491)
Limit modes (Page 1490)
Description of Limit (Page 1488)

12.2.4 Limit error handling

Limit error handling

The block does not report any errors.

See also

Limit block diagram (Page 1493)
Limit I/Os (Page 1492)
Limit messaging (Page 1491)
Limit functions (Page 1490)
Limit modes (Page 1490)
Description of Limit (Page 1488)

12.2.5 Limit messaging

Messaging

This block does not offer messaging.

See also

Limit block diagram (Page 1493)
Limit I/Os (Page 1492)
Limit error handling (Page 1491)
Limit functions (Page 1490)
Limit modes (Page 1490)
Description of Limit (Page 1488)

12.2.6 Limit I/Os

I/Os of Limit

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1490)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
In	Analog input value	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
OutHyst*	Hysteresis in %	REAL	0.0
OutHiLim	High limit of output value	REAL	100.0
OutLoLim	Low limit of output value	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Limit error handling (Page 1491)	INT	-1
Out	Analog output value	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
OutHiAct	1 = High limit overshoot	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OutLoAct	1 = Low limit undershoot	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

See also

Limit block diagram (Page 1493)

Limit messaging (Page 1491)

Limit modes (Page 1490)

Description of Limit (Page 1488)

12.2.7 Limit block diagram

Limit block diagram

A block diagram is not provided for this block.

See also

Limit I/Os (Page 1492)

Limit messaging (Page 1491)

Limit error handling (Page 1491)

Limit functions (Page 1490)

Limit modes (Page 1490)

Description of Limit (Page 1488)

12.3 MuxAn03 - Selection of an analog value to increase availability / certainty

12.3.1 Description of MuxAn03

Object name (type + number) and family

Type + number: FB 1860

Family: LogicAn

Area of application for MuxAn03

The block is used for the following applications:

- Selection of an analog value to increase availability or certainty in the input of analog values

How it works

The block uses up to three process values PV1 ... PV3 to determine an output value and outputs this with the corresponding signal status at the PV output parameter.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any special startup characteristics.

Status word allocation for Status1 parameter

This block does not have the Status parameter.

See also

MuxAn03 block diagram (Page 1499)
MuxAn03 I/Os (Page 1498)
MuxAn03 messaging (Page 1497)
MuxAn03 error handling (Page 1497)
MuxAn03 functions (Page 1495)
MuxAn03 modes (Page 1494)

12.3.2 MuxAn03 modes

MuxAn03 operating modes

This block does not have any modes.

See also

MuxAn03 block diagram (Page 1499)
MuxAn03 I/Os (Page 1498)
MuxAn03 messaging (Page 1497)
MuxAn03 error handling (Page 1497)
MuxAn03 functions (Page 1495)
Description of MuxAn03 (Page 1493)

12.3.3 MuxAn03 functions

Functions of MuxAn03

The functions for this block are listed below.

Selection of output signal

Use the SelValue input parameter to select whether the output value is to offer higher availability or higher certainty.

Increasing availability

- **Selection 1 of 2** (SelValue = 0):The block determines the input parameter with the higher priority from the two input parameters PV1 and PV2 based on their signal status. The value determined is written to the PV output parameter.

  If both input parameters have the same signal status, the PV1input parameter is written to the PVoutput parameter.

- **Selection 1 of 3** (SelValue = 1): The block determines the input parameter with the higher priority from the three input parameters PV1, PV2 and PV3 based on their signal status. The value determined is written to the PV output parameter.

  If two or more of the input parameters have the same signal status, the one with the lowest index is written to the PV output parameter.

Increasing certainty

- **Selection 2 of 2** (SelValue = 2): The block determines whether the two input parameters PV1 and PV2 have the same signal status and whether they deviate from one another by no more than the setting at input parameter PlDiff. Only then does the PV output parameter also have this signal status. The analog value of PVis set to a value of PV1.

  If PV1 and PV2 deviate from one another by more than PlDiff, the PV signal status is set to "Bad, due to device". The analog value of PVis set to a value of PV1.

  If PV1 and PV2 do not deviate from one another by more than PlDiff, but have a different signal state, the PV output parameter is generated from the lower priority signal status of the two input parameters and the associated analog value.

- **Selection 2 of 3** (SelValue = 3): The block determines whether two of the three input parameters PV1, PV2 and PV3 have the same high priority signal status and whether they deviate from one another by no more than the setting at input parameter PlDiff. Only if this is the case, does the PV output parameter also have this signal status. The analog value of PVis set to the value of the input parameter with the lowest index (PV1 or PV2) of the values determined.

  If all input parameters PV1, PV2 and PV3 deviate from one another by more than PlDiff, the signal status of PV is set to "Bad, due to device". The analog value of PVis set to the value of the PV1 input parameter.

  If at least two input parameters do not deviate from one another by more than PlDiff, but have a different signal state, the value from these input parameters with the signal status of the second highest priority is written to the PV output parameter.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for blocks with configurable status prioritization (Page 99).

See also

MuxAn03 block diagram (Page 1499)

MuxAn03 I/Os (Page 1498)

MuxAn03 messaging (Page 1497)

MuxAn03 error handling (Page 1497)

MuxAn03 modes (Page 1494)

Description of MuxAn03 (Page 1493)

12.3.4 MuxAn03 error handling

MuxAn03 error handling

Parameter assignment errors are handled as follows:

- If the input parameter is `SelValue` < 0, the parameter is automatically set to `SelValue` = 0.
- If the input parameter is `SelValue` > 3, the parameter is automatically set to `SelValue` = 3 .
- If the input parameter is `SelPrio` < 0, the parameter is automatically set to `SelPrio` = 0 .
- If the input parameter is `SelPrio` > 7, the parameter is automatically set to `SelPrio` = 7 .

An error number is not output in any of these cases.

See also

MuxAn03 block diagram (Page 1499)
MuxAn03 I/Os (Page 1498)
MuxAn03 messaging (Page 1497)
MuxAn03 functions (Page 1495)
MuxAn03 modes (Page 1494)
Description of MuxAn03 (Page 1493)

12.3.5 MuxAn03 messaging

Messaging

This block does not offer messaging.

See also

MuxAn03 block diagram (Page 1499)
MuxAn03 I/Os (Page 1498)
MuxAn03 error handling (Page 1497)
MuxAn03 functions (Page 1495)
MuxAn03 modes (Page 1494)
Description of MuxAn03 (Page 1493)

12.3.6 MuxAn03 I/Os

MuxAn03 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
PV1	Process value 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
PV2	Process value 2	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
PV3	Process value 3	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
PlDiff	Plausibility check value	REAL	0.0
SelPrio*	Setting of the prioritization for forming the best signal status	INT	6
SelValue*	Selection criterion for the search	INT	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
PV	Process value determined	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

See also

MuxAn03 block diagram (Page 1499)
MuxAn03 messaging (Page 1497)
MuxAn03 error handling (Page 1497)
MuxAn03 functions (Page 1495)
MuxAn03 modes (Page 1494)
Description of MuxAn03 (Page 1493)

12.3.7 MuxAn03 block diagram

MuxAn03 block diagram

A block diagram is not provided for this block.

See also

MuxAn03 I/Os (Page 1498)
MuxAn03 messaging (Page 1497)
MuxAn03 error handling (Page 1497)
MuxAn03 functions (Page 1495)
MuxAn03 modes (Page 1494)
Description of MuxAn03 (Page 1493)

12.4 RateLim - Signal ramp

12.4.1 Description of RateLim

Object name (type + number) and family

Type + number: FB 1882
Family: LogicAn

Area of application for RateLim

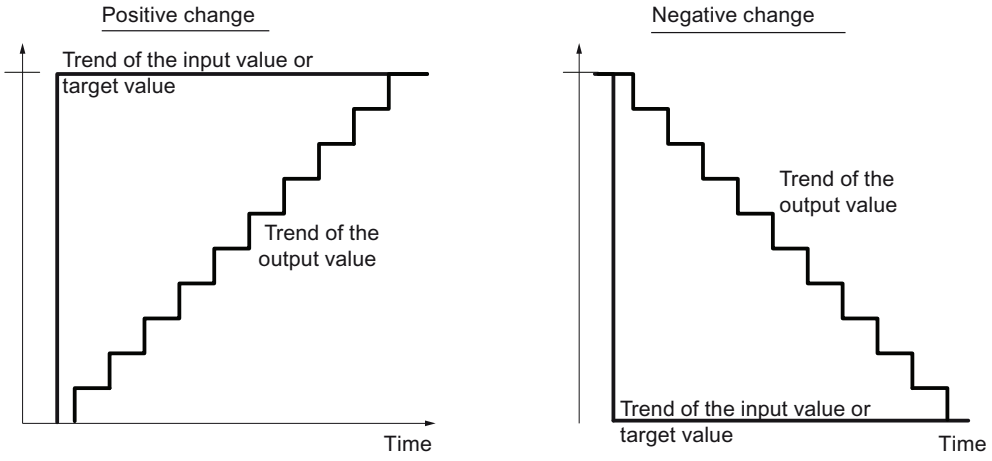
The block is used for the following applications:

- Limitation of the slope of an analog signal
- Ramped approach to a target

How it works

Slope limit: Starting from the current output value, the new output value is calculated in such a way that it does not exceed a specified positive or negative slope.

Ramp function: The current output value can be ramped up to a target. The ramp slope can be configured by a time period or by a positive or negative ramp slope.



The input value is forwarded directly when the gradient and ramp function are switched off (`RmpOn.Value = 0`, `RateOn.Value = 0`): `Out.Value = In.Value`.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB3x). The block is then installed automatically in startup OB (OB100).

Further addressing is not required.

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

RateLim functions (Page 1501)
RateLim messaging (Page 1504)
RateLim I/Os (Page 1505)
RateLim block diagram (Page 1506)
RateLim error handling (Page 1503)
RateLim modes (Page 1501)

12.4.2 RateLim modes

RateLim operating modes

This block does not have any modes.

See also

RateLim block diagram (Page 1506)
RateLim I/Os (Page 1505)
RateLim messaging (Page 1504)
RateLim error handling (Page 1503)
RateLim functions (Page 1501)
Description of RateLim (Page 1499)

12.4.3 RateLim functions

Functions of RateLim

The functions for this block are listed below.

Limitation of the slope of the analog signal `In.Value`

The block calculates the gradient of the input signal over time and compares it with the `UpRaLim` (positive change) `DnRaLim` (negative change) limits. See the table below.

- If the slope exceeds the amount of the respective limit (`UpRaLim` or `DnRaLim`), the output `Out` is corrected only by the valid limit and the corresponding limit display `UpRaAct` = 1 or `DnRaAct` = 1 is set.
- If the gradient is within the valid range, the input value is transferred (`In` = `Out`) and `UpRaAct` = 1 or `DnRaAct` = 1 are reset.
- If the corresponding limit is 0 (`UpRaLim` with positive gradient or `DnRaLim` with negative gradient), then the input value `In` is written directly to the output `Out`.

RateOn	ΔIn / Δt	Meaning	Output `Out`	UpRaAct	DnRaAct
1	< |`DnRaLim`|	Input value dropping too fast	`Out` - (|`DnRaLim`| · `SampleTime`) * Time factor	0	1
1	|`DnRaLim`| bis `UpRaLim`	Change speed `In` is permitted	`In`	0	0
1	> |`UpRaLim`|	Input value `In` rising too fast	`Out` + (|`UpRaLim`| · `SampleTime`) * Time factor	1	0
0	-	`RateOn` is deactivated	`In`	0	0

In this case, the time factor is formed from the `TimeFactor` parameter.

`TimeFactor`	Time factor
0	1
1	1/60
2	1/(60*60)

Ramp function

Starting from the current output value `Out.Value`, the output value can be ramped to the target value `RmpTarget` when the ramp function is switched on the target value is changed.

You can use the `RmpModTime` input parameter to specify whether the ramp is defined by time or gradients.

- If you select time (`RmpModTime = 1`): The gradient of the ramp is calculated automatically by the block so that after the start (`RmpOn.Value = 0 -> 1`) or a change of the target value (`RmpTarget.Value`), the target value is reached after the configured time (`RmpTime`). The unit of the ramp time (`RmpTime`) depends on `TimeFactor`.
- If you select gradients (`RmpModTime = 0`): The ramp slope corresponds to the configured rates of change `UpRaLim` (positive) or `DnRaLim` (negative).

When the output value has reached the target, the output value remains at the target value as long as the ramp function remains enabled.

Switching the ramp function and slope limiting function on or off

The ramp function is switched off with the `RmpOn = 0` input, the slope limiting function is switched off with the `RateOn` = 0 input. If both are switched off, the `In` input value is written directly to the `Out` output. Limits are no longer monitored. If both functions are switched on, the ramp function has priority.

Time base of the gradient limits

The gradient limits are set at the `UpRaLim` and `DnRaLim` parameters depending on the `TimeFactor`.

`TimeFactor = 0`: Unit of the gradient limiting is Unit/Second

`TimeFactor = 1`: Unit of the gradient limiting is Unit/Minute

`TimeFactor = 2`: Unit of the gradient limiting is Unit/Hour

Forming the signal status for blocks

The signal status of `Out` is formed from:

```
RmpOn =1: Out.ST := RmpTarget.ST
```

Otherwise: `Out.ST := In.ST`

Configurable reactions using the `Feature` I/O

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section.

The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
8	Unit for the rate of change (Page 123)

See also

Description of RateLim (Page 1499)

RateLim messaging (Page 1504)

RateLim I/Os (Page 1505)

RateLim block diagram (Page 1506)

RateLim modes (Page 1501)

RateLim error handling (Page 1503)

12.4.4 RateLim error handling

Error handling of RateLim

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
30	The value of `In` can no longer be displayed in the REAL number field.
43	Incorrect time unit set at `TimeFactor`.

See also

RateLim block diagram (Page 1506)
RateLim I/Os (Page 1505)
RateLim messaging (Page 1504)
RateLim modes (Page 1501)
Description of RateLim (Page 1499)
RateLim functions (Page 1501)

12.4.5 RateLim messaging

Messaging

This block does not offer messaging.

See also

Description of RateLim (Page 1499)
RateLim functions (Page 1501)
RateLim I/Os (Page 1505)
RateLim block diagram (Page 1506)
RateLim error handling (Page 1503)
RateLim modes (Page 1501)

12.4.6 RateLim I/Os

I/Os of RateLim

Input parameters

Parameter	Description	Type	Default
DnRaLim	Maximum negative change in the output value in units/s or %/s	REAL	3.0
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1501)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
In*	Analog input value	STRUCT • Value: REAL • ST:BYTE	- • 0.0 • 16#80
InScale	Scaling of the measuring range as a structure	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0
RateOn	1 = Switch on gradient function	STRUCT • Value: BOOL • ST:BYTE	- • 0 • 16#80
RmpModTime	1 = Use time (RmpTime) for the ramp function 0 = Use gradients (UpRaLim, DnRaLim) for the ramp function	BOOL	0
RmpOn	1 = Switch on ramp function for target value RmpTarget	STRUCT • Value: BOOL • ST:BYTE	- • 0 • 16#80
RmpTarget	Target value for the ramp function	STRUCT • Value: REAL • ST:BYTE	- • 0 • 16#80
RmpTime*	Duration [unit depends on TimeFactor] for ramp function from the current Out to RmpTarget	REAL	0.0
SampleTime	Sampling time [s] (assigned automatically)	REAL	0.1
TimeFactor	Time unit: 0 = Seconds 1 = Minutes 2 = Hours	INT	0
UpRaLim	Maximum positive change in the output value in units/s or %/s	REAL	3.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
DnRaAct	1 = Negative change in the output value	STRUCT • Value: BOOL • ST:BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see RateLim error handling (Page 1503)	INT	-1
Out	Output value	STRUCT • Value: REAL • ST:BYTE	- • 0.0 • 16#80
UpRaAct	1 = Positive change in the output value	STRUCT • Value: BOOL • ST:BYTE	- • 0 • 16#80

See also

Description of RateLim (Page 1499)

RateLim messaging (Page 1504)

RateLim block diagram (Page 1506)

RateLim modes (Page 1501)

12.4.7 RateLim block diagram

Ramp block diagram

A block diagram is not provided for this block.

See also

RateLim I/Os (Page 1505)

RateLim messaging (Page 1504)

RateLim error handling (Page 1503)

RateLim functions (Page 1501)

RateLim modes (Page 1501)

Description of RateLim (Page 1499)

12.5 RedAn02 - 1 out of 2 selection for redundant analog values

12.5.1 Description of RedAn02

Object name (type + number) and family

Type + number: FC 385

Family: LogicAn

Area of application for RedAn02

The block is used for the following applications:

- 1 out of 2 selection for redundant analog values

How it works

The block selects from two input values the one with the best signal status and outputs it at the output `Out`. In addition, the outputs `SimAct`, `Uncertain` and `LossRed` are set according to the signal status.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

RedAn02 modes (Page 1508)

Functions of RedAn02 (Page 1508)

RedAn02 error handling (Page 1509)

RedAn02 messaging (Page 1509)

RedAn02 I/Os (Page 1510)

Block diagram of RedAn02 (Page 1511)

12.5.2 RedAn02 modes

RedAn02 operating modes

This block does not have any modes.

See also

Description of RedAn02 (Page 1507)
Functions of RedAn02 (Page 1508)
RedAn02 error handling (Page 1509)
RedAn02 messaging (Page 1509)
RedAn02 I/Os (Page 1510)
Block diagram of RedAn02 (Page 1511)

12.5.3 Functions of RedAn02

Functions of RedAn02

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status of redundancy blocks (Page 97).

See also

Description of RedAn02 (Page 1507)
RedAn02 modes (Page 1508)
RedAn02 error handling (Page 1509)
RedAn02 messaging (Page 1509)
RedAn02 I/Os (Page 1510)
Block diagram of RedAn02 (Page 1511)

12.5.4 RedAn02 error handling

RedAn02 error handling

The block does not report any errors.

See also

Description of RedAn02 (Page 1507)
RedAn02 modes (Page 1508)
Functions of RedAn02 (Page 1508)
RedAn02 messaging (Page 1509)
RedAn02 I/Os (Page 1510)
Block diagram of RedAn02 (Page 1511)

12.5.5 RedAn02 messaging

Messaging

This block does not offer messaging.

See also

Description of RedAn02 (Page 1507)
RedAn02 modes (Page 1508)
Functions of RedAn02 (Page 1508)
RedAn02 error handling (Page 1509)
Block diagram of RedAn02 (Page 1511)
RedAn02 I/Os (Page 1510)

12.5.6 RedAn02 I/Os

RedAn02 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Analog input value 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST:BYTE	• 16#80
In2	Analog input value 2	STRUCT	-
		• Value: REAL	• 0.0
		• ST:BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
LossRed	1= Redundancy loss at one of the inputs	STRUCT	-
		• Value: BOOL	• 0
		• ST:BYTE	• 16#80
Out	Output of the process value with the better signal status	STRUCT	-
		• Value: REAL	• 0.0
		• ST:BYTE	• 16#80
SimAct	1 = one input value has the Simulation status	STRUCT	-
		• Value: BOOL	• 0
		• ST:BYTE	• 16#80
Uncertain	1 = one input value has the "uncertain" status	STRUCT	-
		• Value: BOOL	• 0
		• ST:BYTE	• 16#80

See also

Description of RedAn02 (Page 1507)
RedAn02 modes (Page 1508)
Functions of RedAn02 (Page 1508)
RedAn02 error handling (Page 1509)
RedAn02 messaging (Page 1509)
Block diagram of RedAn02 (Page 1511)

12.5.7 Block diagram of RedAn02

RedAn02 block diagram

A block diagram is not provided for this block.

See also

Description of RedAn02 (Page 1507)
RedAn02 modes (Page 1508)
Functions of RedAn02 (Page 1508)
RedAn02 messaging (Page 1509)
RedAn02 I/Os (Page 1510)
RedAn02 error handling (Page 1509)

12.6 SelA02In - Output of two analog values

12.6.1 Description of SelA02In

Object name (type + number)

Type + number: FB 1886

Family: LogicAn

Area of application for SelA02In

The block is used for the following applications:

- Selecting one of two analog values and switching it through to the output.

How it works

Depending on the setting of parameter `SelMode` the block selects one of the two input parameters `In1` or `In2` and writes its value to the output parameter `Out`.

This is displayed at the `In2Selected` output parameter.

Configuration

Use the CFC editor to install the block in any OB.

For the SelA02In block, the Advanced Process Library contains templates for process tag types as examples and there is a example project (APL_Example_xx, xx designates the language variant) with an application scenario for this block, which describes how the block works.

Examples of process tag types:

- Source chart for GainSched function block (gain scheduling) (Page 1813)
- Override control (Page 1814)
- Override control with PIDConR (OverrideR) (Page 1816)

Application scenario in the example project:

- Process simulation including noise generator (Page 1828)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

SelA02In block diagram (Page 1516)

SelA02In I/Os (Page 1515)

SelA02In messaging (Page 1514)

SelA02In error handling (Page 1514)

SelA02In functions (Page 1513)

SelA02In modes (Page 1513)

12.6.2 SelA02In modes

SelA02In modes

This block does not have any modes.

See also

SelA02In block diagram (Page 1516)

SelA02In I/Os (Page 1515)

SelA02In messaging (Page 1514)

SelA02In error handling (Page 1514)

SelA02In functions (Page 1513)

Description of SelA02In (Page 1511)

12.6.3 SelA02In functions

Functions of SelA02In

The functions for this block are listed below.

Select input parameter

The `SelMode` parameter can affect the selection as follows:

- `SelMode` ≤ 0: The selection depends on the parameter `Sel_In2`
  - `Sel_In2` = 0: Input parameter `In1` is written with its signal status to output parameter `Out`.
  - `Sel_In2` = 1: Input parameter `In2` is written with its signal status to output parameter `Out`.
- `SelMode` = 1: The input parameter with the lower value (`In1` or `In2`) is written with its signal status to the output parameter `Out`.
- `SelMode` ≥ 2: The input parameter with the higher value (`In1` or `In2`) is written with its signal status to the output parameter `Out`.

The signal status of `Sel_In2` is output at the `In2Selected` output parameter.

See also

SelA02In block diagram (Page 1516)
SelA02In I/Os (Page 1515)
SelA02In messaging (Page 1514)
SelA02In error handling (Page 1514)
SelA02In modes (Page 1513)
Description of SelA02In (Page 1511)

12.6.4 SelA02In error handling

SelA02In error handling

The block does not report any errors.

See also

SelA02In block diagram (Page 1516)
SelA02In I/Os (Page 1515)
SelA02In messaging (Page 1514)
SelA02In functions (Page 1513)
SelA02In modes (Page 1513)
Description of SelA02In (Page 1511)

12.6.5 SelA02In messaging

Messaging

This block does not offer messaging.

See also

SelA02In block diagram (Page 1516)
SelA02In I/Os (Page 1515)
SelA02In error handling (Page 1514)
SelA02In functions (Page 1513)
SelA02In modes (Page 1513)
Description of SelA02In (Page 1511)

12.6.6 SelA02In I/Os

SelA02In I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Analog process value 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
In2	Analog process value 2	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SelMode	Selection of the function: 0 = Select with Sel_In2 1 = Minimum 2 = Maximum	INT	0
Sel_In2	Selecting the input parameter: 0 = In1 1 = In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
In2Selected	Selected input parameter: 0 = In1 1 = In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out	Analog process value	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

See also

SelA02In block diagram (Page 1516)
SelA02In messaging (Page 1514)
SelA02In error handling (Page 1514)
SelA02In functions (Page 1513)
SelA02In modes (Page 1513)
Description of SelA02In (Page 1511)

12.6.7 SelA02In block diagram

SelA02In block diagram

A block diagram is not provided for this block.

See also

SelA02In I/Os (Page 1515)
SelA02In messaging (Page 1514)
SelA02In error handling (Page 1514)
SelA02In functions (Page 1513)
SelA02In modes (Page 1513)
Description of SelA02In (Page 1511)

12.7 SelA16In - Output of 16 analog values

12.7.1 Description of SelA16In

Object name (type + number) and family

Type + number: FB 1888
Family: LogicAn

Area of application for SelA16In

The block is used for the following applications:

- Selecting one of 16 analog values and switching it through to the output.

How it works

The block writes the value of one of the input parameters `In01` through `In16` to the output parameter `Out`. The selection is performed via the `SelInt` input parameter.

The signal status of the selected input parameter is written to the signal status of the output parameter `Out`. There is no additional signal status evaluation.

The unit `InxUnit` of the selected input parameter `Inx` (x = 01 ...16) is written to the output parameter `OutUnit`.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

You can find a description for each parameter in section SelA16In I/Os (Page 1522).

Status bit	Parameter
0 - 2	Not used
3	`OosAct.Value`
4	`OosLi.Value`
5	Not used
6	`OnAct.Value`
7 - 11	Not used
12 – 27	Used to highlight the green line in the standard view
28 - 31	Not used

Status word allocation for `Status2` parameter

Status bit	Parameter
0	1 = Hide input 1
...	...
15	1 = Hide input 16
16 - 31	Not used

See also

SelA16In block diagram (Page 1526)

SelA16In messaging (Page 1522)

SelA16In error handling (Page 1521)

SelA16In functions (Page 1519)

SelA16In modes (Page 1518)

12.7.2 SelA16In modes

SelA16In operating modes

The block can be operated using the following modes:

- On (Page 58)
- Out of service (Page 58)

"On"

You can find general information about the "On" mode in the section On (Page 58).

"Out of service"

You can find general information about the "Out of service" mode in the section Out of service (Page 58).

See also

SelA16In block diagram (Page 1526)

SelA16In I/Os (Page 1522)

SelA16In messaging (Page 1522)

SelA16In error handling (Page 1521)

SelA16In functions (Page 1519)

Description of SelA16In (Page 1516)

12.7.3 SelA16In functions

Functions of SelA16In

The functions for this block are listed below.

Opening additional faceplates

This block provides the standard function Opening additional faceplates (Page 165).

Operator control permissions

This block provides the standard function Operator control permissions (Page 205).

The block has the following permissions for the `OS_Perm` parameter:

Bit	Function
0	Not used
1	1 =Operator can switch to "On" mode
2	Not used
3	1 =Operator can switch to "Out of service" mode
4	1 = Operator can set the input 1
5	1 = Operator can set the input 2
6	1 = Operator can set the input 3
7	1 = Operator can set the input 4
8	1 = Operator can set the input 5
9	1 = Operator can set the input 6
10	1 = Operator can set the input 7
11	1 = Operator can set the input 8
12	1 = Operator can set the input 9
13	1 = Operator can set the input 10
14	1 = Operator can set the input 11
15	1 = Operator can set the input 12
16	1 = Operator can set the input 13
17	1 = Operator can set the input 14
18	1 = Operator can set the input 15
19	1 = Operator can set the input 16
20 - 31	Not used

Note

If you interconnect a parameter that is also listed in `OS_Perm` as a parameter, you have to reset the corresponding `OS_Perm` bit.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status of analog logic blocks (Page 96).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `In1.ST`

etc. to

- `In16.ST`

Selecting a unit of measure

This block provides the standard function Selecting a unit of measure (Page 168).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
1	Reaction to the out of service mode (Page 148)
5	Display only input values that are interconnected in the faceplate (Page 129)
24	Activating local operating permission (Page 130)

Cascading of SelA16In

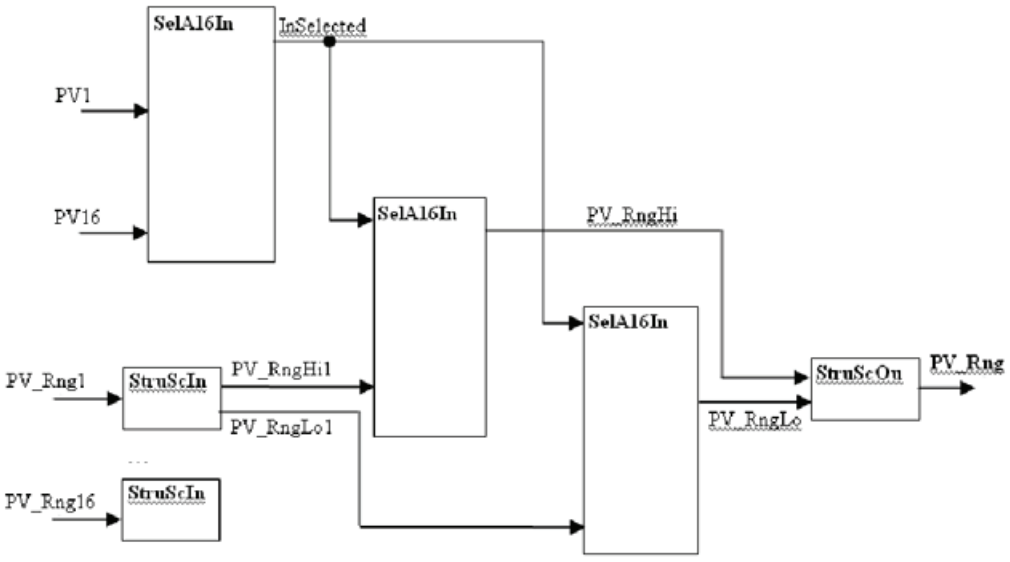


Figure 12-1 Process value area can be realized using conversion blocks and cascaded SelA16In blocks.

See also

SelA16In block diagram (Page 1526)

SelA16In I/Os (Page 1522)

SelA16In messaging (Page 1522)

SelA16In error handling (Page 1521)

SelA16In modes (Page 1518)

Description of SelA16In (Page 1516)

12.7.4 SelA16In error handling

Error handling of SelA16In

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	There is no error.
18	1 > SelExt > 16

See also

SelA16In block diagram (Page 1526)

SelA16In I/Os (Page 1522)

SelA16In messaging (Page 1522)

SelA16In functions (Page 1519)

SelA16In modes (Page 1518)

Description of SelA16In (Page 1516)

12.7.5 SelA16In messaging

Messaging

This block does not offer messaging.

See also

SelA16In block diagram (Page 1526)
SelA16In I/Os (Page 1522)
SelA16In error handling (Page 1521)
SelA16In functions (Page 1519)
SelA16In modes (Page 1518)
Description of SelA16In (Page 1516)

12.7.6 SelA16In I/Os

I/Os of SelA16In

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1519)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 31: BOOL	• 0
In01	Analog input parameter 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
In02	Analog input parameter 2	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF
In03	Analog input parameter 3	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#FF

Parameter	Description	Type	Default
In04	Analog input parameter 4	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In05	Analog input parameter 5	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In06	Analog input parameter 6	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In07	Analog input parameter 7	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In08	Analog input parameter 8	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In09	Analog input parameter 9	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In10	Analog input parameter 10	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In11	Analog input parameter 11	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In12	Analog input parameter 12	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In13	Analog input parameter 13	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In14	Analog input parameter 14	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In15	Analog input parameter 15	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF

Parameter	Description	Type	Default
In16	Analog input parameter 16	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#FF
In01Unit	Unit for parameter In01	INT	1001
In02Unit	Unit for parameter In02	INT	1001
In03Unit	Unit for parameter In03	INT	1001
In04Unit	Unit for parameter In04	INT	1001
In05Unit	Unit for parameter In05	INT	1001
In06Unit	Unit for parameter In06	INT	1001
In07Unit	Unit for parameter In07	INT	1001
In08Unit	Unit for parameter In08	INT	1001
In09Unit	Unit for parameter In09	INT	1001
In10Unit	Unit for parameter In10	INT	1001
In11Unit	Unit for parameter In11	INT	1001
In12Unit	Unit for parameter In12	INT	1001
In13Unit	Unit for parameter In13	INT	1001
In14Unit	Unit for parameter In14	INT	1001
In15Unit	Unit for parameter In15	INT	1001
In16Unit	Unit for parameter In16	INT	1001
LiOp	Selection of the input parameter via: 0 = Operator 1 = Interconnection or SFC	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OnOp*	1 = "On" mode via operator	BOOL	0
OosLi	1 = "Out of service", via interconnection or SFC (0-1 edge transition)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosOp*	1 = "Out of service", via OS operator	BOOL	0
OpSt_In	Input parameter for local operating permission, connected with the Out output parameter of the upstream block, OpStations (Page 304)	DWORD	16#00000000
OS_Perm	I/O for operator control permissions (Page 1519)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 1 • 1 • 1
SelExt	External selection of the input parameter: 1 = In01 selected 16 = In16 selected Selection outside the range 1...16 is not possible	INT	1
SelFp1	Call a block saved in this parameter as an additional faceplate (Page 165) in the standard view	ANY	-

Parameter	Description	Type	Default
SelFp2	Call a block saved in this parameter as an additional faceplate (Page 165) in the preview	ANY	-
SelInt*	Selecting the input parameter: 1 = In01 selected 16 = In16 selected You cannot select anything outside the range of 1 to 16.	INT	1
UserStatus	Freely assignable bits for use in PCS 7 OS	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see SelA16In error handling (Page 1521).	INT	-1
InSelected	Selected input parameter: 1 = In01 selected 16 = In16 selected	STRUCT • Value: INT • ST: BYTE	- • 1 • 16#80
OnAct	1 = "On" mode enabled	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
OosAct	1 = Block is "Out of service"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpSt_Out	Value of the OpSt_In input parameter, for feedforwarding to other blocks. Bit 31 of this parameter is used by Feature bit 24	DWORD	16#00000000
OS_PermLog	Display of OS_Perm with settings changed by the block algorithm	DWORD	16#FFFFFFFF
OS_PermOut	Display of OS_Perm	DWORD	16#FFFFFFFF
Out	Output	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
OutUnit	Unit for parameter Out	INT	1001
ST_Worst	Worst signal status	BYTE	16#80
Status	Status word (Page 1516)	DWORD	16#00000000
Status2	Status word (Page 1516)	DWORD	16#00000000

See also

SelA16In block diagram (Page 1526)
SelA16In messaging (Page 1522)
SelA16In modes (Page 1518)

12.7.7 SelA16In block diagram

SelA16In block diagram

A block diagram is not provided for this block.

See also

SelA16In I/Os (Page 1522)
SelA16In messaging (Page 1522)
SelA16In error handling (Page 1521)
SelA16In functions (Page 1519)
SelA16In modes (Page 1518)
Description of SelA16In (Page 1516)

12.7.8 Operator control and monitoring

12.7.8.1 SelA16In views

Views of the SelA16In block

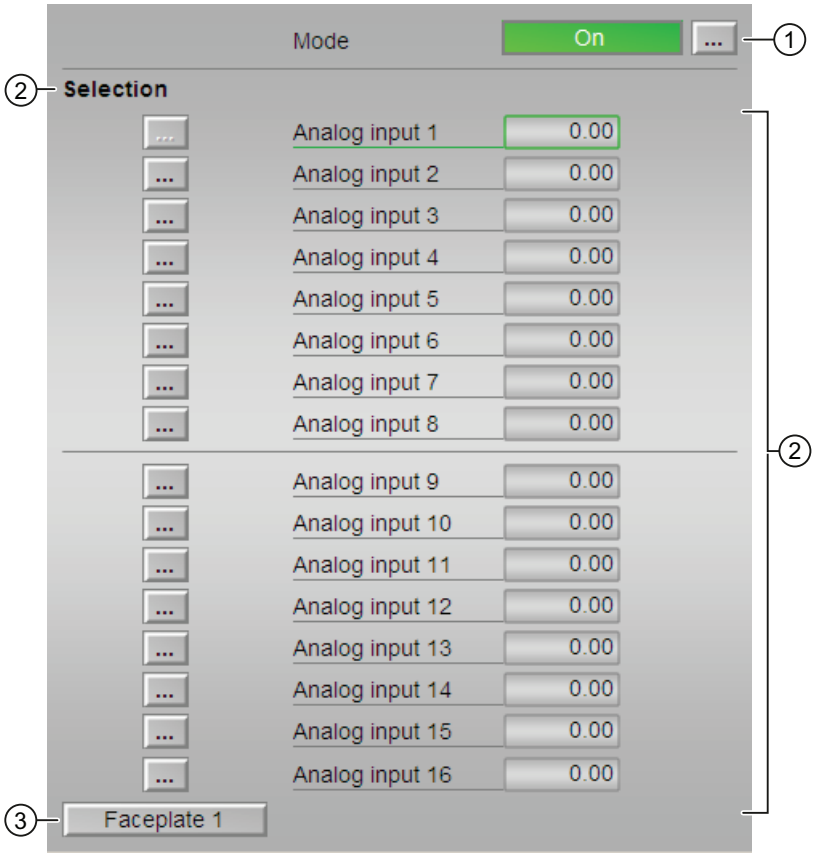
The block SelA16In provides the following views:

- SelA16In standard view (Page 1527)
- SelA16In preview (Page 1528)
- Memo view (Page 252)
- Block icon for SelA16In (Page 1529)

Refer to the sections Structure of the faceplate (Page 200) and Block icon structure (Page 185) for general information on the faceplate and block icon.

12.7.8.2 SelA16In standard view

SelA16In standard view



(1) Displaying and switching the operating mode

This area provides information on the currently valid operating mode. The following operating modes can be shown here:

- On (Page 58)
- Out of service (Page 58)

Refer to the Switching operating states and operating modes (Page 208) section for information on switching the operating mode.

(2) Switching analog values

This area shows you the analog values connected in the ES for this block.

You can find additional information on this in Switching operating states and operating modes (Page 208).

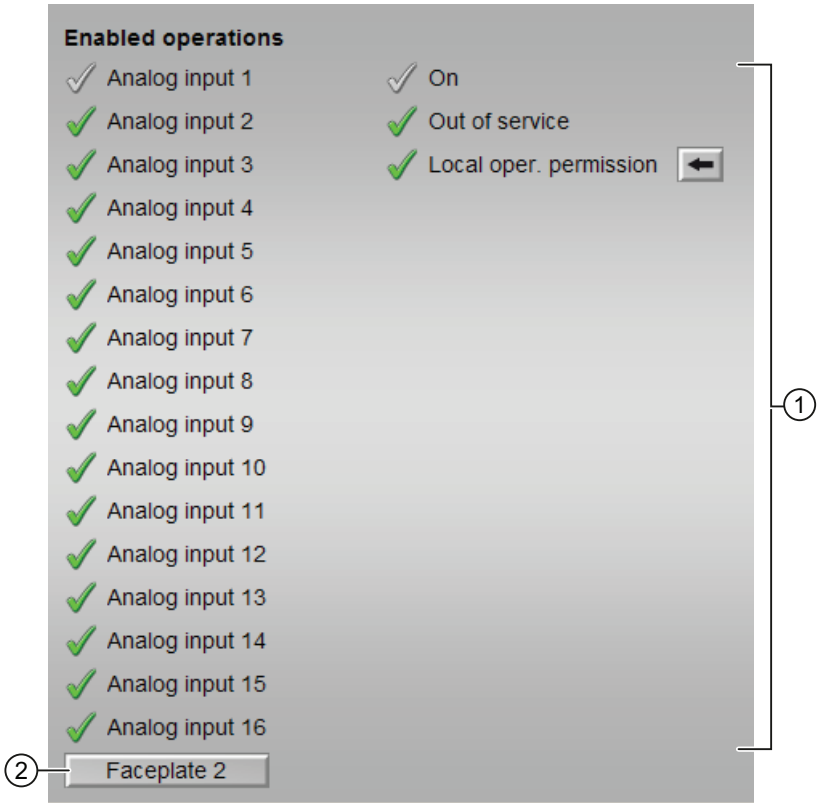
(3) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

12.7.8.3 SelA16In preview

Preview of SelA16In



(1) Enabled operations

This area shows all operations for which special operator control permissions are assigned. They depend on the configuration in the engineering system (ES) that applies to this block.

Symbols for enabled operations:

- **Green check mark**: the OS operator can control this parameter
- **Gray check mark**: the OS operator cannot control this parameter at this time due to the process
- **Red cross**: the OS operator cannot control this parameter due to the configured AS operator control permissions (`OS_Perm` or `OS1Perm`)

The following enabled operations are shown here:

- Analog input 1 to 16: You can switch to this analog input.
- "On": You can switch to "On" operating mode.
- "Out of service": You can switch to "Out of service" operating mode.
- "Local operating permission": Use the ← button to switch to the standard view of the OpStations block. Additional information is available in the section Operator control permissions (Page 205).

(2) Navigation button for switching to the standard view of any faceplate

Use this navigation button to reach the standard view of a block configured in the engineering system. The visibility of this navigation button depends on the configuration in the engineering system (ES).

You can find additional information on this in the Opening additional faceplates (Page 165) section.

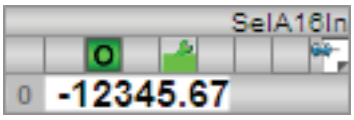
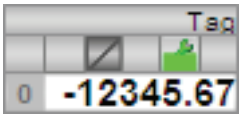
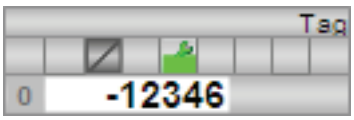
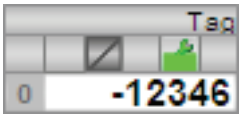
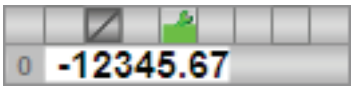
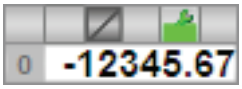
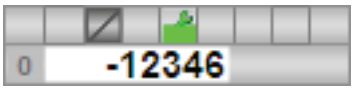
12.7.8.4 Block icon for SelA16In

Block icons for SelA16In

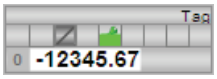
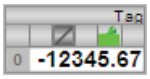
A variety of block icons are available with the following functions:

- Process tag type
- Operating modes
- Signal status, release for maintenance
- Memo display
- Display of the selected analog value

The block icons from template @TemplateAPLV7.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	Block icon in the full display
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	-	Block icon in "Out of service" mode (example with type 1 block icon)

The block icons from template @TemplateAPLV8.PDL:

Icons	Selection of the block icon in CFC	Special features
	1	
	2	

Additional information on the block icon and the control options in the block icon is available in the following sections:

- Configuring the block icons (Page 191)
- Block icon structure (Page 185)
- Operation via the block icon (Page 193).

Digital logic blocks 13

13.1 And04 - Forming an AND signal from 4 binary input signals

13.1.1 Description of And04

Object name (type + number) and family

Type + number: FC 355

Family: LogicDi

Area of application for And04

The block is used for the following applications:

- Forming an AND-output signal from four binary input values

How it works

Four input parameters are combined via the AND function ("and-ing") into one output value `Out`.

You can use this block to e.g. start or stop a device if all incoming signals are the same.

You can find additional information on forming the signal status under Forming and outputting the signal status of digital logic blocks (Page 95)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

And04 block diagram (Page 1537)
And04 I/Os (Page 1536)
And04 messaging (Page 1535)
And04 error handling (Page 1535)
And04 functions (Page 1534)
And04 modes (Page 1534)

13.1.2 And04 modes

And04 modes

This block does not have any modes.

See also

And04 block diagram (Page 1537)
And04 I/Os (Page 1536)
And04 messaging (Page 1535)
And04 error handling (Page 1535)
And04 functions (Page 1534)
Description of And04 (Page 1533)

13.1.3 And04 functions

Functions of And04

This block does not have any other functions.

See also

And04 block diagram (Page 1537)
And04 I/Os (Page 1536)
And04 messaging (Page 1535)
And04 error handling (Page 1535)
And04 modes (Page 1534)
Description of And04 (Page 1533)

13.1.4 And04 error handling

And04 error handling

The block does not report any errors.

See also

And04 block diagram (Page 1537)
And04 I/Os (Page 1536)
And04 messaging (Page 1535)
And04 functions (Page 1534)
And04 modes (Page 1534)
Description of And04 (Page 1533)

13.1.5 And04 messaging

Messaging

This block does not offer messaging.

See also

And04 block diagram (Page 1537)
And04 I/Os (Page 1536)
And04 error handling (Page 1535)
And04 functions (Page 1534)
And04 modes (Page 1534)
Description of And04 (Page 1533)

13.1.6 And04 I/Os

And04 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Input 1	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#80
In2	Input 2	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#80
In3	Input 3	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#80
In4	Input 4	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

See also

And04 block diagram (Page 1537)
And04 messaging (Page 1535)
And04 error handling (Page 1535)
And04 functions (Page 1534)
And04 modes (Page 1534)
Description of And04 (Page 1533)

13.1.7 And04 block diagram

And04 block diagram

A block diagram is not provided for this block.

See also

And04 I/Os (Page 1536)
And04 messaging (Page 1535)
And04 error handling (Page 1535)
And04 functions (Page 1534)
And04 modes (Page 1534)
Description of And04 (Page 1533)

13.2 And08 - Forming an AND signal from 8 binary input signals

13.2.1 Description of And08

Object name (type + number) and family

Type + number: FC 356

Family: LogicDi

Area of application for And08

The block is used for the following applications:

- Forming an AND- output signal from eight binary input values

How it works

Eight input parameters are combined via the AND function ("and-ing") into one output value `Out`.

You can use this block to e.g. start or stop a device if all incoming signals are the same.

You can find additional information on forming the signal status under Forming and outputting the signal status of digital logic blocks (Page 95)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

And08 block diagram (Page 1542)
And08 I/Os (Page 1540)
And08 messaging (Page 1540)
And08 error handling (Page 1539)
And08 functions (Page 1539)
And08 modes (Page 1538)

13.2.2 And08 modes

And08 modes

This block does not have any modes.

See also

And08 block diagram (Page 1542)
And08 I/Os (Page 1540)
And08 messaging (Page 1540)
And08 error handling (Page 1539)
And08 functions (Page 1539)
Description of And08 (Page 1537)

13.2.3 And08 functions

Functions of And08

This block does not have any other functions.

See also

And08 block diagram (Page 1542)
And08 I/Os (Page 1540)
And08 messaging (Page 1540)
And08 error handling (Page 1539)
And08 modes (Page 1538)
Description of And08 (Page 1537)

13.2.4 And08 error handling

And08 error handling

The block does not report any errors.

See also

And08 block diagram (Page 1542)
And08 I/Os (Page 1540)
And08 messaging (Page 1540)
And08 functions (Page 1539)
And08 modes (Page 1538)
Description of And08 (Page 1537)

13.2.5 And08 messaging

Messaging

This block does not offer messaging.

See also

And08 block diagram (Page 1542)
And08 I/Os (Page 1540)
And08 error handling (Page 1539)
And08 functions (Page 1539)
And08 modes (Page 1538)
Description of And08 (Page 1537)

13.2.6 And08 I/Os

And08 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Input 1	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
In2	Input 2	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
In3	Input 3	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
In4	Input 4	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
In5	Input 5	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80

Parameter	Description	Type	Default
In6	Input 6	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#80
In7	Input 7	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#80
In8	Input 8	STRUCT	-
		• Value: BOOL	• 1
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

See also

And08 block diagram (Page 1542)
And08 messaging (Page 1540)
And08 error handling (Page 1539)
And08 functions (Page 1539)
And08 modes (Page 1538)
Description of And08 (Page 1537)

13.2.7 And08 block diagram

And08 block diagram

A block diagram is not provided for this block.

See also

And08 I/Os (Page 1540)
And08 messaging (Page 1540)
And08 error handling (Page 1539)
And08 functions (Page 1539)
And08 modes (Page 1538)
Description of And08 (Page 1537)

13.3 FlipFlop - preparation of a bistabile flip-flop

13.3.1 Description of FlipFlop

Object name (type + number) and family

Type + number: FC 389

Family: LogicDi

Area of application for FlipFlop

The block is used for the following applications:

- Preparation of a bistabile flip-flop

How it works

The block provides the function of a bistabile flip-flop, whereby the Mode input parameter can be used to select between SR- (`Mode = 0`) and RS-FlipFlop (`Mode = 1`).

The flip-flop provides the two control inputs for setting and resetting:

- `SetLi`: Set
- `RstLi`: Reset

With a positive edge at the input parameter for setting `SetLi`, the output parameter `Out` is set to 1. Simultaneously, the output parameter `InvOut` is reset.

With a positive edge at the input parameter for resetting `RstLi`, the output parameter `Out` is reset. Simultaneously, the output parameter `InvOut` is set.

If the two input parameters are`SetLi` and `RstLi = 0`, then the block retains its state. In this case, nothing changes at the output parameters.

How the block operates as SR-FlipFlop (`Mode` = 0)

The input parameter for setting `SetLi` has priority over the input parameter for resetting `RstLi`.

Truth table:

RstLi	SetLi	Out	InvOut
0	0	Last value	Last value
0	1	1	0
1	0	0	1
1	1	1	0

How the block operates as RS-FlipFlop (`Mode` = 1)

The input parameter for resetting `RstLi` has priority over the input parameter for setting `SetLi`.

Truth table:

RstLi	SetLi	Out	InvOut
0	0	Last value	Last value
0	1	1	0
1	0	0	1
1	1	0	1

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

FlipFlop modes (Page 1544)
FlipFlop functions (Page 1544)
FlipFlop error handling (Page 1546)
FlipFlop messaging (Page 1546)
FlipFlop I/Os (Page 1547)
FlipFlop block diagram (Page 1548)

13.3.2 FlipFlop modes

FlipFlop operating modes

This block does not have any modes.

See also

Description of FlipFlop (Page 1542)
FlipFlop functions (Page 1544)
FlipFlop error handling (Page 1546)
FlipFlop messaging (Page 1546)
FlipFlop I/Os (Page 1547)
FlipFlop block diagram (Page 1548)

13.3.3 FlipFlop functions

Functions of FlipFlop

The block provides the following functions:

Forming the signal status for blocks – SR-FlipFlop

The signal status is formed as follows:

RstLi	SetLi	Out.ST	InvOut.ST
0	0	Last signal status	Last signal status
0	1	= SetLi.ST	= SetLi.ST
1	0	= RstLi.ST	= RstLi.ST
1	1	= SetLi.ST	= SetLi.ST

Forming the signal status for blocks - RS-FlipFlop

The signal status is formed as follows:

RstLi	SetLi	Out.ST	InvOut.ST
0	0	Last signal status	Last signal status
0	1	= SetLi.ST	= SetLi.ST
1	0	= RstLi.ST	= RstLi.ST
1	1	= RstLi.ST	= RstLi.ST

See also

Description of FlipFlop (Page 1542)
FlipFlop modes (Page 1544)
FlipFlop error handling (Page 1546)
FlipFlop messaging (Page 1546)
FlipFlop I/Os (Page 1547)
FlipFlop block diagram (Page 1548)

13.3.4 FlipFlop error handling

FlipFlop error handling

The block does not report any errors.

See also

Description of FlipFlop (Page 1542)
FlipFlop modes (Page 1544)
FlipFlop functions (Page 1544)
FlipFlop messaging (Page 1546)
FlipFlop I/Os (Page 1547)
FlipFlop block diagram (Page 1548)

13.3.5 FlipFlop messaging

Messaging

This block does not offer messaging.

See also

Description of FlipFlop (Page 1542)
FlipFlop modes (Page 1544)
FlipFlop functions (Page 1544)
FlipFlop error handling (Page 1546)
FlipFlop I/Os (Page 1547)
FlipFlop block diagram (Page 1548)

13.3.6 FlipFlop I/Os

FlipFlop I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Mode	Specifying how the block works: • 0 = SR-FlipFlop • 1 = RS-FlipFlop	BOOL	0
RstLi	1 = Reset via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SetLi	1 = Set via interconnection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
InvOut	Inverted output signal	STRUCT • Value: BOOL • ST: BYTE	- • 1 • 16#80
Out	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Description of FlipFlop (Page 1542)
FlipFlop modes (Page 1544)
FlipFlop functions (Page 1544)
FlipFlop error handling (Page 1546)
FlipFlop messaging (Page 1546)
FlipFlop block diagram (Page 1548)

13.3.7 FlipFlop block diagram

FlipFlop block diagram

A block diagram is not provided for this block.

See also

Description of FlipFlop (Page 1542)
FlipFlop modes (Page 1544)
FlipFlop functions (Page 1544)
FlipFlop error handling (Page 1546)
FlipFlop messaging (Page 1546)
FlipFlop I/Os (Page 1547)

13.4 Or04 - Forming an OR signal from 4 binary input signals

13.4.1 Description of Or04

Object name (type + number) and family

Type + number: FC 364

Family: LogicDi

Area of application for Or04

The block is used for the following applications:

- Forming an OR-output signal from four binary input values

How it works

Four input parameters are combined via the OR-function ("or-ing") into one output value `Out`.

You can find additional information on forming the signal status under Forming and outputting the signal status of digital logic blocks (Page 95)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Or04 block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810)
- Cascade control with PIDConR (CascadeR) (Page 1812)
- Dosing (DoseLean) (Page 1819)
- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)
- PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800)
- Model-based predictive control (ModPreCon) (Page 1816)
- Override control (Page 1814)
- Override control with PIDConR (OverrideR) (Page 1816)
- PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799)
- PIDConR with safety logic and control loop monitoring (PIDConR_ConPerMon) (Page 1800)
- Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)
- Ratio control with PIDConR (RatioR) (Page 1809)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)
- Step controller with assigned actuator block and position feedback (StepControlActor) (Page 1805)
- Valve (ValveLean) (Page 1824)
- Dosing with PA/FF devices (DoseLean_Fb) (Page 1820)
- PID controller for PA/FF devices (PIDControlLean_Fb) (Page 1799)
- Control valve (VlvAnL) (Page 1826)
- Control value for PA/FF devices (ValveAnalog_Fb) (Page 1826)
- Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

Or04 block diagram (Page 1553)
Or04 I/Os (Page 1552)
Or04 messaging (Page 1551)
Or04 error handling (Page 1551)
Or04 functions (Page 1550)
Or04 modes (Page 1550)

13.4.2 Or04 modes

Or04 modes

This block does not have any modes.

See also

Or04 block diagram (Page 1553)
Or04 I/Os (Page 1552)
Or04 messaging (Page 1551)
Or04 error handling (Page 1551)
Or04 functions (Page 1550)
Description of Or04 (Page 1548)

13.4.3 Or04 functions

Functions of Or04

This block does not have any other functions.

See also

Or04 block diagram (Page 1553)
Or04 I/Os (Page 1552)
Or04 messaging (Page 1551)
Or04 error handling (Page 1551)
Or04 modes (Page 1550)
Description of Or04 (Page 1548)

13.4.4 Or04 error handling

Or04 error handling

The block does not report any errors.

See also

Or04 block diagram (Page 1553)
Or04 I/Os (Page 1552)
Or04 messaging (Page 1551)
Or04 functions (Page 1550)
Or04 modes (Page 1550)
Description of Or04 (Page 1548)

13.4.5 Or04 messaging

Messaging

This block does not offer messaging.

See also

Or04 block diagram (Page 1553)
Or04 I/Os (Page 1552)
Or04 error handling (Page 1551)
Or04 functions (Page 1550)
Or04 modes (Page 1550)
Description of Or04 (Page 1548)

13.4.6 Or04 I/Os

Or04 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Value 1	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
In2	Value 2	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
In3	Value 3	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
In4	Value 4	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

See also

Or04 block diagram (Page 1553)
Or04 messaging (Page 1551)
Or04 error handling (Page 1551)
Or04 functions (Page 1550)
Or04 modes (Page 1550)
Description of Or04 (Page 1548)

13.4.7 Or04 block diagram

Or04 block diagram

A block diagram is not provided for this block.

See also

Or04 I/Os (Page 1552)

Or04 messaging (Page 1551)

Or04 error handling (Page 1551)

Or04 functions (Page 1550)

Or04 modes (Page 1550)

Description of Or04 (Page 1548)

13.5 Or08 - Forming an OR signal from 8 binary input signals

13.5.1 Description of Or08

Object name (type + number) and family

Type + number: FC 365

Family: LogicDi

Area of application for Or08

The block is used for the following applications:

- Forming an OR- output signal from eight binary input values

How it works

Eight input parameters are combined via the OR-function ("or-ing") into one output value `Out`.

You can find additional information on forming the signal status under Forming and outputting the signal status of digital logic blocks (Page 95)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Or08 block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Monitoring eight digital process tags (Digital8Monitoring) (Page 1818)
- Step controller with assigned actuator block and position feedback (StepControlActor) (Page 1805)
- Step controller with direct access to the actuator and without position feedback (StepControlDirect) (Page 1805)
- Two-speed motor (Motor2Speed) (Page 1821)
- Reversing motor (MotorReversible) (Page 1822)
- Reversing motor with controllable speed (MotorSpeedControlled) (Page 1822)
- Two-way valve (Valve2Way) (Page 1825)
- Motor valve (ValveMotor) (Page 1825)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

Or08 block diagram (Page 1558)

Or08 I/Os (Page 1557)

Or08 messaging (Page 1556)

Or08 error handling (Page 1556)

Or08 functions (Page 1555)

Or08 modes (Page 1555)

13.5.2 Or08 modes

Or08 modes

This block does not have any operating modes.

See also

Or08 block diagram (Page 1558)
Or08 I/Os (Page 1557)
Or08 messaging (Page 1556)
Or08 error handling (Page 1556)
Or08 functions (Page 1555)
Description of Or08 (Page 1553)

13.5.3 Or08 functions

Functions of Or08

This block does not have any other functions.

See also

Or08 block diagram (Page 1558)
Or08 I/Os (Page 1557)
Or08 messaging (Page 1556)
Or08 error handling (Page 1556)
Or08 modes (Page 1555)
Description of Or08 (Page 1553)

13.5.4 Or08 error handling

Or08 error handling

The block does not report any errors.

See also

Or08 block diagram (Page 1558)
Or08 I/Os (Page 1557)
Or08 messaging (Page 1556)
Or08 functions (Page 1555)
Or08 modes (Page 1555)
Description of Or08 (Page 1553)

13.5.5 Or08 messaging

Messaging

This block does not offer messaging.

See also

Or08 block diagram (Page 1558)
Or08 I/Os (Page 1557)
Or08 error handling (Page 1556)
Or08 functions (Page 1555)
Or08 modes (Page 1555)
Description of Or08 (Page 1553)

13.5.6 Or08 I/Os

Or08 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Value 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In2	Value 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In3	Value 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In4	Value 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In5	Value 5	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In6	Value 6	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In7	Value 7	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In8	Value 8	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

See also

Or08 block diagram (Page 1558)
Or08 messaging (Page 1556)
Or08 error handling (Page 1556)
Or08 functions (Page 1555)
Or08 modes (Page 1555)
Description of Or08 (Page 1553)

13.5.7 Or08 block diagram

Or08 block diagram

A block diagram is not provided for this block.

See also

Or08 I/Os (Page 1557)
Or08 messaging (Page 1556)
Or08 error handling (Page 1556)
Or08 functions (Page 1555)
Or08 modes (Page 1555)
Description of Or08 (Page 1553)

13.6 Not01 - Inversion of an input signal

13.6.1 Description of Not01

Object name (type + number) and family

Type + number: FC 382

Family: LogicDi

Area of application for Not01

The block is used for the following applications:

- Inversion of an input signal

How it works

The block inverts the binary signal available at the `In` input parameter and writes the result to its output parameter `Out`.

The signal status is passed from the input directly to the output.

You can find additional information on forming the signal status under Forming and outputting the signal status of digital logic blocks (Page 95)

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

For the Not01 block, the Advanced Process Library contains a template for process tag types as an example with an application scenario for this block.

Example of process tag types:

- Step controller with assigned actuator block and position feedback (StepControlActor) (Page 1805)
- Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)

See also

Not01 block diagram (Page 1563)

Not01 I/Os (Page 1562)

Not01 messaging (Page 1561)

Not01 error handling (Page 1561)

Not01 functions (Page 1560)

Not01 modes (Page 1560)

13.6.2 Not01 modes

Not01 operating modes

This block does not have any operating modes.

See also

Not01 block diagram (Page 1563)
Not01 I/Os (Page 1562)
Not01 messaging (Page 1561)
Not01 error handling (Page 1561)
Not01 functions (Page 1560)
Description of Not01 (Page 1559)

13.6.3 Not01 functions

Functions of Not01

There are no other functions for this block.

See also

Not01 block diagram (Page 1563)
Not01 I/Os (Page 1562)
Not01 messaging (Page 1561)
Not01 error handling (Page 1561)
Not01 modes (Page 1560)
Description of Not01 (Page 1559)

13.6.4 Not01 error handling

Not01 error handling

The block does not report any errors.

See also

Not01 block diagram (Page 1563)
Not01 I/Os (Page 1562)
Not01 messaging (Page 1561)
Not01 functions (Page 1560)
Not01 modes (Page 1560)
Description of Not01 (Page 1559)

13.6.5 Not01 messaging

Messaging

This block does not offer messaging.

See also

Not01 block diagram (Page 1563)
Not01 I/Os (Page 1562)
Not01 error handling (Page 1561)
Not01 functions (Page 1560)
Not01 modes (Page 1560)
Description of Not01 (Page 1559)

13.6.6 Not01 I/Os

Not01 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In	Input value	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

See also

Not01 block diagram (Page 1563)
Not01 messaging (Page 1561)
Not01 error handling (Page 1561)
Not01 functions (Page 1560)
Not01 modes (Page 1560)
Description of Not01 (Page 1559)

13.6.7 Not01 block diagram

Not01 block diagram

A block diagram is not provided for this block.

See also

Not01 I/Os (Page 1562)

Not01 messaging (Page 1561)

Not01 error handling (Page 1561)

Not01 functions (Page 1560)

Not01 modes (Page 1560)

Description of Not01 (Page 1559)

13.7 RedDi02 - 1 out of 2 selection for redundant digital values

13.7.1 Description of RedDi02

Object name (type + number) and family

Type + number: FC 386

Family: LogicDi

Area of application for RedDi02

The block is used for the following applications:

- 1 out of 2 selection for redundant digital values

How it works

The block selects from two input values the one with the best signal status and outputs it at the output `Out`. In addition, the outputs `SimAct`, `Uncertain` and `LossRed` are set according to the signal status.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

RedDi02 modes (Page 1564)
RedDi02 functions (Page 1564)
RedDi02 error handling (Page 1565)
RedDi02 messaging (Page 1566)
RedDi02 I/Os (Page 1566)
RedDi02 block diagram (Page 1567)

13.7.2 RedDi02 modes

RedDi02 operating modes

This block does not have any operating modes.

See also

Description of RedDi02 (Page 1563)
RedDi02 functions (Page 1564)
RedDi02 error handling (Page 1565)
RedDi02 messaging (Page 1566)
RedDi02 I/Os (Page 1566)
RedDi02 block diagram (Page 1567)

13.7.3 RedDi02 functions

Functions of RedDi02

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status of redundancy blocks (Page 97).

See also

Description of RedDi02 (Page 1563)

RedDi02 modes (Page 1564)

RedDi02 error handling (Page 1565)

RedDi02 messaging (Page 1566)

RedDi02 I/Os (Page 1566)

RedDi02 block diagram (Page 1567)

13.7.4 RedDi02 error handling

RedDi02 error handling

The block does not report any errors.

See also

Description of RedDi02 (Page 1563)

RedDi02 modes (Page 1564)

RedDi02 functions (Page 1564)

RedDi02 messaging (Page 1566)

RedDi02 I/Os (Page 1566)

RedDi02 block diagram (Page 1567)

13.7.5 RedDi02 messaging

Messaging

This block does not offer messaging.

See also

Description of RedDi02 (Page 1563)
RedDi02 modes (Page 1564)
RedDi02 functions (Page 1564)
RedDi02 error handling (Page 1565)
RedDi02 I/Os (Page 1566)
RedDi02 block diagram (Page 1567)

13.7.6 RedDi02 I/Os

I/Os of RedDi02

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Digital input value 1	STRUCT	-
		• Value: BOOL	• 0
		• ST:BYTE	• 16#80
In2	Digital input value 2	STRUCT	-
		• Value: BOOL	• 0
		• ST:BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
LossRed	1= Redundancy loss at one of the inputs	STRUCT	-
		• Value: BOOL	• 0
		• ST:BYTE	• 16#80

Parameter	Description	Type	Default
Out	Output of the process value with the better signal status	STRUCT • Value: BOOL • ST:BYTE	- • 0 • 16#80
SimAct	1 = one input value has the Simulation status	STRUCT • Value: BOOL • ST:BYTE	- • 0 • 16#80
Uncertain	1 = one input value has the "uncertain" status	STRUCT • Value: BOOL • ST:BYTE	- • 0 • 16#80

See also

Description of RedDi02 (Page 1563)
RedDi02 modes (Page 1564)
RedDi02 functions (Page 1564)
RedDi02 error handling (Page 1565)
RedDi02 messaging (Page 1566)
RedDi02 block diagram (Page 1567)

13.7.7 RedDi02 block diagram

RedDi02 block diagram

A block diagram is not provided for this block.

See also

Description of RedDi02 (Page 1563)
RedDi02 modes (Page 1564)
RedDi02 functions (Page 1564)
RedDi02 error handling (Page 1565)
RedDi02 messaging (Page 1566)
RedDi02 I/Os (Page 1566)

13.8 SelD02In - Output of one of two digital signals

13.8.1 Description of SelD02In

Object name (type + number) and family

Type + number: FC 391

Family: LogicDi

Area of application for SelD02In

The block is used for the following applications:

- Selection from two digital values

How it works

Depending on the value of the input `Sel_In2`, the block switches the value of the input `In1` or the input `In2` to the output `Out`.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

SelD02In modes (Page 1569)

SelD02In functions (Page 1569)

SelD02In error handling (Page 1570)

SelD02In messaging (Page 1570)

SelD02In I/Os (Page 1571)

SelD02In block diagram (Page 1572)

13.8.2 SelD02In modes

SelD02In operating modes

This block does not have any operating modes.

See also

Description of SelD02In (Page 1568)
SelD02In functions (Page 1569)
SelD02In error handling (Page 1570)
SelD02In messaging (Page 1570)
SelD02In I/Os (Page 1571)
SelD02In block diagram (Page 1572)

13.8.3 SelD02In functions

Functions of SelD02In

The functions for this block are listed below.

Select input parameter

You can use the parameter `Sel_In2` to specify whether the input parameter `In1` or `In2` is to be output at the output parameter:

- `Sel_In2` = 0: Input parameter `In1` is written with its signal status to output parameter `Out`.
- `Sel_In2` = 1: Input parameter `In2` is written with its signal status to output parameter `Out`.

Display of selected value

The output parameter `In2Selected` indicates which of the two input parameters has just been output:

- `In2Selected` = 0: At the output parameter `Out`, the value of the input parameter `In1` is output.
- `In2Selected` = 1: At the output parameter `Out`, the value of the input parameter `In2` is output.

The signal status of `Sel_In2` is output at the `In2Selected` output parameter.

See also

Description of SelD02In (Page 1568)
SelD02In modes (Page 1569)
SelD02In error handling (Page 1570)
SelD02In messaging (Page 1570)
SelD02In I/Os (Page 1571)
SelD02In block diagram (Page 1572)

13.8.4 SelD02In error handling

SelD02In error handling

The block does not report any errors.

See also

Description of SelD02In (Page 1568)
SelD02In modes (Page 1569)
SelD02In functions (Page 1569)
SelD02In messaging (Page 1570)
SelD02In I/Os (Page 1571)
SelD02In block diagram (Page 1572)

13.8.5 SelD02In messaging

Messaging

This block does not offer messaging.

See also

Description of SelD02In (Page 1568)
SelD02In modes (Page 1569)
SelD02In functions (Page 1569)
SelD02In error handling (Page 1570)
SelD02In I/Os (Page 1571)
SelD02In block diagram (Page 1572)

13.8.6 SelD02In I/Os

SelD02In I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Input 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In2	Input 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Sel_In2	Selecting the input parameter: 0 = In1 1 = In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
In2Selected	Selected input parameter: 0 = In1 1 = In2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Out	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Description of SelD02In (Page 1568)
SelD02In modes (Page 1569)
SelD02In functions (Page 1569)
SelD02In error handling (Page 1570)
SelD02In messaging (Page 1570)
SelD02In block diagram (Page 1572)

13.8.7 SelD02In block diagram

SelD02In block diagram

A block diagram is not provided for this block.

See also

Description of SelD02In (Page 1568)
SelD02In modes (Page 1569)
SelD02In functions (Page 1569)
SelD02In error handling (Page 1570)
SelD02In messaging (Page 1570)
SelD02In I/Os (Page 1571)

13.9 XOr04 - EXKLUSIV ODER linking

13.9.1 Description of XOr04

Object name (type + number) and family

Type + number: FC 388

Family: LogicDi

Area of application for XOr04

The block is used for the following applications:

- EXKLUSIV ODER linking of up to 4 inputs

How it works

The block links up to four input parameters `In1` to `In4`. The output parameter `Out` then becomes exactly 1, if there is a 1 when there is an uneven number of inputs and 0 at the rest.

Truth table

	In1	In2	In3	In4	Out
0	0	0	0	0	0
1	0	0	0	1	1
2	0	0	1	0	1
3	0	0	1	1	0
4	0	1	0	0	1
5	0	1	0	1	0
6	0	1	1	0	0
7	0	1	1	1	1
8	1	0	0	0	1
9	1	0	0	1	0
10	1	0	1	0	0
11	1	0	1	1	1
12	1	1	0	0	0
13	1	1	0	1	1
14	1	1	1	0	1
15	1	1	1	1	0

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

XOr04 modes (Page 1574)
XOr04 functions (Page 1574)
XOr04 error handling (Page 1575)
XOr04 messaging (Page 1575)
XOr04 I/Os (Page 1576)
XOr04 block diagram (Page 1577)

13.9.2 XOr04 modes

XOr04 operating modes

This block does not have any operating modes.

See also

Description of XOr04 (Page 1572)
XOr04 functions (Page 1574)
XOr04 error handling (Page 1575)
XOr04 messaging (Page 1575)
XOr04 I/Os (Page 1576)
XOr04 block diagram (Page 1577)

13.9.3 XOr04 functions

Functions of XOr04

The functions for this block are listed below.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status of digital logic blocks (Page 95).

See also

Description of XOr04 (Page 1572)
XOr04 modes (Page 1574)
XOr04 error handling (Page 1575)
XOr04 messaging (Page 1575)
XOr04 I/Os (Page 1576)
XOr04 block diagram (Page 1577)

13.9.4 XOr04 error handling

XOr04 error handling

The block does not report any errors.

See also

Description of XOr04 (Page 1572)
XOr04 modes (Page 1574)
XOr04 functions (Page 1574)
XOr04 messaging (Page 1575)
XOr04 I/Os (Page 1576)
XOr04 block diagram (Page 1577)

13.9.5 XOr04 messaging

Messaging

This block does not offer messaging.

See also

Description of XOr04 (Page 1572)
XOr04 modes (Page 1574)
XOr04 functions (Page 1574)
XOr04 error handling (Page 1575)
XOr04 I/Os (Page 1576)
XOr04 block diagram (Page 1577)

13.9.6 XOr04 I/Os

XOr04 I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Input 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In2	Input 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In3	Input 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
In4	Input 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Description of XOr04 (Page 1572)
XOr04 modes (Page 1574)
XOr04 functions (Page 1574)
XOr04 error handling (Page 1575)
XOr04 messaging (Page 1575)
XOr04 block diagram (Page 1577)

13.9.7 XOr04 block diagram

XOr04 block diagram

A block diagram is not provided for this block.

See also

Description of XOr04 (Page 1572)
XOr04 modes (Page 1574)
XOr04 functions (Page 1574)
XOr04 error handling (Page 1575)
XOr04 messaging (Page 1575)
XOr04 I/Os (Page 1576)

Generator blocks

14

14.1 NoiseGen - Generating signal noise

14.1.1 Description of NoiseGen

Object name (type + number) and family

Object name: FB 1863

Family: Genrator

Area of application for NoiseGen

The block is used for the following applications:

- Noise generator

You do not need this block.

How it works

This block serves to generate signal noise. It is used for demonstration purposes in the example project so that the simulated signals react naturally.

You can employ it for simulation examples, demonstrations, trade fair models etc. It is never needed in real plants because real measuring devices always supply signals with noise.

There is an example project for the NoiseGen block (APL_Example_xx, xx refers to the language variant) with an application scenario for this block, which explains how the block works.

Application scenario in the example project:

- Process simulation including noise generator (Page 1828)

See also

NoiseGen I/Os (Page 1580)

14.1.2 NoiseGen I/Os

NoiseGen I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Enable	1 = generate noise signals	BOOL	1
Offset	Mean temporal value of the Noise output signal	REAL	20.0
Restart*	1 = block restart	BOOL	1
StdDev	Standard deviation of the noise signal	REAL	1.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Noise	Generated noise signal	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

See also

Description of NoiseGen (Page 1579)

Channel blocks 15

15.1 Information on using channel blocks

Information on using channel blocks

- The descriptions of the channel blocks specify the OBs in which the blocks are installed. Please note that not all OBs listed will be generated for all CPUs. You can find additional information in the online help of the particular OB.
- If the driver generator uses the channel blocks of the PCS 7 libraries, you require firmware version V3.1 or higher on the CPU.
- The CFC function "Generate module drivers" interconnects and configures the required I/Os automatically. The function is called and executed if hardware modifications are detected when compiling the program, for example.

Signal-processing blocks

Various types of channel blocks are provided in this PCS 7 library for processing signals from inputs and outputs:

1. Standard channel blocks

   This applies to the following blocks:

   – Pcs7AnIn
   – Pcs7AnOu
   – Pcs7DiIn
   – Pcs7DiOu
   – Pcs7DiIT

   These blocks are used only for processing the signals of S7-300/400 SM modules. Use these standard blocks if you want to optimize memory and runtime utilization and do not need to process any PA devices.

2. **FF/PA channel blocks**

   This applies to the following blocks:

   – FbAnIn
   – FbAnOu
   – FbDiIn
   – FbDiOu

   These blocks are designed especially for use with PA field devices and the PROFIBUS 3.0 Class A and B or with FF field devices. In particular, you should use these blocks if you want to make use of the special features of these devices. In contrast to standard channel blocks, PA channel blocks not only process the signal itself but also all variables, according to the desired device configuration selected in the hardware configuration.

15.2 FbAnIn - Analog input channel block for field devices

15.2.1 Description of FbAnIn

Object name (type + number) and family

Type + number: FB 1813

Family: Channel

Area of application for FbAnIn

The block is used for the following applications:

Signal processing (cyclic service) in accordance with "Transmitter" PROFIBUS PA profile of an analog input value:

- Of a PA field device in accordance with PROFIBUS 3.0 class A and B
- Of an auxiliary variable of a HART field device
- Of an FF field device

How it works

Block FbAnIn cyclically reads the process value and the signal status of the field device from the process image (partition). The process value is available as a physical variable. The signal status contains information about the status of the field device.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Connect the symbol generated in HW Config (symbol table) for the input channel with the PV input parameter.

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The in/out parameter Mode is interconnected with the corresponding output parameter OMODE_xx of the MOD_PAL0, FF_MOD32- or MOD_PAX0 block.
- The in/out parameter DataXchg is interconnected with the corresponding output parameter DXCHG_xx of the MOD_PAL0, FF_MOD32 - or MOD_PAX0 block.
- The icon for the signal status of the analog input channel is interconnected to input PV_ST.
- The MS parameter is interconnected to the O_MS output parameter of the diagnostics driver block.

Note

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter Mode manually. Refer to the Mode settings for field devices (Page 1717) section for more on this.

For the FbAnIn block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Monitoring of an analog process tag for PA/FF devices (AnalogMonitoring_Fb) (Page 1819)
- Dosing with PA/FF devices (DoseLean_Fb) (Page 1820)
- PID controller for PA/FF devices (PIDControlLean_Fb) (Page 1799)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for Status parameter

This block does not have the Status parameter.

See also

FbAnIn block diagram (Page 1590)

FbAnIn I/Os (Page 1588)

FbAnIn messaging (Page 1587)

FbAnIn error handling (Page 1586)

FbAnIn functions (Page 1584)

FbAnIn modes (Page 1584)

15.2.2 FbAnIn modes

FbAnIn modes

This block does not have any operating modes.

See also

FbAnIn block diagram (Page 1590)

FbAnIn I/Os (Page 1588)

FbAnIn messaging (Page 1587)

FbAnIn error handling (Page 1586)

FbAnIn functions (Page 1584)

Description of FbAnIn (Page 1582)

15.2.3 FbAnIn functions

Functions of FbAnIn

The functions for this block are listed below.

Obtaining the standard value

The analog value of the process image (partition) is output as a standard value at the `PV_Li` output parameter.

Holding the last value if raw value is invalid

If the block is to hold the most recent valid value when the analog value is invalid, you must activate this function at the `Feature` Bit Issuing last valid value if raw value is invalid (Page 127).

Output substitute value if raw value is invalid

If the block is to output a substitute value (`SubsPV`) when the analog value is invalid, you must activate this function at the `Feature` Bit Output substitute value if raw value is invalid (Page 124).

Issuing an invalid value if analog value is invalid

If the block is to output an invalid value (`PV_Li` = `PV`), you must activate this function at the `Feature` Bit Output invalid raw value (Page 146).

This function is pre-selected.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55)

Signal status for Fb channel blocks

The block provides the standard function Forming and outputting the signal status for channel blocks for field devices (Page 104).

The signal status of process value PV_Li is generated from internal events such as channel errors, higher-level errors, or simulations, as well as from the signal status PV_ST, which comes directly from the device.

The signal status PV_ST can accept values of 16#00 - 16#FF.

The block recognizes a higher-level error, for example, failure of a DP/PA link, via the Mode input parameter.

- If the high byte is Mode = 16#80, then the values in the process image (partition) are valid.
- If the high byte is Mode = 16#40 (value status = higher-level error, ModErr = 1) then the analog value is treated as invalid.

The measuring type set in the low word of the Mode input parameter will be ignored.

The bit combinations of signal status PV_ST are output as output parameters (BOOL values). These conform to the bit combinations specified in PROFIBUS 3.0 "General Requirements".

For FF field devices only: The values of the signal status PV_ST = 16#84 - 16#87 and 16#90 – 16#93 are evaluated by the link in the same way as signal status 16#80 – 16#83.

If the signal status PV_ST = 16#80 and a process value PV with the value 16#7FFFFFFF (invalid) are transferred from the FF field device, the block will deal with signal status 16#00 (invalid) from the FF field device.

Simulating signals

The block provides the standard function Simulating signals (Page 47).

Configurable reactions using the Feature parameter

You can find an overview of all reactions provided by the Feature parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
28	Output invalid raw value (Page 146)
29	Output substitute value if raw value is invalid (Page 124)
30	Issuing last valid value if raw value is invalid (Page 127)

Sign-of-life monitoring

If an input value whose signal status is `16#80` (good) remains constant for a programmable time (monitoring time), the input value is detected as faulty and the outputs `Bad = 1` and `FrzVal = 1` are set.

The monitoring time is set at the `FrznTmIn` input parameter in seconds. With `FrznTmIn = 0` or `FrznEn = 0` (default setting), the sign-of-life monitoring is deactivated, any pending errors are reset.

The input value is considered as faulty as long as it seen as constant. The monitoring time is restarted each time the input value is changed.

See also

FbAnIn block diagram (Page 1590)

FbAnIn I/Os (Page 1588)

FbAnIn messaging (Page 1587)

FbAnIn error handling (Page 1586)

FbAnIn modes (Page 1584)

Description of FbAnIn (Page 1582)

15.2.4 FbAnIn error handling

Error handling of FbAnIn

Please refer to the section Error handling (Page 104) in the basic instructions.

The following errors can be displayed for this block:

- Channel error
- Higher-level error
- Invalid measuring range
- Frozen input value (sign-of-life monitoring)

Channel error

At the output parameter `Bad`, channel errors are displayed with 1. The channel error is generated from the signal status `PV_ST`.

Higher-level error / invalid measuring range

A higher-level error is displayed at the output parameters `ModErr` and `Bad` with 1 if the signal status at `High Word` of the input parameter `Mode` accepts the value 16#40.

A higher-level error is also present when an incorrect measuring type is entered in `Low Word` of the input parameter `Mode`.

In addition, at the output parameter `PV_Li` of the signal status, either 16#00 (in the event of an error) or 16#60 (in Simulation) is output.

See also

FbAnIn block diagram (Page 1590)
FbAnIn I/Os (Page 1588)
FbAnIn messaging (Page 1587)
FbAnIn functions (Page 1584)
FbAnIn modes (Page 1584)
Description of FbAnIn (Page 1582)

15.2.5 FbAnIn messaging

Messaging

This block does not offer messaging.

See also

FbAnIn block diagram (Page 1590)
FbAnIn I/Os (Page 1588)
FbAnIn error handling (Page 1586)
FbAnIn functions (Page 1584)
FbAnIn modes (Page 1584)
Description of FbAnIn (Page 1582)

15.2.6 FbAnIn I/Os

I/Os of FbAnIn

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1584)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 28: BOOL	• 1
		• ...	• 0
		• Bit 31: BOOL	• 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmIn*	Flutter time [s]	INT	0
FrznEn	1 = Sign-of-life monitoring activated	BOOL	0
FrznTmIn	Monitoring time in [s]	REAL	0
MS	Maintenance status	DWORD	16#00000000
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
PV	Process value (analog value)	REAL	0.0
PV_ST	Signal status for the process value	BYTE	16#80
PV_Unit	Unit of measure for process value	INT	1001
SampleTime	Sampling time in [s]	REAL	0.1
Scale	Scaling of the process value as a structure	STRUCT	-
		• High: REAL	• 100.0
		• Low:REAL	• 0.0
SimOn	1 = Simulation on	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
SimPV	Process value used for SimOn = 1	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
SubsPV	Substitute value	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Value status and measuring type	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see FbAnIn error handling (Page 1586)	INT	-1
FrznVal	Frozen process value	REAL	0.0
ModErr	1 = Device/module is faulty	STRUCT • Value: BOOL • ST: BYTE	- • 0 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 16#80
PV_Li	Standard value (physical variable)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_LiUnit	Unit of the process value	INT	0
RemTime	Remaining monitoring time [s]	REAL	0
SampleTime	Sampling time [s]	REAL	0.1
ScaleOut	Scaling of the process value as a structure	STRUCT • High: REAL • Low:REAL	- • 100.0 • 0.0
SimAct	1 = Simulation active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

FbAnIn block diagram (Page 1590)
FbAnIn messaging (Page 1587)
FbAnIn modes (Page 1584)
Description of FbAnIn (Page 1582)

15.2.7 FbAnIn block diagram

FbAnIn block diagram

A block diagram is not provided for this block.

See also

FbAnIn I/Os (Page 1588)
FbAnIn messaging (Page 1587)
FbAnIn error handling (Page 1586)
FbAnIn functions (Page 1584)
FbAnIn modes (Page 1584)
Description of FbAnIn (Page 1582)

15.3 FbAnOu - Analog output channel block for field devices

15.3.1 Description of FbAnOu

Object name (type + number) and family

Type + number: FB 1814
Family: Channel

Area of application for FbAnOu

The block is used for the following applications:

Signal processing (cyclic service) in accordance with "Actuator" PROFIBUS PA profile of an analog input value:

- Of a PA field device in accordance with PROFIBUS 3.0 class A and B
- Of an auxiliary variable of a HART field device
- Of an FF field device

How it works

Block FbAnOu cyclically reads the process values and the signal status of the field device from the process image (partition). The process values are available as physical variables. The signal status contains information about the status of the field device.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

You must interconnect each used signal of the block with the symbols configured in HW Config or in the symbol table according to your user data configuration:

PA device connection	Data type	I/O
Rbk	REAL	Input
RCasOut	REAL	Input
PosD	BYTE	Input
SP	REAL	Output
RCasIn	REAL	Output

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The in/out parameter Mode is interconnected with the corresponding output parameter OMode_xx of the MOD_PAL0, FF_MOD32- or MOD_PAX0 block.
- The in/out parameter DataXchg is interconnected with the corresponding output parameter DataXchg_xx of the MOD_PAL0, FF_MOD32- or MOD_PAX0 block.
- The MS parameter is interconnected to the O_MS output parameter of the diagnostics driver block.

- The corresponding signal status is symbolically interconnected depending on the reference data configuration:

I/O field device	Data type	I/O
RbkST	BYTE	Input
RCasOutST	BYTE	Input
PosD_ST	BYTE	Input
SP_ST	BYTE	Output
RCasIn_ST	BYTE	Output
CbkBy0	BYTE	Input
CbkBy1	BYTE	Input
CbkBy2	BYTE	Input

Note

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually. Refer to the Mode settings for field devices (Page 1717) section for more on this.

For the FbAnOu block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- PID controller for PA/FF devices (PIDControlLean_Fb) (Page 1799)
- Control value for PA/FF devices (ValveAnalog_Fb) (Page 1826)

Startup characteristics

The block is executed once in OB100 at system start. The output and in/out parameters are calculated.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

FbAnOu block diagram (Page 1601)

FbAnOu I/Os (Page 1596)

FbAnOu error handling (Page 1595)

FbAnOu functions (Page 1593)

FbAnOu modes (Page 1593)

FbAnOu messaging (Page 1596)

15.3.2 FbAnOu modes

FbAnOu modes

This block does not have any modes.

See also

FbAnOu block diagram (Page 1601)

FbAnOu I/Os (Page 1596)

FbAnOu error handling (Page 1595)

FbAnOu functions (Page 1593)

Description of FbAnOu (Page 1590)

FbAnOu messaging (Page 1596)

15.3.3 FbAnOu functions

Functions of FbAnOu

The functions for this block are listed below.

Obtaining the standard value

The signals of the FF field device are read from the process image (partition) of the inputs and written to the process image (partition) of the outputs. The controlled variable `Rbk` and discrete position feedback`PosD`, are read, as well as the active reference variable `RCasOut`, together with its associated signal status `RbkST`, `PosD_ST` and `RCasOutST` are read and written to the output parameters `SP` and `RCasIn`, with the associated signal status `RbkST` and `RCasInST`.

Additional detailed device information (`Cbk0` - `Cbk2`) can be read as an option. The device information is available per bit at the block output.

The signal status `RbkST` or `RCasOutST` that comes directly from the device can have values from 16#00 – 16#FF.

The values of the signal status `PosD_ST` and `RbkST` of 16#84 - 16#87and 16#90 – 16#93of the FF field device are evaluated like the signal status 16#80 – 16#83.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55)

Signal status for Fb channel blocks

The block provides the standard function Forming and outputting the signal status for channel blocks for field devices (Page 104).

The signal status of the process values (`RCasInLi` or `RbkLi`) is generated from internal events such as channel errors, higher-level errors, or simulations, as well as from the signal status `RbkST` or `RCasInST`, which comes directly from the device.

Value	Meaning
16#80	Valid value
16#60	Simulation
16#28	Bad, process related
16#68	Uncertain, device related
16#78	Uncertain, process related
16#A4	Maintenance request present
16#00	Invalid value

Simulating signals

The block provides the standard function Simulating signals (Page 47).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
30	Outputting a de-energized value for block-external simulation (Page 124)

See also

FbAnOu block diagram (Page 1601)

FbAnOu I/Os (Page 1596)

FbAnOu error handling (Page 1595)

FbAnOu modes (Page 1593)

Description of FbAnOu (Page 1590)

FbAnOu messaging (Page 1596)

15.3.4 FbAnOu error handling

Error handling of FbAnOu

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Channel error
- Higher-level error
- Invalid measuring range

Channel error

At the output parameter `Bad`, channel errors are displayed with 1.

The channel error is generated from the signal states `RbkST`, `RCasOutST`, and `PosD_ST`. In addition to this, a channel error (`Bad` = 1) also occurs if the signal status has a valid value (`RbkST` or `RCasOutST` is 16#80) and the present position of actuator `Rbk` or `RCasOut` has the value 16#7FFFFFFF (invalid).

Higher-level error / invalid measuring range

A higher-level error is displayed at the output parameters `ModErr` and `Bad` with 1 if the signal status at `High Word` of the input parameter `Mode` accepts the value 16#40.

A higher-level error is also present when an incorrect measuring type is entered in `Low Word` of the input parameter `Mode`.

See also

FbAnOu block diagram (Page 1601)

FbAnOu I/Os (Page 1596)

FbAnOu functions (Page 1593)

FbAnOu modes (Page 1593)

Description of FbAnOu (Page 1590)

FbAnOu messaging (Page 1596)

15.3.5 FbAnOu messaging

Messaging

This block does not offer messaging.

See also

Description of FbAnOu (Page 1590)
FbAnOu modes (Page 1593)
FbAnOu functions (Page 1593)
FbAnOu error handling (Page 1595)
FbAnOu I/Os (Page 1596)
FbAnOu block diagram (Page 1601)

15.3.6 FbAnOu I/Os

I/Os of FbAnOu

Input parameters

Parameter	Description	Type	Default
CbkBy0	Additional information on the actuator status	BYTE	16#00
CbkBy1	Additional information on the actuator status	BYTE	16#00
CbkBy2	Additional information on the actuator status	BYTE	16#00
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1593)	STRUCT • Bit 0: BOOL • ... • Bit 30: BOOL • Bit 31: BOOL	- • 0 • 0 • 1 • 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmIn*	Flutter time [s]	INT	0
MS	Maintenance status	DWORD	16#00000000
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
PosD	Discrete position feedback (current position) of the valve: 0 = Not initialized 1 = Closed 2 = Opened 3 = Intermediate	BYTE	16#00
PosD_ST	Signal status of PosD	BYTE	16#80
RCasInLi	Setpoint for the remote cascade operating mode	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
RCasOut	Setpoint from function block in device	REAL	0.0
RCasOutST	Signal status of RCasOut	BYTE	16#80
Rbk	Current position of actuator (actual value)	REAL	0.0
RbkST	Signal status of Rbk	BYTE	16#80
Scale	Scaling of the process value as structure for display	STRUCT • High: REAL • Low:REAL	- • 100.0 • 0.0
SP_Li	Setpoint	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SP_LiUnit	Unit of measure for setpoint	INT	1342
SimOn	1 = Simulation on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPosD	Discrete position feedback for (output parameter PosD_Li), that is used for SimOn = 1.	BYTE	16#00
SimRCasInLi	Setpoint for the remote cascade operating mode RCasInLi, used for SimOn = 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SimRbk	Current position of the valve (actual value) Rbk, used for SimOn = 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SimSP_Li	Setpoint SP_Li, used for SimOn = 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Value status and measuring type	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk0	1 = Field device in safe position	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk1	1 = Request for "local operation"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk2	1 = Device is operated locally	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk3	1 = Emergency operation is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk4	1 = Deviation in direction of movement	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk5	1 = Stop reached (actuator fully open)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk6	1 = Stop reached (actuator fully closed)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Cbk7	1 = Runtime overshoot	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk8	1 = Actuator is opening	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk9	1 = Actuator is closing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk10	1 = Alarm generated by any change to the static data (FB and TB)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk11	1 = Simulation mode	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk12	Not used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk13	1 = Internal control loop interrupted	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk14	1 = Closed-loop control inactive	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk15	1 = Self-test is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk16	1 = Stroke integral exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk17	1 = Additional input is active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see FbAnOu error handling (Page 1595)	INT	-1

Parameter	Description	Type	Default
ModErr	1 = Device/module is faulty	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
PosD_Li	Discrete position feedback (current position) of the valve: 0 = Not initialized 1 = Closed 2 = Opened 3 = Intermediate	BYTE	16#00
PosD_LiST	Signal status PosD_Li	BYTE	16#00
PosDCloseLi	1=feedback Close	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
PosDOpenLi	1=feedback Open	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
RCasIn	Setpoint for the remote cascade operating mode	REAL	0.0
RCasInST	Signal status of RCasIn	BYTE	16#00
RCasOutLi	Setpoint from function block in device	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
RbkLi	Current position of actuator (actual value)	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
ScaleOut	Scaling of the process value as structure for display	STRUCT	-
		• High: REAL	• 100.0
		• Low:REAL	• 0.0
SimAct	1 = Simulation active	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
SP	Setpoint	REAL	0.0
SP_ST	Signal status of setpoint	BYTE	16#00
SP_Unit	Unit of the process value (SP_LiUnit)	INT	0

See also

FbAnOu block diagram (Page 1601)
FbAnOu modes (Page 1593)
Description of FbAnOu (Page 1590)
FbAnOu messaging (Page 1596)

15.3.7 FbAnOu block diagram

FbAnOu block diagram

A block diagram is not provided for this block.

See also

FbAnOu I/Os (Page 1596)
FbAnOu error handling (Page 1595)
FbAnOu functions (Page 1593)
FbAnOu modes (Page 1593)
Description of FbAnOu (Page 1590)
FbAnOu messaging (Page 1596)

15.4 FbDiIn - Digital input channel block for field devices

15.4.1 Description of FbDiIn

Object name (type + number) and family

Type + number: FB 1815

Family: Channel

Area of application for FbDiIn

The block is used for the following applications:

Signal processing of digital input values (discrete input) of a field device (cyclic service in accordance with PROFIBUS PA):

- Of a PA field device in accordance with PROFIBUS 3.0 class A and B
- Of an FF field device

How it works

Block FbDiIn cyclically reads the process values and the signal status of the field device from the process image (partition). The process values are grouped in one byte. The signal status contains information about the status of the field device.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The Mode in/out parameter is interconnected with the corresponding output parameter `OMode_xx`of the MOD_PAL0, FF_MOD32- or MOD_PAX0 block.
- The in/out parameter `DataXchg` is interconnected with the corresponding output parameter `DataXchg_xx` of the MOD_PAL0, FF_MOD32- or MOD_PAX0 block.
- The icon for the signal status of the analog input channel is interconnected to input `PV_ST`.
- The `MS` parameter is interconnected to the `O_MS` output parameter of the diagnostics driver block.

Note

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually. Refer to the Mode settings for field devices (Page 1717) section for more on this.

For the FbDiIn block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Monitoring a digital process tag for PA/FF devices (DigitalMonitoring_Fb) (Page 1817)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

FbDiIn block diagram (Page 1610)

FbDiIn I/Os (Page 1607)

FbDiIn messaging (Page 1606)

FbDiIn error handling (Page 1605)

FbDiIn functions (Page 1603)

FbDiIn modes (Page 1603)

15.4.2 FbDiIn modes

FbDiIn modes

This block does not have any modes.

See also

FbDiIn block diagram (Page 1610)

FbDiIn I/Os (Page 1607)

FbDiIn messaging (Page 1606)

FbDiIn error handling (Page 1605)

FbDiIn functions (Page 1603)

Description of FbDiIn (Page 1601)

15.4.3 FbDiIn functions

Functions of FbDiIn

The functions for this block are listed below.

Obtaining the standard value

The digital values (WORD format) of the process image (partition) are output at the `PV_Li0` - `PV_Li7` output parameters.

The signal status `PV_ST` that comes directly from the device can have values from 16#00 – 16#FF.

The values of the signal status `PV_ST` of 16#84 - 16#87 and 16#90 – 16#93 of the FF field device are evaluated in the same way as 16#80 – 16#83.

Holding the last value if raw value is invalid

If the block is to hold the most recent valid value when the digital value is invalid, you must activate this function at the `Feature` Bit Issuing last valid value if raw value is invalid (Page 127).

Output substitute value if raw value is invalid

If the block is to output a substitute value (`SubsPV`) when the digital value is invalid, you must activate this function at the `Feature` Bit Output substitute value if raw value is invalid (Page 124).

Output of invalid value if raw value is invalid

If the block is to output an invalid value (`PV_Li` = `PV`), you must activate this function at the `Feature` Bit Output invalid raw value (Page 146).

This function is pre-selected.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55)

Signal status for Fb channel blocks

The block provides the standard function Forming and outputting the signal status for channel blocks for field devices (Page 104).

The signal status of the process value `PV_Li0` - `PV_Li7` is generated from internal events such as channel errors, higher-level errors, or simulations, as well as from the signal status `PV_ST`, which comes directly from the device.

Value	Meaning
16#80	Valid value
16#60	Simulation
16#28	Bad, process related
16#68	Uncertain, device related
16#78	Uncertain, process related
16#A4	Maintenance request present
16#00	Invalid value

Simulating signals

The block provides the standard function Simulating signals (Page 47).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
28	Output invalid raw value (Page 146)
29	Output substitute value if raw value is invalid (Page 124)
30	Issuing last valid value if raw value is invalid (Page 127)

See also

FbDiIn block diagram (Page 1610)

FbDiIn I/Os (Page 1607)

FbDiIn messaging (Page 1606)

FbDiIn error handling (Page 1605)

FbDiIn modes (Page 1603)

Description of FbDiIn (Page 1601)

15.4.4 FbDiIn error handling

Error handling of FbDiIn

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Channel error
- Higher-level error
- Invalid measuring range

Channel error

At the output parameter `Bad`, channel errors are displayed with 1. The channel error is generated from the signal status `PV_ST`.

Higher-level error / invalid measuring range

A higher-level error is displayed at the output parameters `ModErr` and `Bad` with 1 if the signal status at `High Word` of the input parameter `Mode` accepts the value 16#40.

A higher-level error is also present when an incorrect measuring type is entered in `Low Word` of the input parameter `Mode`.

Either 16#00 (in the event of an error) or 16#60 (in the event of simulation) is output at the `PV_LiX` output parameter of the signal status. (`PV_LiX`: X = 0 ... 7)

See also

FbDiIn block diagram (Page 1610)
FbDiIn I/Os (Page 1607)
FbDiIn messaging (Page 1606)
FbDiIn functions (Page 1603)
FbDiIn modes (Page 1603)
Description of FbDiIn (Page 1601)

15.4.5 FbDiIn messaging

Messaging

This block does not offer messaging.

See also

FbDiIn block diagram (Page 1610)
FbDiIn I/Os (Page 1607)
FbDiIn error handling (Page 1605)
FbDiIn functions (Page 1603)
FbDiIn modes (Page 1603)
Description of FbDiIn (Page 1601)

15.4.6 FbDiIn I/Os

FbDiIn I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1603)	STRUCT • Bit 0: BOOL • ... • Bit 28: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 1 • 0 • 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmIn*	Flutter time [s]	INT	0
MS	Maintenance status	DWORD	16#00000000
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV	Process value (digital value)	BYTE	16#00
PV_ST	Signal status for the process value	BYTE	16#80
SimOn	1 = Simulation on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV0	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV1	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV2	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV3	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
SimPV4	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV5	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV6	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV7	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SubsPV	Substitute value	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Value status and measuring type	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see FbDiIn error handling (Page 1605)	INT	-1
ModErr	1 = Device/module is faulty	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Li0	Process value 0	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Li1	Process value 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Li2	Process value 2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Li3	Process value 3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Li4	Process value 4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Li5	Process value 5	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Li6	Process value 6	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
PV_Li7	Process value 7	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimAct	1 = Simulation active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

FbDiIn block diagram (Page 1610)
FbDiIn messaging (Page 1606)
FbDiIn modes (Page 1603)
Description of FbDiIn (Page 1601)

15.4.7 FbDiIn block diagram

FbDiIn block diagram

A block diagram is not provided for this block.

See also

FbDiIn I/Os (Page 1607)
FbDiIn messaging (Page 1606)
FbDiIn error handling (Page 1605)
FbDiIn modes (Page 1603)
FbDiIn functions (Page 1603)
Description of FbDiIn (Page 1601)

15.5 FbDiOu - Digital output channel block for field devices

15.5.1 Description of FbDiOu

Object name (type + number) and family

Type + number: FB 1816

Family: Channel

Area of application for FbDiOu

The block is used for the following applications:

Signal processing of max 8 digital input/output values of a field device (cyclic service in accordance with PROFIBUS PA):

- Of a PA field device in accordance with PROFIBUS 3.0 class A and B
- Of an FF field device

How it works

Block FbDiOu cyclically reads the process values and the signal status of the field device from the process image (partition). The eight process values are grouped in one byte for each of the input parameters `SP_Li` and `RCasInLi`. The signal status contains information about the status of the field device.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

You must interconnect each used signal of the block with the symbols configured in HW Config or in the symbol table according to your user data configuration:

I/O field device	Data type	I/O
`Rbk`	BYTE	Input
`RCasOut`	BYTE	Input
`SP`	BYTE	Output
`RCasIn`	BYTE	Output

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The Mode in/out parameter is interconnected with the corresponding output parameter `OMode_xx`of the MOD_PAL0, FF_MOD32- or MOD_PAX0 block.
- The in/out parameter `DataXchg` is interconnected with the corresponding output parameter `DataXchg_xx` of the MOD_PAL0, FF_MOD32- or MOD_PAX0 block.
- The `MS` parameter is interconnected to the `O_MS` output parameter of the diagnostics driver block.
- The corresponding signal status is symbolically interconnected depending on the reference data configuration:

I/O field device	Data type	I/O
`RbkST`	BYTE	Input
`RCasOutST`	BYTE	Input
`SP_ST`	BYTE	Output
`RCasInST`	BYTE	Output
`CbkBy0`	BYTE	Input
`CbkBy1`	BYTE	Input
`CbkBy2`	BYTE	Input

Note

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually. Refer to the Mode settings for field devices (Page 1717) section for more on this.

For the FbDiOu block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Dosing with PA/FF devices (DoseLean_Fb) (Page 1820)

Startup characteristics

The block will run through one time in OB100 at system start. The output and in/out parameters are calculated.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

FbDiOu block diagram (Page 1621)
FbDiOu I/Os (Page 1616)
FbDiOu messaging (Page 1616)
FbDiOu error handling (Page 1615)
FbDiOu functions (Page 1613)
FbDiOu modes (Page 1613)

15.5.2 FbDiOu modes

FbDiOu modes

This block does not have any modes.

See also

FbDiOu block diagram (Page 1621)
FbDiOu I/Os (Page 1616)
FbDiOu messaging (Page 1616)
FbDiOu error handling (Page 1615)
FbDiOu functions (Page 1613)
Description of FbDiOu (Page 1611)

15.5.3 FbDiOu functions

Functions of FbDiOu

The functions for this block are listed below.

Obtaining the standard value

The signals of the FF field device are read from the process image (partition) of the inputs and written to the process image (partition) of the outputs. The input parameter `Rbk` and the active reference variable `RCasOut`, together with its associated signal status `RbkST` and `RCasOutST` are read and written to the output parameters `SP` and `RCasIn` with the associated signal status `RbkST` and `RCasOutSt`. Additional detailed device information (`CbkBy0` - `CbkBy2`) can be read as an option. The device information is available per bit at the block output.

The signal status `RbkST` or `RCasOutST` that comes directly from the device can have values from 16#00 – 16#FF.

The values of the signal status `RbkST` and `RCasOutST` of 16#84 - 16#87and 16#90 – 16#93of the FF field device are evaluated by the link as 16#80 – 16#83.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55)

Signal status for Fb channel blocks

The block provides the standard function Forming and outputting the signal status for channel blocks for field devices (Page 104).

The signal status of the process values (`RCasIn` or `RbkLi`) is generated from internal events such as channel errors, higher-level errors, or simulations, as well as from the signal status `RbkLiST` or `RCasInST`, which comes directly from the device.

Value	Meaning
16#80	Valid value
16#60	Simulation
16#28	Bad, process related
16#68	Uncertain, device related
16#78	Uncertain, process related
16#A4	Maintenance request present
16#00	Invalid value

Simulating signals

The block provides the standard function Simulating signals (Page 47).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
30	Outputting a de-energized value for block-external simulation (Page 124)

See also

FbDiOu block diagram (Page 1621)

FbDiOu I/Os (Page 1616)

FbDiOu messaging (Page 1616)

FbDiOu error handling (Page 1615)

FbDiOu modes (Page 1613)

Description of FbDiOu (Page 1611)

15.5.4 FbDiOu error handling

Error handling of FbDiOu

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Channel error
- Higher-level error
- Invalid measuring range

Channel error

At the output parameter `Bad`, channel errors are displayed with 1. The channel error is generated from the signal states `RbkST` and `RCasOutSt`.

Higher-level error / invalid measuring range

A higher-level error is displayed at the output parameters `ModErr` and `Bad` with 1 if the signal status at `High Word` of the input parameter `Mode` accepts the value 16#40.

A higher-level error is also present when an incorrect measuring type is entered in `Low Word` of the input parameter `Mode`.

See also

FbDiOu block diagram (Page 1621)
FbDiOu I/Os (Page 1616)
FbDiOu messaging (Page 1616)
FbDiOu functions (Page 1613)
FbDiOu modes (Page 1613)
Description of FbDiOu (Page 1611)

15.5.5 FbDiOu messaging

Messaging

This block does not offer messaging.

See also

FbDiOu block diagram (Page 1621)
FbDiOu I/Os (Page 1616)
FbDiOu error handling (Page 1615)
FbDiOu functions (Page 1613)
FbDiOu modes (Page 1613)
Description of FbDiOu (Page 1611)

15.5.6 FbDiOu I/Os

I/Os of FbDiOu

Input parameters

Parameter	Description	Type	Default
CbkBy0	Additional information on the actuator status	BYTE	16#00
CbkBy1	Additional information on the actuator status	BYTE	16#00
CbkBy2	Additional information on the actuator status	BYTE	16#00
EN	1 = Called block will be processed	BOOL	1

Parameter	Description	Type	Default
Feature	I/O for additional functions (Page 1613)	STRUCT • Bit 0: BOOL • ... • Bit 30: BOOL • Bit 31: BOOL	- • 0 • 0 • 1 • 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmIn*	Flutter time [s]	INT	0
MS	Maintenance status	DWORD	16#00000000
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RCasInLi	Setpoint for the remote cascade operating mode	BYTE	16#00
RCasInLiST	Signal status for the setpoint value (RCasInLi)	BYTE	16#80
Rbk	Current position of actuator (actual value)	BYTE	16#00
RbkST	Signal status of Rbk	BYTE	16#80
RCasOut	Setpoint from function block in device	BYTE	16#00
RCasOutST	Signal status of RCasOut	BYTE	16#80
SP_Li	Setpoint	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn	1 = Simulation on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimRCasInLi	Setpoint for the remote cascade operating mode RCasInLi, used for SimOn = 1	BYTE	16#00
SimRbk	0 = Actuator is closed 1 = Actuator is open	BOOL	0
SimSP_Li	1 = Setpoint SP_Li, used for SimOn = 1	BOOL	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Value status and measuring type	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk0	1 = Field device in safe position active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk1	1 = Request for "manual mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk2	1 = Field device in "manual mode"	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk3	1 = Emergency override active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk4	1 = Current position differs from expected position	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk5	1 = Valve connection break	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk6	1 = Indicates a short-circuit at the valve connection	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Cbk7	1 = Not used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk8	1 = Actuator is opening	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk9	1 = Actuator is closing	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk10	1 = The alarm generated by any change to the static data (FB and TB)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk11	1 = Simulation of process values is enabled	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk12	1 = Not used	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk13	1 = Internal control loop interrupted	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk14	1 = Valve not active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk15	1 = Device under self test	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk16	1 = Valve travel limit has been exceeded	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk17	1 = Limit of break time exceeded when changing from OPEN to CLOSE	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk18	1 = Limit of break time exceeded when changing from CLOSE to OPEN	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Cbk19	1 = Error occurred in the internal cycle test	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk20	1 = Timeout during the transition from OPEN to CLOSE	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk21	1 = Timeout during the transition from CLOSE to OPEN	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk22	1 = Valve blocked mechanically	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Cbk23	1 = Zero point not reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see FbDiOu error handling (Page 1615).	INT	-1
ModErr	1 = Device/module is faulty	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RCasOutLi	Setpoint from function block in device	BYTE	16#00
RCasOutLiST	Signal status for setpoint from function block in device (RCasOutLi)	BYTE	16#00
RCasIn	Setpoint for the remote cascade operating mode	BYTE	16#00
RCasInST	Signal status of RCasIn	BYTE	16#00
RbkCloseLi	1 = Actuator closed feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RbkLi	Current position of actuator (actual value)	BYTE	16#00
RbkLiST	Signal status of current position of actuator (RbkLi)	BYTE	16#00
RbkOpenLi	1 = Actuator open feedback signal	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
SimAct	1 = The block is in simulation	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SP	Setpoint	BYTE	16#00
SP_ST	Signal status of setpoint	BYTE	16#00

See also

FbDiOu block diagram (Page 1621)
FbDiOu messaging (Page 1616)
FbDiOu modes (Page 1613)
Description of FbDiOu (Page 1611)

15.5.7 FbDiOu block diagram

FbDiOu block diagram

A block diagram is not provided for this block.

See also

FbDiOu I/Os (Page 1616)
FbDiOu messaging (Page 1616)
FbDiOu error handling (Page 1615)
FbDiOu functions (Page 1613)
FbDiOu modes (Page 1613)
Description of FbDiOu (Page 1611)

15.6 FbDrive - channel block for compact drives

15.6.1 Description of FbDrive

Object name (type + number) and family

Type + number: FB 1905

Family: Channel

Area of application of FbDrive

The block is used for the following applications:

- Integration of compact drives in PCS 7

How it works

The FbDrive block integrates any compact drives that meet the following conditions and are detected by the system:

- Message frame type "1" with 2 input words and 2 output words
- Message frame type "20" with 6 input words and 2 output words

Configuration

The interconnection is made symbolic to the first input word. All other interconnections are updated automatically using a wizard. The input and output word must have the same beginning in HW Config.

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Connect the symbol generated in HW Config (symbol table) for the input channel with the `PZDIn1` input parameter.

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The Mode in/out parameter is interconnected to the corresponding `OMODE_xx` output parameter of the MOD_DRV block.
- The in/out parameter `DataXchg` is interconnected to the corresponding `DXCHG_xx` output parameter of the MOD_DRV block.
- With the "1" message frame type, the `PZDIn1` and `PZDIn2` inputs are interconnected to the `PZDOutx` outputs, with the "20" message frame type the `PZDIn3` - `PZDIn6` inputs are also interconnected.
- The `MS` parameter is interconnected to the `O_MS` output parameter of the diagnostics driver block.

Note

If you are not using the CFC function "Generate module drivers" you must set the Mode in/out parameter manually. Refer to the section Mode settings for field devices (Page 1717).

Startup characteristics

The block does not have any startup characteristics.

15.6.2 Operating modes of FbDrive

Operating modes of FbDrive

This block does not have any modes.

15.6.3 Functions of FbDrive

Functions of FbDrive

The functions for this block are listed below.

Reading messages

You can specify the format of messages using the `Feature` bit Reading messages (Page 123).

Transmission of messages

If the block is to send messages to the upstream diagnostics block, you must activate this function at the `Feature` bit Transmission of messages (Page 147).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the Feature parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
28	Reading messages (Page 123)
29	Transmission of messages (Page 147)
30	Outputting a de-energized value for block-external simulation (Page 124)

15.6.4 Error handling of FbDrive

Error handling of FbDrive

Error handling of all the blocks is described in chapter Error handling (Page 104) in the basic instructions.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The ErrorNum I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	No active fault
1	Invalid process value (output parameter Bad = 1)

15.6.5 Messaging of FbDrive

Messaging of FbDrive

This block does not offer messaging.

15.6.6 I/Os of FbDrive

I/Os of FbDrive

Input parameters

Parameter	Description	Type	Default
Ackn	OR operation with control word 1, bit 7	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl12	Control signal 12	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Ctrl13	Control signal 13	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl14	Control signal 14	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ctrl15	Control signal 15	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1
EnOp	Control word 1 bit 3 1= Operator control active 0 = Operator control deactivated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EnRampGen	Control word 1 bit 4 1 = Ramp generation active 0 = Ramp generation reset	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EnSp	Control word 1 bit 6 1 = Setpoint active 0 = Setpoint deactivated	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Feature	I/O for additional functions	STRUCT • Bit 0: BOOL • ... • Bit 29 • ... • Bit 31: BOOL	- • 0 • 0 • 1 • 0 • 0
FlutEn	1 = Flutter suppression on	BOOL	0
FlutTmIn*	Flutter time: If a certain number of status changes occur within this time, the flutter is suppressed	INT	0
InvSp	Setpoint inverted	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Jogg1	Control word 1 bit 8	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Jogg2	Control word 1 bit 9	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Local	Control word 1 bit 10 1 = Control via AS 0 = No control via AS	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS*	Maintenance status	DWORD	0
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Ms_Ext	Maintenance status external	DWORD	0
NoCoastSt	Control word 1 bit 1 1 = Do not de-energize and coast down drive 0 = De-energized and coast down drive	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NoQuickSt	Control word 1 bit 2 1 = No rapid stop 0 = Rapid stop	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PZDIn1	Input word 1 - ZSW1	WORD	16#00
PZDIn2	Input word 2 - NIST_A_GLATT/FIST_GLATT	WORD	16#00
PZDIn3	Input word 3 - IAIST_GLATT	WORD	16#00
PZDIn4	Input word 4 - ITIST_GLATT/MIST_GLATT	WORD	16#00
PZDIn5	Input word 5 - PIST_GLATT	WORD	16#00
PZDIn6	Input word 6 - MsgNamur	WORD	16#00
PZDIn2Unit	Unit of measure for process value	INT	%
PZDIn2Scale	Scaling of the process value as a structure	STRUCT • HIGH: REAL • LOW: REAL	- • 100 • 0
PZDIn3Unit	Unit of measure for process value	INT	%
PZDin3Scale	Scaling of the process value as a structure	STRUCT • HIGH: REAL • LOW: REAL	- • 100 • 0
PZDIn4Unit	Unit of measure for process value	INT	%
PZDIn4Scale	Scaling of the process value as a structure	STRUCT • HIGH: REAL • LOW: REAL	- • 100 • 0
PZDIn5Unit	Unit of measure for process value	INT	%
PZDIn5Scale	Scaling of the process value as a structure	STRUCT • HIGH: REAL • LOW: REAL	- • 100 • 0
PZDIn6Unit	Unit of measure for process value	INT	%

Parameter	Description	Type	Default
PZDIn6Scale	Scaling of the process value as a structure	STRUCT • HIGH: REAL • LOW: REAL	- • 100 • 0
SP_Li	Speed setpoint	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
SP_LiScale	Scaling of the process value as a structure (device data)	STRUCT • HIGH: REAL • LOW: REAL	0 • 50 • 0
Stw1	Control word	WORD	16#00
Stw1ST	Status control word	BYTE	16#00
On	Control word 1 bit 0 1 = ON 0 = OFF	BYTE	- • 0 • 16#80
Telegram	Control object	INT	1
UnfreeRamp	Control word 1 bit 5 1 = Ramp generation can be changed 0 = Ramp generation cannot be changed	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
DataXchg	Data communication	DWORD	0
Mode	Value status and measuring type	DWORD	0

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CtrlReq	1 = Control request	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
CurrentLi	Normal value PZD 3	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
CurrentScale	Scaling PZD 3	STRUCT • HIGH: REAL • LOW: REAL	0 • 100 • 0
CurrentUnit	Unit of measurement PZD 3	INT	%
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number	INT	-1
F_N_Reach	1 = f or n reached or overflow 0 = f or n not reached	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Fault	1 = Error is present	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FreeLi	Normal value PZD 6	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
FreeScale	Scaling PZD 6	STRUCT • HIGH: REAL • LOW: REAL	0 • 100 • 0
FreeUnit	Unit of measurement PZD 6	INT	%
MsgNamur	PZD 6 in VIK-NAMUR mode	WORD	0
ModErr	1 = Device/module is faulty	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NoOff2	1 = De-energize and coast down not active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
NoOff3	1 = Rapid stop not active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OpEn	1 = Enable setpoint operation	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Power1Li	Normal value PZD 4	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
Power1Scale	Scaling PZD 4	STRUCT • HIGH: REAL • LOW: REAL	0 • 100 • 0
Power1Unit	Unit of measurement PZD 4	INT	%
Power2Li	Normal value PZD 5	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80
Power2Scale	Scaling PZD 5	STRUCT • HIGH: REAL • LOW: REAL	0 • 100 • 0
Power2Unit	Unit of measurement PZD 5	INT	%
PZDOut1	Output word 1 - STW1	WORD	16#00
PZDOut2	Output word 2 - NSOLL_A/FSOLL	WORD	16#00
RdyOn	1 = Ready to switch on 0 = Not ready to switch on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
RdyOp	1 = Ready for operation 0 = Not ready for operation	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SpeedErr	1 = Error speed within the tolerance range 0= Error speed outside the tolerance range	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SpeedLi	Normal value PZD 2	STRUCT • Value: REAL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
SpeedScale	Scaling PZD 2	STRUCT • HIGH: REAL • LOW: REAL	0 • 100 • 0
SpeedUnit	Unit of measurement PZD 2	INT	%
SwOn	1 = Cannot switch on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Warning	1 = Warning active 0 = No warning active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Zsw1	Status word	WORD	0
Zsw1_11	Device-specific	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Zsw1_12	Device-specific	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Zsw1_13	Device-specific	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Zsw1_14	Device-specific	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Zsw1_15	Device-specific	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

15.6.7 Block diagram of FbDrive

Block diagram of FbDrive

A block diagram is not provided for this block.

15.7 FbSwtMMS - channel block for MM starter

15.7.1 Description of FbSwtMMS

Object name (type + number) and family

Type + number: FB 1907

Family: Channel

Area of application of FbSwtMMS

The block is used for the following applications:

- Signal processing of compact drives with the profile type 1 on PCS 7.

How it works

The FbSwtMMS block integrates a motor management starter from any switch or starter object.

Configuration

The interconnection is made symbolic to the first input or output word. All other interconnections are updated automatically using a wizard. The input and output word must have the same beginning in HW Config.

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The `MODE` input is interconnected to the relevant `OMODE` output of the MOD_SWT block.
- The `PZDIn2` input and the `PZDOut1` output are interconnected using the icons of the compact drives.
- The `DataXchg` input is interconnected to the relevant `DXCHG_00` output of the MOD_SWT block.
- The `MS` input is interconnected to the relevant `O_MS` output of the MOD_SWT block.

Note

If you are not using the CFC function "Generate module drivers" you must set the Mode in/out parameter manually. Refer to the Mode settings for field devices (Page 1717) section for more on this.

Startup characteristics

The block does not have any startup characteristics.

15.7.2 Operating modes of FbSwtMMS

Operating modes of FbSwtMMS

This block does not have any modes.

15.7.3 Functions of FbSwtMMS

Functions of FbSwtMMS

The functions for this block are listed below.

Transmission of messages

If the block is to send messages to the upstream diagnostics block, you must activate this function at the `Feature` bit Transmission of messages (Page 147).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the Feature parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
29	Transmission of messages (Page 147)
30	Outputting a de-energized value for block-external simulation (Page 124)

15.7.4 Error handling of FbSwtMMS

Error handling of FbSwtMMS

Error handling of all the blocks is described in chapter Error handling (Page 104) in the basic instructions.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The ErrorNum I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; the block is not processed.
0	No active fault
1	Invalid process value (output parameter Bad = 1)

15.7.5 Messaging of FbSwtMMS

Messaging

This block does not offer messaging.

15.7.6 I/Os of FbSwtMMS

I/Os of FbSwtMMS {"I/Os";"FbSwtMMS"} {"FbSwtMMS";"I/Os"}

Input parameters

Parameter	Description	Type	Default
`Auto`	Control command for remote control I Bit 0.5	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
`Ctrl7`	Control input 7	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
`Ctrl8`	Control input 8	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
`Ctrl9`	Control input 9	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
`Ctrl10`	Control input 10	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
Ctrl11	Control input 11	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions	STRUCT • Bit 0: BOOL • ... • Bit 29 • ... • Bit 31: BOOL	- • 0 • 0 • 1 • 0 • 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmln*	Flutter time: If a certain number of state changes occur within this time, fluttering is suppressed.	INT	0
Fwd	Control forward I Bit 0.2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
IScale	Scaling for measured current	STRUCT • High: REAL • Low: REAL	- • 100 • 0
IUnit	Unit of measurement for measured current	INT	%
ManSpec1	Device-specific command, functionality in accordance with manufacturer specifications 1 I Bit 1.4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManSpec2	Device-specific command, functionality in accordance with manufacturer specifications 2 I Bit 1.5	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManSpec3	Device-specific command, functionality in accordance with manufacturer specifications 3 I Bit 1.6	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManSpec4	Device-specific command, functionality in accordance with manufacturer specifications 4 I Bit 1.7	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS*	Maintenance status	DWORD	0
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Mst_Ex	Maintenance status external	DWORD	0

Parameter	Description	Type	Default
Off	Control Off I Bit 0.1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PZDIn1	Connectable input word 1	WORD	16#00
PZDI n2	Connectable input word 2	WORD	16#00
ResetTrip	Undo last operation I Bit 0.6	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Rev	Control backward I Bit 0.0	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StartEmerg	Start command is issued despite a pending internal error I Bit 0.4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StartTest	Start command for an internal self-test I Bit 0.3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Stw1	Control word	WORD	16#00
Swt1ST	Status control word	BYTE	16#00

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
DataXchg	Data communication	DWORD	16#00
Mode	Value status and measuring type	DWORD	16#00

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrAct	Status information internal device fault Q Bit 0.6	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ErrorNum	Output of current error number	INT	-1
FdkAuto	Feedback information for the remote control status Q Bit 0.5	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FdkFwd	Feedback information forward Q Bit 0.2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FdkOff	Feedback information Off Q Bit 0.1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
FdkRev	Feedback information backward Q Bit 0.0	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Imax	Value for highest measured current	REAL	0
IScaleOut	Scaling for measured current	STRUCT • High: REAL • Low: REAL	- • 100 • 0
IUnitOut	Unit of measurement for measured current	INT	%
LockTmAct	Status information, the drive is temporarily locked Q Bit 0.4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManSpcO1	Device-specific feedback, functionality in accordance with manufacturer specifications 1 Q Bit 1.4	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManSpcO2	Device-specific feedback, functionality in accordance with manufacturer specifications 2 Q Bit 1.5	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
ManSpcO3	Device-specific feedback, functionality in accordance with manufacturer specifications 3 Q Bit 1.6	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManSpcO4	Device-specific feedback, functionality in accordance with manufacturer specifications 4 Q Bit 1.7	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManSpcO5	Device-specific feedback, functionality in accordance with manufacturer specifications 5 Q Bit 1.2	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ManSpcO6	Device-specific feedback, functionality in accordance with manufacturer specifications 6 Q Bit 1.3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ModErr	1 = Device/module is faulty	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OverIAct	Status information internal warning overload active Q Bit 0.3	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PZDOut1	Connectable output word	WORD	16#00
Status8	Status output 8 Q Bit 1.0	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Status9	Status output 9 Q Bit 1.1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
WarnAct	Status information internal maintenance active Q Bit 0.7	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
Zsw1	Status word	WORD	16#00

15.7.7 Block diagram of FbSwtMMS

Block diagram of FbSwtMMS

A block diagram is not provided for this block.

15.8 Pcs7AnIn - Analog input channel block

15.8.1 Description of Pcs7AnIn

Object name (type + number) and family

Type + number: FB 1869

Family: Channel

Area of application for Pcs7AnIn

The block is used for the following applications:

- Signal processing of an analog input value from S7-300/400 SM analog input groups

How it works

The cyclic block processes all channel-specific signal functions of an analog input module.

It reads a raw analog value from the process image (partition) and converts it to its physical value or calculates a percentage value based on this raw value. Use the status at input parameter `Mode` to define the format of the raw value and how it is processed.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The in/out parameter `Mode` is interconnected to the corresponding `OMode_xx` output parameter of the MOD block.
- The in/out parameter `DataXchg` is interconnected to the corresponding `DataXchg_xx` output parameter of the MOD block.
- The `MS` parameter is interconnected to the `O_MS` output parameter of the diagnostics driver block.

Connect the symbol generated in HW Config (symbol table) for the input channel with the `PV_In` input parameter.

Note

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually. Refer to the Mode Settings for SM Modules (Page 1708) section for more on this.

For the Pcs7AnIn block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Monitoring an analog process tag (AnalogMonitoring) (Page 1818)
- Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810)
- Cascade control with PIDConR (CascadeR) (Page 1812)
- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)
- PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800)
- Override control (Page 1814)
- Override control with PIDConR (OverrideR) (Page 1816)
- PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799)
- PIDConR with safety logic and control loop monitoring (PIDConR_ConPerMon) (Page 1800)
- Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)
- Ratio control with PIDConR (RatioR) (Page 1809)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)
- Step controller with assigned actuator block and position feedback (StepControlActor) (Page 1805)
- Step controller with direct access to the actuator and without position feedback (StepControlDirect) (Page 1805)
- Model-based predictive control (ModPreCon) (Page 1816)
- Reversing motor with controllable speed (MotorSpeedControlled) (Page 1822)
- Dosing (DoseLean) (Page 1819)
- Control valve (VlvAnL) (Page 1826)
- Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806)

Startup characteristics

The accept value delay is started when `CountLim` ≠ 0 .

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Pcs7AnIn block diagram (Page 1649)
Pcs7AnIn I/Os (Page 1647)
Pcs7AnIn messaging (Page 1646)
Pcs7AnIn error handling (Page 1645)
Pcs7AnIn functions (Page 1641)
Pcs7AnIn modes (Page 1640)

15.8.2 Pcs7AnIn modes

Pcs7AnIn modes

This block does not have any modes.

See also

Pcs7AnIn block diagram (Page 1649)
Pcs7AnIn I/Os (Page 1647)
Pcs7AnIn messaging (Page 1646)
Pcs7AnIn error handling (Page 1645)
Pcs7AnIn functions (Page 1641)
Description of Pcs7AnIn (Page 1638)

15.8.3 Pcs7AnIn functions

Functions of Pcs7AnIn

The functions for this block are listed below.

Checking the raw value

The nominal range sets the range for converting analog signals into digital values (raw values), depending on the measuring type and the range of the analog input module. The nominal range is defined in the hardware configuration and is automatically saved in the in/out parameter when the block driver `Mode` is created.

This includes an overshoot/undershoot range within which an analog signal can still be converted to a digital value. This range is defined in relation to the nominal range (roughly 18.5%). Outside this range an overflow or underflow occurs and output parameter `Bad` = 1 is set.

- Output parameter `PV_LoAct` = 1 is set if the value is outside the nominal low range.
- Output parameter `PV_HiAct` = 1 is set if the value is outside the nominal high range.

NAMUR limit checking (only with modules of 4 to 20 mA)

In "Life Zero" monitoring the process signal is invalid (`Bad` = 1), if the measured current is less than 3.6 mA or greater than 21 mA (defined by NAMUR).

The NAMUR limits are set as fixed defaults for limit monitoring. You can define other limits by setting input parameter `NamurOff` = 1 , and by setting corresponding new limits in [mA] at the `HighLimit` and `LowLimit` input parameters. If the active limits are exceeded or undershot (`PV_HiAct` or `PV_LoAct` = 1) `Bad` = 1 is set for a "Life Zero" analog signal.

Note

The limits that can be selected must lie within the overshoot and undershoot range of the module. Values outside the NAMUR range are also possible, if the module does not automatically limit the measured values.

Obtaining the standard value

The standard value (a physical quantity) is obtained from the raw value using parameters `Scale` and `Mode`. Set two scale values on the structured parameter `Scale`.

- High scale value (`Scale.High`)
- Low scale value (`Scale.Low`)

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually. Refer to the Mode Settings for SM Modules (Page 1708) section for more on this.

The settings of the parameter `Scale` are copied to the output parameter`ScaleOut`. The output parameter can be interconnected to a corresponding input parameter of a technologic block (e.g. `PV_OpScale`).

The standard value is obtained using a linear characteristic. `Scale.Low` is the lowest physical value that the process variable can take and `Scale.High` is the highest.

If `Scale.Low` = 0 and `Scale.High` = 100 a percentage is obtained.

Special cases when obtaining the standard value using the `Scale` parameter:

- If you set `Scale.High` = `Scale.Low`, you obtain the analog input module's electrical input signal (e.g., mA) according to the `Mode` parameter setting.
- If the raw value is already a physical quantity, set `Scale.Low` = 0 and `Scale.High` = 1. This will cause the raw value to be output unchanged, as a physical quantity.
- When using measuring type PTC (**P**ositive **T**emperature **C**oefficient binary evaluation of resistance thermometers), the analog value contains an encoded binary signal. The `PV_Out` output provides the following information:
  - If the measured resistance is within the normal range, `PV_Out` = 0.0
  - If the measured resistance is within the prewarning range, `PV_Out` = 4.0
  - If the measured resistance is in the operating range, `PV_Out` = 1.0

    This is only true if the input parameters are `Scale.Low` = 0 and `Scale.High` = 1 . During simulation or if the substitute value is output, you must only set the input parameters `SimPV_In` and `SubsPV_In` to 0.0 or 1.0.
- With the measuring type "External or internal comparison of thermocouple values", the raw value is adapted to the physical variable ± 80 mV range in S7 300 modules. You have to determine the temperature using the corresponding conversion tables in the module manual. The physical equivalent in [mV] is returned by the module as a raw value. Set `Scale` to ± 80 mV.

Holding the last value if raw value is invalid

If the block is to hold the most recent valid value when the raw value is invalid, you must activate this function at the `Feature` Bit Issuing last valid value if raw value is invalid (Page 127).

You can also influence this function via the input parameter `DeltaVal`.

- `DeltaVal` ≤ 0: the last value is retained and is not influenced
- `DeltaVal` > 0: the last or the next to last value is output

If you set the parameter `DeltaVal` > 0, the last `PV_Out`(k - 1) or next to last `PV_Out`(k - 2) valid output value is output (`PV_Out`(k) is the current value, k is the current time).

At parameter `DeltaVal` you can preset a permitted process value change (`PV_Out`) between two calls.

You have the following options:

- For invalid raw values and `DeltaVal` > `0`:
  - If |`PV_Out`(k - 1) - `PV_Out`(k - 2)| > `DeltaVal`, then `PV_Out` = `PV_Out`(k - 2) (last but one valid output value is output)
  - If |`PV_Out`(k) - `PV_Out`(k - 1)| ≤ `DeltaVal`, then `PV_Out` = `PV_Out`(k - 1) (last valid output value is output)
- For valid raw values and `DeltaVal` > 0:
  - |`PV_Out`(k) - `PV_Out`(k - 1)| > `DeltaVal`, so for one cycle `PV_Out` = `PV_Out`(k - 1) is output, i.e. `DeltaVal` is used to limit the change made to the valid raw value. In addition, the signal status at the output parameter `PV_Out` is set to 16#60 and the output parameter is set to `Bad` = 0 .

    The value of `DeltaVal` should be selected with due care. If the value is too low, the quality code may flutter between16#80 and 16#60, regardless whether or not the raw value is OK.

Output substitute value if raw value is invalid

If the block is to output a substitute value (`SubsPV_In`) when the raw value is invalid, you must activate this function at the `Feature` Bit Output substitute value if raw value is invalid (Page 124).

Output of invalid value if raw value is invalid

If the block is to output an invalid value (`PV_Out` = `PV_In`), you must activate this function at the `Feature` Bit Output invalid raw value (Page 146).

This function is pre-selected.

Value application delay

After a restart, or if the output parameter `Bad` changes its value from 1 to 0 the signal status and the value of output parameter `PV_Out` are not updated until the number of cycles for delayed application of the value (input parameter `CountLim`) have elapsed. During the value application delay the signal status at the output parameters is `PV_Out` = 16#00 and `Bad` = 1. The last value is retained during the value application delay.

If `CountLim` = 0 , the function is deactivated.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55)

Signal status for PCS7 channel blocks

The block provides the standard function Forming and outputting the signal status for PCS 7 channel blocks (Page 103).

Simulating signals

The block provides the standard function Simulating signals (Page 47).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions which are provided by the `Feature` parameter in section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
28	Output invalid raw value (Page 146)
29	Output substitute value if raw value is invalid (Page 124)
30	Issuing last valid value if raw value is invalid (Page 127)

Sign-of-life monitoring

If an input value whose signal status is `16#80` (good) remains constant for a programmable time (monitoring time), the input value is detected as faulty and the outputs `Bad = 1` and `FrzVal = 1` are set. The signal status is set to `PV_Out.ST = 16#00`.

The monitoring time is set at the `FrznTmIn` input parameter in seconds. With `FrznTmIn = 0` or `FrznEn = 0` (default setting), the sign-of-life monitoring is deactivated, any pending errors are reset.

The input value is considered as faulty as long as it seen as constant. The monitoring time is restarted each time the input value is changed.

See also

Pcs7AnIn block diagram (Page 1649)
Pcs7AnIn I/Os (Page 1647)
Pcs7AnIn messaging (Page 1646)
Pcs7AnIn error handling (Page 1645)
Pcs7AnIn modes (Page 1640)
Description of Pcs7AnIn (Page 1638)

15.8.4 Pcs7AnIn error handling

Error handling of Pcs7AnIn

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Channel error
- Higher-level error
- Invalid measuring range
- Frozen input value (sign-of-life monitoring)

Channel error

At the output parameter `Bad`, channel errors are displayed with 1. Channel errors can be detected using the raw value, the NAMUR check or the sign-of-life monitoring.

`PV_LoAct` or `PV_HiAct` remain set to = 1 if a channel error occurs due to the module diagnoses "Undershoot or overshoot of the measurement range“.

Higher-level error / invalid measuring range

A higher-level error is output (output parameter `ModErr` = 1 and `Bad` = 1) if either:

- the signal status in the `High Word` of input parameter `Mode` takes the value 16#40, or
- there is an invalid measuring type in the `Low Word` of the input parameter `Mode`.

See also

Pcs7AnIn block diagram (Page 1649)
Pcs7AnIn I/Os (Page 1647)
Pcs7AnIn messaging (Page 1646)
Pcs7AnIn functions (Page 1641)
Pcs7AnIn modes (Page 1640)
Description of Pcs7AnIn (Page 1638)

15.8.5 Pcs7AnIn messaging

Messaging

This block does not offer messaging.

See also

Pcs7AnIn block diagram (Page 1649)
Pcs7AnIn I/Os (Page 1647)
Pcs7AnIn error handling (Page 1645)
Pcs7AnIn functions (Page 1641)
Pcs7AnIn modes (Page 1640)
Description of Pcs7AnIn (Page 1638)

15.8.6 Pcs7AnIn I/Os

I/Os of Pcs7AnIn

Input parameters

Parameter	Description	Type	Default
CountLim	Startup counter limit	INT	0
DeltaVal	Delta value (PV_In - Last valid value)	REAL	0.0
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1641)	STRUCT • Bit 0: BOOL • ... • Bit 28: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 1 • 0 • 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmIn*	Flutter time [s]	INT	0
FrznEn	1 = Sign-of-life monitoring activated	BOOL	0
FrznTmIn	Monitoring time in [s]	REAL	0
HighLimit	High limit used if NAMUR check (NamurOff = 1) is deactivated	REAL	21.5
LowLimit	Low limit used if NAMUR check (NamurOff = 1) is deactivated	REAL	3.3
MS	Maintenance status	DWORD	16#00000000
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
NamurOff	1= NAMUR limit verification user-defined	BOOL	0
PV_In	Process value (raw value)	WORD	16#0000
PV_InUnit	Unit of measure for process value	INT	1001
SampleTime	Sampling time in [s]	REAL	0.1
Scale	Scaling of the process value as a structure	STRUCT • High: REAL • Low:REAL	- • 100.0 • 0.0
SimOn	1 = Simulation on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
SimPV_In	Process value used for SimOn = 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
SubsPV_In	Substitute value	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Value status and measuring type	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
FrznVal	Frozen process value	REAL	0.0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Pcs7AnIn error handling (Page 1645).	INT	-1
ModErr	1 = Device/module is faulty	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_HiAct	1 = Overshoot of process value	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
PV_LoAct	1 = Undershoot of process value	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
PV_Out	Standard value (physical variable)	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80
PV_OutUnit	Unit of the process value	INT	0
RemTime	Remaining monitoring time [s]	REAL	0
SampleTime	Sampling time [s]	REAL	0.1
ScaleOut	Scaling of the process value for display	STRUCT	-
		• High: REAL	• 100.0
		• Low:REAL	• 0.0
SimAct	1 = Simulation active	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

See also

Pcs7AnIn block diagram (Page 1649)
Pcs7AnIn messaging (Page 1646)
Pcs7AnIn modes (Page 1640)
Description of Pcs7AnIn (Page 1638)

15.8.7 Pcs7AnIn block diagram

Pcs7AnIn block diagram

A block diagram is not provided for this block.

See also

Pcs7AnIn I/Os (Page 1647)
Pcs7AnIn messaging (Page 1646)
Pcs7AnIn error handling (Page 1645)
Pcs7AnIn functions (Page 1641)
Pcs7AnIn modes (Page 1640)
Description of Pcs7AnIn (Page 1638)

15.9 Pcs7AnOu - Analog output channel block

15.9.1 Description of Pcs7AnOu

Object name (type + number) and family

Type + number: FB 1870

Family: Channel

Area of application for Pcs7AnOu

The block is used for the following applications:

- Signal processing of an analog output value from S7-300/400 SM analog output groups

How it works

The block outputs the process value as analog raw value for a process image (partition). Use the Mode in/out parameter to define how the raw value is to be obtained.

The current raw value is always output to the process image (partition).

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The in/out parameter `Mode` is interconnected to the corresponding `OMode_xx` output parameter of the MOD block.
- The in/out parameter `DataXchg` is interconnected to the corresponding `DataXchg_xx` output parameter of the MOD block.
- The `MS` parameter is interconnected to the `O_MS` output parameter of the diagnostics driver block.
- The `Feature` Bit 0 (Setting the startup characteristics (Page 116)) is set with a default automatically when the module driver is generated.

Connect the symbol generated in HW Config (symbol table) for the output channel with the `PV_Out` output parameter.

The templates of the Advanced Process Library contain an example of an Pcs7AnOu application.

Note

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually. Refer to the Mode Settings for SM Modules (Page 1708) section for more on this.

For the Pcs7AnOu block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810)
- Cascade control with PIDConR (CascadeR) (Page 1812)
- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)
- PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800)
- Model-based predictive control (ModPreCon) (Page 1816)
- Reversing motor with controllable speed (MotorSpeedControlled) (Page 1822)
- Override control (Page 1814)
- Override control with PIDConR (OverrideR) (Page 1816)
- PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799)
- PIDConR with safety logic and control loop monitoring (PIDConR_ConPerMon) (Page 1800)
- Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)
- Ratio control with PIDConR (RatioR) (Page 1809)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)
- Control valve (VlvAnL) (Page 1826)
- Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Pcs7AnOu block diagram (Page 1658)
Pcs7AnOu I/Os (Page 1656)
Pcs7AnOu messaging (Page 1655)
Pcs7AnOu error handling (Page 1654)
Pcs7AnOu modes (Page 1652)
Pcs7AnOu functions (Page 1652)

15.9.2 Pcs7AnOu modes

Pcs7AnOu modes

This block does not have any modes.

See also

Pcs7AnOu block diagram (Page 1658)
Pcs7AnOu I/Os (Page 1656)
Pcs7AnOu messaging (Page 1655)
Pcs7AnOu error handling (Page 1654)
Description of Pcs7AnOu (Page 1650)
Pcs7AnOu functions (Page 1652)

15.9.3 Pcs7AnOu functions

Functions of Pcs7AnOu

The functions for this block are listed below.

Forming an I/O value

The peripheral value `PV_Out` is formed from:

- the scale value (input parameter `Scale`)
- the process value (input parameter `PV_In`)
- the measuring type (in/out parameter `Mode`)

Example of measuring type 4 ... 20 mA

If this measuring type is to be used, you must set the Mode parameter with 16#203 accordingly. In the measuring type, the peripheral value for 4mA is output for `PV_In` = `Scale.Low` and the peripheral value for 20 mA is output for `PV_In` = `Scale.High`.

The block writes the input parameter `Scale` directly to the output parameter `ScaleOut` and interconnects it directly to a technologic block. This can be, for example, the input parameter `MV_Opscale` of a control block.

Limiting the process or peripheral value

The peripheral value can be limited in two different ways:

- Limited to within range limits
- Limited to scale values

Limited to within range limits (physical limits of the module): If you want to restrict the peripheral value (`PV_Out`), you must activate this function via the `ScaleOff` = 1 parameter.

The peripheral value is now limited to the following range limits:

- Top: 16#7EFF (32511 dec.)
- Bottom (unipolar): 0 or
- Bottom, unipolar (4 - 20 mA; 1 - 5 V): 16#E500 (-6912 dec.)
- Bottom (bipolar): 16#8100 (-32512 dec.)

If the limits are undershot or overshot `PV_HiAct` = 1 (top) or `PV_LowAct` = 1 (bottom) is displayed at the output parameters. The signal status of the `PV_ChnST` output parameter is set to 16#78 .

Limited to scale values: If you want to restrict the peripheral value (`PV_Out`) to the scale values, you must activate this function via the `ScaleOff` = 0 parameter. You define the high and low scale limits in the `Scale` parameter. If one of the limits is violated, the limit you have entered is output at the `PV_Out` output parameter. This is displayed at the `PV_HiAct` or `PV_LoAct` = 1 output parameter. The signal status of the `PV_ChnST` output parameter is set to 16#78.

Simulating signals

The block provides the standard function Simulating signals (Page 47).

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55)

Forming the signal status for PCS7 channel blocks

The block provides the standard function Forming and outputting the signal status for PCS 7 channel blocks (Page 103).

Configurable reactions using the Feature parameter

You can find an overview of all reactions provided by the Feature parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
30	Outputting a de-energized value for block-external simulation (Page 124)

See also

Pcs7AnOu block diagram (Page 1658)

Pcs7AnOu I/Os (Page 1656)

Pcs7AnOu messaging (Page 1655)

Pcs7AnOu error handling (Page 1654)

Pcs7AnOu modes (Page 1652)

Description of Pcs7AnOu (Page 1650)

15.9.4 Pcs7AnOu error handling

Error handling of Pcs7AnOu

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Channel error
- Higher-level error
- Invalid measuring range

Channel error

At the output parameter Bad, channel errors are displayed with 1. They can be detected using the raw value or the NAMUR check.

PV_LoAct or PV_HiAct remain set to = 1 if a channel error occurs due to the module diagnoses "Undershoot or overshoot of the measurement range“.

Higher-level error / invalid measuring range

A higher-level error is output (output parameter `ModErr` = 1 and `Bad` = 1) if either:

- the signal status in the `High Word` of input parameter `Mode` takes the value 16#40, or
- there is an invalid measuring type in the `Low Word` of the input parameter `Mode`.

See also

Pcs7AnOu block diagram (Page 1658)
Pcs7AnOu I/Os (Page 1656)
Pcs7AnOu messaging (Page 1655)
Pcs7AnOu modes (Page 1652)
Description of Pcs7AnOu (Page 1650)
Pcs7AnOu functions (Page 1652)

15.9.5 Pcs7AnOu messaging

Messaging

This block does not offer messaging.

See also

Pcs7AnOu block diagram (Page 1658)
Pcs7AnOu I/Os (Page 1656)
Pcs7AnOu error handling (Page 1654)
Pcs7AnOu modes (Page 1652)
Description of Pcs7AnOu (Page 1650)
Pcs7AnOu functions (Page 1652)

15.9.6 Pcs7AnOu I/Os

Pcs7AnOu I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1652)	STRUCT • Bit 0: BOOL • ... • Bit 30: BOOL • Bit 31: BOOL	- • 0 • 0 • 1 • 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmIn*	Flutter time [s]	INT	0
MS	Maintenance status	DWORD	16#00000000
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_In	Process value (raw value)	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_InUnit	Unit of measure for process value	INT	1342
Scale	Scaling of the process value as a structure	STRUCT • High: REAL • Low:REAL	- • 100.0 • 0.0
ScaleOff	0 = Limitation to scale limits (Scale) active 1 = Limitation to within range limits (physical limits of the module) active	BOOL	0
SimOn	1 = Simulation on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV_In	Process value used for SimOn = 1	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
StartVal	Starting value that is used on starting the block if Feature Bit 0 = 1.	REAL	0.0

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Description	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Value status and measuring type	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Reserved for future error numbers	INT	-1
ModErr	1 = Device/module is faulty	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_ChnST	Signal status of the output channel and value of PV_Out	STRUCT • Value: REAL • ST: BYTE	- • 0.0 • 16#80
PV_HiAct	1 = Overshoot of process value	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_LoAct	1 = Undershoot of process value	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Out	Process value	WORD	16#0000
PV_OutUnit	Unit of the process value	INT	0

Parameter	Description	Type	Default
ScaleOut	Scaling of the process value as a structure	STRUCT	-
		• High: REAL	• 100.0
		• Low:REAL	• 0.0
SimAct	1 = Simulation active	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

See also

Pcs7AnOu block diagram (Page 1658)
Pcs7AnOu messaging (Page 1655)
Pcs7AnOu error handling (Page 1654)
Pcs7AnOu modes (Page 1652)
Description of Pcs7AnOu (Page 1650)

15.9.7 Pcs7AnOu block diagram

Pcs7AnOu block diagram

A block diagram is not provided for this block.

See also

Pcs7AnOu I/Os (Page 1656)
Pcs7AnOu messaging (Page 1655)
Pcs7AnOu error handling (Page 1654)
Pcs7AnOu modes (Page 1652)
Description of Pcs7AnOu (Page 1650)
Pcs7AnOu functions (Page 1652)

15.10 Pcs7DiIn - Digital input channel block

15.10.1 Description of Pcs7DiIn

Object name (type + number) and family

Type + number: FB 1871

Family: Channel

Area of application for Pcs7DiIn

The block is used for the following applications:

- Signal processing of an digital input value from S7-300/400 SM digital input groups

How it works

The cyclic block processes all channel-specific signal functions of a digital input module.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The in/out parameter `Mode` is interconnected to the corresponding `OMode_xx` output parameter of the MOD block.
- The in/out parameter `DataXchg` is interconnected to the corresponding `DataXchg_xx` output parameter of the MOD block.
- The `MS` parameter is interconnected to the `O_MS` output parameter of the diagnostics driver block.

Connect the symbol generated in HW Config (symbol table) for the input channel with the `PV_In` input parameter.

Note

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually. Refer to the Mode Settings for SM Modules (Page 1708) section for more on this.

For the Pcs7DiIn block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Monitoring eight digital process tags (Digital8Monitoring) (Page 1818)
- Monitoring of a digital process tag (DigitalMonitoring) (Page 1817)
- Reversing motor with controllable speed (MotorSpeedControlled) (Page 1822)
- Step controller with assigned actuator block and position feedback (StepControlActor) (Page 1805)
- Step controller with direct access to the actuator and without position feedback (StepControlDirect) (Page 1805)
- Two-speed motor (Motor2Speed) (Page 1821)
- Reversing motor (MotorReversible) (Page 1822)
- Valve (ValveLean) (Page 1824)
- Two-way valve (Valve2Way) (Page 1825)
- Motor valve (ValveMotor) (Page 1825)
- Control valve (VlvAnL) (Page 1826)

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Pcs7DiIn block diagram (Page 1666)

Pcs7DiIn I/Os (Page 1664)

Pcs7DiIn messaging (Page 1664)

Pcs7DiIn error handling (Page 1663)

Pcs7DiIn functions (Page 1661)

Pcs7DiIn modes (Page 1661)

15.10.2 Pcs7DiIn modes

Pcs7DiIn modes

This block does not have any modes.

See also

Pcs7DiIn block diagram (Page 1666)

Pcs7DiIn I/Os (Page 1664)

Pcs7DiIn messaging (Page 1664)

Pcs7DiIn error handling (Page 1663)

Pcs7DiIn functions (Page 1661)

Description of Pcs7DiIn (Page 1659)

15.10.3 Pcs7DiIn functions

Functions of Pcs7DiIn

The functions for this block are listed below.

Obtaining the standard value

The digital value of the process image (partition) is output at output parameter `PV_Out` with the signal status 16#80.

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually for further settings. Refer to the Mode Settings for SM Modules (Page 1708) section for more on this.

Holding the last value if raw value is invalid

If the block is to hold the most recent valid value when the raw value is invalid, you must activate this function at the `Feature` Bit Issuing last valid value if raw value is invalid (Page 127).

Output substitute value if raw value is invalid

If the block is to output a substitute value (`SubsPV_In`) when the raw value is invalid, you must activate this function at the `Feature` Bit Output substitute value if raw value is invalid (Page 124).

Output of invalid value if raw value is invalid

If the block is to output an invalid value (`PV_Out` = `PV_In`), you must activate this function at the `Feature` Bit Output invalid raw value (Page 146).

This function is pre-selected.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55)

Signal status for PCS7 channel blocks

The block provides the standard function Forming and outputting the signal status for PCS 7 channel blocks (Page 103).

Simulating signals

The block provides the standard function Simulating signals (Page 47).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
28	Output invalid raw value (Page 146)
29	Output substitute value if raw value is invalid (Page 124)
30	Issuing last valid value if raw value is invalid (Page 127)

See also

Pcs7DiIn block diagram (Page 1666)

Pcs7DiIn I/Os (Page 1664)

Pcs7DiIn messaging (Page 1664)

Pcs7DiIn error handling (Page 1663)

Pcs7DiIn modes (Page 1661)

Description of Pcs7DiIn (Page 1659)

15.10.4 Pcs7DiIn error handling

Error handling of Pcs7DiIn

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Channel error
- Higher-level error
- Invalid measuring range

Channel error

At the output parameter `Bad`, channel errors are displayed with 1. They can be detected using the raw value or the NAMUR check.

Higher-level error / invalid measuring range

A higher-level error is output (output parameter `ModErr` = 1) if either:

- the signal status in the `High Word` of input parameter `Mode` takes the value 16#40, or
- there is an invalid measuring type in the `Low Word` of the input parameter `Mode`.

See also

Pcs7DiIn block diagram (Page 1666)

Pcs7DiIn I/Os (Page 1664)

Pcs7DiIn messaging (Page 1664)

Pcs7DiIn functions (Page 1661)

Pcs7DiIn modes (Page 1661)

Description of Pcs7DiIn (Page 1659)

15.10.5 Pcs7DiIn messaging

Messaging

This block does not offer messaging.

See also

Pcs7DiIn block diagram (Page 1666)
Pcs7DiIn I/Os (Page 1664)
Pcs7DiIn error handling (Page 1663)
Pcs7DiIn functions (Page 1661)
Pcs7DiIn modes (Page 1661)
Description of Pcs7DiIn (Page 1659)

15.10.6 Pcs7DiIn I/Os

I/Os of Pcs7DiIn

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1661)	STRUCT • Bit 0: BOOL • ... • Bit 28: BOOL • .... • Bit 31: BOOL	- • 0 • 0 • 1 • 0 • 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmIn*	Flutter time [s]	INT	0
MS	Maintenance status	DWORD	16#00000000
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ProImQB	Quality information from the process image	BOOL	0
PV_In	Process value (raw value)	BOOL	0
SelQB	1 = Use the quality bit from the process image	BOOL	0

Parameter	Description	Type	Default
SimOn	1 = Simulation on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV_In	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SubsPV_In	Substitute value	BOOL	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

In-out parameters

Parameter	Description	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Value status and measuring type	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Pcs7DiIn error handling (Page 1663).	INT	-1
ModErr	1 = Device/module is faulty	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

Parameter	Description	Type	Default
PV_Out	Standard value (physical variable)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimAct	1 = Simulation active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Pcs7DiIn block diagram (Page 1666)
Pcs7DiIn messaging (Page 1664)
Pcs7DiIn functions (Page 1661)
Description of Pcs7DiIn (Page 1659)

15.10.7 Pcs7DiIn block diagram

Pcs7DiIn block diagram

A block diagram is not provided for this block.

See also

Pcs7DiIn I/Os (Page 1664)
Pcs7DiIn messaging (Page 1664)
Pcs7DiIn error handling (Page 1663)
Pcs7DiIn functions (Page 1661)
Pcs7DiIn modes (Page 1661)
Description of Pcs7DiIn (Page 1659)

15.11 Pcs7DiIT - Digital input channel block with time stamp

15.11.1 Description of Pcs7DiIT

Object name (type + number) and family

Type + number: FB 1872

Family: Channel

Area of application for Pcs7DiIT

The block is used for the following applications:

- Signal processing of a digital input value from S7-300/400 SM digital input modules with time stamp.

How it works

The cyclic block processes all channel-specific signal functions of a digital input module with configured time stamp.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Connect the symbol generated in HW Config (symbol table) for the input channel with the `PV_In` input parameter.

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The in/out parameter `Mode` is interconnected to the corresponding `OMode_xx` output parameter of the MOD block.
- The in/out parameter `DataXchg` is interconnected to the corresponding `DataXchg_xx` output parameter of the MOD block.
- The `MS` parameter is interconnected to the `O_MS` output parameter of the diagnostics driver block.
- If the process image (partition) also contains the value status (status bit) of the digital input channel, the corresponding symbol is connected with input `ProImQB` and the input `SelQB` = 1 set.

- The TS_In parameter is interconnected to the TS_XX output parameter of the IMDRV_TS block.
- The in/out parameter TS_C is interconnected to the corresponding TS_C_xx output parameter of the IMDRV_TS block.

Note

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter Mode manually. Refer to the section Mode Settings for SM Modules (Page 1708).

If the time stamp for the input channel is deactivated, the aforementioned connections to the block IMDRV_TS are not used. The block can be used as a simple channel block. When the charts are compiled, a warning is issued as the module driver is generated.

Refer to the section on configuring the channel blocks for information on configuration.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for Status parameter

This block does not have the Status parameter.

See also

Pcs7DiIT block diagram (Page 1675)

Pcs7DiIT I/Os (Page 1672)

Pcs7DiIT messaging (Page 1672)

Pcs7DiIT error handling (Page 1671)

Pcs7DiIT functions (Page 1669)

Pcs7DiIT modes (Page 1669)

15.11.2 Pcs7DiIT modes

Pcs7DiIT modes

This block does not have any modes.

See also

Pcs7DiIT block diagram (Page 1675)

Pcs7DiIT I/Os (Page 1672)

Pcs7DiIT messaging (Page 1672)

Pcs7DiIT error handling (Page 1671)

Pcs7DiIT functions (Page 1669)

Description of Pcs7DiIT (Page 1667)

15.11.3 Pcs7DiIT functions

Functions of Pcs7DiIT

The functions for this block are listed below.

Obtaining the standard value

The digital value of the process image (partition) is output at output parameter `PV_Out` with the signal status 16#80 .

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually for further settings. Refer to the section Mode Settings for SM Modules (Page 1708).

Holding the last value if raw value is invalid

If the block is to hold the most recent valid value when the raw value is invalid, you must activate this function at the `Feature` Bit Issuing last valid value if raw value is invalid (Page 127).

Output substitute value if raw value is invalid

If the block is to output a substitute value (`SubsPV_In`) when the raw value is invalid, you must activate this function at the `Feature` Bit Output substitute value if raw value is invalid (Page 124).

Output of invalid value if raw value is invalid

If the block is to output an invalid value (`PV_Out` = `PV_In`), you must activate this function at the `Feature` Bit Output invalid raw value (Page 146).

This function is pre-selected.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55)

Signal status for PCS7 channel blocks

The block provides the standard function Forming and outputting the signal status for PCS 7 channel blocks (Page 103).

Simulating signals

The block provides the standard function Simulating signals (Page 47).

Time stamp

The block provides the standard function Time stamp (Page 163).

Interconnect the signal with the time stamp from the I/O devices with input parameter `TS_In`.

Interconnect input parameter `TS_In` with the channel-specific output parameter `TS_Oxx` of block IMDRV_TS.

Interconnect in/out parameter `TS_C` with the channel-specific output parameter `TS_Cxx` of block IMDRV_TS. This happens automatically when the CFC function "Generate module drivers" is used.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the Feature parameter in the section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
28	Output invalid raw value (Page 146)
29	Output substitute value if raw value is invalid (Page 124)
30	Issuing last valid value if raw value is invalid (Page 127)

See also

Pcs7DiIT block diagram (Page 1675)

Pcs7DiIT I/Os (Page 1672)

Pcs7DiIT messaging (Page 1672)

Pcs7DiIT error handling (Page 1671)

Pcs7DiIT modes (Page 1669)

Description of Pcs7DiIT (Page 1667)

15.11.4 Pcs7DiIT error handling

Error handling of Pcs7DiIT

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Channel error
- Higher-level error
- Invalid measuring range

Channel error

At the output parameter `Bad`, channel errors are displayed with 1. The channel error is generated from the signal status `PV_ST`.

Higher-level error / invalid measuring range

A higher-level error is displayed at the output parameters `ModErr` and `Bad` with 1 if the signal status at `High Word` of the input parameter `Mode` accepts the value 16#40.

A higher-level error is also present when an incorrect measuring type is entered in `Low Word` of the input parameter `Mode`.

See also

Pcs7DiIT block diagram (Page 1675)

Pcs7DiIT I/Os (Page 1672)

Pcs7DiIT messaging (Page 1672)

Pcs7DiIT functions (Page 1669)

Pcs7DiIT modes (Page 1669)

Description of Pcs7DiIT (Page 1667)

15.11.5 Pcs7DiIT messaging

Messaging

This block does not offer messaging.

See also

Pcs7DiIT block diagram (Page 1675)
Pcs7DiIT I/Os (Page 1672)
Pcs7DiIT error handling (Page 1671)
Pcs7DiIT functions (Page 1669)
Pcs7DiIT modes (Page 1669)
Description of Pcs7DiIT (Page 1667)

15.11.6 Pcs7DiIT I/Os

Pcs7DiIT I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1669)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 28: BOOL	• 1
		• ...	• 0
		• Bit 31: BOOL	• 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmIn*	Flutter time [s]	INT	0
MS	Maintenance status	DWORD	16#00000000
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
PV_In	Process value (raw value)	BOOL	0
ProImQB	Quality information from the process image	BOOL	0

Parameter	Description	Type	Default
SimOn	1 = Simulation on	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
SimPV_In	Process value used for SimOn = 1	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
SelQB	1 = Use the quality bit from the process image	BOOL	0
SubsPV_In	Substitute value	BOOL	0
TS_In	Time stamp of IMDRV_TS; The time is in ISP format	STRUCT	-
		• MsgSig: BOOL	• 0
		• TriInf: BOOL	• 0
		• HdSh: BOOL	• 0
		• ST: BYTE	• 16#80
		• TS0: DWORD	• 16#00000000
		• TS1: DWORD	• 16#00000000

* Values can be written back to these inputs during processing of the block by the block algorithm.

In-out parameters

Parameter	Description	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
TS_C	Time-stamp communication	BYTE	16#00

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Reserved for future error numbers	INT	-1
ModErr	1 = Device/module is faulty	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
PV_Out	1 = Standard value (physical variable)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
SimAct	1 = Simulation active	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
TS_Out	Time stamp	STRUCT	-
		• MsgSig: BOOL	• 0
		• TriInf: BOOL	• 0
		• HdSh: BOOL	• 0
		• ST: BYTE	• 16#80
		• TS0: DWORD	• 16#00000000
		• TS1: DWORD	• 16#00000000
		• Link: BOOL	• 0

See also

Pcs7DiIT block diagram (Page 1675)
Pcs7DiIT messaging (Page 1672)
Pcs7DiIT error handling (Page 1671)
Pcs7DiIT modes (Page 1669)
Description of Pcs7DiIT (Page 1667)

15.11.7 Pcs7DiIT block diagram

Pcs7DiIT block diagram

A block diagram is not provided for this block.

See also

Pcs7DiIT I/Os (Page 1672)
Pcs7DiIT messaging (Page 1672)
Pcs7DiIT error handling (Page 1671)
Pcs7DiIT functions (Page 1669)
Pcs7DiIT modes (Page 1669)
Description of Pcs7DiIT (Page 1667)

15.12 Pcs7DiOu - Digital output channel block

15.12.1 Description of Pcs7DiOu

Object name (type + number) and family

Type + number: FB 1873

Family: Channel

Area of application for Pcs7DiOu

The block is used for the following applications:

- Signal processing of a digital output value from S7-300/400 SM digital output groups.

How it works

The cyclic block processes all channel-specific signal functions of a digital output module.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The in/out parameter `Mode` is interconnected to the corresponding `OMode_xx` output parameter of the MOD block.
- The in/out parameter `DataXchg` is interconnected to the corresponding `DataXchg_xx` output parameter of the MOD block.
- The `MS` parameter is interconnected to the `O_MS` output parameter of the diagnostics driver block.
- The `Feature` Bit 0 (Setting the startup characteristics (Page 116)) is set with a default automatically when the module driver is generated.

Connect the symbol generated in HW Config (symbol table) for the output channel with the `PV_Out` output parameter.

The templates of the Advanced Process Library contain an example of an Pcs7DiOu application.

Note

If you are not using the CFC function "Generate module drivers" you must set the in/out parameter `Mode` manually. Refer to the Mode Settings for SM Modules (Page 1708) section for more on this.

For the Pcs7DiOu block, the Advanced Process Library contains templates for process tag types as examples with various application scenarios for this block.

Examples of process tag types:

- Dosing (DoseLean) (Page 1819)
- Two-speed motor (Motor2Speed) (Page 1821)
- Reversing motor (MotorReversible) (Page 1822)
- Reversing motor with controllable speed (MotorSpeedControlled) (Page 1822)
- Step controller with assigned actuator block and position feedback (StepControlActor) (Page 1805)
- Step controller with direct access to the actuator and without position feedback (StepControlDirect) (Page 1805)
- Valve (ValveLean) (Page 1824)
- Two-way valve (Valve2Way) (Page 1825)
- Motor valve (ValveMotor) (Page 1825)

Startup characteristics

Use the `Feature` Bit Setting the startup characteristics (Page 116) to define the startup characteristics of this block.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

Pcs7DiOu block diagram (Page 1682)

Pcs7DiOu I/Os (Page 1680)

Pcs7DiOu messaging (Page 1679)

Pcs7DiOu error handling (Page 1678)

Pcs7DiOu functions (Page 1677)

Pcs7DiOu modes (Page 1677)

15.12.2 Pcs7DiOu modes

Pcs7DiOu modes

The block does not have any operating modes.

See also

Pcs7DiOu block diagram (Page 1682)

Pcs7DiOu I/Os (Page 1680)

Pcs7DiOu messaging (Page 1679)

Pcs7DiOu error handling (Page 1678)

Pcs7DiOu functions (Page 1677)

Description of Pcs7DiOu (Page 1675)

15.12.3 Pcs7DiOu functions

Functions of Pcs7DiOu

The functions for this block are listed below.

Forming an I/O value

The digital value is written to the process image (partition). The signal status of the process value (`PV_ChnST`) is set to "good" (16#80).

Simulating signals

The block provides the standard function Simulating signals (Page 47).

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55)

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in section Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
0	Setting the startup characteristics (Page 116)
30	Outputting a de-energized value for block-external simulation (Page 124)

See also

Pcs7DiOu block diagram (Page 1682)

Pcs7DiOu I/Os (Page 1680)

Pcs7DiOu messaging (Page 1679)

Pcs7DiOu error handling (Page 1678)

Pcs7DiOu modes (Page 1677)

Description of Pcs7DiOu (Page 1675)

15.12.4 Pcs7DiOu error handling

Error handling of Pcs7DiOu

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Channel error
- Higher-level error
- Invalid measuring range

Channel error

At the output parameter `Bad`, channel errors are displayed with 1. The channel error is generated from the signal status `PV_ST`.

Higher-level error / invalid measuring range

A higher-level error is output (output parameter `ModErr` = 1) if either:

- the signal status in the `High Word` of input parameter `Mode` takes the value 16#40, or
- there is an invalid measuring type in the `Low Word` of the input parameter `Mode`.

See also

Pcs7DiOu block diagram (Page 1682)
Pcs7DiOu I/Os (Page 1680)
Pcs7DiOu messaging (Page 1679)
Pcs7DiOu functions (Page 1677)
Pcs7DiOu modes (Page 1677)
Description of Pcs7DiOu (Page 1675)

15.12.5 Pcs7DiOu messaging

Messaging

This block does not offer messaging.

See also

Pcs7DiOu block diagram (Page 1682)
Pcs7DiOu I/Os (Page 1680)
Pcs7DiOu error handling (Page 1678)
Pcs7DiOu functions (Page 1677)
Pcs7DiOu modes (Page 1677)
Description of Pcs7DiOu (Page 1675)

15.12.6 Pcs7DiOu I/Os

I/Os of Pcs7DiOu

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Feature	I/O for additional functions (Page 1677)	STRUCT • Bit 0: BOOL • ... • Bit 30: BOOL • Bit 31: BOOL	- • 0 • 0 • 1 • 0
FlutEn	1 = Flutter suppression activated	BOOL	0
FlutTmIn*	Flutter time [s]	INT	0
MS	Maintenance status	DWORD	16#00000000
MS_Release	Release for maintenance (interconnected with MS_Release of the technologic block)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_In	Process value (raw value)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimOn	1 = Simulation on	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
SimPV_In	Process value used for SimOn = 1	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
StartVal	Starting value that is used on starting the block if Feature Bit 0 = 1.	BOOL	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

In-out parameters

Parameter	Description	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Value status and measuring type	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
Bad	1 = Process value is not valid	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
ErrorNum	Output of current error number. For error numbers that can be output by this block, see Pcs7DiOu error handling (Page 1678).	INT	-1
ModErr	1 = Device/module is faulty	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
OosAct	1 = Field device is undergoing maintenance	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_ChnST	Signal status of the output channel and value of PV_Out	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
PV_Out	Process value	BOOL	0
SimAct	1 = Simulation active	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

Pcs7DiOu block diagram (Page 1682)

Pcs7DiOu messaging (Page 1679)

Pcs7DiOu modes (Page 1677)

Description of Pcs7DiOu (Page 1675)

15.12.7 Pcs7DiOu block diagram

Pcs7DiOu block diagram

A block diagram is not provided for this block.

See also

Pcs7DiOu I/Os (Page 1680)

Pcs7DiOu messaging (Page 1679)

Pcs7DiOu error handling (Page 1678)

Pcs7DiOu functions (Page 1677)

Pcs7DiOu modes (Page 1677)

Description of Pcs7DiOu (Page 1675)

15.13 Pcs7Cnt1 Controlling and reading FM 350 modules

15.13.1 Description of Pcs7Cnt1

Object name (type + number)

Type + number: FB 1833

Family: Channel

Area of application

The Pcs7Cnt1 block is used for controlling and reading count or measured values of an FM 350-1 or FM 350-2 module.

How it works

"FM 350" refers to the FM 350-1 and FM 350-2 modules in the following.

- The block only communicates through the process image for the FM 350-1. The data are written and read continuously.
- The control and status information and selected count and measured values are contained in the process image for the FM 350-2. The remaining count and measured values can be read via data records.
  In HW Config (User_Type1 and User_Type2) you define how the count or measured values will be saved in the process image. The LoadPv1 and CmpVx parameters are loaded from the FM_CNT block to the FM 350-2 using data records. The writing of the parameters is first triggered in the subsequent cycle of the FM_CNT block.

If an FM 350-2 module is being used, the block writes the LoadPV1 (load count value immediately) or CmpVx (comparison value) parameters to the module (x = channel number) via data records. If the parameter LoadDir = 1 is set in the block, it writes LoadPV1. If LoadPre = 1 is set, it writes in preparation LoadPV1. The CmpVx parameter is written after every change.

The Mode input indicates in what format the count and/or measured value is available in the process image. If the high word of the input parameter Mode = 16#40xxxx (value status = higher-level error, ModErr= 1), the count or measured value is treated as invalid.

The measured values are written to the corresponding outputs, PV1, PV1_Li as well as PV2 and PV2_Li; a differential value between the old value and new value is formed for the PV1 via the last cycle and sent at the PV1CycLi output. If the read values are in order, the status of the outputs is set to 16#80.

The units for PV1_UnitLi, ScalePV1_Li, PV2_UnitLi and ScalePV2_Li are set with the extension "_IN" via the inputs of the same name.

Note

Status CmpVal0(comparator 1), CmpVal1 (comparator 2), ZeroSt (zero crossing), OFlow (overflow) and UFlow (underflow) are automatically acknowledged. They are active for at least one cycle.

The measured value is output as a numeric value by the FM 350. Additional information on this is available in the manual for the module.

The block also supplies the counted pulses of PV1(PV1_Li) at the PV1CycLi output with each block call.

The LoadPV1 input parameter is the relevant value which is passed to the module. If, however, LoadPV1_Li is interconnected or the status of LoadPV1_Li is 16#80 , the value is written to LoadPV1 and applied.

Note

The display in PCS7 is limited by the data type DINT. However, the settings in the module are permitted unsigned up to 32 bits.

Configuration

The following actions are executed automatically with the "**Generate module drivers**" CFC function:

- The `Laddr` and `Channel` inputs are configured.
- The `Mode` input is interconnected with the `OMODEx` output of the FM_CNT block.
- The `FM_DATA` structure is interconnected with the structure of the same name of the FM_CNT block.
- The `DataXchg` input is interconnected to the relevant `DXCHG_00` output of the MOD_D1 block.
- The `MS` input is interconnected to the relevant `O_MS` output of the MOD_D1 block.

The block is installed in the CFC editor in a cyclic interrupt OB (OB30 to OB38) .

Status word allocation

This block does not have the `Status` parameter.

See also

I/Os of Pcs7Cnt1 (Page 1688)

15.13.2 Operating modes of Pcs7Cnt1

Pcs7Cnt1 operating modes

This block does not have any modes.

15.13.3 Functions of Pcs7Cnt1

Functions of Pcs7Cnt1

The functions for this block are listed below.

Addressing

1. Create icons for the required count or measured values in the icon table, in accordance with the base address of the FM 350 module. Please note the following:

- FM 350-1: Count or measured value is always in the process image:
  - Select "ED base address" of the module (e.g. ED512) as the address.
- FM 350-2: Count or measured value of the desired channel is in the process image:
  - In "HW Config FM 350-2 configure counter" you can specify where count or measured values will be stored in the process image. Depending on the configuration of User_Type1 or User_Type2, you must select EW for WORD or ED for DWORD. The address is calculated according to the following table:

Count or measured value is defined as:	Measured or count value is in User_Type1:	Measured or count value is in User_Type2:
DWORD or LOW WORD	FM 350-2 base address + 8 bytes	FM 350-2 base address + 12 bytes
HIGH WORD	FM 350-2 base address + 10 bytes	FM 350-2 base address + 14 bytes
Example: The desired count value of channel 2 is in User_Type2 in the high word. The address is calculated for a base address of 512 as: Address = EW 526.		

- FM 350-2: Count or measured value of the desired channel is not in the process image:
  - Select as address: Input word "Base address of the module + channel number" interconnected (e.g. base address = 512, channel number = 5; EW517).

2. Connect the input `Connect` in the CFC chart with the previously created icon via "Interconnection to address...".

Count and measured values that are not in the process image of the FM 350-2 are read out of the module cyclically as a data record, if the inputs `PV1_EN` or `PV2_EN` = 1. Both inputs should be set to 0 for performance reasons, if count or measured value are not needed for the channel in the user program. This prevents count or measured values from being read via data records, if they are not in the process image.

Note

Even if the `PV1_EN` or `PV2_EN` inputs are not set, a read can be performed via data records if the `PV1_EN` or `PV2_EN` are set inputs are set at a different instance of CH_CNT (other channel) of the associated FM350-2.

Simulation

The block provides the standard function Simulating signals (Page 47)

With `SimOn = 1` , the simulation values `SimPV1` and `SimPV2` are written to the outputs `PV1`, `PV1_Li` as well as `PV2` and `PV2_Li` . The status of the outputs is set to 16#60 and `Bad = 1` in the process.

Simulation takes highest priority.

If the block is in simulation state, `SimAct = 1` is set.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the chapter Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
28	Output invalid raw value (Page 146)
29	Output substitute value if raw value is invalid (Page 124)
30	Issuing last valid value if raw value is invalid (Page 127)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for channel blocks for field devices (Page 104).

Value	Meaning
16#80	Valid value
16#60	Simulation
16#60	Last valid value
16#60	Substitute value
16#00	Invalid value

The worst signal status ST_Worst for the block is formed from the following parameters:

- LoadDir.ST
- LoadPre.ST
- LoadPV1_Li.ST
- CntRun.ST
- CntDir.ST
- PV1_Li.ST
- PV2_Li.ST

15.13.4 Error handling of Pcs7Cnt1

Error handling of Pcs7Cnt1

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Higher-level error

Overview of error numbers

The ErrorNum I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	There is no error.
21	Pulse counter overflow

Higher-level error

A higher-level error is displayed at the output parameters ModErr and Bad with 1 if the signal status in the high word of the input parameter Mode assumes the value 16#40.

In addition, at the output parameter PV_Li of the signal status, either 16#00 (in the event of an error) or 16#60 (in Simulation) is output.

15.13.5 Messaging of Pcs7Cnt1

Messaging

This block does not offer messaging.

15.13.6 I/Os of Pcs7Cnt1

I/Os of Pcs7Cnt1

Input parameters

Parameter	Meaning	Type	Default
Channel	Channel FM 350	INT	0
CmpV0	New comparison value 0	DINT	0
CmpV1	New comparison value 1	DINT	0
CmpV2	New comparison value 2	DINT	0
CmpV3	New comparison value 3	DINT	0
Connect	Connection value (WORD or DWORD)	ANY	
CtrlDO0	1 = Enable digital output DO	BOOL	1
CtrlDO1	1 = Enable digital output DO1 (FM 350-1 or FM 350-2 only, dosing mode)	BOOL	1
CtrlDO2	1 = Enable digital output DO2 (FM 350-2 only, dosing mode)	BOOL	1
CtrlDO3	1 = Enable digital output DO3 (FM 350-2 only, dosing mode)	BOOL	1
EnSetDn	1 = enable for setting in backward direction	BOOL	1
EnSetUp	1 = enable for setting in forward direction	BOOL	1
Feature	I/O for additional functions (Page 1684)	STRUCT • Bit 0: BOOL • ... • Bit 28: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 1 • 0 • 0
FlutEn	1 = Flutter suppression active	BOOL	0
FlutTmIn*	Flutter suppression time	INT	0
Laddr	Logical address FM 350	INT	0
LoadPv1*	Load counter	DINT	0
LoadPV1_Li	Load counter structured	AnaVal	
LoadDir*	1 = Load counter directly	DigVal	
LoadPre*	1 = Load prepared counter	DigVal	
MS	Maintenance status	DWORD	0

Parameter	Meaning	Type	Default
MS_Release	Release for maintenance	DigVal	
PV1En	1 = Counted value used	BOOL	1
PV2En	1 = Measured value used	BOOL	1
PV1_Unit	Unit of the current value	INT	
PV2_Unit	Unit of the measured value	INT	
RstOpErr	1 = Reset operator error	DigVal	
RstSync*	1 = Reset synchronization	DigVal	
ScalePV1	Range of the current count value	ScaVal	
ScalePV2	Range of current measured value	ScaVal	
SetDO0	1 = Open DO0	BOOL	1
SetDO1	1 = Open DO1 (FM 350-1 or FM 350-2 only, dosing mode)	BOOL	1
SetDO2	1 = Open DO2 (FM 350-2 only, dosing mode)	BOOL	1
SetDO3	1 = Open DO3 (FM 350-2 only, dosing mode)	BOOL	1
SimPV1	Simulation count value	AnaVal	0
SimPv2	Simulation measured value	AnaVal	0
SimON	1 = simulation active	DigVal	0
Stopgate	1 = General GATE stop	BOOL	0
StopGate	1 = Stop gate	BOOL	1
SubsPV1	Count substitute value	DINT	0
SubsPV2	Measured substitute value	DINT	0
SubsOn	1 = substitute value active	BOOL	0
SwGateEn	1 = Enable SW-TOR	BOOL	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Meaning	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Operating mode	DWORD	0

Output parameters

Parameter	Meaning	Type	Default
Bad	1 = invalid values	DigVal	
CmpValL0	1 = comparison value 1	BOOL	0
CmpVal1	1 = comparison value 2	BOOL	0
CmpVal2	1 = comparison value 3	BOOL	0
CmpVal3	1 = comparison value 4	BOOL	0
CntDir	Direction counter	DigVal	
CntRun	1 = status counter working	DigVal	
CntSync	1 = status counter synchronized	BOOL	0
ErrorNum	Parameter error	INT	-1
IntGate	1 = Status of internal TOR	BOOL	0
ModErr	1 = higher-level error	DigVal	
PV1	Current load or LATCH value/current measured value	DINT	0
PV1CycLi	Pulses per cycle	AnaVal	
PV1_Li	Current count value structured	AnaVal	
PV1_UnitLi	Unit of the current count value	INT	
PV2	Current measured value	DINT	0
PV2_Li	Measured value structured	AnaVal	
PV2_UnitLi	Unit of the measured value	INT	
NewLatch	1 = new LATCH value (in clock-synchronous mode only)	BOOL	0
OpErr	1 = operator error	BOOL	0
OosAct	Field device out of service, maintenance	DigVal	
OFlow	1 = status overflow	BOOL	0
RstSync	1 = Reset synchronization	DigVal	
ScalePV1_Li	Range of current counter values	ScaVal	
ScalePV2_Li	Range of the measured values	ScaVal	
SetDi	1 = status digital input DI set	BOOL	0
SimAct	1 = simulation values	DigVal	
StartDI	1 = digital input DI start	BOOL	0
StCmpV0	1 = Saved status of comparator 1	BOOL	0
StCmpV1	1 = Saved status of comparator 2	BOOL	0
StCmpV2	1 = Saved status of comparator 3;	BOOL	0
StCmpV3	1 = Saved status of comparator 4;	BOOL	0
StopDI	1 = status digital input DI stop	BOOL	0
ST_Worst	Worst signal status	BYTE	16#80
SwGate	1 = Software gate	BOOL	0
UFlow	1 = status underflow	BOOL	0
ZeroSt	1 = status zero crossing	BOOL	0

See also

Functions of Pcs7Cnt1 (Page 1684)

15.13.7 Block diagram of Pcs7Cnt1

Block diagram of Pcs7Cnt1

A block diagram is not provided for this block.

15.14 Pcs7Cnt2 Control and read an 8-DI_NAMUR module of the ET 200iSP

15.14.1 Description of Pcs7Cnt2

Object name (type + number)

Type + number: FB 1834

Family: Channel

Area of application

The Pcs7Cnt2 block is used to control and read a count or frequency value from an 8-DI NAMUR module of the ET 200iSP. The block supports the following configurations of the module:

- 2 counters or 1 counter cascaded
- 2 frequency measurements

How it works

Depending on the mode setting of the module in HW Config, the user data of the module are stored in the process image. The Pcs7Cnt2 block differentiates between the following modes:

MODE (low word)	Operating mode	HW Config setting: "Configuration"	HW Config setting: "Channel (0 to 1) mode"
1	Counter (16 bits) without control function by means of digital signals	(Channel 0 to 1): COUNT(Channel 2 to 7): DI	Periodic or normal count functions (up or down counter)
2	Counter (32 bits) without control function by means of digital signals	(Channel 0 to 1): COUNT(Channel 2 to 7): DI	Cascade function (channel 0 only) (down counter)
3	Counter (16 bits) with control function by means of digital signals	(Channel 0 to 1): COUNT (Channel 2 to 7): CONTROL	Periodic or normal count functions (up or down counter)
4	Counter (32 bits) with control function by means of digital signals	(Channel 0 to 1): COUNT (Channel 2 to 7): CONTROL	Cascade function (channel 0 only) (down counter)
5	Frequency (16 bits)	(Channel 0 to 1): TRACE (Channel 2 to 7): DI	-

The driver generator sets the module mode configured in HW Config at the `MODE` input of the `MOD_D1` block on the appropriate channel of the module. The `Mode` input indicates in what format the count or frequency value is available in the process image. If the high word of the input parameter `MODE = 16#40xxxx` (value status = higher-level error, `ModErr = 1`), the count or frequency value is treated as invalid.

Depending on the mode, either two independent counters (16 bits) or one counter (32 bits) exist in the process image. The `Channel` input specifies the module counter for which the block is responsible.

The counter functions can be controlled by signals that can be influenced both over the digital inputs of the module or over the user data of the process image.

Note

Please note that the signals of the digital inputs are ORed with the equivalent signals from the PIO in the module.

The following signals are available:

Block input	Module	Meaning
-	Z1	Counter pulse counter 1
-	Z2	Counter pulse counter 2
`StopGate (Channel = 0)`	TOR1	With the active GATE signal, an active count operation can be interrupted. The GATE = "1" signal stops the count operation despite pending count pulses. At the same time, the assigned output is deactivated if it was active. This state remains until the GATE signal is set to "0". The output is brought to the previous state and the count operation is continued. The GATE signal is subordinate to the RSO and RSC signals, in other words, the RSO and RSC signals have the effect described above regardless of an active GATE signal.
`StopGate (Channel = 1)`	TOR2	See description of "GATE 1"
`RstPV1 (Channel = 0)`	RSZ1	The rising edge of the RSC signal sets the count of the assigned channel as follows: • When counting up (normal counter function), back to zero • When counting down (periodic counter function and cascade function), to the defined setpoint When counting down (periodic counter function and cascade function), any output that is set is also reset.
`RstPV1 (Channel = 1)`	RSZ2	See description of "RSC1"
`RstDO (Channel = 0)`	RSA1	On the rising edge of the RSO signal, the assigned output can be reset. The count is not influenced by setting RSO.
`Rst_DO (CHANNEL = 1)`	RSA2	See description of "RSO2"

The in/out parameters `RstPV1` and `RstDO` are always reset to zero. After resetting, the earliest point at which a renewed reset will be possible is in the next cycle but one (rising edge).

The count value or frequency value and their states are stored in the process image as shown below and are indicated at the following block outputs:

Bytes	Bit	Input signal	Block output	Meaning
0, 1	0-15	Proc. value counter 1	`PV1_Li`	16-bit counter 1 or 32-bit counter (bytes 0 to 3) or frequency value 1
2, 3	0-15	Proc. value counter 2		16-bit counter 2 (only with 16-bit counter 1) or frequency value 2
4	0	A 1	`ZeroSt`	Zero crossing counter 1
	1	A2		Zero crossing counter 2
	2	TOR 1	`PV1`	Status gate 1
	3	TOR 2		Status gate 2
	4	RSZ1	`SimAct`	Status reset counter 1
	5	RSZ2		Status reset counter 2
	6	RSA1	`RstDO_Out`	Status reset outputs counter 1
	7	RSA2		Status reset outputs counter 2

The LoadPV1 parameter is always written to the process image. Depending on the mode set with HW Config, it is either the 16-bit or 32-bit setpoint (down counter) or the count limit (up counter).

Depending on the mode setting, only the following integer values of LoadPV1 or LoadPV1_Li are transferred to the module based on the status at LoadPV1_Li:

- 16-bit counter: 0 to 65 535
- 32-bit counter: 0 to 2 147 483 647

If the value for LoadPV1 or LoadPV1_Li is outside of these limits, the last valid value of LoadPV1 or LoadPV1_Li is retained in the module and OpErr = 1 is set.

The block also supplies the counted pulses of PV1(PV1_Li) at the PV1CycLi output with each block call.

The PV1_UnitLi and ScalePV1_Li outputs are written with the inputs of the same name PV1_Unit and ScalePV1.

The LoadPV1 input parameter is the relevant value which is passed to the module. If, however, LoadPV1_Li is interconnected or the status of LoadPV1_Li is 16#80 , the value is written to LoadPV1 and applied.

Configuration

The following actions are executed automatically with the "**Generate module drivers**" CFC function:

- The Laddr, Laddr1, Channel inputs are configured.
- The Mode input is interconnected with the OMODEx output of the MOD_D1 block.
- The DataXchg input is interconnected to the relevant DXCHG_00 output of the MOD_D1 block.
- The MS input is interconnected to the relevant O_MS output of the MOD_D1 block.

Note

In HW Config, it is possible to assign only digital signals DI2 to DI7 of the module (HW Config channel 2 to 7 = DI) instead of the control signals TOR 1 to RSA2. In this configuration of the DI NAMUR module, the states of outputs PV1, Zero, SimAct and RstDo_Out are based on the inputs of the block.

When using the digital control signals TOR 1 to RSA2 of the module (HW Config channel 2 to 7 = CONTROL), conflicts with the block digital signals may arise depending on the signal state. In this case, the digital signals do not take effect. If you want control over the block, you must not assign the control signals in HW Config.

Example:

Module	Block	Has the effect	
TOR 1 = 1	StopGate = 0		TOR on
TOR 1 = 0	StopGate = 1		TOR on
TOR 1 = 0	StopGate = 0		TOR off

Status word allocation

This block does not have the `Status` parameter.

See also

I/Os of Pcs7Cnt2 (Page 1698)

15.14.2 Operating modes of Pcs7Cnt2

Operating modes of Pcs7Cnt2

This block does not have any modes.

15.14.3 Functions of Pcs7Cnt2

Functions of Pcs7Cnt2

The functions for this block are listed below.

Addressing

You need to assign parameters for three Feature bits for the response to an invalid raw value for the channel blocks.

If more than one of these Feature bits are set (=1), the following priority applies:

- Output invalid raw value (Feature bit 28 = highest priority)
- Output substitute value if raw value is invalid (Feature bit 29)
- Output the last valid value if raw value is invalid (Feature bit 30, lowest priority)

You must connect the icon (from the icon table) for the count or frequency value with the `Connect` input parameter.

Simulation

The block provides the standard function Simulating signals (Page 47)

With `SimOn = 1` , the simulation values `SimPV1` and `SimPV2` are written to the outputs `PV1`, `PV1_Li` as well as `PV2` and `PV2_Li` . The status of the outputs is set to 16#60 and `Bad = 1` in the process.

Simulation takes highest priority.

If the block is in simulation state, `SimAct = 1` is set.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the chapter Configurable functions with the Feature I/O (Page 131). The following functionality is available for this block at the relevant bits:

Bit	Function
28	Output invalid raw value (Page 146)
29	Output substitute value if raw value is invalid (Page 124)
30	Issuing last valid value if raw value is invalid (Page 127)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for channel blocks for field devices (Page 104).

Value	Meaning
16#80	Valid value
16#60	Simulation
16#60	Last valid value
16#60	Substitute value
16#00	Invalid value

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `LoadPV1_Li.ST`
- `PV1_Li.ST`
- `RstDO.ST`
- `RstPV1.ST`

Redundancy

The higher-level MOD_D1 block evaluates the redundancy of DP master systems operating in an H system.

15.14.4 Error handling of Pcs7Cnt2

Error handling of Pcs7Cnt2

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers
- Higher-level error

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	No active fault
21	Pulse counter overflow

Higher-level error

A higher-level error is displayed at the output parameters `ModErr` and `Bad` with 1 if the signal status in the high word of the input parameter `Mode` assumes the value 16#40.

In addition, at the output parameter `PV_Li` of the signal status, either 16#00 (in the event of an error) or 16#60 (in Simulation) is output.

15.14.5 Messaging of Pcs7Cnt2

Messaging

This block does not offer messaging.

15.14.6 I/Os of Pcs7Cnt2

I/Os of CH_CNT2

Input parameters

Parameter	Meaning	Type	Default
Channel	Channel 8 DI NAMUR (outputs)	INT	0
Connect	Connects values	ANY	
`Feature`	I/O for additional functions (Page 1695)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 28: BOOL	• 1
		• ...	• 0
		• Bit 31: BOOL	• 0
FlutTmIn*	Flutter suppression time	INT	0
Laddr	Logical address (outputs)	INT	0
Laddr1	Logical address (outputs)	INT	0
LoadPV1*	Counter load value	DINT	0
LoadPV1_Li	Counter load value structured	STRUCT	
MS	Maintenance status	DWORD	0
MS_Release	Release for maintenance	DigVal	
PV1_Unit	Unit of the current value	INT	
RstDO*	1 = Reset digital outputs	DigVal	
RstPV1*	1 = Reset counter	DigVal	
ScalePV1	Range of the current count value	ScaVal	
SimOn	1 = simulation active	DigVal	
SimPV1	Simulation value	AnaVal	
StopGate	1 = Stop gate	BOOL	1
SubsPV1	Substitute value	DINT	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Meaning	Type	Default
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0
Mode	Operating mode	DWORD	0

Output parameters

Parameter	Meaning	Type	Default
Bad	1 = invalid values	DigVal	
ErrorNum	Parameter error	INT	-1
Gate	1 = TOR on	BOOL	0
ModErr	1 = higher-level error	DigVal	
OosAct	Field device out of service, maintenance is taking place	DigVal	
OpErr	1 = operator error	BOOL	0
PV1	Current count value/frequency value	DINT	0
PV1CycLi	Pulses per cycle	AnaVal	
PV1_Li	Current count value structured	AnaVal	
PV1_UnitLi	Unit of the current count value	INT	
RstDO_Out	1 = Reset digital outputs	BOOL	0
RstPV1_Out	1 = Reset counter	BOOL	0
ScalePV1_Li	Range of the current count value	ScaVal	
SimAct	1 = Simulation active	DigVal	
ST_Worst	Worst signal value	BYTE	16#80
ZeroSt	1 = status zero crossing	BOOL	0

See also

Functions of Pcs7Cnt2 (Page 1695)

15.14.7 Block diagram of Pcs7Cnt2

Block diagram of Pcs7Cnt2

A block diagram is not provided for this block.

15.15 Pcs7Cnt3: Control and read the 1 COUNT 24V/100kHz module for count mode

15.15.1 Description of Pcs7Cnt3

Object name (type + number)

Type + number: FB 1835

Family: Channel

Area of application

The block is used to control and read count, measured and latch values of the "1 COUNT 24V/100kHz" module (as of 6ES7 138-4DA04-0AB0) for the count and measurement modes.

How it works

The block communicates via the process image. The data are written and read continuously.

In `Mode` 1- 3, the `LoadVal` parameter is sent to the module when a positive edge is detected either at the `LoadPre` in/out parameter (= load counter in preparation) or `LoadDir` (= load counter immediately). The parameters `CmpV1` (comparison value 1) and `CmpV2` (comparison value 2) are transferred to the module when they are changed and during startup.

In `Mode` 4- 6, the parameters `UFlowLi`(low limit) and `OFlowLi` (high limit) are transferred to the module when they are changed and during startup.

Depending on the mode setting of the module in HW Config, the user data of the module is stored in the process image. The block distinguishes between the following modes:

MODE (LowWord)	Operating mode	Description
1	Continuous counting	The 1Count24V/100kHz counts continuously from the load value in this mode
2	One-time counting	In this mode, 1Count24V/100kHz counts once, depending on the configured main counting direction
3	Periodic counting	In this mode, 1Count24V/100kHz counts periodically, depending on the configured main counting direction
4	Frequency measurement	1Count24V/100kHz determines the frequency of the pulse sequence at the input
5	Speed measurement	1Count24V/100kHz determines the speed of the device connected to the input
6	Period duration measurement	1Count24V/100kHz determines the pulse length of the pulse sequence at the input

The `Mode` input indicates the format in which the count and latch value or the count and measured value is available in the process image. If the high byte of input/output parameter is `Mode = 16#40` (value status = higher-level error, `ModErr = 1`), the count, measured and latch values are treated as invalid.

The states `PV1_sync` (synchronization), `CmpVal0` (comparator 0), `CmpVal1` (comparator 1), `OFlow` (overflow), `Uflow` (underflow) and `ZeroSt` (zero crossing) are acknowledged automatically by the block. They are active for at least one cycle.

The block also supplies the counted pulses of `PV1`(`PV1_Li`) at the `PV1CycLi` output with each block call.

The units for `PV1_UnitLi`, `ScalePV1_Li`, `PV2_UnitLi` and `ScalePV2_Li` are set with the `PV1_Unit`, `ScalePV1`, `PV2_Unit` and `ScalePV2` inputs of the same name.

The `LoadPV1` input parameter is the relevant value which is passed to the module. If, however, `LoadPV1_Li` is interconnected or the status of `LoadPV1_Li` is 16#80 , the value is written to `LoadPV1` and applied.

Calling OBs

OB100 and cyclic OB (recommendation 100 ms) in which the data will be received and sent.

Configuration

Connect the symbol (from the symbol table) for the count value with the `Connect` input parameter. You need to enter the symbol (Symbol column) in the symbol table and the supplement the row in the Address column with the ED base address of the module (e.g. ED512). When the CFC function "Generate module drivers" is used, the following occurs automatically:

- The `Laddr` input is configured.
- The `Mode` input is interconnected to the `OMODE_00`output of the MOD_D1 block.
- The `DataXchg` input is interconnected to the relevant `DXCHG_00` output of the MOD_D1 block.
- The `MS` input is interconnected to the relevant `O_MS` output of the MOD_D1 block.

Startup characteristics

In `Mode` 1-3, the parameters `CmpV1` (comparison value 1) and `CmpV2` (comparison value 2) are transferred to the module during startup.

In `Mode` 4-6, the parameters `UflowLi` (low limit) and `OFlowLi` (high limit) are transferred to the module during startup .

Status word allocation

This block does not have the `Status` parameter.

See also

I/Os of Pcs7Cnt3 (Page 1705)

15.15.2 Operating modes of Pcs7Cnt3

Operating modes of Pcs7Cnt3

This block does not have any modes.

15.15.3 Functions of Pcs7Cnt3

Functions of Pcs7Cnt3

The functions for this block are listed below.

Addressing

Connect the symbol (from the symbol table) for the count value with the `Connect` input parameter.

You need to enter the symbol (Symbol column) in the symbol table and the supplement the row in the Address column with the ED base address of the module (e.g. ED512).

Simulation

The block provides the standard function Simulating signals (Page 47)

With `SimOn = 1` , the simulation values `SimPV1` and `SimPV2` are written to the outputs `PV1`, `PV1_Li` as well as `PV2` and `PV2_Li` . The status of the outputs is set to 16#60 and `Bad = 1` in the process.

Simulation takes highest priority.

If the block is in simulation state, `SimAct = 1` is set.

Flutter suppression

This block provides the standard function Flutter suppression for channel blocks (Page 55).

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
28	Output invalid raw value (Page 146)
29	Output substitute value if raw value is invalid (Page 124)
30	Issuing last valid value if raw value is invalid (Page 127)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for channel blocks for field devices (Page 104).

Value	Meaning
16#80	Valid value
16#60	Simulation
16#60	Last valid value
16#60	Substitute value
16#00	Invalid value

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `LoadPV1_Li.ST`
- `PV1_Li.ST`
- `PV2_Li.ST`

15.15.4 Error handling of Pcs7Cnt3

Error handling of Pcs7Cnt3

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Higher-level error
- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	No active fault
21	Pulse counter overflow

Higher-level error

A higher-level error is displayed at the output parameters `ModErr` and `Bad` with 1 if the signal status in the high word of the input parameter `Mode` assumes the value 16#40.

In addition, at the output parameter `PV_Li` of the signal status, either 16#00 (in the event of an error) or 16#60 (in Simulation) is output.

15.15.5 MessagingPcs7Cnt3

Messaging

This block does not offer messaging.

15.15.6 I/Os of Pcs7Cnt3

I/Os of Pcs7Cnt3

Input parameters

Parameter	Meaning	Type	Default
AckTrip	1 = Error detected	BOOL	0
CmpV1	Comparison value 1	DINT	0
CmpV2	Comparison value 2	DINT	0
Connect	Connection value	DWORD	
CtrlDO1	1=Enable DO1	BOOL	1
CtrlDO2	1=Enable DO2	BOOL	1
CtrlSyncEn	1=enable synchronization	BOOL	0
Feature	I/O for additional functions (Page 1702)	STRUCT	-
		• Bit 0: BOOL	• 0
		• ...	• 0
		• Bit 28: BOOL	• 1
		• ...	• 0
		• Bit 31: BOOL	• 0
FlutEn	1 = Flutter suppression active		
FlutTmIn*	Flutter suppression time	INT	0
Laddr	Logic address of the module	INT	0
LoadPV1*	Load counter	DINT	0
LoadPV1_Li	Load counter structured	STRUCT	

Parameter	Meaning	Type	Default
LoadDir	1 = Load counter directly	DigVal	
LoadPre	1 = Load prepared counter	DigVal	
MS	Maintenance status	DWORD	0
MS_Release	Release for maintenance	DigVal	
PV1_Unit	Unit of the current value	INT	
PV2_Unit	Unit of the measured value	INT	
OFlow*	High limit	DINT	0
OFlowLi	High limit structured	AnaVal	
ScalePV1	Range of the current count value	ScaVal	
ScalePV2	Range of current measured value	ScaVal	
SetDO1	1= Open DO1	BOOL	0
SetDO2	1= Open DO2	BOOL	0
SimPV1	Simulation count value	AnaVal	
SimPV2	Simulation measured value/simulation latch value	AnaVal	
SimOn	1= simulation on	BOOL	0
SubsPV1	Count substitute value	DINT	0
SubsPV2	Measured/latch substitute value	DINT	0
SwGateEn	1= enable software gate	BOOL	0
UFlow*	Low limit	DINT	0
UFlowLi	Low limit structured	AnaVal	

* Values can be written back to these inputs during processing of the block by the block algorithm.

In/out parameters

Parameter	Meaning	Data type	Default
Mode	Operating mode	DWORD	0
DataXchg	Bidirectional data exchange channel (xx = 00 - 15) Bit = 0: Release for maintenance Bit1 Byte0: Flutter suppression Bit2 to Bit7 Byte0: Reserved Byte 1: Reserved Byte 2: Reserved Byte 3: Fluttering time	DWORD	0

Output parameters

Parameter	Meaning	Data type	Default
Bad	1 = invalid process value	DigVal	
CmpVal1	1 = status of comparator 1	BOOL	0
CmpVal2	1 = status of comparator 2	BOOL	0
DO1St	1 = status DO1	BOOL	0
DO1Err	1= short circuit / wire break / overtemperature	BOOL	0
DO2St	1 = status DO2	BOOL	0
ErrorNum	Error message	INT	-1
IntGate	1 = status of internal gate	BOOL	0
LoadErr	1= error in load function	BOOL	0
ModErr	1= higher-level error	DigVal	
OFlowSt	1 = high count value	BOOL	0
OosAct	Field device out of service, maintenance is taking place	DigVal	
ParaErr	1= parameter assignment error	BOOL	0
PV1	Current count value	DINT	0
PV1CycLi	Pulses per cycle	AnaVal	
PV1_Down	1 = status direction down	BOOL	0
PV1_Li	Current count value structured	AnaVal	
PV1_UnitLi	Unit of the current count value	INT	
PV1_Up	1 = status direction up	BOOL	0
PV1_Sync	1 = Count synchronous	BOOL	0
PV2	Measured value/latch value	DINT	0
PV2_Li	Structured measured value/latch value	AnaVal	
PV2_UnitLi	Unit of the measured value	INT	
ScalePV1_Li	Range of the current count value	ScaVal	
ScalePV2_Li	Range of current measured values/latch values	ScaVal	
SetDI	1 = Set digital input	BOOL	0
SimAct	1= simulation active	DigVal	
ST_Worst	Worst signal status	BYTE	16#80
UFlowSt	1 = low count value	BOOL	0
V24Err	1= short circuit sensor power supply	BOOL	0
ZeroSt	1= status zero crossing	BOOL	0

See also

Functions of Pcs7Cnt3 (Page 1702)

15.15.7 Block diagram of Pcs7Cnt3

Block diagram of Pcs7Cnt3

A block diagram is not provided for this block.

15.16 Annex for channel blocks

15.16.1 Mode Settings for SM Modules

Mode Structure

The structure and meaning of the input Mode of data type DWORD are shown below:

Byte 3:	16#80: Value status "valid value" 16#00: Value status "invalid value" 16#40: Value status "invalid value"	 (Channel error) (Higher-level error)
Byte 2:	16#01: Restart (OB 100) has been carried out 16#02: Measuring range high limit violated 16#04: Measuring range low limit violated 16#xy: Variant identification with multiple mode assignment (see below)	 (Channel-error diagnostics) (Channel-error diagnostics)
Byte 1, 0 (low word):	Measuring range coding (see below)	

Example:

16#80010203 = value status "valid value", restart has been carried out, current 4 mA to 20mA

Mode: 16#090C and variant

Variant	x	y	Measuring range
0	0	0,1,2,4	Ni 120 standard range
1	1	0,1,2,4	KTY84/110

Mode: 16#090D and variant

Variant	x	y	Measuring range
0	0	0,1,2,4	Ni 120 climate range
1	1	0,1,2,4	KTY84/130

Mode: 16#07 (Coding A) and variant

Variant	x	y	Measuring range
0	0	0,1,2,4	HART interface
1	1	0,1,2,4	Thermocouple, dynamic reference temperature

Measuring range coding of the analog input modules

Depending on the measuring range coding of the analog input modules, the parameter `Mode` (low word = measuring range coding) corresponding to the channel must be specified in accordance with the table. When thermocouples are used there are various options for combining the measurement type (coding A) with the measuring range (coding B). In this case, the low word of parameter `Mode` must be calculated according to the following formula and the result entered at the Mode input parameter as an INTEGER value:

Measuring range coding = 256 · Code A + Code B

Please note: The table shows codes **A** and **B** in binary format, and the measuring range coding as a hexadecimal number as the result.

Measuring type	Code (A)	Measuring range	Code(B)	`Messberiechskodierung` (256*A+B)
Deactivated				16#0000
Voltage	2#0001	± 25 mV	2#1010	16#010A
		± 50mV	2#1011	16#010B
		± 80 mV	2#0001	16#0101
		± 250 mV	2#0010	16#0102
		± 500 mV	2#0011	16#0103
		± 1 V	2#0100	16#0104
		± 2,5 V	2#0101	16#0105
		± 5 V	2#0110	16#0106
		1 to 5V	2#0111	16#0107
		0 to 10V	2#1000	16#0108
		± 10 V	2#1001	16#0109
		± 100 mV	2#1100	16#010C
4-wire measuring transducer	2#0010	± 3.2 mA	2#0000	16#0200
		± 5 mA	2#0101	16#0205
		± 10 mA	2#0001	16#0201
		0 to 20 mA	2#0010	16#0202
		4 to 20 mA	2#0011	16#0203
		± 20 mA	2#0100	16#0204
HART interface	2#0111	4 to 20 mA (variant 0)	2#1100	16#070C
2-wire measuring transducer	2#0011	0 to 20 mA *1	2#0010	16#0302
		4 to 20 mA	2#0011	16#0303
		± 20 mA	2#0100	16#0304

Measuring type	Code (A)	Measuring range	Code(B)	`Messberiechskodierung` (256*A+B)
Resistor 4-wire connection	2#0100	48 Ω	2#0000	16#0400
		150 Ω	2#0010	16#0402
		300 Ω	2#0100	16#0404
		600 Ω	2#0110	16#0406
		1000 Ω	2#0111	16#040E
		3000 Ω	2#0111	16#0407
		6000 Ω	2#1000	16#0408
		PTC	2#1111	16#040F
Resistor 3-wire connection	2#0101	48 Ω	2#0000	16#0500
		150 Ω	2#0010	16#0502
		300 Ω	2#0100	16#0504
		600 Ω	2#0110	16#0506
		1000 Ω	2#0111	16#050E
		3000 Ω	2#0111	16#0507
		6000 Ω	2#1000	16#0508
		PTC	2#1111	16#050F
Resistor 2-wire connection	2#0110	48 Ω	2#0000	16#0600
		150 Ω	2#0010	16#0602
		300 Ω	2#0100	16#0604
		600 Ω	2#0110	16#0606
		1000 Ω	2#0111	16#060E
		3000 Ω	2#0111	16#0607
		6000 Ω	2#1000	16#0608
		PTC	2#1111	16#060F
Thermocouple, linear, 4-wire connection	2#1000	Pt 100 climate range	2#0000	16#0800
		Pt 200 climate range	2#0111	16#0807
		Pt 500 climate range	2#1000	16#0808
		Pt 1000 climate range	2#1001	16#0809
		Ni 100 climate range	2#0001	16#0801
		Ni 1000 / LG-Ni 1000 climatic range	2#1010	16#080A
		Pt 100 standard range	2#0010	16#0802
		Pt 200 standard range	2#0011	16#0803
		Pt 500 standard range	2#0100	16#0804
		Pt 1000 standard range	2#0101	16#0805
		Ni 100 standard range	2#1011	16#080B
		Ni 1000 / LG-Ni 1000 standard range	2#0110	16#0806
		Ni 120 standard range	2#1100	16#080C
		Ni 120 climate range	2#1101	16#080D
		Cu 10 climate range	2#1110	16#080E
		Cu 10 standard range	2#1111	16#080F

Measuring type	Code (A)	Measuring range	Code(B)	Messberiechskodierung (256*A+B)
		Ni 200 standard range	2#10000	16#0810
		Ni 200 climate range	2#10001	16#0811
		Ni 500 standard range	2#10010	16#0812
		Ni 500 climate range	2#10011	16#0813
		Pt 10 GOST climatic	2#10100	16#0814
		Pt 10 GOST standard (TC = 3910)	2#10101	16#0815
		Pt 50 GOST climatic	2#10110	16#0816
		Pt 50 GOST standard (TC = 3910)	2#10111	16#0817
		Pt 100 GOST climatic	2#11000	16#0818
		Pt 100 GOST standard (TC = 3910)	2#11001	16#0819
		Pt 500 GOST climatic	2#11010	16#081A
		Pt 500 GOST standard (TC = 3910)	2#11011	16#081B
		Cu 10 GOST climatic	2#11100	16#081C
		Cu 10 GOST standard (TC = 426)	2#11101	16#081D
		Cu 50 GOST climatic	2#11110	16#081E
		Cu 50 GOST standard (TC= 426)	2#11111	16#081F
		Cu 100 GOST climatic	2#100000	16#0820
		Cu 100 GOST standard (TC= 426)	2#100001	16#0821
		Ni 100 GOST climatic	2#100010	16#0822
		Ni 100 GOST standard	2#100011	16#0823
		Pt 10 GOST standard (TC = 3850)	2#1010101	16#0855
		Pt 50 GOST standard (TC = 3850)	2#1010111	16#0857
		Pt 100 GOST standard (TC = 3850)	2#1011001	16#0859
		Pt 500 GOST standard (TC = 3850)	2#1011011	16#085B
		Cu 10 GOST standard (TC= 428)	2#10011101	16#089D
		Cu 50 GOST standard (TC= 428)	2#10011111	16#089F
		Cu 100 GOST standard (TC= 428)	2#10100001	16#08A1
Thermocouple, linear, 3-wire connection	2#1001	Pt 100 climate range	2#0000	16#0900
		Pt 200 climate range	2#0111	16#0907
		Pt 500 climate range	2#1000	16#0908

Measuring type	Code (A)	Measuring range	Code(B)	`Messberiechskodierung` (256*A+B)
		Pt 1000 climate range	2#1001	16#0909
		Ni 100 climate range	2#0001	16#0901
		Ni 1000 / LG-Ni 1000 climatic range	2#1010	16#090A
		Pt 100 standard range	2#0010	16#0902
		Pt 200 standard range	2#0011	16#0903
		Pt 500 standard range	2#0100	16#0904
		Pt 1000 standard range	2#0101	16#0905
		Ni 100 standard range	2#1011	16#090B
		Ni 1000 / LG-Ni 1000 standard range	2#0110	16#0906
		Ni 120 standard range (variant 0) KTY83/110 (variant 1)	2#1100	16#090C
		Ni 120 climate range (variant 0) KTY84/130 (variant 1)	2#1101	16#090D
		Cu 10 climate range	2#1110	16#090E
		Cu 10 standard range	2#1111	16#090F
		Ni 200 standard range	2#10000	16#0910
		Ni 200 climate range	2#10001	16#0911
		Ni 500 standard range	2#10010	16#0912
		Ni 500 climate range	2#10011	16#0913
		Pt 10 GOST climatic	2#10100	16#0914
		Pt 10 GOST standard (TC = 3910)	2#10101	16#0915
		Pt 50 GOST climatic	2#10110	16#0916
		Pt 50 GOST standard (TC = 3910)	2#10111	16#0917
		Pt 100 GOST climatic	2#11000	16#0918
		Pt 100 GOST standard (TC = 3910)	2#11001	16#0919
		Pt 500 GOST climatic	2#11010	16#091A
		Pt 500 GOST standard (TC = 3910)	2#11011	16#091B
		Cu 10 GOST climatic	2#11100	16#091C
		Cu 10 GOST standard (TC= 426)	2#11101	16#091D
		Cu 50 GOST climatic	2#11110	16#091E
		Cu 50 GOST standard (TC= 426)	2#11111	16#091F
		Cu 100 GOST climatic	2#100000	16#0920
		Cu 100 GOST standard (TC= 426)	2#100001	16#0921

Measuring type	Code (A)	Measuring range	Code(B)	Messberiechskodierung (256*A+B)
		Ni 100 GOST climatic	2#100010	16#0922
		Ni 100 GOST standard	2#100011	16#0923
		Pt 10 GOST standard (TC = 3850)	2#1010101	16#0955
		Pt 50 GOST standard (TC = 3850)	2#1010111	16#0957
		Pt 100 GOST standard (TC = 3850)	2#1011001	16#0959
		Pt 500 GOST standard (TC = 3850)	2#1011011	16#095B
		Cu 10 GOST standard (TC= 428)	2#10011101	16#099D
		Cu 50 GOST standard (TC= 428)	2#10011111	16#099F
		Cu 100 GOST standard (TC= 428)	2#10100001	16#09A1
Thermocouple, linear, 2-wire connection	2#1111	Pt 100 climate range	2#0000	16#0F00
		Pt 200 climate range	2#0111	16#0F07
		Pt 500 climate range	2#1000	16#0F08
		Pt 1000 climate range	2#1001	16#0F09
		Ni 100 climate range	2#0001	16#0F01
		Ni 1000 / LG-Ni 1000 climatic range	2#1010	16#0F0A
		Pt 100 standard range	2#0010	16#0F02
		Pt 200 standard range	2#0011	16#0F03
		Pt 500 standard range	2#0100	16#0F04
		Pt 1000 standard range	2#0101	16#0F05
		Ni 100 standard range	2#1011	16#0F0B
		Ni 1000 / LG-Ni 1000 standard range	2#0110	16#0F06
		Ni 120 standard range	2#1100	16#0F0C
		Ni 120 climate range	2#1101	16#0F0D
		Cu 10 climate range	2#1110	16#0F0E
		Cu 10 standard range	2#1111	16#0F0F
		Ni 200 standard range	2#10000	16#0F10
		Ni 200 climate range	2#10001	16#0F11
		Ni 500 standard range	2#10010	16#0F12
		Ni 500 climate range	2#10011	16#0F13
Thermocouple, linear, reference temperature 0 ºC / No reference point	2#1010	Type B [PtRh-PtRh]	2#0000	16#0A00
		Type N [NiCrSi-NiSi]	2#0001	16#0A01
		Type E [NiCr-CuNi]	2#0010	16#0A02
		Type R [PtRh-Pt]	2#0011	16#0A03
		Type S [PtRh-Pt]	2#0100	16#0A04

Measuring type	Code (A)	Measuring range	Code(B)	`Messberiechskodierung` (256*A+B)
		Type J [Fe-CuNi IEC]	2#0101	16#0A05
		Type L [Fe-CuNi DIN]	2#0110	16#0A06
		Type T [Cu-CuNi IEC]	2#0111	16#0A07
		Type K [NiCr-Ni]	2#1000	16#0A08
		Type U [Cu-CuNi DIN]	2#1001	16#0A09
		Type C	2#1010	16#0A0A
		Type TXK/XK(L)	2#1011	16#0A0B
Thermocouple, linear, reference temperature 50 ºC	2#1011	Type B [PtRh-PtRh]	2#0000	16#0B00
		Type N [NiCrSi-NiSi]	2#0001	16#0B01
		Type E [NiCr-CuNi]	2#0010	16#0B02
		Type R [PtRh-Pt]	2#0011	16#0B03
		Type S [PtRh-Pt]	2#0100	16#0B04
		Type J [Fe-CuNi IEC]	2#0101	16#0B05
		Type L [Fe-CuNi DIN]	2#0110	16#0B06
		Type T [Cu-CuNi IEC]	2#0111	16#0B07
		Type K [NiCr-Ni]	2#1000	16#0B08
		Type U [Cu-CuNi DIN]	2#1001	16#0B09
		Type C	2#1010	16#0B0A
		Type TXK/XK(L)	2#1011	16#0B0B
Thermocouple, fixed ref. temp	2#1100	Type B [PtRh-PtRh]	2#0000	16#0C00
		Type N [NiCrSi-NiSi]	2#0001	16#0C01
		Type E [NiCr-CuNi]	2#0010	16#0C02
		Type R [PtRh-Pt]	2#0011	16#0C03
		Type S [PtRh-Pt]	2#0100	16#0C04
		Type J [Fe-CuNi IEC]	2#0101	16#0C05
		Type L [Fe-CuNi DIN]	2#0110	16#0C06
		Type T [Cu-CuNi IEC]	2#0111	16#0C07
		Type K [NiCr-Ni]	2#1000	16#0C08
Thermocouple, linear, internal compensation/internal reference point	2#1101	Type B [PtRh-PtRh]	2#0000	16#0D00
		Type N [NiCrSi-NiSi]	2#0001	16#0D01
		Type E [NiCr-CuNi]	2#0010	16#0D02
		Type R [PtRh-Pt]	2#0011	16#0D03
		Type S [PtRh-Pt]	2#0100	16#0D04
		Type J [Fe-CuNi IEC]	2#0101	16#0D05
		Type L [Fe-CuNi DIN]	2#0110	16#0D06
		Type T [Cu-CuNi IEC]	2#0111	16#0D07
		Type K [NiCr-Ni]	2#1000	16#0D08
		Type U [Cu-CuNi DIN]	2#1001	16#0D09
		Type C	2#1010	16#0D0A
		Type TXK/XK(L)	2#1011	16#0D0B

Measuring type	Code (A)	Measuring range	Code(B)	`Messberiechskodierung` (256*A+B)
Thermocouple, linear, internal compensation/reference point RTD (0)	2#1110	Type B [PtRh-PtRh]	2#0000	16#0E00
		Type N [NiCrSi-NiSi]	2#0001	16#0E01
		Type E [NiCr-CuNi]	2#0010	16#0E02
		Type R [PtRh-Pt]	2#0011	16#0E03
		Type S [PtRh-Pt]	2#0100	16#0E04
		Type J [Fe-CuNi IEC]	2#0101	16#0E05
		Type L [Fe-CuNi DIN]	2#0110	16#0E06
		Type T [Cu-CuNi IEC]	2#0111	16#0E07
		Type K [NiCr-Ni]	2#1000	16#0E08
		Type U [Cu-CuNi DIN]	2#1001	16#0E09
		Type C	2#1010	16#0E0A
		Type TXK/XK(L)	2#1011	16#0E0B
Thermocouple, dynamic ref. temp	2#0111	Type B [PtRh-PtRh] (variant 1)	2#0000	16#0700
		Type N [NiCrSi-NiSi] (variant 1)	2#0001	16#0701
		Type E [NiCr-CuNi] (variant 1)	2#0010	16#0702
		Type R [PtRh-Pt] (variant 1)	2#0011	16#0703
		Type S [PtRh-Pt] (variant 1)	2#0100	16#0704
		Type J [Fe-CuNi IEC] (variant 1)	2#0101	16#0705
		Type L [Fe-CuNi DIN] (variant 1)	2#0110	16#0706
		Type T [Cu-CuNi IEC] (variant 1)	2#0111	16#0707
		Type K [NiCr-Ni] (variant 1)	2#1000	16#0708

*1: This measuring range is only supported by F channel blocks.

Effect of the temperature coefficients on the measuring range

- Setting TC = 3850 at GOST Standard Pt 10, Pt 50, Pt 100, Pt 500 sets Bit 7 within the measuring range byte (0 x 40)
- Setting TC = 428 at GOST Standard Cu 10, Cu 50, Cu 100 sets Bit 8 within the measuring range byte (0 x 80)

Measuring range coding of the analog output modules

Depending on the measuring range coding of the analog output modules, the parameter `Mode` (measuring-range coding) corresponding to the channel must be specified in accordance with the table.

Measuring type	Measuring range	`Mode`
Voltage	± 5 V	16#0106
	1 to 5 V	16#0107
	0 to 10V	16#0108
	± 10 V	16#0109
Current	0 to 20mA	16#0202
	4 to 20 mA	16#0203
	± 20 mA	16#0204
HART interface	4 to 20 mA	16#070C

Measuring-Range Coding of the Digital Input and Output Modules

There is no measuring type and no measuring range for digital input modules and digital output modules:

- `Mode` **= 16#FFFF** (for DiIn)
- `Mode` **= 16#FFFE** (for DiOu)

Measuring range coding of the controller module

There is no measuring type and no measuring range for controller modules:

- `Mode` **= 16#FFFD**

15.16.2 Mode settings for field devices

Mode settings for field devices

Block	Parameter at block ...	...and at field device	Input/output from block view (PLS view)	Mode 16#xxyy O = xx I = yy
Analog input (FbAnIn)	PV	OUT	I	16#0001
Analog output (FbAnOu)	SP	SP	O	16#0100
Analog output (FbAnOu)	SP Rbk PosD	SP READBACK POS_D	O I I	16#0103
Analog output (FbAnOu)	SP CbkBy0 - CbkBy2	SP CHECK_BACK	O I	16#0104
Analog output (FbAnOu)	SP Rbk PosD CbkBy0 - CbkBy2	SP READBACK POS_D CHECK_BACK	O I I I	16#0105
Analog output (FbAnOu)	RCasIn, RCasOut	RCAS_IN RCAS_OUT	O I	16#0206
Analog output (FbAnOu)	RCasIn RCasOut CbkBy0 - CbkBy2	RCAS_IN RCAS_OUT CHECK_BACK	O I I	16#0207
Analog output (FbAnOu)	SP RCasIn Rbk RCasOut PosD CbkBy0 - CbkBy2	SP RCAS_IN READBACK RCAS_OUT POS_D CHECK_BACK	O O I I I I	16#0308
Binary input (FbDiIn)	PV	OUT_D	I	16#0002
Binary output (FbDiOu)	SP	SP_D	O	16#0400
Binary output (FbDiOu)	SP Rbk	SP_D READBACK_D	O I	16#0409
Binary output (FbDiOu)	SP CbkBy0 - CbkBy2	SP_D CHECKBACK_D	O I	16#040A
Binary output (FbDiOu)	SP Rbk CbkBy0 - CbkBy2	SP_D READBACK_D CHECK_BACK_D	O I I	16#040B
Binary output (FbDiOu)	RCasIn RCasOut	RCAS_IN_D RCAS_OUT_D	O I	16#050C
Binary output (FbDiOu)	RCasIn RCasOut CbkBy0 - CbkBy2	RCAS_IN_D RCAS_OUT_D CHECK_BACK_D	O I I	16#050D
Binary output (FbDiOu)	SP RCasIn Rbk RCasOut CbkBy0 - CbkBy2	SP_D RCAS_IN_D READBACK_D RCAS_OUT_D CHECK_BACK_D	O O I I I	16#060E

Conversion blocks 16

16.1 StruAnIn - separating an analog structured variable

16.1.1 Description of StruAnIn

Object name (type + number) and family

Type + number: FC 375

Family: Convert

Area of application for StruAnIn

The block is used for the following applications:

- Separation of an analog value with a structure into a variable of the REAL data type and a signal status

How it works

The block separates an analog value with a structure interconnected to the `In` input parameter into a variable (`Out`) of the REAL data type and a (`ST`) signal status.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for parameter `Status`

This block does not have the `Status` parameter.

See also

StruAnIn block diagram (Page 1723)
StruAnIn I/Os (Page 1722)
StruAnIn messaging (Page 1721)
StruAnIn error handling (Page 1721)
StruAnIn functions (Page 1720)
StruAnIn modes (Page 1720)

16.1.2 StruAnIn modes

StruAnIn modes

This block does not have any modes.

See also

StruAnIn block diagram (Page 1723)
StruAnIn I/Os (Page 1722)
StruAnIn messaging (Page 1721)
StruAnIn error handling (Page 1721)
StruAnIn functions (Page 1720)
Description of StruAnIn (Page 1719)

16.1.3 StruAnIn functions

Functions of StruAnIn

There are no other functions for this block.

See also

StruAnIn block diagram (Page 1723)
StruAnIn I/Os (Page 1722)
StruAnIn messaging (Page 1721)
StruAnIn error handling (Page 1721)
StruAnIn modes (Page 1720)
Description of StruAnIn (Page 1719)

16.1.4 StruAnIn error handling

StruAnIn error handling

The block does not report any errors.

See also

StruAnIn block diagram (Page 1723)
StruAnIn I/Os (Page 1722)
StruAnIn messaging (Page 1721)
StruAnIn functions (Page 1720)
StruAnIn modes (Page 1720)
Description of StruAnIn (Page 1719)

16.1.5 StruAnIn messaging

Messaging

This block does not offer messaging.

See also

StruAnIn block diagram (Page 1723)
StruAnIn I/Os (Page 1722)
StruAnIn error handling (Page 1721)
StruAnIn functions (Page 1720)
StruAnIn modes (Page 1720)
Description of StruAnIn (Page 1719)

16.1.6 StruAnIn I/Os

StruAnIn I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In	Analog value with structure	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ST	Signal status	BYTE	16#80
Value	Analog value	REAL	0.0

See also

StruAnIn block diagram (Page 1723)
StruAnIn messaging (Page 1721)
StruAnIn error handling (Page 1721)
StruAnIn functions (Page 1720)
StruAnIn modes (Page 1720)
Description of StruAnIn (Page 1719)

16.1.7 StruAnIn block diagram

StruAnIn block diagram

A block diagram is not provided for this block.

See also

StruAnIn I/Os (Page 1722)

StruAnIn messaging (Page 1721)

StruAnIn error handling (Page 1721)

StruAnIn functions (Page 1720)

StruAnIn modes (Page 1720)

Description of StruAnIn (Page 1719)

16.2 StruAnOu - creating an analog structured variable

16.2.1 Description of StruAnOu

Object name (type + number) and family

Type + number: FC 376

Family: Convert

Area of application for StruAnOu

The block is used for the following applications:

- Merging a variable of the REAL data type and a signal status into an analog process value.

How it works

The block merges an analog value (`Value`) of the REAL data type and a signal status (`ST`) to form an analog value (`Out`) with a structure.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

StruAnOu modes (Page 1724)
StruAnOu functions (Page 1725)
StruAnOu error handling (Page 1725)
StruAnOu messaging (Page 1726)
StruAnOu I/Os (Page 1726)
StruAnOu block diagram (Page 1727)

16.2.2 StruAnOu modes

StruAnOu modes

This block does not have any modes.

See also

Description of StruAnOu (Page 1723)
StruAnOu functions (Page 1725)
StruAnOu error handling (Page 1725)
StruAnOu messaging (Page 1726)
StruAnOu I/Os (Page 1726)
StruAnOu block diagram (Page 1727)

16.2.3 StruAnOu functions

Functions of StruAnOu

There are no other functions for this block.

See also

Description of StruAnOu (Page 1723)
StruAnOu modes (Page 1724)
StruAnOu error handling (Page 1725)
StruAnOu messaging (Page 1726)
StruAnOu I/Os (Page 1726)
StruAnOu block diagram (Page 1727)

16.2.4 StruAnOu error handling

StruAnOu error handling

The block does not report any errors.

See also

Description of StruAnOu (Page 1723)
StruAnOu modes (Page 1724)
StruAnOu functions (Page 1725)
StruAnOu messaging (Page 1726)
StruAnOu I/Os (Page 1726)
StruAnOu block diagram (Page 1727)

16.2.5 StruAnOu messaging

Messaging

This block does not offer messaging.

See also

Description of StruAnOu (Page 1723)
StruAnOu modes (Page 1724)
StruAnOu functions (Page 1725)
StruAnOu error handling (Page 1725)
StruAnOu I/Os (Page 1726)
StruAnOu block diagram (Page 1727)

16.2.6 StruAnOu I/Os

StruAnOu I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
ST	Signal status	BYTE	16#80
Value	Analog value	REAL	0.0

Output parameters

Parameter	Description	Type	Default
Bad	1 = (ST = 16#00 to 16#3F)	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Analog value with structure	STRUCT	-
		• Value: REAL	• 0.0
		• ST: BYTE	• 16#80

See also

Description of StruAnOu (Page 1723)
StruAnOu modes (Page 1724)
StruAnOu functions (Page 1725)
StruAnOu error handling (Page 1725)
StruAnOu messaging (Page 1726)
StruAnOu block diagram (Page 1727)

16.2.7 StruAnOu block diagram

StruAnOu block diagram

A block diagram is not provided for this block.

See also

Description of StruAnOu (Page 1723)
StruAnOu modes (Page 1724)
StruAnOu functions (Page 1725)
StruAnOu error handling (Page 1725)
StruAnOu messaging (Page 1726)
StruAnOu I/Os (Page 1726)

16.3 StruDiIn - separating a digital structured variable

16.3.1 Description of StruDiIn

Object name (type + number) and family

Type + number: FC 377

Family: Convert

Area of application for StruDiIn

The block is used for the following applications:

- Separating a binary process value into a variable of the BOOL data type, a process value and signal status.

How it works

The block separates a binary process value interconnected to the `In` input parameter into a variable of the BOOL data type and a signal status.

Configuration

Use the CFC editor to install the block in any OB

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

StruDiIn block diagram (Page 1732)

StruDiIn I/Os (Page 1731)

StruDiIn messaging (Page 1730)

StruDiIn error handling (Page 1730)

StruDiIn functions (Page 1729)

StruDiIn modes (Page 1729)

16.3.2 StruDiIn modes

StruDiIn modes

This block does not have any modes.

See also

StruDiIn block diagram (Page 1732)
StruDiIn I/Os (Page 1731)
StruDiIn messaging (Page 1730)
StruDiIn error handling (Page 1730)
StruDiIn functions (Page 1729)
Description of StruDiIn (Page 1728)

16.3.3 StruDiIn functions

Functions of StruDiIn

There are no other functions for this block.

See also

StruDiIn block diagram (Page 1732)
StruDiIn I/Os (Page 1731)
StruDiIn messaging (Page 1730)
StruDiIn error handling (Page 1730)
StruDiIn modes (Page 1729)
Description of StruDiIn (Page 1728)

16.3.4 StruDiIn error handling

StruDiIn error handling

The block does not report any errors.

See also

StruDiIn block diagram (Page 1732)
StruDiIn I/Os (Page 1731)
StruDiIn messaging (Page 1730)
StruDiIn functions (Page 1729)
StruDiIn modes (Page 1729)
Description of StruDiIn (Page 1728)

16.3.5 StruDiIn messaging

Messaging

This block does not offer messaging.

See also

StruDiIn block diagram (Page 1732)
StruDiIn I/Os (Page 1731)
StruDiIn error handling (Page 1730)
StruDiIn functions (Page 1729)
StruDiIn modes (Page 1729)
Description of StruDiIn (Page 1728)

16.3.6 StruDiIn I/Os

StruDiIn I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In	Binary process value	STRUCT	-
		• Value: BOOL	• 0
		• ST: BYTE	• 16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ST	Signal status	BYTE	16#80
Value	Binary variable	BOOL	0

See also

StruDiIn block diagram (Page 1732)
StruDiIn messaging (Page 1730)
StruDiIn error handling (Page 1730)
StruDiIn functions (Page 1729)
StruDiIn modes (Page 1729)
Description of StruDiIn (Page 1728)

16.3.7 StruDiIn block diagram

StruDiIn block diagram

A block diagram is not provided for this block.

See also

StruDiIn I/Os (Page 1731)

StruDiIn messaging (Page 1730)

StruDiIn error handling (Page 1730)

StruDiIn functions (Page 1729)

StruDiIn modes (Page 1729)

Description of StruDiIn (Page 1728)

16.4 StruDiOu - creating a digital structured variable

16.4.1 Description of StruDiOu

Object name (type + number) and family

Type + number: FC 378

Family: Convert

Area of application for StruDiOu

The block is used for the following applications:

- Merging a variable of the BOOL data type and a signal status into a binary process value.

How it works

The block merges a variable of the BOOL data type and a signal status into a binary process value.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

StruDiOu block diagram (Page 1736)
StruDiOu I/Os (Page 1735)
StruDiOu messaging (Page 1735)
StruDiOu error handling (Page 1734)
StruDiOu functions (Page 1734)
StruDiOu modes (Page 1733)

16.4.2 StruDiOu modes

StruDiOu modes

This block does not have any modes.

See also

StruDiOu block diagram (Page 1736)
StruDiOu I/Os (Page 1735)
StruDiOu messaging (Page 1735)
StruDiOu error handling (Page 1734)
StruDiOu functions (Page 1734)
Description of StruDiOu (Page 1732)

16.4.3 StruDiOu functions

Functions of StruDiOu

There are no other functions for this block.

See also

StruDiOu block diagram (Page 1736)
StruDiOu I/Os (Page 1735)
StruDiOu messaging (Page 1735)
StruDiOu error handling (Page 1734)
StruDiOu modes (Page 1733)
Description of StruDiOu (Page 1732)

16.4.4 StruDiOu error handling

StruDiOu error handling

The block does not report any errors.

See also

StruDiOu block diagram (Page 1736)
StruDiOu I/Os (Page 1735)
StruDiOu messaging (Page 1735)
StruDiOu functions (Page 1734)
StruDiOu modes (Page 1733)
Description of StruDiOu (Page 1732)

16.4.5 StruDiOu messaging

Messaging

This block does not offer messaging.

See also

StruDiOu block diagram (Page 1736)
StruDiOu I/Os (Page 1735)
StruDiOu error handling (Page 1734)
StruDiOu functions (Page 1734)
StruDiOu modes (Page 1733)
Description of StruDiOu (Page 1732)

16.4.6 StruDiOu I/Os

StruDiOu I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
ST	Signal status	BYTE	16#80
Value	Binary variable	BOOL	0

Output parameters

Parameter	Description	Type	Default
Bad	1 = (ST = 16#00 to 16#3F)	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Binary process value	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80

See also

StruDiOu block diagram (Page 1736)
StruDiOu messaging (Page 1735)
StruDiOu error handling (Page 1734)
StruDiOu functions (Page 1734)
StruDiOu modes (Page 1733)
Description of StruDiOu (Page 1732)

16.4.7 StruDiOu block diagram

StruDiOu block diagram

A block diagram is not provided for this block.

See also

StruDiOu I/Os (Page 1735)
StruDiOu messaging (Page 1735)
StruDiOu error handling (Page 1734)
StruDiOu functions (Page 1734)
StruDiOu modes (Page 1733)
Description of StruDiOu (Page 1732)

16.5 StruScIn - separating a display area into two variables

16.5.1 Description of StruScIn

Object name (type + number) and family

Type + number: FC 379
Family: Convert

Area of application for StruScIn

The block is used for the following applications:

- Separation of a display area into two variables of data type REAL.

How it works

The block separates a display area interconnected to the `Scale` input parameter into two variables of the REAL. data type

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

StruScIn block diagram (Page 1740)

StruScIn I/Os (Page 1739)

StruScIn messaging (Page 1739)

StruScIn error handling (Page 1738)

StruScIn functions (Page 1738)

StruScIn modes (Page 1737)

16.5.2 StruScIn modes

StruScIn modes

This block does not have any modes.

See also

StruScIn block diagram (Page 1740)

StruScIn I/Os (Page 1739)

StruScIn messaging (Page 1739)

StruScIn error handling (Page 1738)

StruScIn functions (Page 1738)

Description of StruScIn (Page 1736)

16.5.3 StruScIn functions

Functions of StruScIn

There are no other functions for this block.

See also

StruScIn block diagram (Page 1740)
StruScIn I/Os (Page 1739)
StruScIn messaging (Page 1739)
StruScIn error handling (Page 1738)
StruScIn modes (Page 1737)
Description of StruScIn (Page 1736)

16.5.4 StruScIn error handling

StruScIn error handling

The block does not report any errors.

See also

StruScIn block diagram (Page 1740)
StruScIn I/Os (Page 1739)
StruScIn messaging (Page 1739)
StruScIn functions (Page 1738)
StruScIn modes (Page 1737)
Description of StruScIn (Page 1736)

16.5.5 StruScIn messaging

Messaging

This block does not offer messaging.

See also

StruScIn block diagram (Page 1740)
StruScIn I/Os (Page 1739)
StruScIn error handling (Page 1738)
StruScIn functions (Page 1738)
StruScIn modes (Page 1737)
Description of StruScIn (Page 1736)

16.5.6 StruScIn I/Os

StruScIn I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
Scale	Display area	STRUCT	-
		• High: REAL	• 100.0
		• Low: REAL	• 0.0

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
HiScale	High limit of display area	REAL	100.0
LoScale	Low limit of display area	REAL	0.0

See also

StruScIn block diagram (Page 1740)
StruScIn messaging (Page 1739)
StruScIn error handling (Page 1738)
StruScIn functions (Page 1738)
StruScIn modes (Page 1737)
Description of StruScIn (Page 1736)

16.5.7 StruScIn block diagram

StruScIn block diagram

A block diagram is not provided for this block.

See also

StruScIn I/Os (Page 1739)
StruScIn messaging (Page 1739)
StruScIn error handling (Page 1738)
StruScIn functions (Page 1738)
StruScIn modes (Page 1737)
Description of StruScIn (Page 1736)

16.6 StruScOu - merging two variables into a display area

16.6.1 Description of StruScOu

Object name (type + number) and family

Type + number: FC 380

Family: Convert

Area of application for StruScOu

The block is used for the following applications:

- Merging two variables of the REAL data type into a display area.

How it works

The block merges two variables of the REAL data type into a display area.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

StruScOu block diagram (Page 1745)

StruScOu I/Os (Page 1744)

StruScOu messaging (Page 1743)

StruScOu error handling (Page 1743)

StruScOu functions (Page 1742)

StruScOu modes (Page 1742)

16.6.2 StruScOu modes

StruScOu modes

This block does not have any modes.

See also

StruScOu block diagram (Page 1745)
StruScOu I/Os (Page 1744)
StruScOu messaging (Page 1743)
StruScOu error handling (Page 1743)
StruScOu functions (Page 1742)
Description of StruScOu (Page 1741)

16.6.3 StruScOu functions

Functions of StruScOu

There are no other functions for this block.

See also

StruScOu block diagram (Page 1745)
StruScOu I/Os (Page 1744)
StruScOu messaging (Page 1743)
StruScOu error handling (Page 1743)
StruScOu modes (Page 1742)
Description of StruScOu (Page 1741)

16.6.4 StruScOu error handling

StruScOu error handling

The block does not report any errors.

See also

StruScOu block diagram (Page 1745)
StruScOu I/Os (Page 1744)
StruScOu messaging (Page 1743)
StruScOu functions (Page 1742)
StruScOu modes (Page 1742)
Description of StruScOu (Page 1741)

16.6.5 StruScOu messaging

Messaging

This block does not offer messaging.

See also

StruScOu block diagram (Page 1745)
StruScOu I/Os (Page 1744)
StruScOu error handling (Page 1743)
StruScOu functions (Page 1742)
StruScOu modes (Page 1742)
Description of StruScOu (Page 1741)

16.6.6 StruScOu I/Os

StruScOu I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
HiScale	High limit of display area	REAL	100.0
LoScale	Low limit of display area	REAL	0.0

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Scale	Display area	STRUCT • High: REAL • Low: REAL	- • 100.0 • 0.0

See also

StruScOu block diagram (Page 1745)
StruScOu messaging (Page 1743)
StruScOu error handling (Page 1743)
StruScOu functions (Page 1742)
StruScOu modes (Page 1742)
Description of StruScOu (Page 1741)

16.6.7 StruScOu block diagram

StruScOu block diagram

A block diagram is not provided for this block.

See also

StruScOu I/Os (Page 1744)

StruScOu messaging (Page 1743)

StruScOu error handling (Page 1743)

StruScOu functions (Page 1742)

StruScOu modes (Page 1742)

Description of StruScOu (Page 1741)

16.7 STIn - separating the signal status into individual binary displays

16.7.1 Description of STIn

Object name (type + number) and family

Type + number: FC 373

Family: Convert

Area of application for STIn

The block is used for the following applications:

- Separation of signal status into individual binary displays

How it works

The block separates a signal status interconnected to the input parameter into individual binary displays.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

STIn block diagram (Page 1749)
STIn I/Os (Page 1748)
STIn messaging (Page 1748)
STIn error handling (Page 1747)
STIn functions (Page 1747)
STIn modes (Page 1746)

16.7.2 STIn modes

STIn modes

This block does not have any modes.

See also

STIn block diagram (Page 1749)
STIn I/Os (Page 1748)
STIn messaging (Page 1748)
STIn error handling (Page 1747)
STIn functions (Page 1747)
Description of STIn (Page 1745)

16.7.3 STIn functions

Functions of STIn

There are no other functions for this block.

See also

STIn block diagram (Page 1749)
STIn I/Os (Page 1748)
STIn messaging (Page 1748)
STIn error handling (Page 1747)
STIn modes (Page 1746)
Description of STIn (Page 1745)

16.7.4 STIn error handling

STIn error handling

The block does not report any errors.

See also

STIn block diagram (Page 1749)
STIn I/Os (Page 1748)
STIn messaging (Page 1748)
STIn functions (Page 1747)
STIn modes (Page 1746)
Description of STIn (Page 1745)

16.7.5 STIn messaging

Messaging

This block does not offer messaging.

See also

STIn block diagram (Page 1749)
STIn I/Os (Page 1748)
STIn error handling (Page 1747)
STIn functions (Page 1747)
STIn modes (Page 1746)
Description of STIn (Page 1745)

16.7.6 STIn I/Os

STIn I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In	Signal status	BYTE	16#80

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
ST_00	1 = Bad, device related	BOOL	0
ST_28	1 = Bad, process related	BOOL	0
ST_60	1 = Local functional check/simulation	BOOL	0
ST_68	1 = Unknown, device related	BOOL	0
ST_78	1 = Unknown, process related	BOOL	0
ST_80	1 = Good	BOOL	0
ST_A4	1 = Maintenance request	BOOL	0

See also

STIn error handling (Page 1747)
STIn block diagram (Page 1749)
Description of STIn (Page 1745)
STIn modes (Page 1746)
STIn functions (Page 1747)
STIn messaging (Page 1748)

16.7.7 STIn block diagram

STIn block diagram

A block diagram is not provided for this block.

See also

Description of STIn (Page 1745)
STIn modes (Page 1746)
STIn functions (Page 1747)
STIn error handling (Page 1747)
STIn messaging (Page 1748)
STIn I/Os (Page 1748)

16.8 STOu - merging individual binary signals into a signal status

16.8.1 Description of STOu

Object name (type + number) and family

Type + number: FC 374

Family: Convert

Area of application for STOu

The block is used for the following applications:

- Merging individual binary signals into a signal status

How it works

The block merges individual binary signals into a `Out` signal status.

If several binary signals are set, the one with the highest priority becomes effective, as described in the section Forming and outputting the signal status for technologic blocks (Page 93) for technologic blocks.

If no binary signal is set, the "Bad, process related" signal status is set.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

STOu block diagram (Page 1754)

STOu I/Os (Page 1753)

STOu messaging (Page 1752)

STOu error handling (Page 1752)

STOu functions (Page 1751)

STOu modes (Page 1751)

16.8.2 STOu modes

STOu modes

This block does not have any modes.

See also

STOu block diagram (Page 1754)
STOu I/Os (Page 1753)
STOu messaging (Page 1752)
STOu error handling (Page 1752)
STOu functions (Page 1751)
Description of STOu (Page 1750)

16.8.3 STOu functions

Functions of STOu

There are no other functions for this block.

See also

STOu block diagram (Page 1754)
STOu I/Os (Page 1753)
STOu messaging (Page 1752)
STOu error handling (Page 1752)
STOu modes (Page 1751)
Description of STOu (Page 1750)

16.8.4 STOu error handling

STOu error handling

The block does not report any errors.

See also

STOu block diagram (Page 1754)
STOu I/Os (Page 1753)
STOu messaging (Page 1752)
STOu functions (Page 1751)
STOu modes (Page 1751)
Description of STOu (Page 1750)

16.8.5 STOu messaging

Messaging

This block does not offer messaging.

See also

STOu block diagram (Page 1754)
STOu I/Os (Page 1753)
STOu error handling (Page 1752)
STOu functions (Page 1751)
STOu modes (Page 1751)
Description of STOu (Page 1750)

16.8.6 STOu I/Os

STOu I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
ST_00	1 = Bad, device related	BOOL	0
ST_28	1 = Bad, process related	BOOL	0
ST_60	1 = Local functional check/simulation	BOOL	0
ST_68	1 = Unknown, device related	BOOL	0
ST_78	1 = Unknown, process related	BOOL	0
ST_80	1 = Good	BOOL	0
ST_A4	1 = Maintenance request	BOOL	0

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Signal status	BYTE	16#80

See also

STOu error handling (Page 1752)
STOu block diagram (Page 1754)
STOu messaging (Page 1752)
STOu functions (Page 1751)
STOu modes (Page 1751)
Description of STOu (Page 1750)

16.8.7 STOu block diagram

STOu block diagram

A block diagram is not provided for this block.

See also

STOu I/Os (Page 1753)

STOu messaging (Page 1752)

STOu error handling (Page 1752)

STOu functions (Page 1751)

STOu modes (Page 1751)

Description of STOu (Page 1750)

16.9 MSTIn - separating the maintenance status into individual status displays

16.9.1 Description of MSTIn

Object name (type + number) and family

Type + number: FB 1858

Family: Convert

Area of application for MSTIn

The block is used for the following applications:

- Separation of the maintenance status into individual status displays

How it works

The block separates a maintenance status interconnected to the `In` input parameter into individual status displays.

If the input parameter receives information that at least one value is simulated, for example (`In` = 16#00000003), this is indicated at output parameter `MST_03` with the value 1.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

MSTIn block diagram (Page 1758)
MSTIn I/Os (Page 1757)
MSTIn messaging (Page 1757)
MSTIn error handling (Page 1756)
MSTIn functions (Page 1756)
MSTIn modes (Page 1755)

16.9.2 MSTIn modes

MSTIn modes

This block does not have any modes.

See also

MSTIn I/Os (Page 1757)
MSTIn messaging (Page 1757)
MSTIn error handling (Page 1756)
MSTIn functions (Page 1756)
MSTIn block diagram (Page 1758)
Description of MSTIn (Page 1754)

16.9.3 MSTIn functions

Functions of MSTIn

There are no other functions for this block.

See also

MSTIn block diagram (Page 1758)
MSTIn I/Os (Page 1757)
MSTIn messaging (Page 1757)
MSTIn error handling (Page 1756)
MSTIn modes (Page 1755)
Description of MSTIn (Page 1754)

16.9.4 MSTIn error handling

MSTIn error handling

The block does not report any errors.

See also

MSTIn block diagram (Page 1758)
MSTIn I/Os (Page 1757)
MSTIn messaging (Page 1757)
MSTIn functions (Page 1756)
MSTIn modes (Page 1755)
Description of MSTIn (Page 1754)

16.9.5 MSTIn messaging

Messaging

This block does not offer messaging.

See also

MSTIn block diagram (Page 1758)
MSTIn I/Os (Page 1757)
MSTIn error handling (Page 1756)
MSTIn functions (Page 1756)
MSTIn modes (Page 1755)
Description of MSTIn (Page 1754)

16.9.6 MSTIn I/Os

MSTIn I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In	Maintenance status	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
MST_00	1 = Good	BOOL	0
MST_01	1 = Passivated	BOOL	0
MST_02	1 = "Out of service"	BOOL	0
MST_03	1 = At least one process value is simulated	BOOL	0
MST_04	1 = "Local mode"	BOOL	0
MST_05	1 = Maintenance requirement	BOOL	0
MST_06	1 = Maintenance request	BOOL	0
MST_07	1 = Maintenance alarm	BOOL	0
MST_08	1 = Unknown	BOOL	0
MST_09	1 = Configuration changed	BOOL	0

See also

MSTIn block diagram (Page 1758)
MSTIn messaging (Page 1757)
MSTIn error handling (Page 1756)
MSTIn functions (Page 1756)
MSTIn modes (Page 1755)
Description of MSTIn (Page 1754)

16.9.7 MSTIn block diagram

MSTIn block diagram

A block diagram is not provided for this block.

See also

MSTIn I/Os (Page 1757)
MSTIn messaging (Page 1757)
MSTIn error handling (Page 1756)
MSTIn functions (Page 1756)
MSTIn modes (Page 1755)
Description of MSTIn (Page 1754)

16.10 MSTOu - merging individual status displays into a maintenance status

16.10.1 Description of MSTOu

Object name (type + number) and family

Type + number: FB 1859

Family: Convert

Area of application for MSTOu

The block is used for the following applications:

- Merging individual status displays into a maintenance status

How it works

The block merges individual status displays into a maintenance status. If several status displays are set, the status display with the highest number becomes effective.

If status display `MST_03` = 1 is set, for example, this is indicated at output parameter `Out` with the value 16#00000003.

If no status display is set, the `Out` = 16#00 maintenance status is set.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

MSTOu block diagram (Page 1763)
MSTOu I/Os (Page 1762)
MSTOu messaging (Page 1761)
MSTOu error handling (Page 1761)
MSTOu functions (Page 1760)
MSTOu modes (Page 1760)

16.10.2 MSTOu modes

MSTOu modes

This block does not have any modes.

See also

MSTOu block diagram (Page 1763)
MSTOu I/Os (Page 1762)
MSTOu messaging (Page 1761)
MSTOu error handling (Page 1761)
MSTOu functions (Page 1760)
Description of MSTOu (Page 1759)

16.10.3 MSTOu functions

Functions of MSTOu

There are no other functions for this block.

See also

MSTOu block diagram (Page 1763)
MSTOu I/Os (Page 1762)
MSTOu messaging (Page 1761)
MSTOu error handling (Page 1761)
MSTOu modes (Page 1760)
Description of MSTOu (Page 1759)

16.10.4 MSTOu error handling

MSTOu error handling

The block does not report any errors.

See also

MSTOu block diagram (Page 1763)
MSTOu I/Os (Page 1762)
MSTOu messaging (Page 1761)
MSTOu functions (Page 1760)
MSTOu modes (Page 1760)
Description of MSTOu (Page 1759)

16.10.5 MSTOu messaging

Messaging

This block does not offer messaging.

See also

MSTOu block diagram (Page 1763)
MSTOu I/Os (Page 1762)
MSTOu error handling (Page 1761)
MSTOu functions (Page 1760)
MSTOu modes (Page 1760)
Description of MSTOu (Page 1759)

16.10.6 MSTOu I/Os

MSTOu I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
MST_00	1 = Good	BOOL	0
MST_01	1 = Passivated	BOOL	0
MST_02	1 = "Out of service"	BOOL	0
MST_03	1 = At least one process value is simulated	BOOL	0
MST_04	1 = "Local mode"	BOOL	0
MST_05	1 = Maintenance requirement	BOOL	0
MST_06	1 = Maintenance request	BOOL	0
MST_07	1 = Maintenance alarm	BOOL	0
MST_08	1 = Unknown	BOOL	0
MST_09	1 = Configuration changed	BOOL	0

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Maintenance status	DWORD	16#00000000

See also

MSTOu block diagram (Page 1763)
MSTOu messaging (Page 1761)
MSTOu error handling (Page 1761)
MSTOu functions (Page 1760)
MSTOu modes (Page 1760)
Description of MSTOu (Page 1759)

16.10.7 MSTOu block diagram

MSTOu block diagram

A block diagram is not provided for this block.

See also

MSTOu I/Os (Page 1762)

MSTOu messaging (Page 1761)

MSTOu error handling (Page 1761)

MSTOu functions (Page 1760)

MSTOu modes (Page 1760)

Description of MSTOu (Page 1759)

16.11 RealToDw - Converting REAL to DWORD

16.11.1 Description of RealToDw

Object name (type + number) and family

Type + number: FC 282

Family: Convert

Area of application for RealToDw

The block is used for the following applications:

- Converting a REAL number to a double word (DWORD)

How it works

With a REAL number between 0 and 4294967000 at input `In`, the value is transferred and output as a DWORD at the output `Out`.

If `In` is outside these limits, the error number 30 is output at the `ErrorNum` output and the `Out` is set to these limits.

Configuration

Use the CFC editor to install the block in any OB.

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for Status parameter

This block does not have the `Status` parameter.

16.11.2 Operating modes of RealToDw

Operating modes of RealToDw

This block does not have any modes.

16.11.3 Functions of ReaLToDw

Functions of RealToDw

There are no other functions for this block.

16.11.4 Error handling of RealToDw

Error handling of RealToDw

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	No active fault
30	`In` cannot be displayed in DWORD format

16.11.5 Messaging of RealToDw

Messaging

This block does not offer messaging.

16.11.6 I/Os of RealToDw

I/Os of RealToDw

Input parameters

Parameter	Description	Type	Default
In	Analog input value	REAL	0

Output parameters

Parameter	Description	Type	Default
ErrorNum	Error number	INT	-1
Out	Converted output value	DWORD	0
ST	Status	BYTE	16#80

16.11.7 Block diagram of RealToDw

Block diagram of RealToDw

A block diagram is not provided for this block.

Maintenance blocks 17

17.1 MuxMST - Determination of the worst maintenance status

17.1.1 Description of MuxMST

Object name (type + number) and family

Type + number: FB 1861

Family: Maint

Area of application for MuxMST

The block is used for the following applications:

- Determination of the worst maintenance status (from a maximum of 10 statuses)

How it works

The block determines the worst of several maintenance states. Each status is made available to the block via interconnection to the `Inx` input parameter (x = 01 ... 10) . The states are compared and the highest value written to the `Out` output parameter.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

During startup, the `Inx` input parameters (x = 01 ... 10) and output parameter are reset to their defaults.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

See also

MuxMST block diagram (Page 1771)
MuxMST I/Os (Page 1770)
MuxMST messaging (Page 1769)
MuxMST error handling (Page 1769)
MuxMST functions (Page 1768)
MuxMST modes (Page 1768)

17.1.2 MuxMST modes

MuxMST operating modes

This block does not have any modes.

See also

MuxMST block diagram (Page 1771)
MuxMST I/Os (Page 1770)
MuxMST messaging (Page 1769)
MuxMST error handling (Page 1769)
MuxMST functions (Page 1768)
Description of MuxMST (Page 1767)

17.1.3 MuxMST functions

Functions of MuxMST

This block provides no other functions.

See also

MuxMST block diagram (Page 1771)
MuxMST I/Os (Page 1770)
MuxMST messaging (Page 1769)
MuxMST error handling (Page 1769)
MuxMST modes (Page 1768)
Description of MuxMST (Page 1767)

17.1.4 MuxMST error handling

MuxMST error handling

The block does not report any errors.

See also

MuxMST block diagram (Page 1771)
MuxMST I/Os (Page 1770)
MuxMST messaging (Page 1769)
MuxMST functions (Page 1768)
MuxMST modes (Page 1768)
Description of MuxMST (Page 1767)

17.1.5 MuxMST messaging

Messaging

This block does not offer messaging.

See also

MuxMST block diagram (Page 1771)
MuxMST I/Os (Page 1770)
MuxMST error handling (Page 1769)
MuxMST functions (Page 1768)
MuxMST modes (Page 1768)
Description of MuxMST (Page 1767)

17.1.6 MuxMST I/Os

MuxMST I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In01	Input for signal of maintenance status 0	DWORD	16#00000000
In02	Input for signal of maintenance status 1	DWORD	16#00000000
In03	Input for signal of maintenance status 2	DWORD	16#00000000
In04	Input for signal of maintenance status 3	DWORD	16#00000000
In05	Input for signal of maintenance status 4	DWORD	16#00000000
In06	Input for signal of maintenance status 5	DWORD	16#00000000
In07	Input for signal of maintenance status 6	DWORD	16#00000000
In08	Input for signal of maintenance status 7	DWORD	16#00000000
In09	Input for signal of maintenance status 8	DWORD	16#00000000
In10	Input for signal of maintenance status 9	DWORD	16#00000000

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output signal with the worst signal status	DWORD	16#00000000

See also

MuxMST block diagram (Page 1771)
MuxMST messaging (Page 1769)
MuxMST error handling (Page 1769)
MuxMST functions (Page 1768)
MuxMST modes (Page 1768)
Description of MuxMST (Page 1767)

17.1.7 MuxMST block diagram

MuxMST block diagram

A block diagram is not provided for this block.

See also

MuxMST I/Os (Page 1770)
MuxMST messaging (Page 1769)
MuxMST error handling (Page 1769)
MuxMST functions (Page 1768)
MuxMST modes (Page 1768)
Description of MuxMST (Page 1767)

17.2 MuxST- Determination of the worst signal status

17.2.1 Description of MuxST

Object name (type + number) and family

Type + number: FB 1862

Family: Maint

Area of application for MuxST

The block is used for the following applications:

- Determination of the worst signal status (from a maximum of 10 statuses)

How it works

The block determines the worst of several signal states. Each status is made available to the block via interconnection to the `Inx` input parameter (x = 1 ... 10). The states are compared and the value with the highest priority is written to the `Out` output parameter.

Also refer to the section Auto-Hotspot for information on priorities.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38).

Startup characteristics

During startup, the `Inx` input parameters (x = 1 ... 10) and output parameter are reset to their defaults.

Status word allocation for `Status1` parameter

This block does not have the `Status` parameter.

See also

MuxST block diagram (Page 1775)

MuxST I/Os (Page 1774)

MuxST messaging (Page 1774)

MuxST error handling (Page 1773)

MuxST functions (Page 1772)

MuxST modes (Page 1772)

17.2.2 MuxST modes

MuxST operating modes

This block does not have any modes.

See also

MuxST block diagram (Page 1775)

MuxST I/Os (Page 1774)

MuxST messaging (Page 1774)

MuxST error handling (Page 1773)

MuxST functions (Page 1772)

Description of MuxST (Page 1771)

17.2.3 MuxST functions

Functions of MuxST

The functions for this block are listed below.

Selecting signals for processing

Using the `SelInput` input parameter, you select the number of interconnectable input parameters to be used for processing in the block. The selected number denotes the input parameters used `In1` ... `Inn`.

If, for example, you set this input parameter to `SelInput` = 3, the input parameters `In1`, `In2` and `In3` will be used for processing.

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for blocks with configurable status prioritization (Page 99).

See also

MuxST block diagram (Page 1775)

MuxST I/Os (Page 1774)

MuxST messaging (Page 1774)

MuxST error handling (Page 1773)

MuxST modes (Page 1772)

Description of MuxST (Page 1771)

17.2.4 MuxST error handling

MuxST error handling

The block does not report any errors.

See also

MuxST block diagram (Page 1775)

MuxST I/Os (Page 1774)

MuxST messaging (Page 1774)

MuxST functions (Page 1772)

MuxST modes (Page 1772)

Description of MuxST (Page 1771)

17.2.5 MuxST messaging

Messaging

This block does not offer messaging.

See also

MuxST block diagram (Page 1775)
MuxST I/Os (Page 1774)
MuxST error handling (Page 1773)
MuxST functions (Page 1772)
MuxST modes (Page 1772)
Description of MuxST (Page 1771)

17.2.6 MuxST I/Os

MuxST I/Os

Input parameters

Parameter	Description	Type	Default
EN	1 = Called block will be processed	BOOL	1
In1	Input for signal of signal status 0	BYTE	16#80
In2	Input for signal of signal status 1	BYTE	16#80
In3	Input for signal of signal status 2	BYTE	16#80
In4	Input for signal of signal status 3	BYTE	16#80
In5	Input for signal of signal status 4	BYTE	16#80
In6	Input for signal of signal status 5	BYTE	16#80
In7	Input for signal of signal status 6	BYTE	16#80
In8	Input for signal of signal status 7	BYTE	16#80
In9	Input for signal of signal status 8	BYTE	16#80
In10	Input for signal of signal status 9	BYTE	16#80
SelInput*	Selection of the input parameter for forming the worst signal status	INT	2
SelPrio*	Setting of the prioritization for forming the worst signal status	INT	0

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

Parameter	Description	Type	Default
ENO	1 = Block algorithm completed without errors	BOOL	0
Out	Output of the worst signal status	BYTE	16#80

See also

MuxST block diagram (Page 1775)
MuxST messaging (Page 1774)
MuxST error handling (Page 1773)
MuxST functions (Page 1772)
MuxST modes (Page 1772)
Description of MuxST (Page 1771)

17.2.7 MuxST block diagram

MuxST block diagram

A block diagram is not provided for this block.

See also

MuxST I/Os (Page 1774)
MuxST messaging (Page 1774)
MuxST error handling (Page 1773)
MuxST functions (Page 1772)
MuxST modes (Page 1772)
Description of MuxST (Page 1771)

17.3 STRep - Status display of block groups

17.3.1 Description of STRep

Object name (type + number) and family

Type + number: FB 1801

Family: MAINT

Area of application of STRep

The STRep block is used for displaying the status of a group of blocks that is designed for hiding messages automatically.

How it works

The block has 32 `DigVal` type inputs that describe defined states. Depending on which `StateX` input is set, `QSTATE` is output at the INT output. If several `StateX` inputs are set, the most significant is output and the `MSA` output is set.

The status of the `StateX` inputs does not influence the result at `QSTATE`.

Configuration

Use the CFC editor to install the block in a cyclic interrupt OB (OB30 to OB38). The block is also installed automatically in the startup OB (OB100).

Startup characteristics

The block does not have any startup characteristics.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

17.3.2 Operating modes of STRep

Operating modes of STRep

This block does not have any modes.

17.3.3 Functions of STRep

Functions of STRep

There are no other functions for this block.

17.3.4 Error handling of STRep

Error handling of STRep

The block does not report any errors.

17.3.5 Messaging of STRep

Messaging

This block does not offer messaging.

17.3.6 I/Os of STRep

I/Os of STRep

Input parameters

Parameter	Description	Type	Default
State1 ...State10	Process status 1 ... 10	DigVal	0
State11 ... State32	Process status 11 ... 32	DigVal	0
QERR	1 = Error	BOOL	1
QSTATE	Process status	INT	0

Output parameters

Parameter	Description	Type	Default
MSA	1 = More than one process status is active	STRUCT • Value:BOOL:BYTE • ST:BYTE	- • 1 • 16#80
QSTATE	Process status of the type INT 0...32	INT	0

17.3.7 Block diagram of STRep

Block diagram of STRep

A block diagram is not provided for this block.

17.4 AssetM process variable monitoring for violation of limits

17.4.1 Description of AssetM

Object name (type + number) and family

Type and number: FB 1840

Family: Maint

Area of application of AssetM

The block is used for the following applications:

Monitoring of up to 3 analog process variables for exceeding 3 limits respectively. It reports the wait status of the process variables:

- When overshooting a limit
- Via the device-based signal status or
- Via binary message inputs

How it works

The block monitors up to 3 inputs for high and low violations of three limits respectively. Upon reaching or exceeding a limit, the respective output is set and a corresponding message is generated.

The three process variables are equivalent for limit monitoring as long as the overshoot of a limit (e.g. maintenance request) is reported by one process variable. A new message will only be created again if all process variables have undershot this limit at least for one cycle.

The monitoring of individual limits can be deactivated.

In addition to limit monitoring, the signal status of the individual process variables is also analyzed. The device-specific signal status of a process value triggers the corresponding message that is also used by the limit monitoring.

Configuration

In the CFC editor, install the block in a cyclic interrupt OB (e.g. OB32). The block is also installed automatically in the startup OB (OB 100).

Startup characteristics

The messages are suppressed after startup for the number of cycles set at `RunUpCyc`.

Status word allocation for `Status` parameter

This block does not have the `Status` parameter.

Binary message inputs

`Message1`	Bad, maintenance alarm	Message (S) requires acknowledgement
`Message2`	Uncertain, maintenance request	Message (F) requires acknowledgement
`Message3`	Good, maintenance required	Message (M) requires acknowledgement
`Message4`	Bad, local operation/functional check	Message (S) requires acknowledgement
`Message5`	Uncertain, simulation	Message (SA) does not require acknowledgement
`Message6`	Bad, device out of service	Message (SA) does not require acknowledgement
`Message7`	bad, passivated	Message (SA) does not require acknowledgement

For each `PVx`, there is an input (`PVx_Rst`) and an output (`P_PVx_Rst`) that can be used to reset a technologic block.

The statuses are created with ALARM_8P for messages requiring acknowledgment and with NOTIFY_8P for those not requiring acknowledgment. The message function can be disabled by setting `MsgLock` = 0. In this case, `MS` = 8 is set.

The detailed diagnostics is shown in the diagnostic view of the faceplate via the inputs `Diag1` to `Diag16`.

If one of the inputs is set to 1, then the status display is shown in front of the corresponding text.

The texts for the relevant inputs `Diag1` to `Diag16` are entered in the parameter data of the EDD for the relevant instance (see also chapter PLT ID).

If one of the inputs `Diag1` to `Diag16` is set to 1, the explanatory text "Additional status available" is output if an internal interrupt is triggered through `PV0`, `PV1` or `PV2`.

PLT-ID

Die PLT-ID is a connection parameter between a PDM object (parameter data EDD) and the faceplate in the maintenance station. The PLT-ID is linked to the PDM object.

The PDM object is generated in the SIMATIC Manager as follows:

1. Select **View > Process device plant view** in SIMATIC Manager.
2. Select **Insert > SIMATIC PDM > TAG**.
3. Highlight the inserted TAG object and select the context menu command SIMATIC PDM > Device Selection...
4. In the tree structure CFC > DATA_OBJECTS > CFC >, select AssetMon and close the dialog with "OK".
5. In the context menu select **Open Object** and enter all necessary data in the parameter assignment screen form.
6. Select **File> Save** .
   The parameter assignment screen form is closed.
7. Select the TAG object and then **Tools > SIMATIC PDM > Create PLT-ID**.

You can then assign parameters for the generated PLT-ID at the associated parameter "PLT_ID".

Note

The PLT-IDs cannot be changed or deleted individually.

Creating the maintenance status (MS)

MS depends on:

- From the signal status of the signals PV0, PV1 and PV2
- from the binary message inputs (external MS)
- from the interconnectable input MS_In (external maintenance state)
- The interconnectable input STATUS. The process-related errors have no effect; only the device-based errors have an effect.

Of all these events the highest priority event will be displayed in the MS.

The 16 Diagx binary inputs do not have any influence on the MS; they are used only for visualization of the detail diagnostics in the diagnostics view of the faceplate.

Note

The table is valid exclusively for the MS and not for the signal status displays of the individual process values; these are created exclusively by the ST parameters.

The priority is similar to the MS coding. Therefore, the following applies: The greater the value of the MS, the higher the priority.

PVx.Value	PVx.ST	MS_In	Event	STATUS	Messagex. Value	O_MS
-	-	9	Configuration change	16#84 .. 87	-	9
-	-	8	Untested/unknown	-	-	8
PVx.Value >= PVx_AH	16#00	7	bad, maintenance alarm	16#00 .. 1B, 16#24 .. 27, 16#44 .. 4B	x = 1	7
PVx_AH > PVx.Value >= PVx_DH	16#68	6	uncertain, maintenance request	16#40 .. 43, 16#50 .. 5F, 16#64 .. 6B, 16#A8 .. AB	x = 2	6
PVx_DH > PVx.Value >= PVx_RH	16#A4	5	good, maintenance required	16#A4 .. A7	x = 3	5
-	-	4	bad, local operation/functional check	16#3C .. 3F	x = 4	4
-	16#60	3	uncertain, simulation	16#60 .. 63, 16#70 .. 73	x = 5	3
-	-	2	bad, device out of service	16#1C .. 1F	x = 6	2
-	-	1	bad, passivated	16#23	x = 7	1
PVx_RH > PVx.Value	16#28, 16#78	0	process-related fault	16#28 .. 2B, 16#78 .. 7B, 16#A0 .. A3	-	

See also

I/Os of AssetM (Page 1784)

Messages of AssetM (Page 1783)

17.4.2 Operating modes of AssetM

Operating modes of AssetM

This block does not have any modes.

17.4.3 Functions of AssetM

Functions of AssetM

The functions for this block are listed below.

Configurable reactions using the `Feature` parameter

You can find an overview of all reactions provided by the `Feature` parameter in the Configurable functions with the Feature I/O (Page 131) section. The following functionality is available for this block at the relevant bits:

Bit	Function
22	Update acknowledgment and error status of the message call (Page 135)
28	Disabling operating points (Page 121)

Forming the signal status for blocks

This block provides the standard function Forming and outputting the signal status for interlock blocks (Page 100).

The worst signal status `ST_Worst` for the block is formed from the following parameters:

- `PV0.ST`
- `PV1.ST`
- `PV2.ST`

17.4.4 Error handling of AssetM

Error handling of AssetM

Refer to the section Error handling (Page 104) in the basic instructions for the error handling of all blocks.

The following errors can be displayed for this block:

- Error numbers

Overview of error numbers

The `ErrorNum` I/O can be used to output the following error numbers:

Error number	Meaning of the error number
-1	Predefined value when inserting the block; block is not processed
0	No active fault

17.4.5 Messages of AssetM

Messaging

The following messages can be generated for this block:

- Process control fault
- Process messages

Process control fault

Message instance	Message identifier	Message class	Event
`MsgEvId1`	SIG 1	AS process control message - fault	bad, maintenance alarm @4W%t#AssetM_TXT@
	SIG 2	AS process control message - error	uncertain, maintenance request @4W%t#AssetM_TXT@
	SIG 3	Preventive maintenance - General	good, maintenance required @4W%t#AssetM_TXT@
	SIG 4	Reserved	
	SIG 5	Reserved	
	SIG 6	Reserved	
	SIG 7	AS process control message - fault	bad, device out of service
	SIG 8	Reserved	

Process messages

Message instance	Message identifier	Message class	Event
MsgEvId2	1	Status AS	bad, passivated
	2	Status AS	
	3	Status AS	bad, local operation/functional check
	4	Status AS	uncertain, simulation
	5	Status AS	Configuration change
	6	Status AS	Process-related fault
	7	Reserved	
	8	Reserved	

Associated values

Message block ALARM 8P	Associated value	Meaning
MsgEvId1	4	Text number from AssetM_TXT

System text library AssetM

Index	Text
1	Further status available
2	No further status available

17.4.6 I/Os of AssetM

I/Os of AssetM

Input parameters

I/O (parameter)	Meaning	Type	Default
Diagx	Asset detail diagnosis (x = 1 to 16)	BOOL	0
EvIdx	Message number (x = 1, 2, 3)	DWORD	0
Feature	I/O for additional functions (Page 1782)	STRUCT • Bit 0: BOOL • ... • Bit 31: BOOL	- • 0 • 0 • 0
Message1	1 = message: bad, maintenance alarm	BOOL	0
Message2	1 = message: uncertain, maintenance request	BOOL	0

I/O (parameter)	Meaning	Type	Default
Message3	1 = message: good, maintenance required	BOOL	0
Message4	1 = message: bad, local operation/functional check	BOOL	0
Message5	1 = message: uncertain, simulation	BOOL	0
Message6	1 = message: bad, out of service	BOOL	0
Message7	1 = message: passivated	BOOL	0
MS*	Maintenance status	DWORD	0
MsgEvIdx	Event ID x	DWORD	0
MsgLock	1 = Suppress process messages. Refer also to the Suppressing messages using the MsgLock parameter (Page 162) section for more on this.	STRUCT • Value: BOOL • ST: BYTE	- • 0 • 16#80
MS_Release	Release for maintenance	DigVal	
Ms_In	External interconnectable MS	DWORD	0
PLT_ID	Asset ID of EDD	DWORD	0
PV_Hyst	PV_Hysteresis for messages	REAL	5
PVx_AH	Limit PVx (x=0, 1, 2) maintenance alarm	REAL	100
PVx_AH_EN	1 = suppress monitoring of the limit PVx (x = 0, 1, 2), maintenance alarm exceeded	BOOL	0
PVx_DH	Limit PVx (x = 0, 1, 2) maintenance request	REAL	100
PVx_DH_EN	1 = suppress monitoring of the limit PVx (x = 0, 1, 2), maintenance request exceeded	BOOL	0
PVx_RH	Limit PVx (x = 0, 1, 2) maintenance required	REAL	100
PVx_RH_EN	1 = suppress monitoring of the limit PVx (x = 0, 1, 2), maintenance required exceeded	BOOL	0
PVx	Process value PVx (x = 0, 1, 2)	AnaVal	
PVx_Rst*	1 = Reset PVx (x = 0, 1, 2)	BOOL	0
PVxUnit	Unit of the process value	INT	0
RunUpCyc	Number of run-up cycles	INT	3
Status	External status	BYTE	16#80

* Values can be written back to these inputs during processing of the block by the block algorithm.

Output parameters

I/O (parameter)	Meaning	Type	Default
ErrorNum	Program error	INT	-1
MsgAckn	Message recognized	WORD	0
MsgErr_x	Message errors occurred	WORD	0
MsgStatx	Message error information (x = 1, 2, 3)	WORD	0
O_MS	Maintenance status	DWORD	0
PVx_Diff	Differential value to the next expected alarm (x = 0, 1, 2)	AnaVal	
PVx_AH_AcT	1 = Limit PVx (x = 0, 1, 2), maintenance alarm exceeded	BOOL	0
PVx_DH_AcT	1 = Limit PVx (x = 0, 1, 2), maintenance required exceeded	BOOL	0
PVx_RH_AcT	1 = Limit PVx (x = 0, 1, 2), maintenance request exceeded	BOOL	0
P_PVx_Rst	1 = Reset PVx (x = 0, 1, 2)	DigVal	
ST_Worst	Worst signal status of the inputs PVx (x = 0, 1, 2)	BYTE	16#80

See also

Functions of AssetM (Page 1782)

17.4.7 Block diagram of AssetM

Block diagram of ASSETM

A block diagram is not provided for this block.

System blocks 18

18.1 AddInt64 - Addition of two 64-bit integer variables

18.1.1 Description of AddInt64

Object name (type + number) and family

Type + number: FC 353

Family: System

Area of application for AddInt64

The block is used for the following applications:

- Addition of two 64-bit integer variables

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.2 AddR64 - Addition of two 64-bit REAL variables

18.2.1 Description of AddR64

Object name (type + number) and family

Type + number: FC 354

Family: System

Area of application for AddR64

The block is used for the following applications:

- Addition of two 64-bit REAL variables

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.3 DiToInt64 - Converting from DINT to Int64

18.3.1 Description of DiToInt64

Object name (type + number) and family

Type + number: FC 357

Family: System

Area of application for DiToInt64

The block is used for the following applications:

- Converting from DINT to Int64

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.4 Int64ToDi - Converting from Int64 to DINT

18.4.1 Description of Int64ToDi

Object name (type + number) and family

Type + number: FC 359

Family: System

Area of application for Int64ToDi

The block is used for the following applications:

- Converting from Int64 to DINT

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.5 NegInt64 - Negation of an Int64 variable

18.5.1 Description of NegInt64

Object name (type + number) and family

Type + number: FC 362

Family: System

Area of application for NegInt64

The block is used for the following applications:

- Negation of an Int64-variable

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.6 NegR64 - Negation of a Real64 variable

18.6.1 Description of NegR64

Object name (type + number) and family

Type + number: FC 363

Family: System

Area of application for NegR64

The block is used for the following applications:

- Negation of an Real64-variable

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.7 PIDCoefR - Calculation of coefficients

18.7.1 Description of PIDCoefR

Object name (type + number) and family

Type + number: FC 366

Family: System

Area of application for PIDCoefR

The block is used for the following applications:

- Calculation of coefficients of discrete-time difference equations for PIDConR from the continuous-time input parameters (e.g. `TI`, `TD`)

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.8 R64ToReal - Converting Real64 to REAL

18.8.1 Description of R64ToReal

Object name (type + number) and family

Type + number: FC 367

Family: System

Area of application for R64ToReal

The block is used for the following applications:

- Converting from Real64 to REAL (32 Bit)

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.9 RealToR64 - Converting REAL to Real64

18.9.1 Description of RealToR64

Object name (type + number) and family

Type + number: FC 368

Family: System

Area of application for RealToR64

The block is used for the following applications:

- Converting from REAL (32 Bit) to Real64

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.10 SelST16 - Output of the best or worst signal status

18.10.1 Description of SelST16

Object name (type + number) and family

Type and number: FC 369

Family: System

Area of application for SelST16

The block is used for the following applications:

- Output the best or worst signal status

This block is used by technologic blocks which edit and output a signal status.

Therefore this block will not be described in detail.

18.11 ShLeInt64 - Left shift of an Int64 variable

18.11.1 Description of ShLeInt64

Object name (type + number) and family

Type + number: FC 370

Family: System

Area of application for ShLeInt64

The block is used for the following applications:

- Left shift of a (positive) Int64- variable

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.12 ShRiInt64 - Right shift of an Int64 variable

18.12.1 Description of ShRiInt64

Object name (type + number) and family

Type + number: FC 371

Family: System

Area of application for ShRiInt64

The block is used for the following applications:

- Right shift of a (positive) Int64- variable

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

18.13 PIDKernR - calculation of the manipulated variable

18.13.1 Description of PIDKernR

Object name (type + number) and family

Type and number: FB 1877

Family: System

Area of application for PIDKernR

The block is used for the following applications:

- Calculation of the manipulated variable in PIDConR

This block is used by the PIDConR block for calculations that are twice as accurate (64-bit number format).

Therefore this block will not be described in detail.

Process tag types (insertible templates) 19

19.1 Introduction to process tag types

Introduction

You can find control engineering information on the standard process tag types of the Advanced Process Library in a separate chapter in this help:

- PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799)
- PIDConR with safety logic and control loop monitoring (PIDConR_ConPerMon) (Page 1800)
- Step controller with direct access to the actuator and without position feedback (StepControlDirect) (Page 1805)
- Step controller with assigned actuator block and position feedback (StepControlActor) (Page 1805)
- Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806)
- Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)
- Ratio control with PIDConR (RatioR) (Page 1809)
- Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810)
- Cascade control with PIDConR (CascadeR) (Page 1812)

If you want to do without control loop monitoring in order to reduce license costs or CPU resources, you can use accordingly simplified process tag types, which are identifiable by the suffix "Lean" in their names (for example, PIDControlLean, CascadeControlLean, RatioControlLean) or you can delete the ConPerMon block from the CFC charts for any of the process tag types.

In addition to the process tag types mentioned above, you will also find the following in the Templates folder of the library:

- PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802)
- PID controller for PA/FF devices (PIDControlLean_Fb) (Page 1799)
- PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800)
- Override control (Page 1814)
- Override control with PIDConR (OverrideR) (Page 1816)
- PID controller with Smith predictor (SmithPredictorControl) (Page 1804)
- Model-based predictive control (ModPreCon) (Page 1816)

This list contains prototype process tag types for several of the complex control loop structures shown in the example project (Page 1827). These prototypes are simply examples of how such process tag types might appear. In most process plants, it is assumed that high-level control loop structures must be configured individually some in combination with lower-level control loops. This means that mass production of high-level control loop structures as instances of process tag type represents the exception.

Descriptions for the following process tag types are also available:

- Monitoring eight digital process tags (Digital8Monitoring) (Page 1818)
- Monitoring of a digital process tag (DigitalMonitoring) (Page 1817)
- Monitoring a digital process tag for PA/FF devices (DigitalMonitoring_Fb) (Page 1817)
- Monitoring an analog process tag (AnalogMonitoring) (Page 1818)
- Monitoring of an analog process tag for PA/FF devices (AnalogMonitoring_Fb) (Page 1819)
- Dosing (DoseLean) (Page 1819)
- Dosing with PA/FF devices (DoseLean_Fb) (Page 1820)
- Two-speed motor (Motor2Speed) (Page 1821)
- Reversing motor (MotorReversible) (Page 1822)
- Reversing motor with controllable speed (MotorSpeedControlled) (Page 1822)
- Motor (MotorLean) (Page 1820)
- Motor with an additional analog value and time-stamped signals (Motor_AV_EventTs) (Page 1823)
- Motor valve (ValveMotor) (Page 1825)
- Valve (ValveLean) (Page 1824)
- Two-way valve (Valve2Way) (Page 1825)
- Control valve (VlvAnL) (Page 1826)
- Control value for PA/FF devices (ValveAnalog_Fb) (Page 1826)

Using process tag types

When using process tag types in a PCS 7 multiproject, the following procedure is recommended:

- Copy all the required function blocks from the Advanced Process Library to the block folder of the master data library of the multiproject (<Projectname>_Lib).
- Then in the plant view, copy the required process tag types from the Advanced Process Library to the "Process_tag_types" folder of the master data library of the multiproject.
- Make any customizations of the process tag types.

Generating the process tags

Process tags are the instances of the process tag types.

There are two ways of generating process tags:

1. Copy the process tag type from the master data library and insert it in the target folder in the plant hierarchy. You can then set the parameters for and interconnect the CFC chart in the CFC Editor.
2. Using the Import-Export assistant, you can then generate the required process tags of the process tag type that you then assign parameters to and interconnect based on an import file.

Notes on the "Measured value failure" application scenario for controller block process tag types

If there is no valid measured value for `PV`, the controller must not remain in automatic mode because a closed control loop no longer exists. The controller is unable to calculate a useful manipulated variable if there is no feedback of the actual process state. The controller must then be changed to manual or tracking mode. OS operators must be made aware of this situation by a corresponding message. Various reactions to the loss of measured values are conceivable depending on the application background:

1. Tracking a fixed, configured neutral position manipulated variable, for example, Valve closed, Heater off, or similar.
2. Holding the last valid manipulated variable `MV` constant to retain a steady process state as far as possible (if the process was already in such a state).
3. Change to manual mode, so that the OS operator can take over responsibility for process control.

A combination of reactions 2 and 3 is implemented in the template. The controller changes to tracking with the last valid manipulated variable as start value. The switchover is made via the input `MV_TrkOn` of the PID block. Since manual mode already has priority over tracking, the OS operator can subsequently use the command.

Caution: It is not advisable to freeze the last valid manipulated value if the signals are subject to heavy noise, or in control loops with frequent setpoint changes. In such situations, it is advisable to change to variant 1.

If a controller intervenes locally in the process via an actuator (for example, a valve with electropneumatic positioner Sipart PS) specific measures similar to those for a cascade controller must be taken:

- If there is local intervention, the controller tracks the current actuator position. In this case, the feedback signal is applied to input `MV_Trk` and an OR element is set before input `MV_TrkOn`.

Notes on analog position feedback for controller block process tag types

If there is no position feedback, delete the associated analog input channel block at the `MV_Rbk` parameter in the CFC chart. This will also make the corresponding display elements in the standard view of the faceplate invisible.

19.2 PID controller

PID controller

This process tag type forms the basis for generating PID control instances for continuous processes. In addition to the actual PID block, it contains functionality that should be implemented consistently in each control loop. This functionality is, however, not implemented within the PID block itself so that users can adapt the functions to a specific project:

- An analog input channel block for the actual value `PV` plus an analog output channel block for the manipulated variable `MV`.
- Certain logic blocks that change the control loop to a safe mode if the measurement of the process value fails. This state is signaled by the signal status of `PV`.

Note

Read the information for process tag types with controller blocks in Introduction to process tag types (Page 1795).

19.3 PID controller for PA/FF devices (PIDControlLean_Fb)

PID controller

This process tag type forms the basis for generating PID control instances for continuous processes. In addition to the actual PID block, it contains functionality that should be implemented consistently in each control loop. This functionality is, however, not implemented within the PID block itself so that users can adapt the functions to a specific project:

- An analog input channel block for the actual value PV plus an analog output channel block for the manipulated variable MV.
- Certain logic blocks that change the control loop to a safe mode if the measurement of the process value fails. This state is signaled by the signal status of PV.

Note

Read the information for process tag types with controller blocks in Introduction to process tag types (Page 1795).

19.4 PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon)

PID controller with safety logic and control loop monitoring

This process tag type forms the basis for generating PID control instances for continuous processes. In addition to the actual PID block, it contains functionality that should be implemented consistently in each control loop. This functionality is, however, not implemented within the PID block itself so that users can adapt the functions to a specific project:

- An analog input channel block for the actual value PV and (if available) the position feedback (Rbk), plus an analog output channel block for the manipulated variable MV.
- A simple process simulation of the first order, controlled by the manipulated variable MV which provides simulation values to analog input PV. This functionality allows at least elementary function tests control loop before a real process is connected.
- Certain logic blocks that change the control loop to a safe mode if the measurement of the process value fails. This state is signaled by the signal status of PV.
- An additional function block for control loop monitoring that should be installed in all PID control loop.

Note

Read also the information on controller block process tag types in Introduction to process tag types (Page 1795).
You can find information on the use of control loop monitoring in ConPerMon functions (Page 452).

19.5 PIDConR with safety logic and control loop monitoring (PIDConR_ConPerMon)

PIDConR with safety logic and control loop monitoring

This process tag type corresponds to the process tag type PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799) and control loop monitoring when PIDConR is used rather than PIDConL.

19.6 PID - control with operating-point-oriented parameter control (GainScheduling)

PID - control with operating-point-oriented parameter control

Many technical processes have a non-linear response due to non-linear physical, chemical or thermodynamic effects. When such a process needs to be kept in the close vicinity of a fixed operating point, the transfer response can be linearized around this operating point. A linear PID controller can be designed for this linearized transfer function. If, however, the process has a strongly non-linear response and/or operates at different operating points, no constantly good control response can be expected throughout the entire operating range. Due to the non-linearity, various gain factors or process time constants are in effect at different operating points. In keeping with this, different controller parameters will be considered to be optimum.

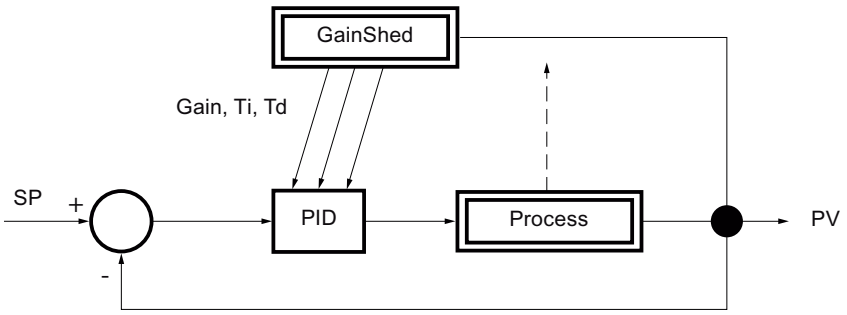


Figure 19-1 Operating-point-oriented parameter adaptation

One possible (the simplest) solution to this problem is known as gain scheduling or parameter scheduling. Using a tool such as the PCS 7 PID Tuner, various experiments are performed at different operating points, in each case with low signal amplitudes. This results in different PID parameter sets for each operating point. Up to three such parameter sets can be stored in the GainSched Function block. The suitable parameter set is selected depending on a continuously measurable variable that describes the state of the process, typically the control variable PV itself. Between the operating points for which there are exact parameter values, the values are calculated by linear interpolation of the neighboring interpolation points so that soft and bumpless transitions are possible between the operating points. The term "parameter scheduling" makes it clear that the "timetable" for adjusting the parameters is specified in advance. In contrast, an adaptive controller adapts itself automatically to the differing process response during operation.

The function block GainSched is produced from the CFC chart "fbGainSched" by compiling it as a block type. This CFC chart is supplied with the library so that the user has the option of expanding the existing basic functionality as necessary, for example to more than three operating points.

Note

The combination of several locally optimized controllers by gain scheduling to form a non-linear controller does not necessarily represent an optimum non-linear controller for the non-linear process when considered from a mathematical point of view. This becomes clear even with benign non-linearities (that are continuous and can be differentiated) when setpoint step changes are made between different operating points. Great caution is needed with non-linearities that are discontinuous or cannot be differentiated or with non-monotonic non-linearities.

Examples of applications

- Control (especially temperature control) of batch processes, for example, batch reactors and batch columns
- pH value control
- Temperature control with phase transitions (for example, fluid/vapor form)
- Control of semi-batch plants (continuous plants with operating point changes, for example, polymerization reactors)
- Control in power plants with load changes

19.7 PID controller with dynamic feedforward control (FfwdDisturbCompensat)

PID controller with dynamic feedforward control

Feedforward can be used when a known, strong disturbance affects the process and its cause can be measured. In these cases, the following general strategy applies: "Control as much as possible (if known in advance and described by a model), control as much as necessary (the rest including the model error and immeasurable disturbances)".

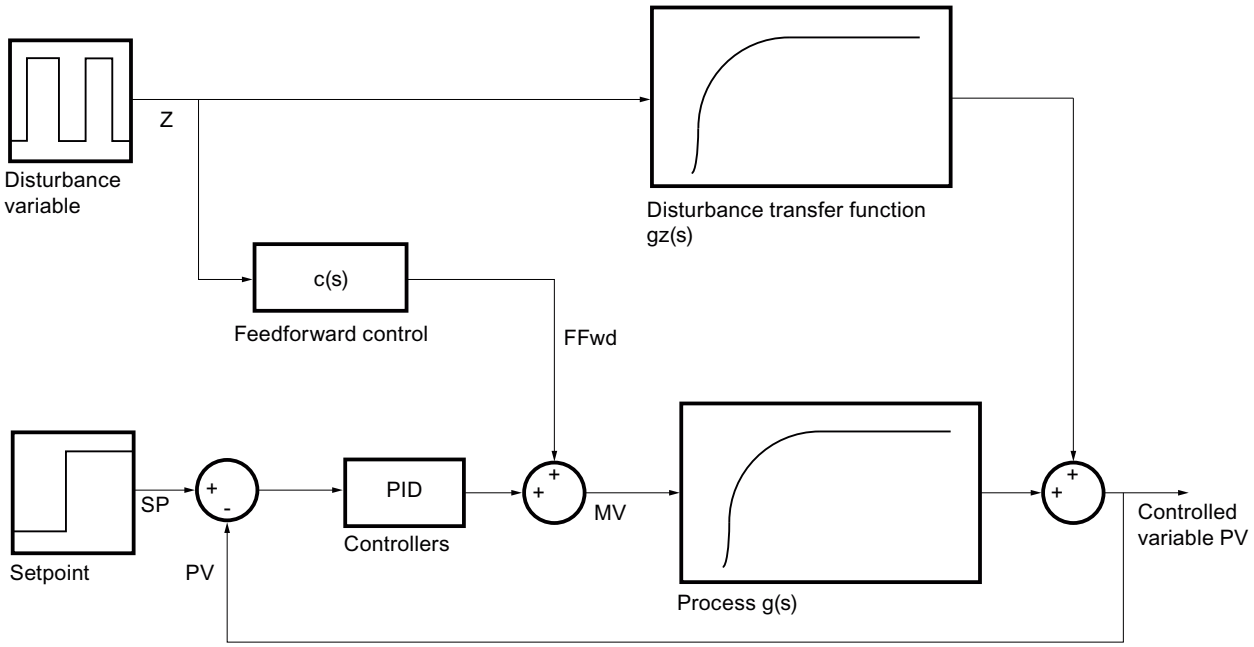


Figure 19-2 Dynamic feedforward control

The effect of a measurable disturbance can be estimated in the form of a transfer function $g_z(s) = y(s) / z(s)$ when the controller is running in manual mode so that no changes whatsoever to the controlled variable y = PV are caused by the manipulated variable and all changes can be attributed to the disturbance z(s).

The transfer function of an ideal feedforward control c(s) can be derived from the requirement that the effect of z on y should be zero for any disturbance signal z(s):

$g_z(s) \cdot z + c(s) \cdot g(s) \cdot z = (g_z(s) \cdot g(s)) \cdot z = 0$

To meet this equation, the compensation block must approximate the equation

$$c(s) = -\frac{g_z(s)}{g(s)}$$

as well as possible. For this to happen, the disturbance transfer function $g_z(s) = y(s) / z(s)$ must be known and the transfer function of the main controlled system $g(s) = y(s) / u(s)$, u = MV must be inverted. If both transfer functions can be modeled as first order with dead time

$$g(s) = \frac{k_s}{1 + t_1 s} \cdot e^{-s\theta}$$

and

$$g(s) = \frac{k_{sz}}{1 + t_{1z} s} \cdot e^{-s\theta_z}$$

and $\theta < \theta_z$ applies, the resulting compensation element must represent the transfer

$$c(s) = -\frac{k_{SZ}}{k_S} \cdot \frac{1 + t_1 s}{1 + t_{1z} s} \cdot e^{-s(\theta_Z - \theta)}$$

function.

In general, the following dynamic transfer function is required for additive feedforward control:

$$FFwd(s) = -k_c \cdot \frac{t_{cd} s + 1}{t_{cl} + 1} \cdot e^{-\theta_c s} \cdot z(s)$$

where:

$MV = MV_{PID} + FFwd$

In the example above, this function includes the following parameters:

$$k_c = \frac{k_{sz}}{k_s}, \quad t_{cd} = t_1, \quad t_{c1} = t_{1z}, \quad \theta_c = \theta_z - \theta'$$

This transfer function can be created outside the controller with a combination of elementary CFC blocks: one DT1 (Diff),, one PT1 (TimeLag) and one DeadTime block. As shown in the process tag type, the Diff block and TimeLag block are connected in parallel, and the DeadTime block as well as a multiplier are connected in series in front as a gain factor.

The input parameters k_c, t_{cd}, t_{c1} need to be configured by the user. For a static feedforward control, both time constants are set to zero.

Examples of applications

- Controlling the outlet temperature of a heat exchanger via steam pressure or heating/cooling medium flow. Flow and inlet temperature of the medium are measurable disturbance variables.
- Fill level control in a drum steam generator using the inlet volume. The outflow is the measurable disturbance variable that is determined by the variable steam consumption in the plant.
- Temperature control in a distillation column using the reflux ration or or heating steam volume. The measurable disturbance variable is the mixture inlet.
- Temperature and concentration control in an agitated tank reactor using cooling medium flow and discharge volume. The temperature and possibly also the concentration of the inflow are measurable disturbance variables.

19.8 PID controller with Smith predictor (SmithPredictorControl)

PID control with Smith predictor

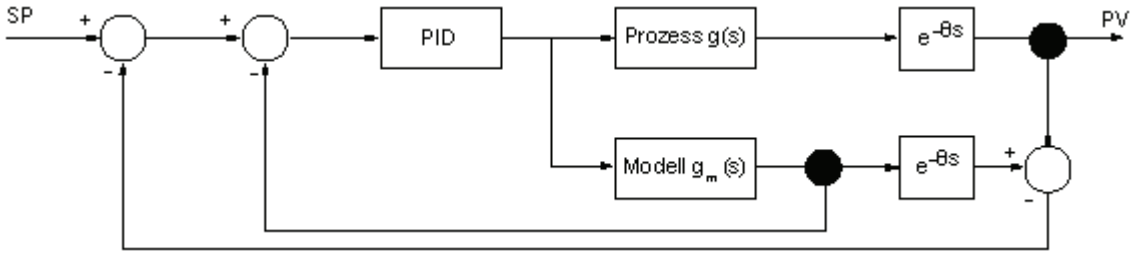


Figure 19-3 PID control with Smith predictor

In processes with large dead times (relative to the dominating time lag constant), a standard PI controller must be set very slowly and compromises must therefore be accepted in the control quality. The control quality can be significantly improved with a Smith predictor that can be derived from the IMC principle (**I**nternal **M**odel **C**ontrol) of model-based control. To achieve this, the transfer function $g_s(s) = g(s) \cdot e^{-s\theta}$ of the controlled system is split up into a part without dead time g(s) and a purely dead time slice $e^{-s\theta}$ with dead time θ. Only the controlled variable y affected by dead time can be measured in the real process. However, a virtual estimate of the controlled variable free of dead time can be taken from the process model (that will become part of the controller) and fed to the controller. This means that the controller itself can be designed for the process without a dead time slice and can therefore be set much more tightly. To compensate unknown disturbances, an estimate of the controlled variable affected by dead time is made in the model and compared with the genuine measured controlled variable. This difference is also fed back to the controller.

In terms of practical application, it must be pointed out that the performance of the Smith predictor depends largely on the model fit, in other words, the dead time must be known. The dead time must be constant or its value must be permanently adapted.

Note

To control processes with large dead times, a model predictive controller (see Description of ModPreCon (Page 568)) is also suitable in a single variable situation. It provides greater flexibility in the system modeling and is more convenient thanks to the integrated design procedures, it does however require more CPU resources.

19.9 Step controller with direct access to the actuator and without position feedback (StepControlDirect)

Step controller with direct access to the actuator and without position feedback

The output of the PIDStepL block is directly connected to the process via two digital output channel blocks. This is the simplest form of a step control. The operator can control the actuator (push-button open/close) in the faceplate of the controller. This push-button operation is preferable when operating simple actuators without position feedback since it allows bumpless switchover to auto mode. This switchover is not possible if actuators without position feedback are operated manually from any location outside the control block. For this reason, the template is designed with a PIDStepL block without position feedback.

19.10 Step controller with assigned actuator block and position feedback (StepControlActor)

Step controller with assigned actuator block and position feedback

The output of the PIDStepL block is directly interconnected with the process by way of an actuator block (for example, a motor or a valve). This additional effort is justified when special automation functions of the actuator block, for example motor current monitoring, tripping and operation in local mode are required. The option of such combinations allows users to do without special functions for operation in local mode or actuator monitoring functions within the controller block.

If the actuator block is not in external default setpoint, or there is an interlock, motor protection or monitoring error, the actuator is incapable of accepting and executing controller commands.

In this context, the resulting structure must be interpreted as a "cascade circuit" consisting of the (primary) controller and actuator block (secondary controller) and measures similar to those for cascade control must be taken. For this purpose, the `CascaCut` output of the actuator block must be interconnected to the `TrkOn` input of the primary controller.

To ensure the bumpless switchover from local or manual mode back to cascade mode, the current actuator position must be fed back to the tracking input of the primary controller. This is, however, only possible when using actuators with position feedback. For this reason, the template is designed for operation with a PIDStepL block with position feedback.

19.11 Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl)

Split-range controller with control loop monitoring (ConPerMon)

A PID closed-loop controller can use a Split-Range block downstream of the controller output to distribute its manipulated variable to several actuators that influence the same control variable based on different physical principles and in different directions. A typical example of such an application is a temperature control, with heating via a live steam valve and cooling via a cooling water valve. The controller can request heating or cooling energy, depending on the sign of the control deviation (or more precisely of the manipulated variable). In other words, it can work with a bidirectional MV output (for example: -100% < MV < 100%), although each actuator only supports unipolar operation (for example: 0% < valve position < 100%).

The Split-Range function block contains two separate (static) characteristics for both actuators. Any significant difference between the two actuators in terms of performance (can be interpreted as different steady state gains for heating and cooling), can be compensated by setting different gradients for the characteristics, so that as far as possible, the controller is presented with a linear process response (independent of the sign).

Example: The cooling effect is not as strong as the heating effect.

If cooling is half as effective as heating, the split-range characteristic for cooling should have twice the gradient.

Note

The effective maximum values of the manipulated variables are obtained from the manipulated variable limits of the controller multiplied by the gradients of the split-range characteristics.

The cooling valve cannot go beyond fully open, in other words, the effective limitation for opening the valve is 100%. If a split range characteristic with gradient 2 is used for cooling, the low limit for the manipulated variable must be set to MV_LoLim = -50% on the controller.

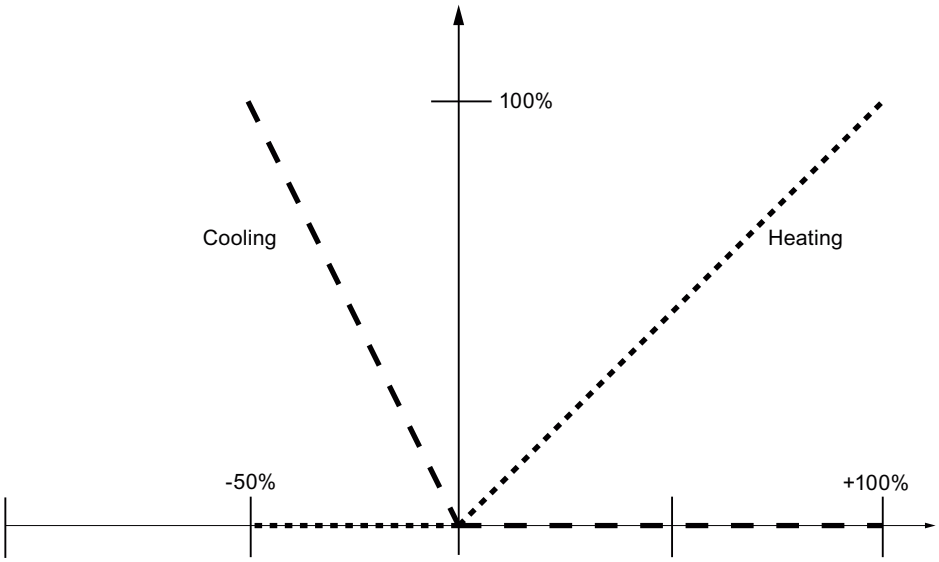


Figure 19-4 Split-range function of the example

The actual split-range function is supplied as separate SplitRange function block that is described in detail in the online help of the block.

Examples of applications:

- Control of the temperature of chemical reactors by means of steam heating valves and water cooling valves.
- Temperature control of glass furnaces or sprue channels by means of gas burners and cooling fans
- Temperature control of extruders by means of electrical heating and cooling fans
- Pressure control in a gas phase reactor by means of inlet and outlet valves
- Pressure control at a steam collecting track that supplies steam to several units by means of inlet valves from several steam generators, or the heating power of several steam generators.

19.12 Split-range control (SplitRangeControlLean)

Split-range control

This process tag type is identical to the following process tag type:

Split-range controller with control loop monitoring through ConPerMon (SplitrangeControl) (Page 1806)

The ConPerMon block is not included, however.

19.13 Ratio control with control loop monitoring through ConPerMon (RatioControl)

Ratio control

Specific mixtures of several liquids or gases can be produced by means of a ratio control system consisting of several flow controllers and a Ratio block. The flow setpoint of an additive is obtained from one of these values:

1. From the current `PV` value of the main flow.
   This is the preferred alternative if the primary flow controller operates with steady-state deviation.
   or
2. From the setpoint `SP` of the main flow.
   This alternative provides a smooth, noise-free setpoint signal to the second controller, and allows for a more precise control of specified ratios in transition states where both flow control loops have approximately the same dynamic response.

It is generally advisable to use the second "setpoint-oriented" alternative for main flow controllers with I action.

Interconnect the selected reference value (actual value or setpoint of the main flow) to the In input parameter of the Ratio block.

The ratio control can be expanded by adding further components, in other words, setpoints 3 to n can be derived from `SP1` (or `PV1`) with the help of additional Ratio blocks.

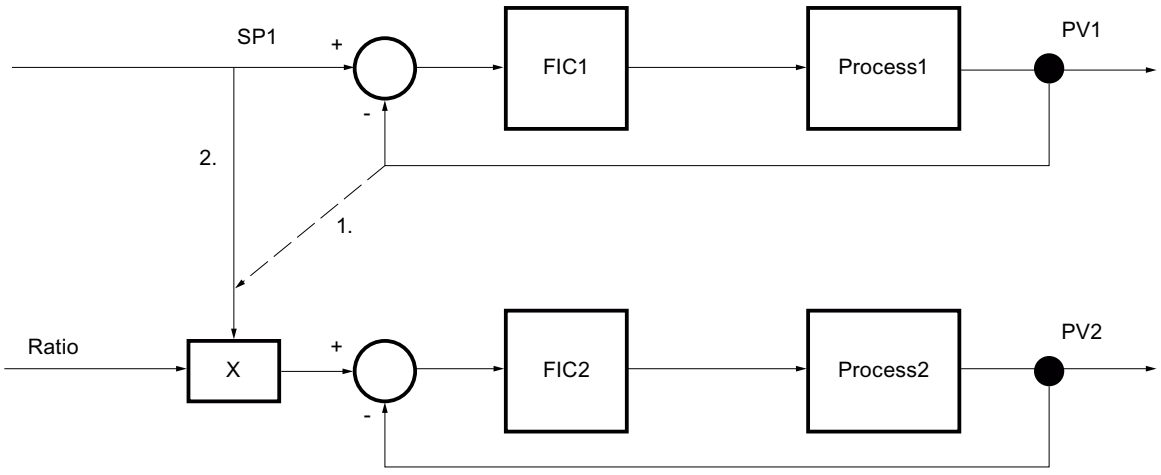


Figure 19-5 Ratio control, process value-oriented (1.) and setpoint-oriented (2.)

The main task of the Ratio block is to define the external setpoint of the secondary (added) component in accordance with

$$Out = In \cdot Ratio + Offset$$

The actual ratio of the two flow actual values is also calculated in accordance with

$$RatioPV = \frac{SecComPV - Offset}{InPV}$$

and displayed on the control panel for checking purposes. In addition, interconnect the actual value of the main flow to the input parameter `InPV` of the Ratio block and the actual value of the flow of the secondary component to the input parameter `SecComPV`.

In both cases 1 and 2, the current value of the ratio is not controlled directly in the closed loop (no feedback-control) but rather uses feedforward-control.

Note

If the PID_Componet1 secondary controller is switched from automatic to another operating mode, the `CascaCut` output parameter is set and the Ratio block is switched to external. In this case, the external setpoint is corrected to the actual value ratio for the ratio of the control actual value to the component actual value: RatioExt = RatioPV. This results in a soft transition to automatic mode.

An additional function block for control loop monitoring must be installed, because it should always be installed in every PID control loop.

19.14 Ratio control (RatioControlLean)

Ratio control

This process tag type is identical to the following process tag type:

Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808)

The ConPerMon block is not included, however.

19.15 Ratio control with PIDConR (RatioR)

Ratio control with PIDConR

This process tag type corresponds to the process tag type Ratio control with control loop monitoring through ConPerMon (RatioControl) (Page 1808) when PIDConR is used rather than PIDConL.

You need to set feature bit 21 Switching operator controls for external setpoint to visible (Page 120) to 1 with a flow controller for the secondary component.

19.16 Cascade control with control loop monitoring through ConPerMon (CascadeControl)

General information on cascade control

A cascade control involves two or more PID controllers connected in series. The manipulated variable of the primary controller is interconnected to the external setpoint of the secondary controller so that both control loops are nested. The advantage of cascade control is that disturbances affecting the inner loop can be compensated much more quickly in the secondary loop than in the slower primary loop. In some situations, non-linear effects of the actuator can be compensated in the secondary loop so that a linear process response can be created for the primary loop. Cascade control is possible only when there are further measurable variables in the process in addition to the main control variable and when the internal control loop is significantly faster than the external loop.

Aspects to be clarified for the cascade control

With any cascade control, the following aspects must be carefully considered and clarified:

- The actuation range of the primary controller must match the setpoint range of the secondary controller to ensure proper operation of the anti-Windup functions of the primary controller.
- If the secondary controller is not operated in "cascade" mode (automatic mode with external setpoint) but in any other mode (for example manual or automatic mode with local setpoint) and therefore does not respond to commands of the primary controller, the primary controller must be put into "tracking" mode to prevent integration of the I action in the primary controller. The manipulated value of the primary controller tracks the process value or setpoint of the secondary controller to allow a bumpless return to cascade mode. The difference between tracking the setpoint and tracking the process value becomes apparent when the secondary controller is put into manual mode. If the process value is tracked, the response is similar to the "Track setpoint to process value in manual mode" of a simple controller.
- If the secondary controller reaches a (high/low) manipulated variable limit, the integrator of the primary controller should be blocked to prevent it going any further in this direction (up / down). The secondary controller cannot go any further in this direction anyway. This prevents any windup of the primary controller when the real actuator has already reached its physical limits while the primary controller has not yet reached its manipulated variable limits.

  Caution:

  – Swap the two bits of this interconnection if the secondary controller has a negative gain.
  – If the secondary controller then reaches a high or low limit, the integrator of the primary controller must be prevented from further integration in this direction.

Procedure

When you set up and commission the controller, you work from the "inside to the outside", in other words, you start by making the settings for the secondary controller and putting it into auto mode. You then set the primary controller parameters and change the secondary controller to cascade mode. When you set the parameters for the primary controller, remember that from its perspective the entire, inner closed control loop is the "controlled system". The parameters you set for the primary controller depend to a greater or lesser extent on the settings you made for the secondary controller. This becomes less important the greater the difference in dynamic response between the primary and secondary control loop.

Priorities

The tracking by the primary controller that is initiated by the secondary controller has lower priority than the manual mode on the primary controller. In turn, manual mode has lower priority than forced mode on the master controller as can, for example, be requested by external logic during an emergency shutdown of the plant (controller input `MV_Forced`, unlimited, activated by `MV_ForOn` with highest priority). For this reason, the PIDConL block for cascade control has an additional tracking input `MV_Trk` that is activated by `MV_TrkOn` and is subject to the normal manipulated variable limiting and has lower priority than manual mode.

Additional application examples

- Temperature control of a distillation column (primary controller) based on the reflux ratio (secondary controller at the top of the column), and heating steam flow rate (secondary controller at the column sump),
- Temperature control of a furnace using a secondary controller to control the fuel flow rate,
- Fill level control for a container using a secondary controller for the inlet and/or outlet flow.
- Position control (in drive engineering) with a secondary controller for the speed and torque.

Using secondary flow controllers

Secondary controllers are usually used for flow control to prevent detrimental effects on the primary controller resulting from changes in flow rate. The non-linearities frequently often found in a flow control element (for example a valve) are "hidden" in the secondary loop because the secondary closed loop has a linear response and non-linearities have no effect on the primary controller or its tuning.

Note

Control loop monitoring is only practical for primary controllers, as explained in the description of the ConPerMon block in the section, Functions/Cascade Control.

19.17 Cascade control (CascadeControlLean)

Cascade control

This process tag type is identical to the following process tag type:

Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810)

The ConPerMon block is not included, however.

19.18 Cascade control with PIDConR (CascadeR)

Cascade control with PIDConR

This process tag type corresponds to a large extent to the process tag type Cascade control with control loop monitoring through ConPerMon (CascadeControl) (Page 1810) when PIDConR is used rather than PIDConL.

Special note: The current `PV_Out` output of the PID_Slave secondary controller is used as an external Reset `ExtReset` on the primary controller. Unlike cascade control, the PID_Master primary controller does not therefore have to be changed to tracking when the cascade is disconnected with all other PID controllers. There is also no need for the direction-dependent blocking of the integrator for the primary controller.

Since the primary controller is reliant on the external Reset, any control deviations in the secondary closed loop interfere with the primary controller; secondary controllers without I action are not therefore recommended for PIDConR.

You need to set the Feature bit Switching operator controls for external setpoint to visible (Page 120) to 1 with a secondary controller of the cascade.

19.19 Source chart for GainSched function block (gain scheduling)

Source chart for GainSched function block

In contrast to all other function blocks, the `GainSched` block is implemented as a CFC chart and is generated with the "Compile chart as block type" function. Several application options are available in this case:

- You can use the precompiled function block `GainSched` from the library if the standard functionality is adequate for your needs.
- If you require special additional functions for gain scheduling in your application (for example more than three operating points, additional logic functions for selecting the parameters), you will need to modify the CFC source chart and compile it as a block type with a different FB number.

Internally, the `GainSched` block consists essentially of three instances of the Polygon block, one for each of the three controller parameters, Gain, TI and TD.

The polygon block itself would extrapolate linearly outside of the boundary points and thereby exceed the value range of its interpolation points. However, as this presents too high a risk for controller parameters, the controller parameters which are output are effectively limited to the table values at the boundary operating points by the automatic introduction of additional interpolation points with a horizontal end tangent outside of the specified range.

19.20 Override control

Override control

In an override control, two or more controllers share a common actuator. Depending on the current process state, a decision is made as to which controller actually has access to the actuator, in other words, the various controllers can override each other.

A typical use case is a gas pipeline with pressure and flow control using a single valve. The main aim of the control is to achieve a certain flow rate, however due to safety considerations, the pressure must be kept within certain limits. The pressure controller is therefore known as the "limiting controller" or "secondary controller".

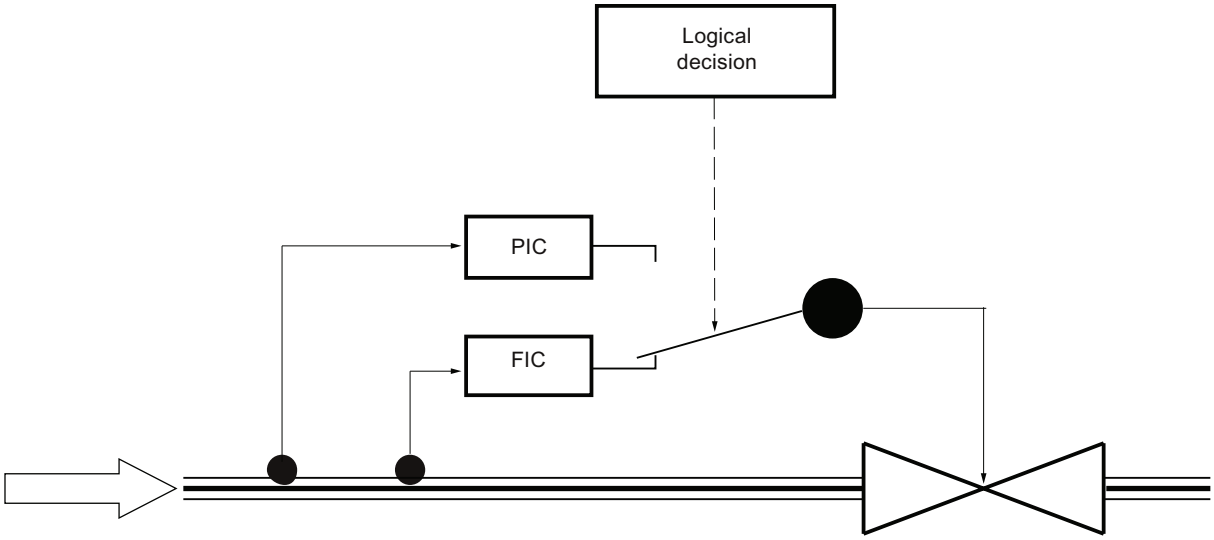


Figure 19-6 Override control with main controller FIC and limiting controller PIC

Criteria for the type of override control

The logical decision as to which controller should be active can be made based on two different criteria resulting in two different types of override controls:

1. The decision is based on a measurable process output variable, for example one of the two controlled variables. In the example above, the warning limits of the pressure controller can be used to decide whether the pressure controller should be active. The passive controller is in tracking mode to avoid Windup problems and to ensure bumpless transfer. The setpoint of the secondary controller must be somewhat lower than the switchover threshold so that the transfer can be reversed again. This type of override control is easy to understand and to implement. Its advantage is that the high and low limit of the secondary controlled variable (for example pressure) can be monitored; its disadvantage is that a limit cycle oscillation results as soon as the limiting controller needs to intervene. The secondary controller will always attempt to return its controlled variable to the safe range and to return command to the main controller (for example flow rate) so that the active and passive controllers swap over continuously. This variant is therefore only recommended when the secondary controller is seldom required and functions mainly as a safety or backup system.
2. The decision is based on a comparison of the manipulated variables of both controllers, for example the controller that demands the higher (or lower) controlled variable takes control of the actuator. In the example above, the controller that wants to open the valve further takes over control. The setpoint of the secondary controller defines the switching threshold. Both controllers run the entire time in automatic mode. To avoid Windup problems, the manipulated variable limits must be tracked in a crossover structure: When the higher (lower) manipulated variable wins, the low (high) limits of all controllers of the currently highest (lowest) manipulated variable must be corrected slightly up or down by, for example, 2% of the manipulated variable range. This means that this scheme can also be used in applications with more than two controlled variables. There is no Windup problem at the high limit because the highest manipulated variable takes over control anyway. This approach avoids the limit cycle oscillation of alternative 1 but is, in principle asymmetrical, in other words either a high or a low limit of the secondary controlled variable can be monitored but not both.
   This type of override control is described in most control textbooks, particularly in the USA. It can, however, only be used with PID algorithms that allow online manipulation of the manipulated variable limits (in PCS 7 as of V6.0).

Additional application examples

- **Steam generator:** The primary controlled variable is the steam pressure but the water level in the steam tank must be monitored so that the heating coils remain completely covered by water and the tank does not overflow. The only manipulated variable is the outlet valve.
- **Compressor:** The primary controlled variable is the throughput but the pressure must be monitored to make sure it does not exceed a safety limit. The only manipulated variable is the motor speed.
- **Steam distribution system:** Every plant involving industrial processes has a network of pipes to distribute steam at various pressures throughout the plant. The high pressure of the steam is reduced to lower levels via a valve. The primary controlled variable is the pressure at the lower-level stage, however the pressure in the high pressure piping must also be monitored to make sure that it does not exceed a safety limit.

19.21 Override control with PIDConR (OverrideR)

Override control with PIDConR

This process tag type corresponds for the most part to the process tag type Override control (Page 1814) when PIDConR is used rather than PIDConL.

Special note: The current manipulated variable output at the final controlling element (e.g. the maximum `MaxMV.Out` manipulated variable proposed by the main controller and limiting controller) is used as the external Reset`ExtReset` for both controllers. Unlike override control, the manipulated variable limits (e.g. `MV_LoLim`) of both controllers do not have to be tracked within a defined space (e.g. `MaxMV_Minus2.Out`) by the manipulated value output at the final controlling element with all other PID controllers.

19.22 Model-based predictive control (ModPreCon)

Model-based predictive control

The process tag type shows how users can expand the ModPreCon block by adding extra functions:

- External alarming with the MonAnL block
- Control quality monitoring with the ConPerMon block
- Safety logic for measure value loss.

You can find details about the ModPreCon block in Description of ModPreCon (Page 568).

Note on using the ConPerMon block in a system with multi-variable

The mathematical concept of the ConPerMon block is designed for single variable applications. If any increase of variance is detected in the channel of a multi-variable control, the ConPerMon algorithm is unable to determine whether this problem is caused by its own internal control channel or by interaction of neighboring channels. It may be helpful, however, to include a ConPerMon block for each control channel of a multi-variable system to monitor whether the control performance during operation remains within the range determined during commissioning. To achieve this, several logic operations must be performed before the `ManSuprCPI` input bit of each ConPerMon block:

- If one or several of the other channels of the multi-variable system are are not in a steady state ("root caused in this channel") due to local causes (for example a setpoint step change) that is indicated by output bit `CPI_SuRoot = 1`, the increase of variance in its own channel cannot be avoided and should not trigger a CPI warning in its own channel.
- If one or several other channels of the multi-variable system exhibit strong variations as indicated by output bit `CPI_WrnAct = 1`, the increase in variance in its own channel cannot be avoided and should not trigger a CPI warning in its own channel. This may be helpful to localize the actual cause of the problem. The channel in which excessive variations are first detected outputs the first alarm; the other channels which may only be affected by errors resulting from the first error do not generate their own alarms.

Examples of applications

- Quality control in distillation columns, for example control of the column top and sump temperature based on the reflux ratio and heating steam volume
- Temperature control of several adjacent zones of furnaces with several burners, for example, tunnel furnaces, glass smelting plants, glass sprue channels etc.
- Quality control in chemical reactors by adjusting of reaction conditions such as pressure, temperature, feed/drain etc.
- Vaporizers, for example, drum steam generators
- Mills, for example, cement mills, sieve mills: quality control (grain size) in combination with flow rate maximized, manipulated variables: sieve speed and mill feed

Note

The statistical evaluation of the service factor (time slice in automatic mode) and the time slices in the manipulated variable limits can be performed in a WinCC trend control, as in the customary case of a single variable. The binary variables from ModPreCon required for this are archived automatically. However, an appropriate trend control must be manually configured on the operator station, since the view archive in the ConPerMon block is not designed for such quantities.

19.23 Monitoring of a digital process tag (DigitalMonitoring)

Monitoring a digital process tag

This process tag type serves as a basis for monitoring a digital process tag using the MonDiL block.

The digital measurement signal is read from the I/O through the PCS7DiIn block.

The process tag type contains the required interconnections between Pcs7DiIn and MonDiL.

19.24 Monitoring a digital process tag for PA/FF devices (DigitalMonitoring_Fb)

Monitoring a digital process tag

This process tag type serves as a basis for monitoring a digital process tag using the MonDiL block.

The digital measurement signal is read from the I/O through the FbDiIn block.

The process tag type contains the required interconnections between FbDiIn and MonDiL.

19.25 Monitoring eight digital process tags (Digital8Monitoring)

Monitoring eight digital process tags

The process tag type serves as a basis for monitoring up to eight digital process tags using the MonDi08 block.

The digital measurement signals are read from the I/O through the PCS7DiIn block.

The process tag type contains the required interconnections between the eight Pcs7DiIn and MonDi08 blocks.

19.26 Monitoring an analog process tag (AnalogMonitoring)

Monitoring an analog process tag

This process tag type serves as a basis for monitoring an analog process tag using the MonAnL block.

The analog value is read from the I/O through the PCS7AnIn block.

The process tag type contains the required interconnections between Pcs7AnIn and MonAnL.

If you wish to monitor and forward the slope of the process value, you usually need to smooth the process value. You can insert a filter block such as Smooth between Pcs7AnIn and MonAnL for this purpose. The gradient of the process value can also be smoothed using the TimeLag parameter at MonAnL.

Procedure for smoothing the process value and its gradient:

1. Check the process value PV in the trend recorder and smooth it using a filter block such as Smooth only as much as is needed.

2. Check the gradient PV_Grad of the process value in the trend recorder and smooth the trend at the TimeLag parameter of MonAnL.

The sum of the time constants of Timelag from MonAnL and TimeConstant from Smooth approximately result in the length of a varying time window in which the gradient is averaged.

19.27 Monitoring of an analog process tag for PA/FF devices (AnalogMonitoring_Fb)

Monitoring an analog process tag

This process tag type serves as a basis for monitoring an analog process tag using the MonAnL block.

The analog value is read from the I/O through the FbAnIn block.

The process tag type contains the required interconnections between FbAnIn and MonAnL.

If you wish to monitor and forward the slope of the process value, you usually need to smooth the process value. You can insert a filter block such as Smooth between FbAnIn and MonAnL for this purpose. The gradient of the process value can also be smoothed using the TimeLag parameter at MonAnL.

Procedure for smoothing the process value and its gradient:

1. Check the process value PV in the trend recorder and smooth it using a filter block such as Smooth only as much as is needed.

2. Check the gradient PV_Grad of the process value in the trend recorder and smooth the trend at the TimeLag parameter of MonAnL.

The sum of the time constants of Timelag from MonAnL and TimeConstant from Smooth approximately result in the length of a varying time window in which the gradient is averaged.

19.28 Dosing (DoseLean)

Dosing

This process tag type serves as a basis for dosing either as "Single component dosing via flow measurement" or as "Fill/extraction weighing via dosing scale" using the DoseL block.

The analog measurement signal is read from the I/O through the PCS7AnIn block.

The interlock signals of DoseL are interconnected to the Intlk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The digital output signals are sent to the I/O through the PCS7DiOu blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

19.29 Dosing with PA/FF devices (DoseLean_Fb)

Dosing

This process tag type serves as a basis for dosing either as "Single component dosing via flow measurement" or as "Fill/extraction weighing via dosing scale" using the DoseL block.

The analog measurement signal is read from the I/O through the FbAnIn block.

The interlock signals of DoseL are interconnected to the Intlk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via FbDiIn.

The digital output signals are sent to the I/O through the FbDiOu blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

19.30 Motor (MotorLean)

Motor with current monitoring

This process tag type serves as a basis for controlling motors with one control signal using the MotL block.

The feedback signal of the motor is read from the I/O through the PCS7DiIn block.

The interlock signals of MotL are interconnected to the IntLk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The digital output signals are sent to the I/O through the PCS7DiOu blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

19.31 Motor with PROFIdrive Drive Profile telegram 1 and 20 (Namur)

Motor with adjustable speed and two directions of rotations according to the speed control mode with standard telegram 1 and 20

The process tag type serves as a basis for control of motors according to the profile "Speed control mode with standard telegram 1 and 20 with and without Namur" with the help of blocks FbDrive and MotSpdCL.

The interlock signals of MotSpdCL are connected to the IntLk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The input/output signals of MotSpdCL are sent to the I/O through the FbDrive block.

The process tag type contains the required interconnections between the blocks mentioned above.

19.32 Two-speed motor (Motor2Speed)

Two-speed motor

This process tag type serves as a basis for controlling motors with two speeds using the MotSpdL block.

The speed feedback signals of the motor are read from the I/O through the PCS7DiIn blocks.

The interlock signals of MotSpdL are connected to the IntLk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The digital output signals are sent to the I/O through the PCS7DiOu blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

19.33 Reversing motor (MotorReversible)

Reversing motor

This process tag type serves as a basis for controlling reversing motors using the MotRevL block.

The feedback signals of the motor are read from the I/O through the PCS7DiIn blocks.

The interlock signals of MotRevL are connected to the IntLk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The digital output signals are sent to the I/O through the PCS7DiOu blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

19.34 Reversing motor with controllable speed (MotorSpeedControlled)

Reversing motor with controllable speed

This process tag type serves as a basis for controlling reversing motors with controllable speed using the MotSpdCL block.

The digital feedback signals of the motor are read from the I/O through the PCS7DiIn blocks.

The speed feedback of the motor is read from the I/O through the PCS7AnIn block.

The interlock signals of MotSpdCL are connected to the IntLk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The digital output signals are sent to the I/O through the PCS7DiOu blocks.

The speed control signal is output to the I/O through the PCS7AnOu block.

The process tag type contains the required interconnections between the blocks mentioned above.

19.35 Motor with an additional analog value and time-stamped signals (Motor_AV_EventTs)

Motor with an additional analog value and time-stamped signals

This process tag type shows the monitoring of an additional analog value, for example, for motor current monitoring (AV block) and additional binary signals (EventTs block) at a technologic block with MotL as an example.

By interconnecting the AV or EventTs block, messages of this block are displayed in the message view of the technologic block connected to it and can be acknowledged there.

Use of the AV block

The analog signal to be monitored can be read via the Pcs7AnIn block, for example. This has to be interconnected to the AV block. The `AV_Tech` output parameter of the AV block has to be interconnected to the `AV` input parameter of the technologic block.

Use of the EventTs block

A non-time-stamped binary signal from the I/O can be read via the Pcs7DiIn block, for example. The `PV_Out` output parameter of Pcs7DiIn has to be interconnected to the `Inx` input parameter of the EventTs block. The time stamp of this signal is generated by the EventTs block at signal change.

A time-stamped binary signal from the I/O must be read via the Pcs7DiIT block. The `TS_Out` output parameter of Pcs7DiIT has to be interconnected to the `InTSx` input parameter of the EventTs block.

The `EventTsOut` output parameter of the EventTs block has to be interconnected to the EventTsIn input parameter of the technologic block.

Additional interconnections

The interlock signals of MotL are interconnected to the IntLk02 interlock blocks. In turn, these interlock blocks are interconnected to other blocks, for example, to digital process tags via the Pcs7DiIn block.

The digital output signal is output to the I/O through the PCS7DiOu block.

The process tag type contains the required interconnections between the blocks mentioned above.

19.36 Motor according to the profile for low voltage switchgear devices with profile 1 of the MM_Starter

Motor with two directions of rotation according to the manage motor starter with profile type 1

The process tag type serves as a basis for control of motors according to the profile "Manage motor starter - profile type 1" with the help of blocks FbSwtMMS and MotRevL.

The interlock signals of MotRevL are connected to the IntLk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The input/output signals of MotRevL are sent to the I/O through the FbSwrtMMS block.

The process tag type contains the required interconnections between the blocks mentioned above.

19.37 Valve (ValveLean)

Valve

This process tag type serves as a basis for controlling a valve with two positions (open/close) using the VlvL block.

The feedback signals of the valve are read from the I/O through the PCS7DiIn blocks.

The interlock signals of VlvL are connected to the IntLk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The digital output signals are sent to the I/O through the PCS7DiOu blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

19.38 Two-way valve (Valve2Way)

Two-way valve

This serves as a basis for controlling a

- multi-way valves with up to three switching positions or
- three individual valves (valve network) to implement a 2-way valve circuit with neutral position

using the Vlv2WayL block.

The feedback signals of the valve or valves are read from the I/O through the PCS7DiIn blocks.

The interlock signals of Vlv2WayL are connected to the IntLk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The digital output signals are sent to the I/O through the PCS7DiOu blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

19.39 Motor valve (ValveMotor)

Motor valve

This process tag type serves as a basis for controlling a motor valve using the VlvMotL block.

The feedback signals of the valve are read from the I/O through the PCS7DiIn blocks.

The interlock signals of VlvMotL are connected to the IntLk02 interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via Pcs7DiIn.

The digital output signals are sent to the I/O through the PCS7DiOu blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

19.40 Control valve (VlvAnL)

Analog control valve

This process tag type serves as a basis for controlling an analog control valve (0 to 100%) using the `VlvAnL` block.

The feedback signals of the valve's total travelled positions (open/closed) are read by the I/Os through the `Pcs7DiIn` blocks.

The feedback signal of the current analog position is read through the `Pcs7AnIn` block.

The interlock signals of `VlvAnL` are interconnected to the `IntLk02` interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via `Pcs7DiIn`.

The analog actuating signal is output to the peripherals via the `Pcs7AnOu` blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

19.41 Control value for PA/FF devices (ValveAnalog_Fb)

Analog control valve

This process tag type serves as a basis for controlling an analog control valve (0 to 100%) using the `VlvAnL` block.

The feedback signals of the valve's total travelled positions (open/closed) and the current analog position of the value are read by the I/Os through the `FbAnOu` blocks.

The analog actuating signal is output to the peripherals via the `FbAnOu` blocks.

The process tag type contains the required interconnections between the blocks mentioned above.

The interlock signals of `VlvAnL` are interconnected to the `Intlk02` interlock blocks. These interlock blocks in turn are connected to other blocks, for example, to digital process tags via `FbDiIn`.

19.42 Example project APL_Example_xx

19.42.1 Introduction to the PCS 7 example project for Advanced Process Control

Introduction

This document relates to the PCS 7 example project, Process Control (APL_Example_xx, xx indicates the language variant) for the PCS7 Advanced Process Library.

In contrast to the process tag types (insertable templates), the example project is primarily intended for training purposes:

The main aim was to familiarize users with with the new advanced process control structures by allowing them to experiment without having to intervene in the real process. The examples provide realistic process simulation. Working with these examples helps you to understand the concept and specific structural requirements, and to assess the uses of these functions before you implement them in a real system. For this reason, the examples contain a third-order simulation model with gain, equivalence value, and measurement noise but no analog channel blocks. The process model is supplied as the "ProcSimC" CFC chart and incorporated in the examples using the chart-in-chart technique.

The following examples are provided:

- Cascade control of a temperature by using the heat flow (Page 1829)
- Control loop monitoring with simulation of colored noise (Page 1831)
- Feedforward control to compensate a measurable disturbance variable (Page 1832)
- Operating point-oriented adaptation of parameters (gain scheduling) for non-linear processes (Page 1833)
- Override control on a pipeline (Page 1834)
- Smith predicator for a dead time system (Page 1834)
- Filtering of noisy measured values in a control loop (Page 1835)
- Predictive control of a 2x2 multi-variable controlled system (Page 1836)
- Predictive control of a non-linear process (Page 1837)

A template for Fuzzy Control using the *PCS 7 add-on product FuzzyControl++* can be downloaded from the Internet pages of *Siemens I&S* and is therefore not included in the demo project.

A separate tree folder ("Unit") is provided for each example in the PCS7 example project. Each folder contains a CFC chart with an interconnection example, a brief explanatory text, and an assigned OS picture with self-explanatory visualization of the process example based on a pre-configured trend recorder. A short text in the OS picture describes commissioning and presentation.

19.42.2 Process simulation including noise generator

Process simulation including noise generator

Users require only a few standard blocks to create a dynamic process model that reflects the response pattern of many technological processes with adequate precision. This model is used in all example projects (APL_Example_xx). However, you can also use this model for sales presentations or to test closed-loop control functions, in other words in a project phase in which the real plant is not yet available ("virtual process", "shadow plant"). Process simulation is supplied as an open source CFC chart "ProcSimC" that users can install in other CFC charts as a nested chart (chart-in-chart). It contains three first order delay elements, a gain factor, an equivalence value `PV` (for `MV = 0`), and a noise generator for white measurement noise. An additive input is provided for (artificial) interference of the input. The Laplace transformation function described below is implemented by means of this model.

$$PV(s) = \frac{Gain}{(TimeLag1 \cdot s + 1)(TimeLag2 \cdot s + 1)(TimeLag3 \cdot s + 1)}(MV(s) + DisV(s)) + PV_0 + Noise$$

Use cases

Users can adapt this flexible model to suit the requirements of various use cases, for example:

- **Simulation of temperature control systems:** `PV0` represents the temperature without heating, for example, the ambient temperature. The value of `TimeLag1` is typically significantly higher than `TimeLag2` and `TimeLag3`. The value of the latter can also be zero. The sensor develops a typical quantization noise of 0.1° C. The gain is positive can be interpreted as the theoretical maximum temperature that can be reached at full heating power. However, in most situations this cannot be measured experimentally because many actuators are dimensioned so that the only require approximately one third of the heating power for constant operation at the operating point. The power reserve is only intended to cover operating point changes and heating up phases.
- **Simulation of pressure control systems:** If you define the valve position so that it is closed at 0% and open at 100%, the process Gain of a container pressure control system is normally a negative value because the pressure reduces (>0) when the outlet valve of the container is opened. In contrast to this, the gain of an overpressure value is positive. `PV0 > 0` is the pressure when the value is completely closed. The situation is, of course, the opposite when pressures below ambient pressure are involved, for example, in vacuum systems. Note that most valves do not return a reproducible characteristic in the region of their closed position (actuation ratio 1:20 or 1:50). The time constants for pressure control of liquids are typically fast, whereas with pressure control in gas tanks, particularly in large tanks, they are slower. The magnitude of the process gain depends largely on the physical units of pressure, for example, Bar or Pa. Pressure sensors typically develop higher measurement noise than temperature sensors.

- **Simulation of flow control systems:** If you define the valve position so that it is closed at 0% and open at 100%, the process `Gain` is usually positive, since the flow rate increases when the valve opens. `PV0 = 0` if the flow stops completely when the valve is closed, in other words, the valve closes tight. The time constants are significantly faster than in temperature controls and are usually all of the same order. The magnitude of the process gain depends largely on the physical units of flow, for example, m3/s or l/min. The measurement noise affecting flow sensors is normally higher than with temperature sensors.

To implement a dead time for process simulation, you can insert a DeadTime block before the ProcSimC input and call it in a different cyclic interrupt OB (OB3x).

Model variants

Two different model variants are supplied:

1. Continuous process simulation ProcSimC in which the `MV` input is an analog value, for example, heating power or valve position.
2. Process simulation ProcSimS for step controllers, with control of the actuator by two binary inputs "up"/"down" or "open"/"close". Internally, the actuator is modeled as an integrator, whereby:

   - MotorHiLim = 100%,

   - MotorLoLim = 0%

   - TI = MotorTime.

   The integrator input is derived from the binary inputs according to the following formula:

$$\underline{I}nteg.Input = \begin{cases} 100 & if\ Up = True \\ -100 & if\ Down = True \\ 0 & otherwise \end{cases}$$

See also

NoiseGen I/Os (Page 1580)

19.42.3 Cascade control of a temperature by using the heat flow

Cascade control of a temperature by using the heat flow

This template contains simulation models for a flow and temperature controlled system and the parameters of the noise generator block (see the I/O table). You can use this model to test the mode transitions described in the Cascade control (Page 1810) section. You can also try out the properties of different parameter sets for the primary and secondary controllers. The following features are typical for this type of application:

- The controlled temperature system is slower than the controlled flow system.
- There are two time constants that are far apart.
- There is an offset corresponding to ambient temperature.
- It has less noise than the controlled flow system.

Process parameters of the example project for cascade control

ProcSimC	Gain	TimeLag1	TimeLag2	PV0	NoiceVariance
Flow control loop	8	1	1	0	0.22
Temperature control loop	0.3	8	1	20	0.1

Parameters for PID controllers --> PI cascade with fast control response

The parameters listed in the table below apply to a fast control response with low control deviation but with strong actuator intervention.

PID	Gain	TI	TD
TIC101	10	8.8	2.6
FIC101	0.1	1.8	0

Controller parameters for PI --> P cascade with soft controller intervention

The advantage of the parameters listed in the table below is that the controller "goes easy" on final control element (for example a valve).

PID	Gain	TI	TD
TIC101	10	6.8	0
FIC101	0.1	0	0

It is generally advisable to make the secondary controller "simpler" than the primary controller, in other words to reduce the number of different dynamic channels so that it is genuinely secondary to the primary controller.

The steady state control deviation in the secondary loop is not normally relevant for the application. On the other hand, the reaction time of the secondary loop is important because the time constants of the secondary closed control loop are part of the controlled system for the primary controller. If you do without I action in the secondary controller for these reasons, it is not advisable limit the setpoint ranges of the secondary controller precisely to the achievable physical range of the process value in the secondary loop, as you would not be able to use the full actuating range of the secondary controller due to the steady state deviation. You should instead set more generous setpoint limits for the secondary controller and manipulated variable limits for the primary controller. The anti-Windup measures of the primary controller are oriented on the interconnection of `IntHoldNeg` and `IntHoldPos`. If the secondary controller does not have any I action, if will not be capable of a bumpless manual-automatic changeover. You should therefore set an `MV_Offset` that approximates the typical `MV` value for the operating point of the process.

A cascade temperature control system with a secondary controller for heating and/or cooling medium flow is commonly used for

- Heat exchangers
- Reactors without a cooling jacket

19.42.4 Control loop monitoring with simulation of colored noise

Control loop monitoring with simulation of colored noise

The interconnection of the ConPerMon block with a PID controller can be found in the process tag type PID_Control (see PID controller with safety logic and control loop monitoring (PIDConL_ConPerMon) (Page 1799)). The example project supports you and helps to familiarize you with the concept and the potential of closed control loop monitoring. To do this, the template includes a process simulation with disturbance model. The colored noise is generated with the aid of a shape filter from a white noise signal. This produces a spectrum of disturbance signals that also contains energy components in the lower frequency ranges of the bandwidth of the closed control loop. Part of the disturbances can therefore be compensated by the PID controller while the high-frequency measurement noise cannot be corrected by any controller.

Application

After commissioning the controller and ConPerMon block, you should be able to watch the effects of the following actions that demonstrate the potential of control loop monitoring:

- Switch the controller to manual mode:

  The variance of the controlled variable will rise but the CPI becomes invalid because no statements can be made about the control fit unless the control loop is closed.

- Change the parameters of the process simulation, for example, change TimeLag2 from 2s to 8s:

  This deterioration of the dynamic characteristics of the process (for example due to wear and tear) brings about a deterioration of the control quality that becomes visible in the CPI value long before it can be seen with the naked eye in the standard PV trends. If the control quality drops below a defined level, a CPI warning or even an alarm is generated.

- Request a setpoint step change from the controller:

  The CPI will become temporarily invalid because all stochastic characteristics of the control quality, such as the variance, are based on the assumption of a steady state with a constant mean value. Select the "Setpoint" view from the drop-down list box in the ConPerMon faceplate to be able to watch the deterministic characteristics such as overshoot and settling ratio. Once a steady state is achieved again at the new setpoint and the entire time window is filled with data from the steady state, the monitoring of the stochastic characteristics is reactivated automatically.

You can find detailed information on the ConPerMon block and notes on interpreting its displays in the online help on the block (Page 447).

19.42.5 Feedforward control to compensate a measurable disturbance variable

Feedforward control to compensate a measurable disturbance variable

The example is based on the process tag type PID controller with dynamic feedforward control (FfwdDisturbCompensat) (Page 1802) and uses the following parameter sets:

Main controlled system:

$$g(s) = \frac{2}{2s+1} e^{-1.2s}$$

Disturbance transfer function:

$$g_z(s) = \frac{1}{3s+1} e^{-1.6s}$$

- PID: Gain = 0.197
- TI= 1.9
- TD= 0

Feedforward control:

$$c(s) = -\frac{g_z(s)}{g(s)} = -\frac{1}{2} \cdot \frac{2s+1}{3s+1} e^{-0.4s}$$

The same process simulation is set up twice, one instance with disturbance feedforward and the other without (all other process and controller parameters identical). The advantages of the feedforward control can be tested in a direct comparison ("benchmark simulation", "parallel slalom ").

19.42.6 Operating point-oriented adaptation of parameters (gain scheduling) for non-linear processes

Operating point-oriented adaptation of parameters (gain scheduling) for non-linear processes

The example is based on the process tag type PID - control with operating-point-oriented parameter control (GainScheduling) (Page 1800).

In the simulation template, the settings of the two most important process parameters are changed based on polylines depending on the operating point. The process and controller parameters for the example are shown in the following table.

Operating point	X=PV	ProcSim.Gain	ProcSim.TmLag1	ProcSim.TmLag2	Gain	TI	TD
1	20	4	5	10	0.6	14.7	3.7
2	100	3	3	10	1	8.8	2.2
3	200	2	1	10	10	4.1	1.1

The same process simulation is set up twice, one instance with gain scheduling and the other without (all other process and controller parameters are identical). The advantages of the gain scheduling can be tested in a direct comparison ("benchmark simulation", "parallel slalom").

19.42.7 Override control on a pipeline

Override control on a pipeline

The example is based on the process tag type Override control (Page 1814) and uses the following parameter sets:

Primary process (flow control):

$$g(s) = \frac{3}{(2s+1)^2}$$

Flow increases when the valve is opened and it disappears when the valve is closed.

PI flow controller: Gain= 0.33 , TI= 2.7

Secondary process (pressure control):

$$g_p(s) = \frac{-0.8}{(7s+1)(1s+1)}$$

The pressure rises when the valve is opened and is 80 bar when it is fully open.

PI pressure controller: Gain= 2.8 , TI= 4

Switching limits 15 bar < pressure < 70 bar.

19.42.8 Smith predicator for a dead time system

Smith predicator for a dead time system

The example is based on the process tag type PID controller with Smith predictor (SmithPredictorControl) (Page 1804).

In the example, the same process simulation is set up twice, one instance with Smith predictor and the other without (all other process parameters are identical). The advantages of the Smith predictor can be tested in a direct comparison ("benchmark simulation", "parallel slalom").

19.42.9 Filtering of noisy measured values in a control loop

Filtering of noisy measured values in a control loop

The example illustrates the use of the Smooth block in a closed control loop. The block can be connected to any signal source without specialist knowledge so there is no need for a special process tag type. The simulation template is useful in testing the effects of a low-pass filter on a closed control loop by simulation. Increasing the filter time constant improves the smoothing effect but also causes a phase lag in the control loop that can have detrimental effects on the control quality and even the stability.

Parameters used

The following parameters are used in the simulation example:

Process transfer function:

$$g(s) = \frac{3}{(15s+1)(2s+1)}$$

with white noise on the output signal.

PI controller:

- Gain = 0.5
- TI = 7 s
- Sample time = 0.1s

Butterworth filter:

- TimeConstant = 3 s.

At 0.3 seconds, hardly any smoothing effect can be recognized, at 15 seconds significant deterioration of the control quality is already noticeable.

Processes with signals strongly affected by noise are a typical area of application (for example pressure sensors) and sensitive actuators (for example valves).

You can find detailed information on the Smooth block in the online help on the block (Page 1472).

19.42.10 Predictive control of a 2x2 multi-variable controlled system

Predictive control of a 2x2 multi-variable controlled system

The example is based on the process tag type Model-based predictive control (ModPreCon) (Page 1816).

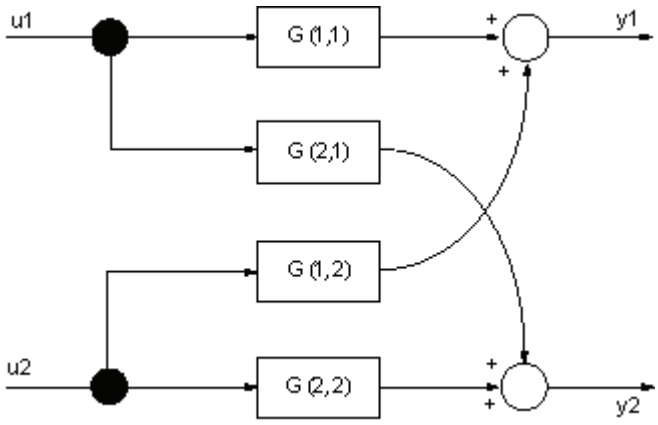


Figure 19-7 MIMO 2x2 process with a p-canonical structure

The example shows the application of the ModPreCon block for simulating a 2x2 multi-variable process consisting of the following four transfer functions:

$$\underline{G}(s) = \begin{bmatrix} G(1,1) & G(1,2) & \cdots & G(1,n_u) \\ G(2,1) & G(2,2) & \cdots & G(2,n_u) \\ \vdots & \vdots & \ddots & \vdots \\ G(n_y,1) & G(n_y,2) & \cdots & G(n_y,n_u) \end{bmatrix} = \begin{bmatrix} \dfrac{3}{(30s+1)(4s+1)} & \dfrac{1.2}{(34s+1)(14s+1)(6s+1)} \\ \dfrac{1.3}{(28s+1)(12s+1)(6s+1)} & \dfrac{4}{(26s+1)(6s+1)} \end{bmatrix}$$

where n_y = 2 = number of controlled variables, n_u = 2 = number of manipulated variables, and $G(i_y, i_u)$ the transfer function from input i_u to output i_y. This simplest of multi-variable control systems helps familiarize newcomers with the concept and application of model-based multi-variable controllers.

19.42.11 Predictive control of a non-linear process

Predictive control of a non-linear process

The example is based on the approach used by multi-model controlling as described in the section ModPreCon functions (Page 575), Controlling linear and non-linear processes.

A multi-variable process is observed with two input variables and two output variables. The non-linear reaction of four partial transfer functions Proc511, Proc512, Proc521 and Proc522 depends on a measurable process value, in this case the controlled variable PV511.

The assumption that all non-linearities of the multi-variable process depend on the current operating point, which is defined by a single measurable variable, restricts the range of application but is reasonable in many practical applications. The approach of the presented multi-model controlling only makes sense with this assumption.

In the example it is assumed that the operating point is defined by a temperature, and the process reaction is different at high temperatures (200° C) than it is at low temperatures (20° C).

Some parameters of the third order partial transfer function

$$Proc(i,j) = \frac{CV(i)}{MV(j)} = \frac{Gain}{(TmLag1 \cdot s + 1) \cdot (TmLag2 \cdot s + 1)(TmLag3 \cdot s + 1)}$$

are set using polylines continually depending on the operating point.

The external values of the operating-point-oriented parameters for the example are shown in the following table:

Operating point	PV511	Proc511.Gain	Proc511.TmLag2	Proc521.Gain	Proc512.TmLag2	Proc522.Gain
1	20	4	12	0.9	19	3
2	200	2	2	1.7	9	5

The changes of the process parameters are so substantial that a single linear controller cannot achieve enough control performance over the entire operating range. The changes, however, are continual and reproducible, which is an important requirement for the multi-model approach.

All other process parameters are constant:

	Gain	TmLag1	TmLag2	TmLag3
Proc511	variable	30	variable	0
Proc512	1.2	34	variable	6
Proc521	variable	28	12	6
Proc522	variable	26	6	0

The primary controller TIC511522Low was designed using the MPC Configurator for the low operating point at 20° C, the secondary controller TIC511522High is made for the high operating point at 200° C.

The matching functions for relevance of the two controllers are polylines with four interpolation points at 0, 30, 190 and 300° C. In the range between 0 and 30° C, only the controller designed for 20° C is active; only the controller designed for 200° C is active between 190 and 300° C. The manipulated variables of both controllers overlap between 30 and 190°.

Definitions 20

20.1 Batch process

Batch process

A batch process is a process control process, which is executed according to a recipe control batch by batch, i.e. intermittently, in a continually repeating sequence, for example, dosing raw material, tempering, performing chemical reactions, cooling, discharging reactors.

20.2 Approximation

Approximation

An approximation method in the mathematical sense.

20.3 Prediction horizon

Prediction horizon

For predictive controller: Time period running from the present to the future with a defined length. A process reaction is predicted within the prediction horizon.

20.4 Trajectory

Trajectory

In physics: refers to a flight path or track.

In control engineering: course of a variable over time, described by a sequence of values in a specified time scale.

20.5 Maverick

Maverick

A maverick in a continuous physical measurement is a numerical value that changes from one sampling point to another more than would be physically plausible. In other words, the difference between two neighboring values is greater than a specified tolerance range.

20.6 Ergodic process

Ergodic process

An ergodic process in mathematical statistics is a stationary process, in which the expected value can be estimated by generating the mean value over a time period of infinite length.

20.7 Conti process

Conti process

A Conti process is a process control process, whereby raw material is fed in a continual flow, and the products are continually output.

20.8 Multivariable controller

Multivariable controller

With a multivariable controller, one manipulated variable can influence several controlled variables and one controlled variable can be influenced by several manipulated variables, as is shown in the following diagram.

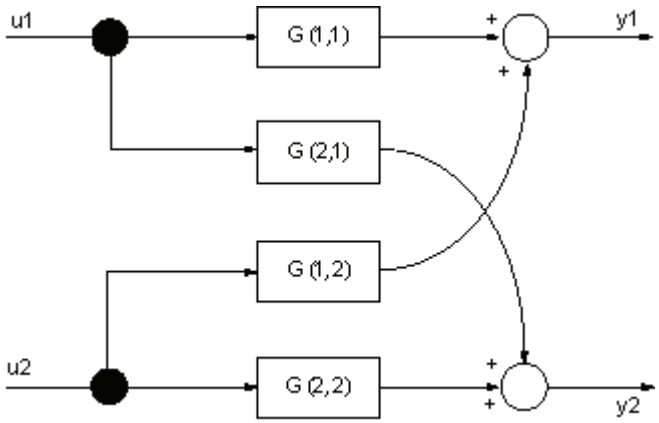


Figure 20-1 Example of a multivariable controller

When a multivariable section is automated using several individual PID controllers, the individual controllers do not take account of the interactions or connections in the process. The greater the connections between the sub-sections, the harder it is to set individual controllers and the worse the control performance.

In such cases a multivariable controller offers higher control performance and simpler controller settings.

20.9 non-phase minimum

Non-phase minimum behavior mean

A phase minimum system is described by a linear, time-invariant transfer function, the frequency of which displays the smallest possible clockwise phase rotation for the given number of poles and zeros if the frequency interval is run through from negative to positive in full an infinite number of times. This means that both the transfer function and its inverse are causal and stable.

Non-phase minimum behavior means for example that the process initially deflects downwards when the manipulated variable jumps positively before moving in a positive direction. Dead time systems are also non-phase minimal.

Index

B

C

D

E

F

G

H

I

L

M

N

O

P

R

S

T

U

V

W

X