Universal Diagnostic Block and HMI Template for the AS Interface Safety Monitor

AS-Interface

Block description • Septembre 2011

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Universal Diagnostic Block and HMI Template for the AS Interface Safety Monitor

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Block description

1 Application

Introduction

The Actuator Sensor Interface (AS interface, AS-i) is a networking solution for binary sensors and actuators using a field bus of the lowest automation system layer.

To ensure their fail-safe communication SIEMENS offers for any bus system the appropriate safety technology which is PROFIsafe for PROFIBUS/PROFINET and ASIsafe for AS-Interface applications.

For the Sensor - Actuator level ASIsafe is coming in two different features:

- **ASIsafe Solution local** including standard PLC, standard AS-i master and AS-i safety monitor (ASIMON) as local solution.
- **ASIsafe Solution PROFIsafe** including fail-safe PLC and DP/AS-i F-Link as ASIsafe integration acting across cells and stations.

The present document refers to the local solution **ASIsafe Solution local.**

The AS-i safety monitor

Together with AS-i slaves the AS-i safety monitor provides the basis for a small safety island. The safety monitor checks the safe inputs of the safe AS-i slaves and its configurable shutdown logic provides their safe shutdown.

Several AS-i safety monitors can be implemented within an AS-i system. One fail-save slave can be monitored by several monitors.

As per the device model up to two dependent or independent enable circuits are available.

The safety monitor does not need its own slave address to ensure its function. If an AS-i address is assigned to the AS-i safety monitor via the communication software, though, a PLC can read out the diagnostic information from the safety monitor via the AS-i master.

Figure 1-1

Project overview

The code package on hand shall simplify the diagnosis of AS-Interface safety monitors in the user program and on HMI panels.

It includes a STEP 7 example program with function blocks to conveniently evaluate the diagnostic information of one or several safety monitors and forward it to a HMI panel for representation.

This document contains the description of the downloadable example program.

Performance limitations

The present document and the pertaining function block only include the diagnostic of an AS-i safety monitor.

Information regarding to the diagnostic of an AS-i master and slave as well as the AS-i command interface, you will find e.g. at this applications

http://support.automation.siemens.com/WW/view/en/50897766

http://support.automation.siemens.com/WW/view/en/51678777

Applicability

It supports all current safety monitors of the SIMATIC product range:

- Advanced safety monitor from V2.x up
- Basic safety monitor from V2.x up
- Safety monitor V1.x

The following devices can be used as AS-i Master:

- DP/AS-i Link 20E
- DP/AS-i LINK Advanced
- CP 343-2 (P)

STEP 7 V5.5 and WinCC flexible 2008 Advanced are used as configuration software for PLC and HMI.

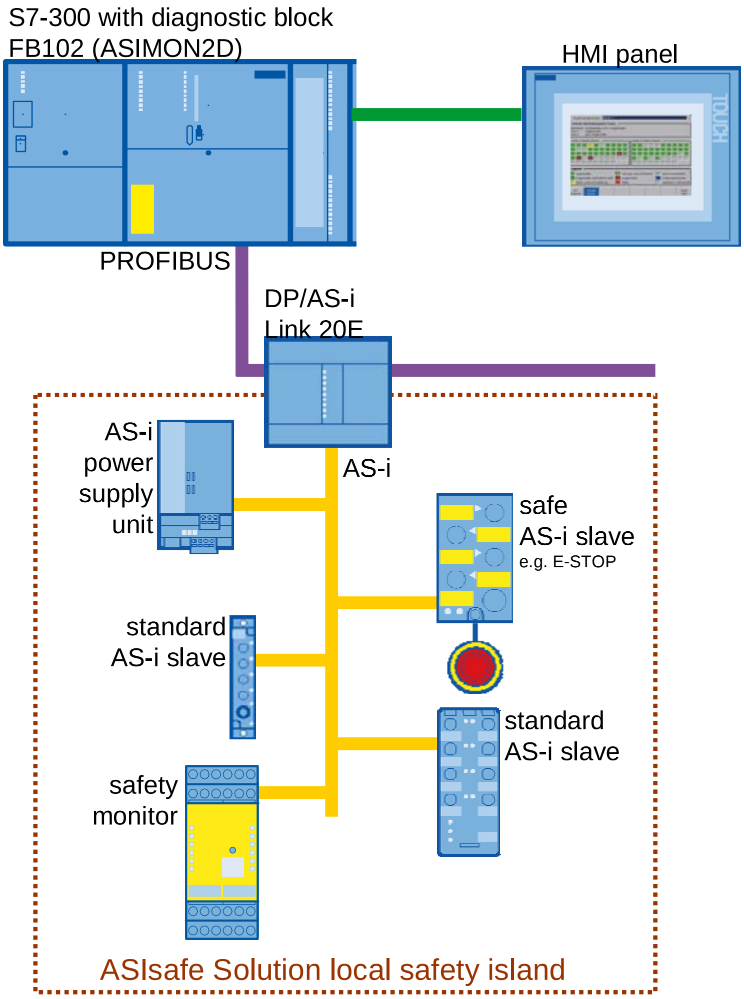
The safety monitor itself is configured via the ASIMON PC software.

Note For further information on the hardware and software requirements refer to chapter 2.4 Hardware/software requirements for this project).

Schematic layout

The figure below shows a possible hardware setup for the use of STEP 7 blocks in a small AS-i safety island.

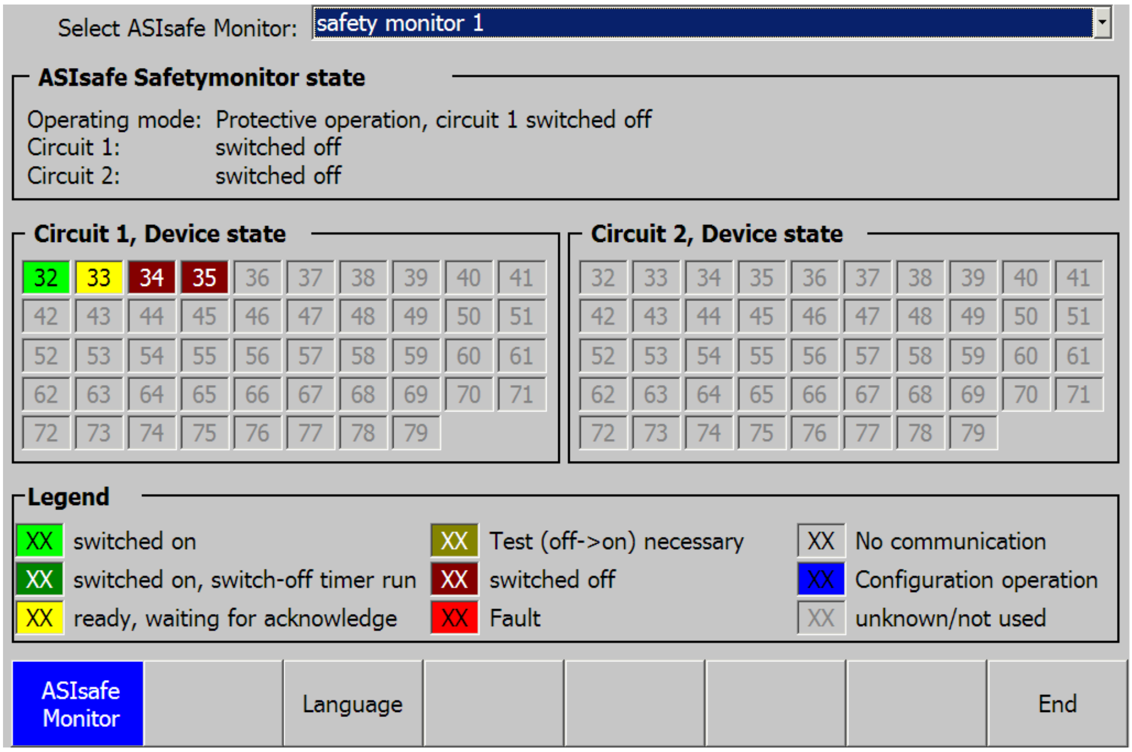
Figure 1-2



HMI visualization

The figure below shows the HMI template for the visual diagnostic of the AS-i safety monitors:

Figure 1-3



Select ASIsafe Monitor: safety monitor 1

ASIsafe Safetymonitor state

Operating mode: Protective operation, circuit 1 switched off
Circuit 1: switched off
Circuit 2: switched off

Circuit 1, Device state

32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61
62	63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79		

Circuit 2, Device state

32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61
62	63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79		

Legend

XX	switched on	XX	Test (off->on) necessary	XX	No communication
XX	switched on, switch-off timer run	XX	switched off	XX	Configuration operation
XX	ready, waiting for acknowledge	XX	Fault	XX	unknown/not used

2 Project overview

What will you learn here?

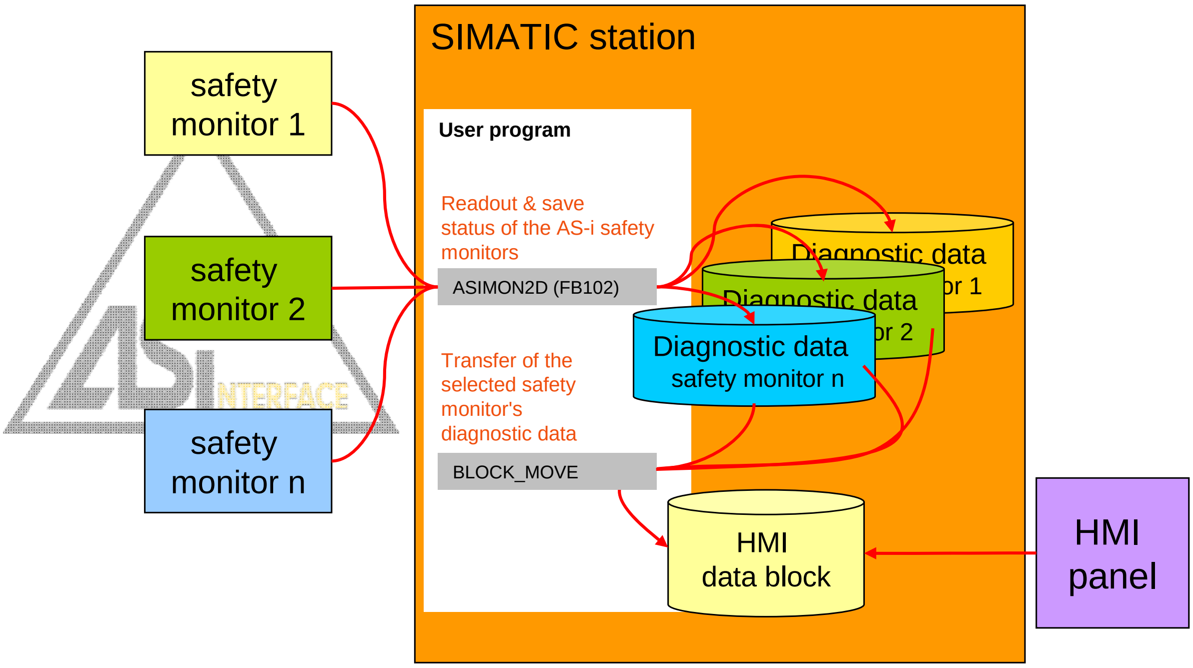
This chapter gives the user an idea of the project. It outlines the core functionality, the blocks used and the resources which are useful for the project.

2.1 Workflow

Functionality

The figure below shows a schematic illustration of the project's functionality:

Figure 2-1



Description

The SIMATIC CPU's user program is running program blocks to read out and store in arrays the AS-i safety monitors' status. A 1:1 copy provides this information to a further data block which acts as interface to the HMI panel.

2.2 Program blocks

2.2.1 The most important function blocks at a glance

Overview

The **ASI SYS DIAG** (FB100) function block provides general diagnostic of the AS-i system. This function block optionally reads out of the AS-i masters the system status list W#16#00B3, via the system function **RDSYSST** (SFC51), or data set 1, respectively, via the system function **RD_REC** (SFC59), and stores the data in an instance data block.

Both methods provide information on the current device status (e.g. internal / external error, auxiliary voltage missing) and the connected slaves (available or missing).

The **ASIMON2D** (FB102) function block provides readout and evaluation of diagnostic information from a safety monitor.

This function block provides the statuses of its enable circuits, the operating mode as well as the blocks' statuses of the shutdown logic and stores the diagnostic data in the instance data block.

The **ASIMON_DIAG DATA** (DB70) data block provides a dedicated data structure for any of the AS-i safety monitors. A copy of the diagnostic data from FB102's instance data block is stored there.

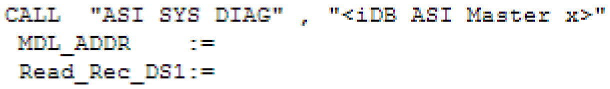
ASI HMI DB (DB69) data block acts as interface to the WinCC flexible visualization and is an image of the diagnostic data from DB70 data block of the relevant safety monitor.

ASI SYS DIAG (FB100)

FB 100 provides status information on the AS-i system and stores it into an instance data block. A separate instance data block per AS-i master is required.

The chart below shows the function block in STL representation:

Figure 2-2



```
CALL  "ASI SYS DIAG" , "<iDB ASI Master x>"
 MDL_ADDR    :=
 Read_Rec_DS1:=
```

The parameters have the following meaning:

Table 2-1

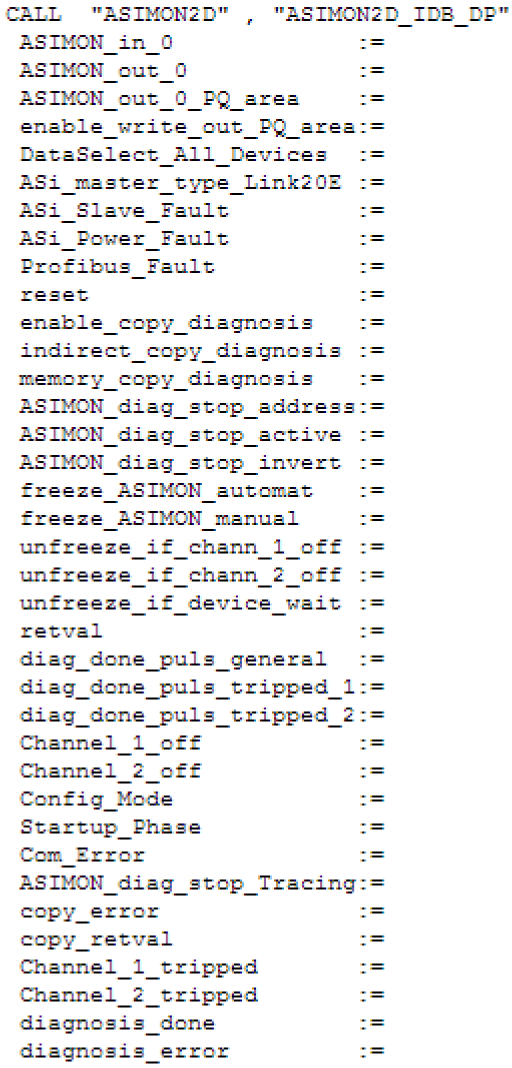
Type	Variable	Data type	Meaning
Input	MDL_ADDR	Word	Device address of AS-i Master
	Read_Rec_DS1	Boolean	**True:** Data set 1 (diagnostic) is read out from AS-i master. Reading of the data set may require various cycles, therefore the call in diagnostic OB 82 etc. is not recommended. As the data set is directly read out from the AS-i master it is very easy to detect the presence of the master. **False:** The system status list (diagnostic) W#16#00B3 is read out from AS-i master. Reading of the system status list is synchronized, e.g. during the call cycle.

ASIMON2D

The FB102 reads out diagnostic data from the safety monitor and saves them in an instance data block. Any safety monitor requires its own instance data block.

The chart below shows the function block in STL representation:

Figure 2-3



```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0             :=
 ASIMON_out_0            :=
 ASIMON_out_0_PQ_area    :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices  :=
 ASi_master_type_Link20E :=
 ASi_Slave_Fault         :=
 ASi_Power_Fault         :=
 Profibus_Fault          :=
 reset                   :=
 enable_copy_diagnosis   :=
 indirect_copy_diagnosis :=
 memory_copy_diagnosis   :=
 ASIMON_diag_stop_address:=
 ASIMON_diag_stop_active :=
 ASIMON_diag_stop_invert :=
 freeze_ASIMON_automat   :=
 freeze_ASIMON_manual    :=
 unfreeze_if_chann_1_off :=
 unfreeze_if_chann_2_off :=
 unfreeze_if_device_wait :=
 retval                  :=
 diag_done_puls_general  :=
 diag_done_puls_tripped_1:=
 diag_done_puls_tripped_2:=
 Channel_1_off           :=
 Channel_2_off           :=
 Config_Mode             :=
 Startup_Phase           :=
 Com_Error               :=
 ASIMON_diag_stop_Tracing:=
 copy_error              :=
 copy_retval             :=
 Channel_1_tripped       :=
 Channel_2_tripped       :=
 diagnosis_done          :=
 diagnosis_error         :=
```

The parameters have the following meaning:

Note This table gives an overview on the interfaces only. For further details on selected parameters refer to chapter 4 (ASIMON2D interface description

Table 2-2

Type	Variable	Data type	Meaning
Input	ASIMON_IN_0	Pointer	Input bit 0 of the AS-i safety monitor.
	ASIMON_OUT_0	Pointer	Output bit 0 of the AS-i safety monitor.
	ASIMON_out_0_PQ_area	Pointer	Peripheral output bit 0 of the AS-i safety monitor for direct writing to the I/O address
	Enable_write_out_PQ_area	Boolean	Write access enable to the peripheral output area (mapped by ASIMON_out_0_PQ_area).
	DataSelect_All_Devices	Boolean	Data format indication for the safety monitor's diagnostic data (see chapter 6.4.2)
	ASi_master_type_Link20E	Boolean	Option between byte or word access to the peripheral area of the PLC (depending on AS-i master's technical specifications).
	ASi_Slave_Fault	Boolean	Transfer of an error message upon safety monitor failure.
	ASi_Power_Fault	Boolean	Transfer of an error message upon AS-i voltage failure.
	Profibus_Fault	Boolean	Transfer of an error message upon communication failure towards AS-i master.
	Reset	Boolean	Resetting the block.
	Enable_copy_diagnosis	Boolean	Enable to copy diagnostic data to destination area.
	Indirect_copy_diagnosis	Boolean	Determines the destination area at the memory_copy_diagnosis parameter.
	memory_copy_diagnosis	Boolean	Destination area where to copy the diagnostic data.
	ASIMON_diag_stop_address	Pointer	PLC output bit of the diagnostic stop function.
	ASIMON_diag_stop_active	Boolean	Enable of the diagnostic stop function.
	ASIMON_diag_stop_invert	Boolean	Determines the settings for the diagnostic stop function.
	freeze_ASIMON_automat	Boolean	Automatic management of the diagnostic stop condition.
	freeze_ASIMON_manual	Boolean	Manual management of the diagnostic stop condition.
	unfreeze_if_chann_1_off	Boolean	Additional rules to cancel the diagnostic stop condition.
	unfreeze_if_chann_2_off	Boolean	Additional rules to cancel the diagnostic stop condition.
	unfreeze_if_device_wait	Boolean	Additional rules to cancel the diagnostic stop condition.

Type	Variable	Data type	Meaning
Output	retval	Int	Status information of the diagnostic function block.
	diag_done_puls_general	Boolean	Feedback at the end of diagnostic sequence processing.
	diag_done_puls_tripped_1	Boolean	Feedback at the end of diagnostic sequence processing upon additional logging of enable circuit 1 disconnection.
	diag_done_puls_tripped_2	Boolean	Feedback at the end of diagnostic sequence processing upon additional logging of enable circuit 2 disconnection.
	Channel_1_off	Boolean	Status of enable circuit 1
	Channel_2_off	Boolean	Status of enable circuit 2
	Config_Mode	Boolean	Indicates the operating mode of the safety monitor.
	Startup_Phase	Boolean	Status feedback of the initialization phase
	Com_Error	Boolean	Error message upon communication failure to the safety monitor.
	ASIMON_diag_stop_Tracing	Boolean	Indicates the status of the diagnostic stop condition.
	copy_error	Boolean	Status feedback on the diagnostic data copy.
	copy_retval	Int	Information about the diagnostic data copy after en error has occurred.
Input and output	Channel_1_tripped	Boolean	Logging a disconnection of enable circuit 1.
	Channel_2_tripped	Boolean	Logging a disconnection of enable circuit 2.
	diagnosis_done	Boolean	Indicates a successful diagnostic sequence processing.
	diagnosis_error	Boolean	Indicates a faulty diagnostic sequence processing.

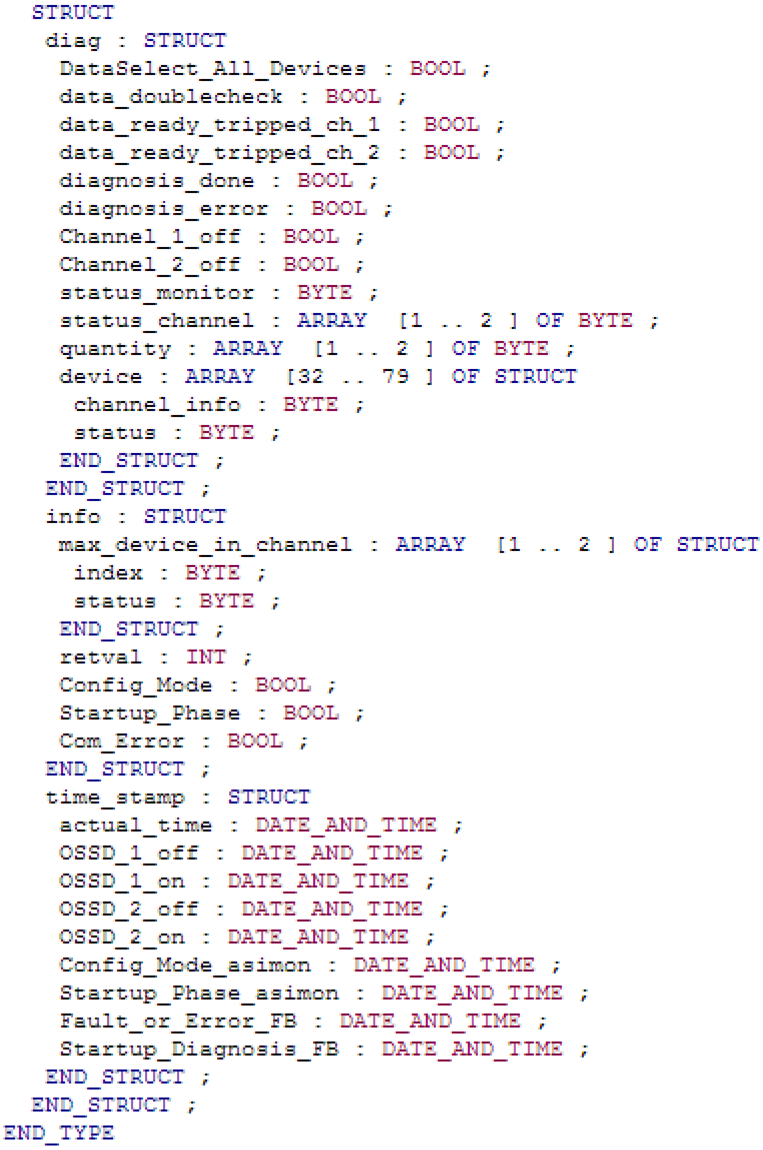
ASI HMI DB

The data block contains, apart from the coordination variables for WinCC flexible, a copy of the diagnostic data of the safety monitor subject to visualization.

The diagnostic data are subdivided in three areas:

- The **diag** area (102 bytes) includes the proper diagnostic data from the safety monitor.
- The **info** area (8 bytes) includes additional information from the diagnostic function block FB102.
- The **time_stamp** are (72 bytes) includes time stamps for different events.

Figure 2-4



```
  STRUCT
   diag : STRUCT
    DataSelect_All_Devices : BOOL ;
    data_doublecheck : BOOL ;
    data_ready_tripped_ch_1 : BOOL ;
    data_ready_tripped_ch_2 : BOOL ;
    diagnosis_done : BOOL ;
    diagnosis_error : BOOL ;
    Channel_1_off : BOOL ;
    Channel_2_off : BOOL ;
    status_monitor : BYTE ;
    status_channel : ARRAY  [1 .. 2 ] OF BYTE ;
    quantity : ARRAY  [1 .. 2 ] OF BYTE ;
    device : ARRAY  [32 .. 79 ] OF STRUCT
     channel_info : BYTE ;
     status : BYTE ;
    END_STRUCT ;
   END_STRUCT ;
   info : STRUCT
    max_device_in_channel : ARRAY  [1 .. 2 ] OF STRUCT
     index : BYTE ;
     status : BYTE ;
    END_STRUCT ;
    retval : INT ;
    Config_Mode : BOOL ;
    Startup_Phase : BOOL ;
    Com_Error : BOOL ;
   END_STRUCT ;
   time_stamp : STRUCT
    actual_time : DATE_AND_TIME ;
    OSSD_1_off : DATE_AND_TIME ;
    OSSD_1_on : DATE_AND_TIME ;
    OSSD_2_off : DATE_AND_TIME ;
    OSSD_2_on : DATE_AND_TIME ;
    Config_Mode_asimon : DATE_AND_TIME ;
    Startup_Phase_asimon : DATE_AND_TIME ;
    Fault_or_Error_FB : DATE_AND_TIME ;
    Startup_Diagnosis_FB : DATE_AND_TIME ;
   END_STRUCT ;
  END_STRUCT ;
END_TYPE
```

The data have the following meaning:

Table 2-3

Name	Meaning	Note
diag	Diagnostic information of the safety monitor.	
dataSelect_All_Devices	Indicates the data format type of the diagnostic data.	According to the settings in the ASIMON configuration software (also see chapter 6.4.2).
data_doublecheck	**True:** Readout of diagnostic data is not finished.	
data_ready_tripped_ch_1	**True:** Readout of diagnostic data is finished and a disconnection of enable circuit 1 has been logged.	
data_ready_tripped_ch_2	**True:** Readout of diagnostic data is finished and a disconnection of enable circuit 2 has been logged.	
diagnosis_done	**True:** The diagnostic sequence is finished.	
diagnosis_error	**True:** The diagnostic sequence was aborted.	
Channel_1_off	**True:** Enable circuit 1 is disconnected.	
Channel_2_off	**True:** Enable circuit 2 is disconnected.	
status_monitor	Status of the safety monitor	• 1000 = ok; • 1001 = output circuit 1 disconnected; output circuit 2 connected. • 1010 = output circuit 2 disconnected; output circuit 1 connected. • 1011= output circuits 1+2 disconnected • 11xx= configuration mode
status_channel [1] status_channel [2]	Status of the output circuits (output circuit 1: x = 0 (output circuit 2: x = 1) LED color at the monitor: • x000 =green • x001= yellow • x010 = red • x011= red flashing	Explanation of the LED colors: • x000 = output circuit contacts closed • x001= start/restart inhibit active • x010 = output circuit contacts open • x011= error at the monitored AS-i device level
Quantity [1] Quantity [2]	Number of blocks other than "green" in the output circuits	
Device[m].channel_info	One „channel_info“ data byte exist per device (m = 32...79). These 48 data bytes indicate for any device in which enable circuit it is configured.	Binary values: • 0000 = device included in pre-processing or not configured • device included in enable circuit 1 • 0010 = device included in enable circuit 2

Name	Meaning	Note
		• 0011= device included in both enable circuits
Device[m].status	One "status" data byte exist per device (m = 32...79). The 48 data bytes describe the status of the different devices in the enable circuits. Colors displayed in PC-software “ASiMON”: • 0000 = green • 0001 = green flashing • 0010 = yellow • 0011 = yellow flashing • 0100 = red • 0101 = red flashing • 0110 = grey	Binary values: • 0000 = device switched on • 0001 = device switched on; stop timer started. • 0010 = device waiting for onsite acknowledgment / start condition. • 0011 = (two-channel depending) device was operated at one channel; check (off -> on) required, also in case of "start-up test". • 0100 = device is regularly switched off. • 0101 = (the positive guided) device has switched off at one channel or error at contactor check. Service button must be pressed. • 0110 = device communication error between AS-i module and safety monitor • 0111 = safety monitor is in configuration mode.
info	Additional information on the diagnostic function block	
max_device_in_channel [1].index	If index = 0: undefined. Otherwise: Highest block index in output circuit 1 with status <>0.	Range of values for the highest block index: 32..79
max_device_in_channel [1].status	State of the block with the highest index.	Meaning like above at "status"
max_device_in_channel [2].index	If index = 0: undefined. Otherwise: Highest block index in output circuit 1 with status <>0.	Range of values for the highest block index: 32..79
max_device_in_channel [2].status	State of the block with the highest index.	Meaning like above at "status"
retval	Return value of the diagnostic sequence	
Config_Mode	**True:** Safety monitor is in configuration mode	
Startup_Phase	**True:** Safety monitor is in initialization	
Com_Error	**True:** Communication error towards safety monitor	
time_stamp	**Time stamp**	
actual_time	Current time of the function block	
OSSD_1_off	Time of the last power-down cycle from output circuit 1	

Name	Meaning	Note
OSSD_1_on	Time of the last Switch-on cycle from output circuit 1	
OSSD_2_off	Time of the last power-down cycle from output circuit 2	
OSSD_1_on	Time of the last Switch-on cycle from output circuit 2	
Config_Mode_asimon	Time when the system switched to configuration mode	
Startup_Phase_asimon	Time when the system switched to the start-up phase	
Fault_or_Error_FB	Time of abortion or error detection in FB.	
Startup_Diagnosis_FB	Time of the restart of FB after an error has occurred.	

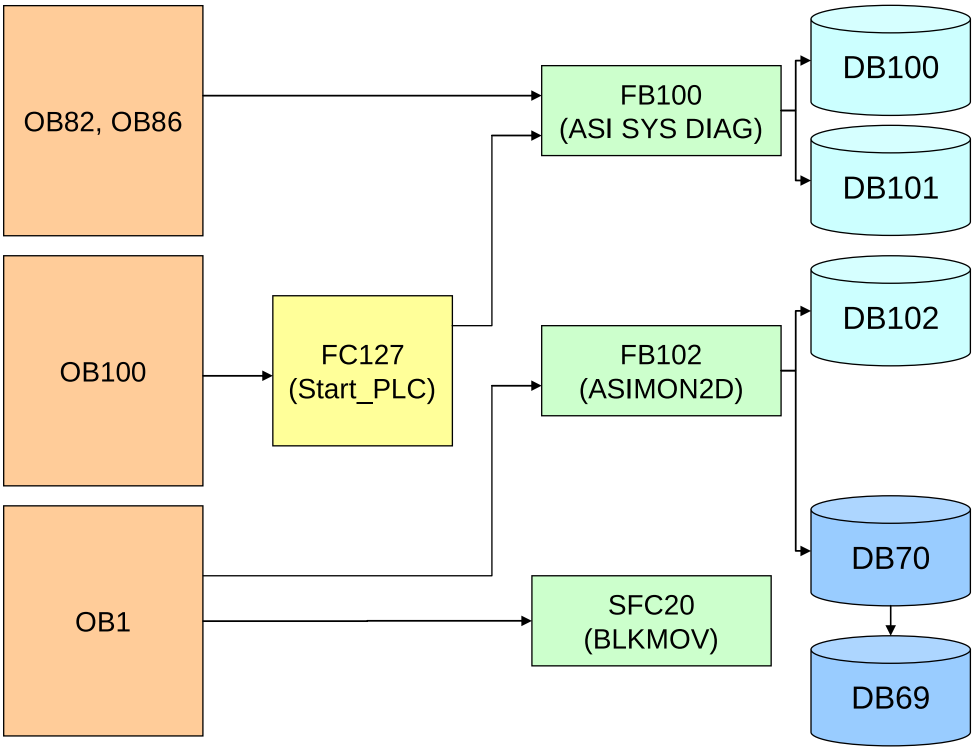
2.2.2 Call environment

To be quickly informed on an AS-i slave failure it makes sense to call the **ASI SYS DIAG** (FB100) function block during the CPU's start-up phase and in the error OBs (OB8x).

The **ASIMON2D** function block is called at OB1's periodic execution level. Optionally, the block can also be integrated into OB100. This way the block will initialize still during the CPU's start-up phase.

The chart below shows the call scheme of the attached S7 project:

Figure 2-5



2.3 Resources and basic data

This chapter outlines the expected storage allocation, points to restrictions to be considered during the application of this project and informs about special features of the safety monitor.

Note This chapter gives an overview only and does not claim to be exhaustive.

For further information on the AS-i safety monitor and the ASIMON configuration software refer to the relevant manual (see chapter 7 References and History).

2.3.1 Project resources

Project size

The table below gives the size of the program blocks or instance data blocks in RAM:

Table 2-4

No.	Block	Size	Information
1.	ASIMON2D FB102	5722 bytes	
2.	Instance data block for FB 102	362 bytes	Any safety monitor needs its own instance data block.
3.	HMI DB69	222 bytes	
4.	Data structure in DB70	182 bytes per AS-i safety monitor.	

Restrictions at "read dataset"

In the ASI DIAG (FB100) block, information on the status of the AS-i slaves is requested and read at the respective master via data record 1. The system function SFC 59 (RDREC; read dataset) is used for such purpose.

Depending on the CPU type only a certain number of SFCs, hence ASI SYS DIAG calls, can be processed in parallel.
The number of simultaneous calls varies between four (for smaller CPUs) and eight (for larger CPUs).
Further information is available in the Internet under

http://support.automation.siemens.com/WW/view/en/15364459.

2.3.2 Technical features

Safety monitor types

Six different types are available as AS-i safety monitor which distinguish in the scope of functions and performance data. For the different types and their scope of functions, please refer to the Catalog and / or the Manual.

Minimal configuration requirement

To use the safety monitor, as many as four (fail-safe or not fail-safe) AS-i slaves must be available to the AS-i bus. If the required minimum quantity is not reached with AS-i modules, further AS-i slaves can be emulated via the AS-i safety monitor. The first emulated slave (monitor basic address) serves the conveyance of the diagnosis informations. In addition the safety monitor can provide up to 3 so-called simulated slave.

The addresses of the simulated AS-i slaves starts directly after the monitor base address and therefore must not be reserved by other AS-I modules.

Number of bus addresses

The safety monitor allocates a certain number of addresses depending on how many AS-i slaves it has to provide. The following table shows the bus addresses' allocation:

Table 2-5

Number of AS-i addresses allocated by the safety monitor	Information
0	No monitor bus address has been allocated to the AS-interface safety monitor. No communication possible between AS-i master and safety monitor and hence, no diagnostic via AS-interface to the safety monitor.
1	One monitor base address has been allocated to the AS-interface safety monitor but no further slaves are being simulated (0). Diagnostic possible via AS-interface to safety monitor through the monitor base address.
2	One monitor base address has been allocated to the AS-interface safety monitor and one further slave is being simulated (1). Diagnostic possible via AS-interface to safety monitor through the monitor base address. The PLC may retrieve additional status information of the monitor by reading the input bit of the slave simulated further.
4	One monitor base address has been allocated to the AS-interface safety monitor and three further slaves are being simulated (3). Diagnostic possible via AS-interface to safety monitor through the monitor base address. The PLC may retrieve additional status information of the monitor by reading the input bit of the first slave of the slaves simulated further. The second and third slaves in the slaves simulated further only help increase the AS-i bus' cycle time to ensure the safety monitor's operation.

2.4 Hardware/software requirements for this project

The project requires the following hardware and software:

Hardware

The WinCC flexible visualization screens were optimized for the following operator panels:

- MP177 6’’
- MP277 8’’ (resolution corresponds to the 10’’ panel)
- Runtime 15’’

Optimization supports all current safety monitors of the SIMENS product range:

- Advanced safety monitor from V2.x up
- Basic safety monitor from V2.x up
- Safety monitor V1.x

The following devices can be used as AS-i master:

- DP/AS-i Link 20E
- DP/AS-i LINK Advanced
- CP 343-2 (P)

Configuration software

Table 2-6

No.	Order no.	Qty.	Component
1.	6ES7810-4CC10-0YA5	1	STEP 7 V5.5 Floating license
2.	6AV6613-0AA51-3CA5	1	WinCC flexible 2008 Advanced
3.	3RK1802-2FB06-0GA1	1	ASIMON V3 configuration software

3 Overview of the HMI template

What will you learn here?

This chapter shows how the HMI template is represented and explains how it works.

3.1 The layout at a glance

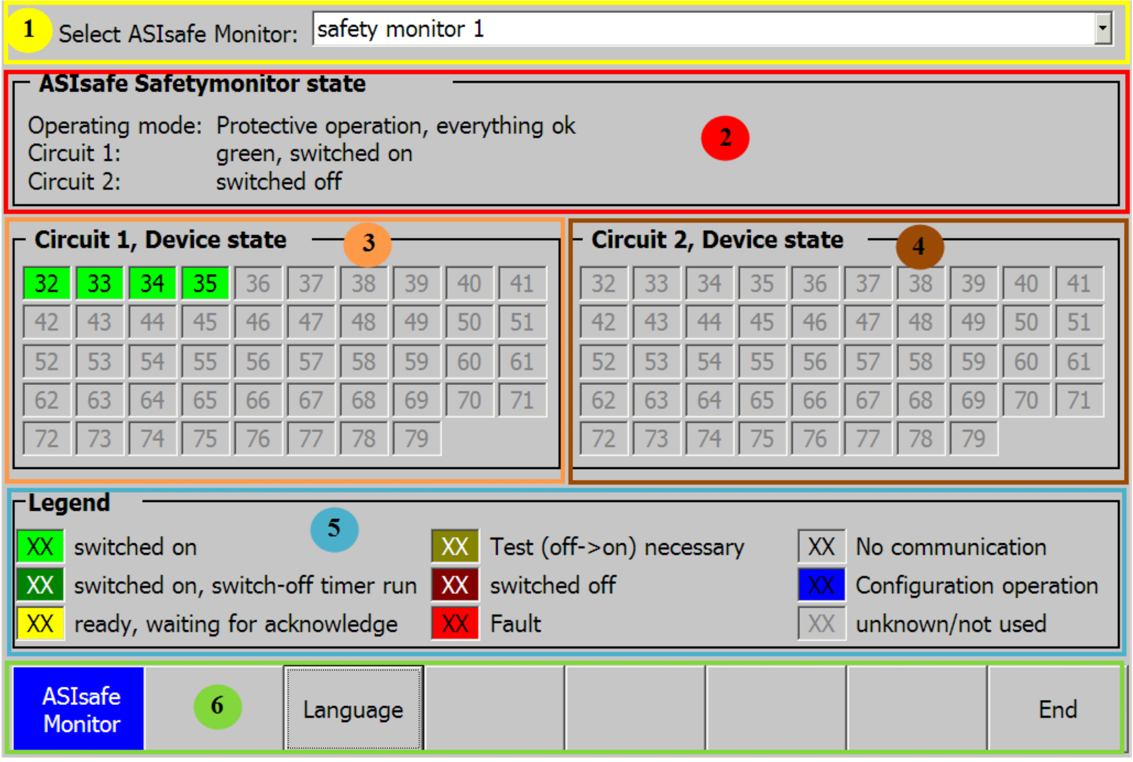
Overview

The WinCC flexible visualization is a tool which represents, graphically well arranged, the status of the safety monitor and the function blocks and provides their diagnostic.

The AS-i safety monitor reads and prepares the data.

The AS-i diagnostic screen is subdivided into six areas:

Figure 3-1



Select ASIsafe Monitor: safety monitor 1

ASIsafe Safetymonitor state

Operating mode: Protective operation, everything ok
Circuit 1: green, switched on
Circuit 2: switched off

Circuit 1, Device state

32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61
62	63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79		

Circuit 2, Device state

32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61
62	63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79		

Legend

XX	switched on	XX	Test (off->on) necessary	XX	No communication
XX	switched on, switch-off timer run	XX	switched off	XX	Configuration operation
XX	ready, waiting for acknowledge	XX	Fault	XX	unknown/not used

The table below shows the meaning of the individual areas:

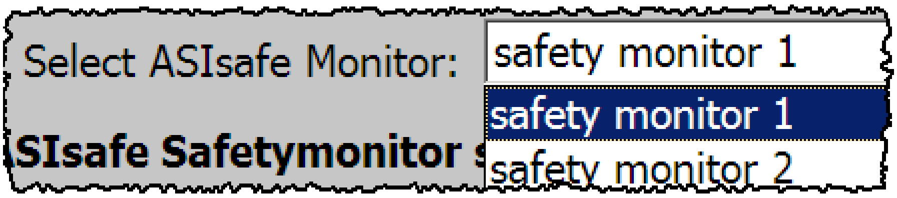
Table 3-1

No.	Function
1.	Selection of the AS-i safety monitor; any monitor is represented with its output circuits.
2.	Status of the safety monitor
3.	Status of the blocks of enable circuit 1
4.	Status of the blocks of enable circuit 2
5.	Legend
6.	Menu fields

Selection of the AS-i safety monitor

The user selects the AS-i safety monitor from a drop-down list. The screenshot below shows the list with the two entries as an example:

Figure 3-2



Select ASIsafe Monitor: safety monitor 1

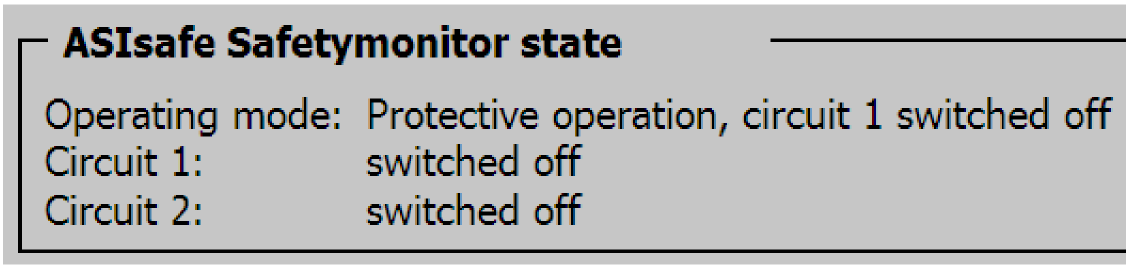
Status of the AS-i safety monitor

By sending calls for data to the AS-i master safety monitor, status information can be gathered.

This information includes:

- Operating mode of the monitor
- Status of output circuit 1
- Status of output circuit 2

Figure 3-3



ASIsafe Safetymonitor state

Operating mode: Protective operation, circuit 1 switched off
Circuit 1: switched off
Circuit 2: switched off

The following messages can be displayed:

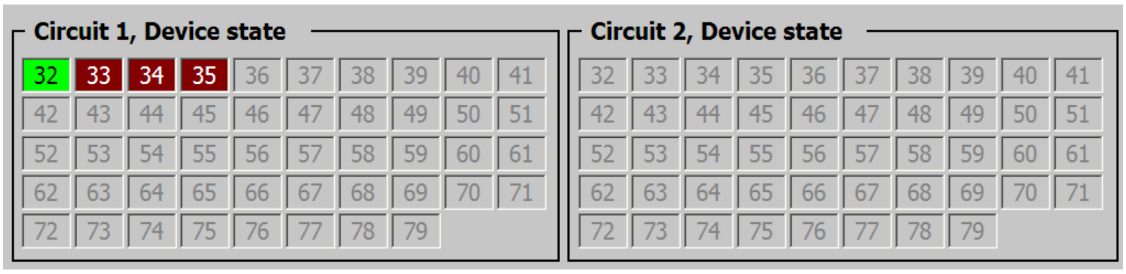
- Protected mode: everything ok (not existing, not configured or dependent output circuits are displayed as ok).
- Protected mode: output circuit 1 off.
- Protected mode: output circuit 2 off.
- Protected mode: both output circuits off.
- Configuration mode: power On
- Configuration mode: reserved / not defined.
- Configuration mode: fatal device error; RESET or replacement required.

Status of the blocks in the enable circuits

The “Device state” area displays an overview of the configured function blocks. Any block configured in the ASIMON configuration software is assigned a number which is called index. This index automatically assigned by **ASIMON** unequivocally identifies the function block in question, independently of whether it has been configured for the first or for the second enable circuit.

WinCC flexible displays the different states in different background colors.

Figure 3-4



The following color assignment applies:

Table 3-2

Color	Meaning
Green	Switched on
Dark green	Switched on; disconnection timer running.
Yellow	Ready; waiting for acknowledgment.
Olive	Test (off -> on) required.
Dark red	Switched off
Red	Error
Gray	No communication
Blue	Configuration mode
All disabled	Unknown / not used

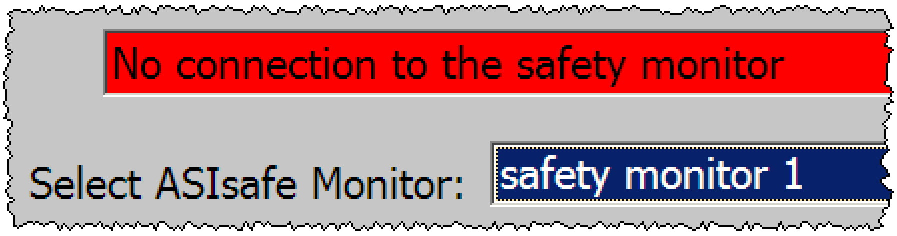
Further messages

Besides the statuses of the AS-i safety monitor, failures of the visualization environment are displayed too. These include messages such as:

- No connection between CPU and visualization;
- Addressing error for FB102;
- No data from AS-i safety monitor;

The visualization displays the messages in plain text, as shown in the figure below:

Figure 3-5



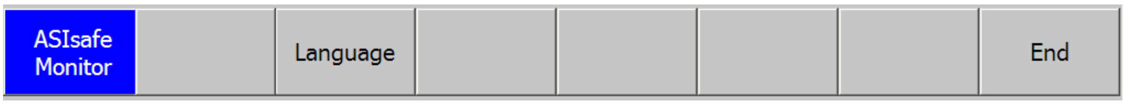
No connection to the safety monitor

Select ASIsafe Monitor: safety monitor 1

Menu fields

The menu field is simply used to switch between languages and to terminate Runtime.

Figure 3-6



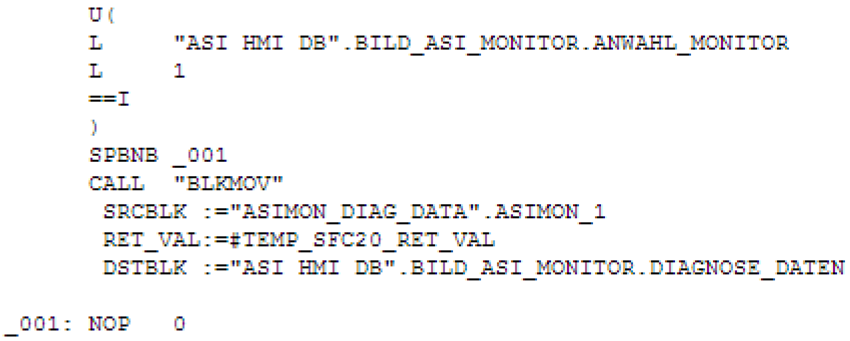
3.2 Supplying data to the WinCC flexible pictures

To supply the required data to the visualization screens the OB1 uses the system function BLKMOV (SFC20).

In WinCC flexible, the user can select from a pick list a safety monitor having an AS-i address assigned.

Depending on the monitor whose data is required, the raw information from the respective area of the instance data block DB70 is transferred to the HMI data block DB69 and prepared for display.

Figure 3-7

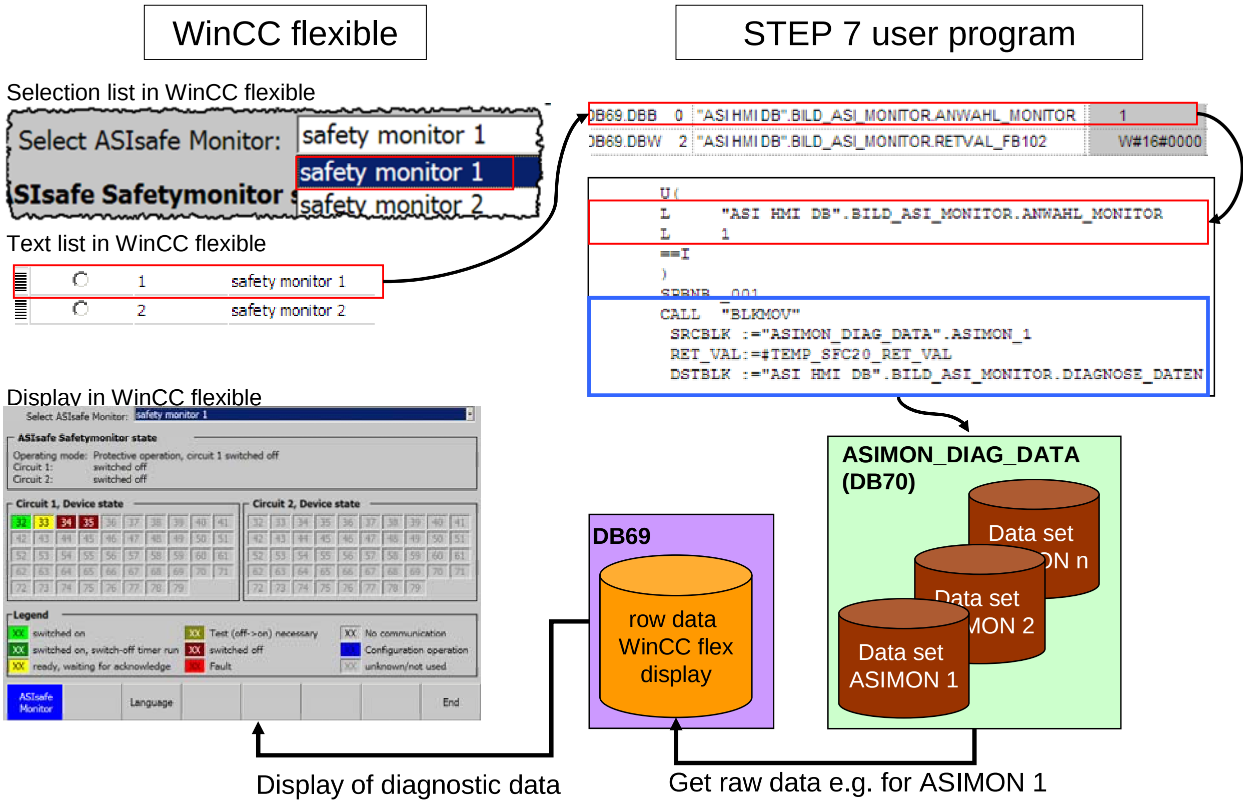


```
      U(
      L      "ASI HMI DB".BILD_ASI_MONITOR.ANWAHL_MONITOR
      L      1
      ==I
      )
      SPBNB _001
      CALL  "BLKMOV"
       SRCBLK :="ASIMON_DIAG_DATA".ASIMON_1
       RET_VAL:=#TEMP_SFC20_RET_VAL
       DSTBLK :="ASI HMI DB".BILD_ASI_MONITOR.DIAGNOSE_DATEN

 _001: NOP   0
```

The chart below illustrates this procedure:

Figure 3-8


WinCC flexible
STEP 7 user program
Selection list in WinCC flexible
Text list in WinCC flexible
Display in WinCC flexible
DB69
row data WinCC flex display
ASIMON_DIAG_DATA (DB70)
Data set ASIMON 1
Data set ASIMON 2
Data set ASIMON n
Display of diagnostic data
Get raw data e.g. for ASIMON 1

Select ASIsafe Monitor: safety monitor 1

safety monitor 1

safety monitor 2

○	1	safety monitor 1
○	2	safety monitor 2

```
DB69.DBB   0  "ASI HMI DB".BILD_ASI_MONITOR.ANWAHL_MONITOR     1
DB69.DBW   2  "ASI HMI DB".BILD_ASI_MONITOR.RETVAL_FB102       W#16#0000
```

```
      U(
      L      "ASI HMI DB".BILD_ASI_MONITOR.ANWAHL_MONITOR
      L      1
      ==I
      )
      SPBNB  _001
      CALL   "BLKMOV"
       SRCBLK :="ASIMON_DIAG_DATA".ASIMON_1
       RET_VAL:=#TEMP_SFC20_RET_VAL
       DSTBLK :="ASI HMI DB".BILD_ASI_MONITOR.DIAGNOSE_DATEN
```

Select ASIsafe Monitor: safety monitor 1

ASIsafe Safetymonitor state

Operating mode: Protective operation, circuit 1 switched off
Circuit 1: switched off
Circuit 2: switched off

Circuit 1, Device state

32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61
62	63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79		

Circuit 2, Device state

32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61
62	63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79		

Legend

XX	switched on	XX	Test (off->on) necessary	XX	No communication
XX	switched on, switch-off timer run	XX	switched off	XX	Configuration operation
XX	ready, waiting for acknowledge	XX	Fault	XX	unknown/not used

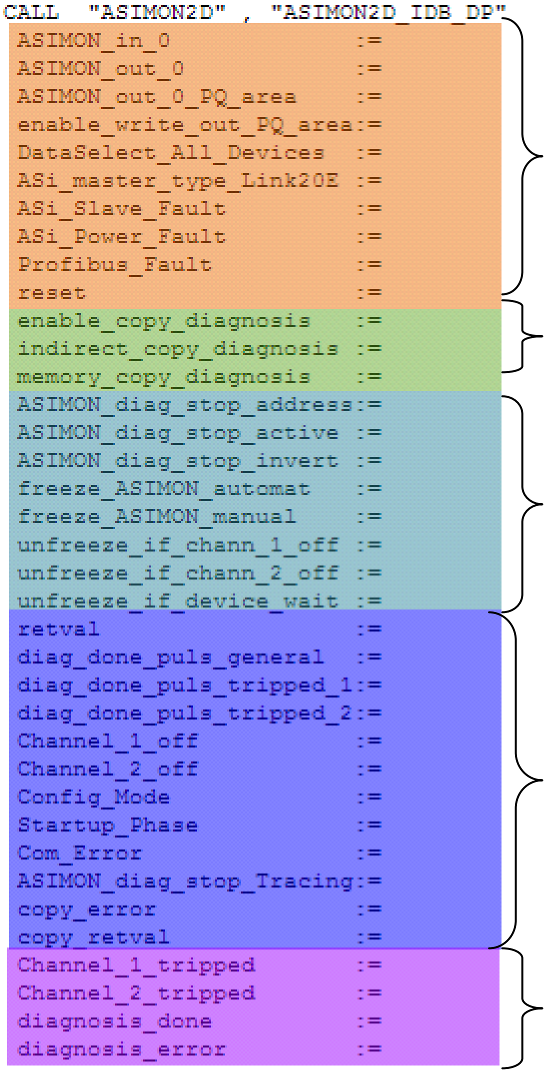
ASIsafe Monitor | Language | End

4 ASIMON2D interface description

4.1 Overview of the interfaces

The color-encoded chart below shows the interfaces of FB102 which belong to the same function:

Figure 4-1



```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0                :=
 ASIMON_out_0               :=
 ASIMON_out_0_PQ_area       :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices     :=
 ASi_master_type_Link20E    :=
 ASi_Slave_Fault            :=
 ASi_Power_Fault            :=
 Profibus_Fault             :=
 reset                      :=
 enable_copy_diagnosis      :=
 indirect_copy_diagnosis    :=
 memory_copy_diagnosis      :=
 ASIMON_diag_stop_address:=
 ASIMON_diag_stop_active    :=
 ASIMON_diag_stop_invert    :=
 freeze_ASIMON_automat      :=
 freeze_ASIMON_manual       :=
 unfreeze_if_chann_1_off    :=
 unfreeze_if_chann_2_off    :=
 unfreeze_if_device_wait    :=
 retval                     :=
 diag_done_puls_general     :=
 diag_done_puls_tripped_1:=
 diag_done_puls_tripped_2:=
 Channel_1_off              :=
 Channel_2_off              :=
 Config_Mode                :=
 Startup_Phase              :=
 Com_Error                  :=
 ASIMON_diag_stop_Tracing:=
 copy_error                 :=
 copy_retval                :=
 Channel_1_tripped          :=
 Channel_2_tripped          :=
 diagnosis_done             :=
 diagnosis_error            :=
```

Initialization
Chapter 4.2 (Input parameters for initialization

Copy function
Chapter 4.3 (Forwarding of diagnostic data

Diagnostic stop function
Chapter 4.4 (Input parameters **for** the diagnostic stop function

Error and status monitoring
Chapter 4.5 (Output parameters for error and status monitoring

Status messages
Chapter 0 (IN/OUT parameters for status monitoring)

4.2 Input parameters for initialization

Description

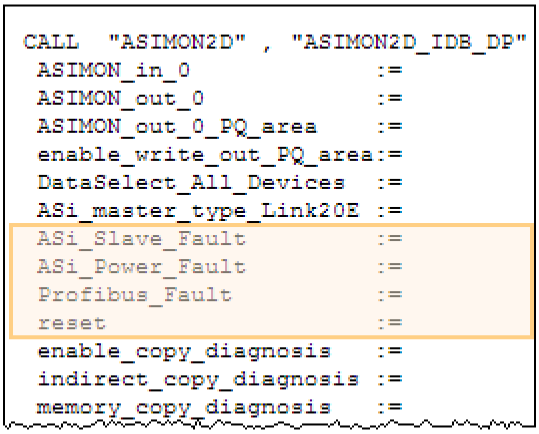
The initialization is one of the most important processes in FB102 which normally will be run a single time only.

4.2.1 Options to influence the initialization

Under normal conditions (e.g. without errors and Reset through the user) initialization must be run a single time only as the input parameters required for won't change during runtime.

Certain parameter statuses though, might implicate that initialization must be run again. This concerns the following BOOLEAN variables:

Figure 4-2



```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0                :=
 ASIMON_out_0               :=
 ASIMON_out_0_PQ_area       :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices     :=
 ASi_master_type_Link20E :=
 ASi_Slave_Fault            :=
 ASi_Power_Fault            :=
 Profibus_Fault             :=
 reset                      :=
 enable_copy_diagnosis      :=
 indirect_copy_diagnosis :=
 memory_copy_diagnosis      :=
```

Table 4-1

Variable	Description
ASi_Slave_Fault	Transfer of an error message upon safety monitor failure.
ASi_Power_Fault	Transfer of an error message upon AS-i voltage failure.
Profibus_Fault	Transfer of an error message upon communication failure towards AS-i master.
Reset	Resetting the block.

The function block **ASI SYS DIAG** (FB100) provides the information on an AS-i slave, voltage or PROFIBUS failure by reading out of the AS-i master the system status list or dataset 1, respectively.

The diagnostic sequence is aborted as soon as one of the four parameters switches to the "true" status.

At the statuses below the initialization is run a **single** time:

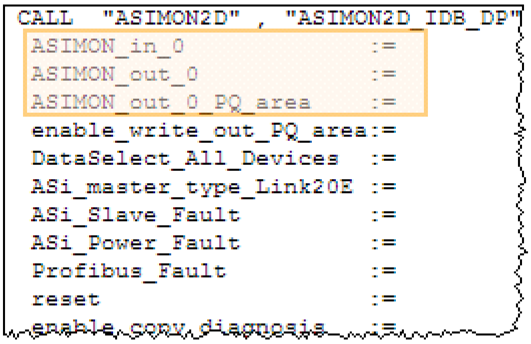
- All four parameters in "false" condition.
- The block-internal time monitoring has detected that during the diagnostic sequence, no data were received from the safety monitor for a time as long as 2s.

The initialization is run **all the time** as long as the „**reset**“ parameter is „true“.

4.2.2 Addressing of the diagnostic nibble

As we learned from chapter 6.4.5 (Diagnostic via AS-i bus) the nibble of AS-i safety monitor's input/output address acts as communication interface for sending the data calls and receiving the diagnostic information. This address is to be transferred as parameter to the ASOMON2D block.

Figure 4-3



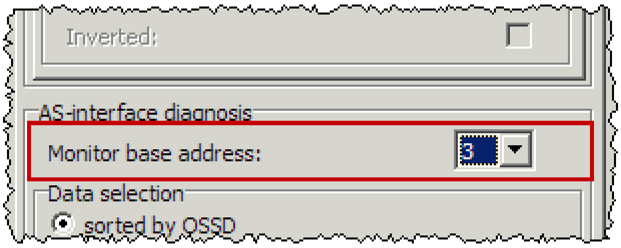
```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0                :=
 ASIMON_out_0               :=
 ASIMON_out_0_PQ_area       :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices   :=
 ASi_master_type_Link20E  :=
 ASi_Slave_Fault          :=
 ASi_Power_Fault          :=
 Profibus_Fault           :=
 reset                    :=
 enable_conv_diagnosis    :=
```

Generalities

The following applies to all three parameters:

- Parameters are evaluated during the initialization only.
- The parameters refer to the four PLC input/output bits (nibbles) of the corresponding AS-i slave address of the safety monitor. The AS-i safety monitor's address has been determined by the ASIMON software during setup.

Figure 4-4



Inverted: □

AS-interface diagnosis

Monitor base address: 3

Data selection

● sorted by OSSD

- The parameters must be mapped to the AS-i I/O bit 0. The function block uses this one and the following three bits to communicate with the AS-i safety monitor. If no bit address is transferred, bit 0 is assumed to be the indicated address.
- It does not make sense to use xx.5, xx6 and xx.7 as bit addresses since they will cause an overflow to the next byte.
- All parameters must be mapped to a valid address. This also applies to the **ASIMON_out_0_PQ_area** parameter even though this one should not to be used.

Mapping variants

Several options are available to indicate the address. They are all listed in the table below. It is also explained which option applies to which parameter.

Table 4-2

Option	Example	Information	Applicable to
Direct addressing	E14.4 A50.0		ASIMON_in_0 ASIMON_out_0
Direct addressing without bit indication	EB14 AW14	Bit 0 is supposed to be the start bit here.	ASIMON_in_0 ASIMON_out_0
Direct addressing with a data block	DB20.DBX1.0		ASIMON_in_0 ASIMON_out_0
Pointer across areas	P#E74.0 P#A56.1	"I" and "A" only as operand	ASIMON_in_0 ASIMON_out_0
Area-internal pointer	P#65.0	FB102 evaluates the pointer in different manner, according to the parameter. ASIMON_in_0: P#P65.0 ASIMON_out_0: P#A56.0	ASIMON_in_0 ASIMON_out_0
Pointer across areas	P#P129.0	"P" as operand	ASIMON_in_0 ASIMON_out_0_PQ_area

CAUTION

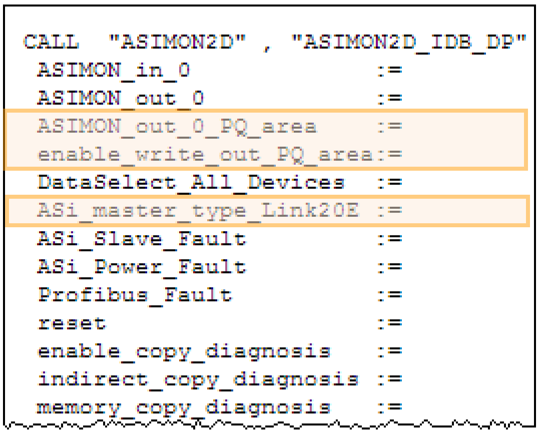
Indicating an I/O area together with the **ASIMON_out_0** parameter is not allowed.

The parameter **ASIMON_out_0_PQ_area** is to be used to directly write to a peripheral output address area.

Peripheral output address area

To use the peripheral output address area, the following variables are involved:

Figure 4-5



```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0                :=
 ASIMON_out_0               :=
 ASIMON_out_0_PQ_area       :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices     :=
 ASi_master_type_Link20E    :=
 ASi_Slave_Fault            :=
 ASi_Power_Fault            :=
 Profibus_Fault             :=
 reset                      :=
 enable_copy_diagnosis      :=
 indirect_copy_diagnosis    :=
 memory_copy_diagnosis      :=
```

To directly write to the four AS-i output bits the parameter **ASIMON_out_0_PQ_area** is used.

This function, hence, must be enabled by mapping the parameter **enable_write_out_PQ_area** to „**true**“.

Table 4-3

Mapping	Description

ASIMON_in_0:= E41.0
ASIMON_out_0:= A41.0
ASIMON_out_0_PQ_area:=P#P41.0
enable_write_out_PQ_area:= **true**
	Writing to the peripheral output address area is enabled.
	Note: The **ASIMON_out_0** parameter must be mapped to a valid address anyway.

ASIMON_in_0:= E41.0
ASIMON_out_0:= A41.0
ASIMON_out_0_PQ_area:=P#P41.0
enable_write_out_PQ_area:= **false**
	Writing to the peripheral output address area is **not** enabled. The storage area from **ASIMON_out_0** is used.
	Note: The **ASIMON_out_0_PQ_area** parameter must be mapped to a valid address anyway.

The access will be per byte or per word, according to the AS-i master type: The following convention applies:

If the AS-i master is a **CP**, the access must be **per byte**. The rest of AS-i masters support the access per word.

Parameter **ASi_master_type_Link20E** manages which access method is to be used.

Table 4-4

Parameter value	Access method	AS-i Master
ASi_master_type_Link20E:=false	per word	• CP 343-2 • CP 343-2P
ASi_master_type_Link20E:=true	per byte	• DP/AS-i Link 20E • DP/AS-i LINK Advanced Single Master • DP/AS-i LINK Advanced Double Masters

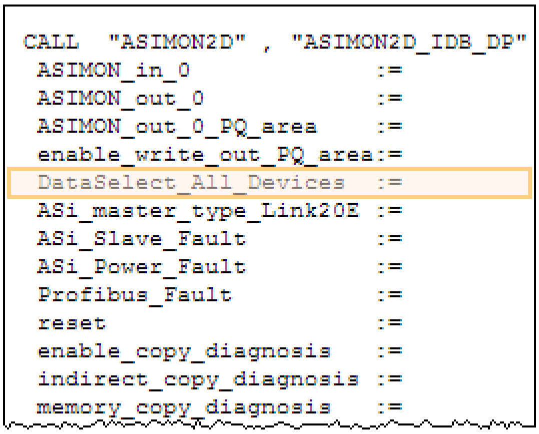
CAUTION

The CPU switches to STOP at peripheral breakdown and OB122 access error not loaded.

4.2.3 Assigning the diagnostic format

Parameter **DataSelect_All_Devices** is used to assign the diagnostic format.

Figure 4-6

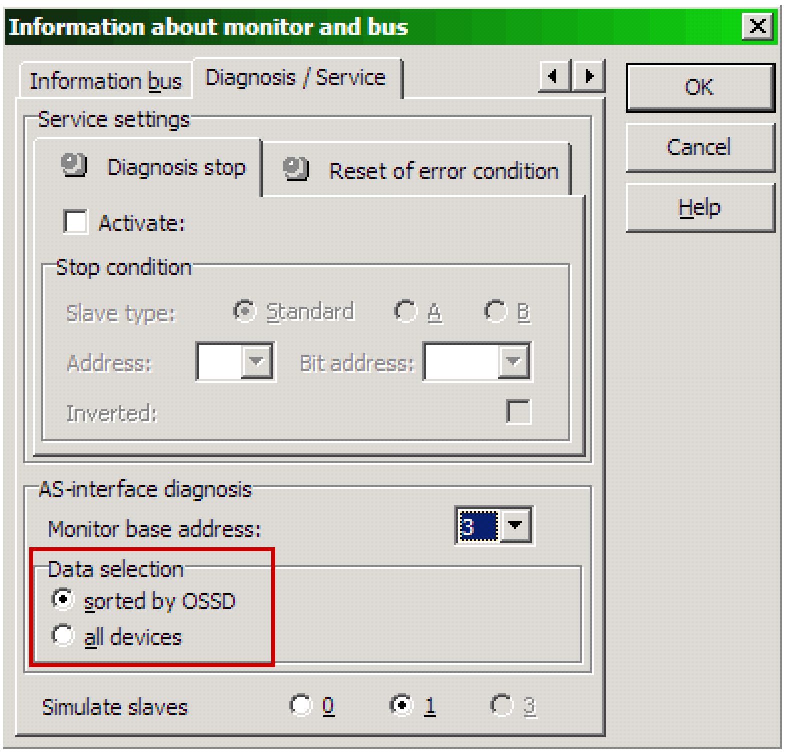


```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0                :=
 ASIMON_out_0               :=
 ASIMON_out_0_PQ_area       :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices     :=
 ASi_master_type_Link20E :=
 ASi_Slave_Fault            :=
 ASi_Power_Fault            :=
 Profibus_Fault             :=
 reset                      :=
 enable_copy_diagnosis      :=
 indirect_copy_diagnosis :=
 memory_copy_diagnosis      :=
```

As we learned from chapter 6.4.2 (Defining the data format for diagnostic), there are two different ways to read out of the monitor the diagnostic data:

1. Sorted by enable circuits (OSSD)
2. All devices

Figure 4-7



☐ Activate:

Slave type: ● Standard ○ A ○ B

Address:

Bit address:

Inverted: ☐

Monitor base address: 3

● sorted by OSSD

○ all devices

Simulate slaves ○ 0 ● 1 ○ 3

The format to be used will be determined by ASIMON software during the setup of the AS-i safety monitor.

The status of the **DataSelect_All_Devices** parameter must imperatively be identical with the ASIMON settings:

Table 4-5

Parameter value	Data format
DataSelect_All_Devices:=false	Sorted by enable circuits
DataSelect_All_Devices:=true	All devices

Note

For AS-i safety monitors < V2.0 **DataSelect_All_Devices:=false** must always be set.

4.3 Forwarding of diagnostic data

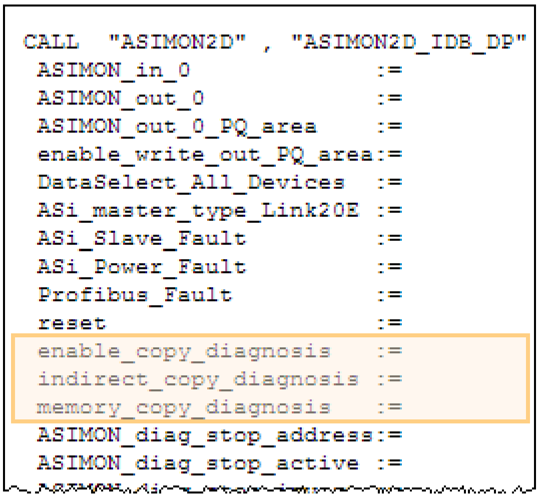
Description

Function block FB102 offers the option to additionally copy the diagnostic data read by the AS-i safety monitor into a storage area predefined by the user.

Parameters involved

The following variables are involved in this process:

Figure 4-8



```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0                 :=
 ASIMON_out_0                :=
 ASIMON_out_0_PQ_area        :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices      :=
 ASi_master_type_Link20E :=
 ASi_Slave_Fault             :=
 ASi_Power_Fault             :=
 Profibus_Fault              :=
 reset                       :=
 enable_copy_diagnosis       :=
 indirect_copy_diagnosis :=
 memory_copy_diagnosis       :=
 ASIMON_diag_stop_address:=
 ASIMON_diag_stop_active :=
```

The parameter **enable_copy_diagnosis** mapped to „**true**“ enables the copy process. The **consistent** data will be forwarded to the assigned storage area after each successful diagnostic sequence.

The copy function will never be called though, if the parameter is "**false**". The output parameters (and IN/OUT parameters) of the function block will be updated and can be evaluated anyway. The diagnostic data can be evaluated via read accesses to the instance data block.

CAUTION

Since the internal data of the function block are not consistent, it is not suggested to deactivate the copy function.

Access to the result of the copy function should be made for consistent diagnostic data (e. g. for visualization).

At the parameter **memory_copy_diagnosis**, an ANY pointer must be created which indicates the destination area for the diagnostic data. The diagnostic data are in total 182 bytes long.

Note

If the indicated destination area is smaller, less data will be forwarded then with the result that the diagnostic data are incomplete.

If the indicated destination area exceeds 182 bytes, 182 bytes only will be forwarded anyway.

Forwarding of the diagnostic data occurs internally in the block, via the system function SFC 20 BLKMOV.

The parameter **indirect_copy_diagnosis** indicates how to interpret the destination area of the memory_copy_diagnosis parameter.

Table 4-6

Parameter value	Meaning
indirect_copy_diagnosis:=false	The ANY pointer at parameter **memory_copy_diagnosis** directly points to the destination area.
indirect_copy_diagnosis:=true	The ANY pointer at parameter **memory_copy_diagnosis** points to a length 10 data area. This data area includes an ANY pointer pointing to the destination area.

4.4 Input parameters for the diagnostic stop function

Note This option is available for AS-i safety monitors from version 2.0 on only.

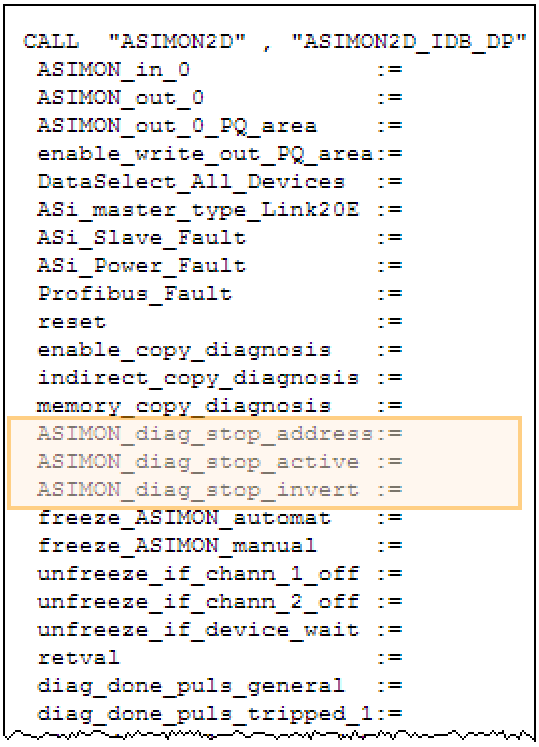
Description

If the stop condition is met the diagnostic stop function freezes the status of any device after the device has logged a disconnection (also refer to chapter 6.4.3 (Diagnostic stop function

Configuring the diagnostic stop function

The diagnostic stop function as configured in the ASIMON configuration software must imperatively be transferred to the parameters of the ASIMON2D function block.

Figure 4-9



```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0                :=
 ASIMON_out_0               :=
 ASIMON_out_0_PQ_area       :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices     :=
 ASi_master_type_Link20E    :=
 ASi_Slave_Fault            :=
 ASi_Power_Fault            :=
 Profibus_Fault             :=
 reset                      :=
 enable_copy_diagnosis      :=
 indirect_copy_diagnosis    :=
 memory_copy_diagnosis      :=
 ASIMON_diag_stop_address:=
 ASIMON_diag_stop_active    :=
 ASIMON_diag_stop_invert    :=
 freeze_ASIMON_automat      :=
 freeze_ASIMON_manual       :=
 unfreeze_if_chann_1_off    :=
 unfreeze_if_chann_2_off    :=
 unfreeze_if_device_wait    :=
 retval                     :=
 diag_done_puls_general     :=
 diag_done_puls_tripped_1:=
```

ASIMON_diag_stop_active determines if the diagnostic stop function is deactivated or activated in the configuration software.

Table 4-7

Parameter value	Meaning
ASIMON_diag_stop_active:=false	Diagnostic stop function is deactivated.
ASIMON_diag_stop_active:=true	Diagnostic stop function is activated.

The **ASIMON_diag_stop_address** parameter defines the PLC output bit of the diagnostic stop condition according to the settings in the ASIMON configuration program. For this parameter apply the same mapping conditions as for ASIMON_out_0 (see Table 4-2).

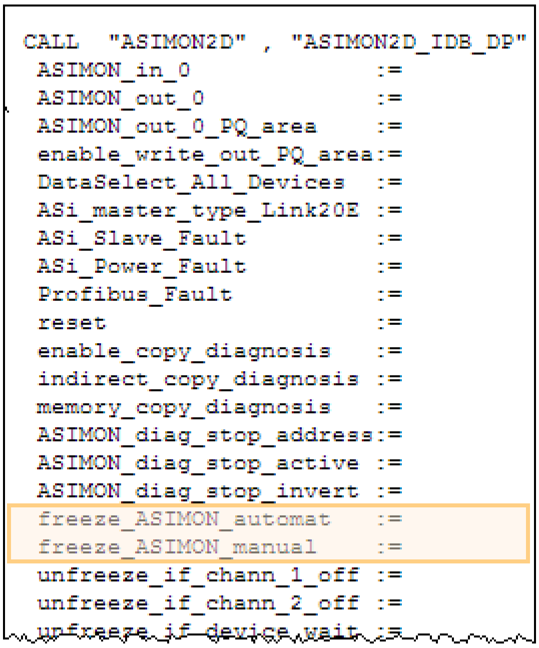
The input variable **ASIMON_diag_stop_invert** informs the software in function block FB102 whether (mapping to true) or not (mapping to false) the option "inverted" has been activated during the configuration via ASIMON.

Status of the diagnostic stop condition

According to the status of the diagnostic stop condition the device either remains in the waiting mode (diagnostic stop condition fulfilled) or switches immediately to the ON status (diagnostic stop condition not fulfilled) after an OFF -> ON switchover.

The PLC output bit responsible for the diagnostic stop condition can optionally be activated automatically by function block FB102 or manually by the user.

Figure 4-10



```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0                :=
 ASIMON_out_0               :=
 ASIMON_out_0_PQ_area       :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices     :=
 ASi_master_type_Link20E :=
 ASi_Slave_Fault            :=
 ASi_Power_Fault            :=
 Profibus_Fault             :=
 reset                      :=
 enable_copy_diagnosis      :=
 indirect_copy_diagnosis :=
 memory_copy_diagnosis      :=
 ASIMON_diag_stop_address:=
 ASIMON_diag_stop_active :=
 ASIMON_diag_stop_invert :=
 freeze_ASIMON_automat      :=
 freeze_ASIMON_manual       :=
 unfreeze_if_chann_1_off :=
 unfreeze_if_chann_2_off :=
 unfreeze_if_device_wait :=
```

Both parameters are interdependent and can be mapped as follows:

Table 4-8

Parameter value	Meaning

freeze_ASIMON_automat:=false
freeze_ASIMON_manual:=true
	The user sets manually the diagnostic stop condition.
	Enable after stop must also be set manually in this case!

freeze_ASIMON_automat:=true
freeze_ASIMON_manual:=false
	The software sets automatically the diagnostic stop condition.
	The software also manages automatically the enable after stop!

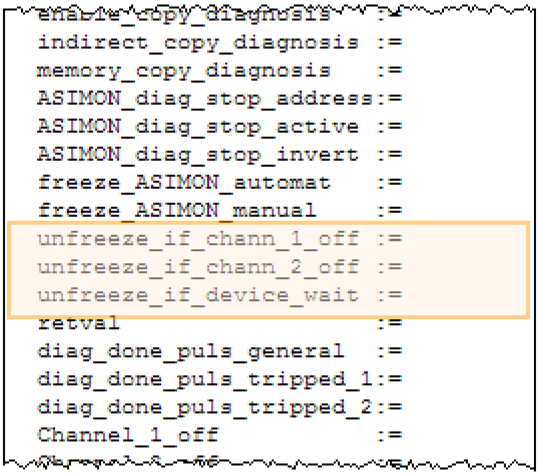
freeze_ASIMON_automat:=false
freeze_ASIMON_manual:=false
	The diagnostic stop condition is permanently deactivated and no devices will be frozen.

Automatic variant

If the automatic variant is selected, the diagnostic condition will be deactivated after the disconnection of both enable circuits has been ascertained.

Further disconnection conditions can be defined additionally:

Figure 4-11



```
  enable_copy_diagnosis   :=
  indirect_copy_diagnosis :=
  memory_copy_diagnosis   :=
  ASIMON_diag_stop_address:=
  ASIMON_diag_stop_active :=
  ASIMON_diag_stop_invert :=
  freeze_ASIMON_automat   :=
  freeze_ASIMON_manual    :=
  unfreeze_if_chann_1_off :=
  unfreeze_if_chann_2_off :=
  unfreeze_if_device_wait :=
  retval                  :=
  diag_done_puls_general  :=
  diag_done_puls_tripped_1:=
  diag_done_puls_tripped_2:=
  Channel_1_off           :=
  Channel_2_off           :=
```

Table 4-9

Parameter value	Meaning
unfreeze_if_chann_1_off:=true	The diagnostic stop condition will be deactivated even though enable circuit 1 has disconnected (independently of enable circuit 2's status).
unfreeze_if_chann_1_off:=true	The diagnostic stop condition will be deactivated even though enable circuit 2 has disconnected (independently of enable circuit 1's status).
unfreeze_if_device_wait:=true	The diagnostic stop condition will also be deactivated periodically if the current diagnostic sequence revealed that at least one device is in the "wait" status. Periodical deactivation means that the diagnostic stop condition is deactivated for 100 ms and then reactivated for 100 ms. Consequently, all short-time device deactivations cannot be logged any more but "frozen" devices which do not directly cause the enable circuit's disconnection (e.g. certain gate inputs) will possibly be enabled again while the program is running.

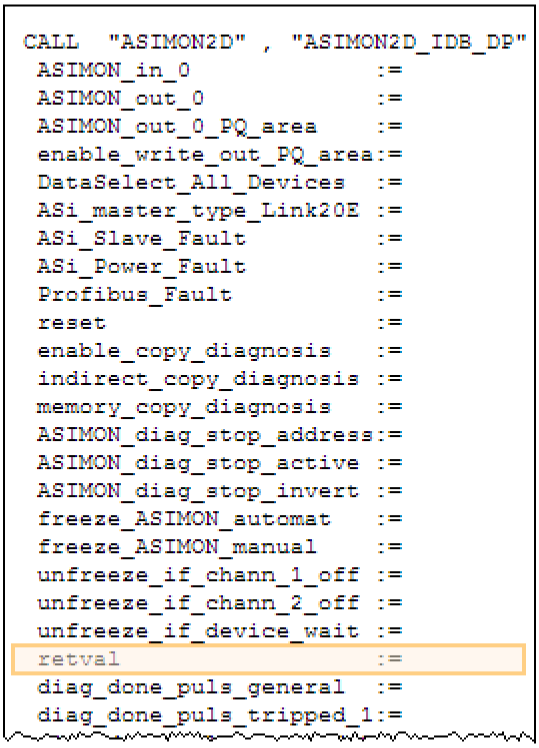
4.5 Output parameters for error and status monitoring

4.5.1 Status of function block FB102

Description

The output parameter **retval** informs about the status of the ASIMON2D function block and should be read as 4-digit hexadecimal value.

Figure 4-12



```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0                :=
 ASIMON_out_0               :=
 ASIMON_out_0_PQ_area       :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices     :=
 ASi_master_type_Link20E :=
 ASi_Slave_Fault            :=
 ASi_Power_Fault            :=
 Profibus_Fault             :=
 reset                      :=
 enable_copy_diagnosis      :=
 indirect_copy_diagnosis :=
 memory_copy_diagnosis      :=
 ASIMON_diag_stop_address:=
 ASIMON_diag_stop_active :=
 ASIMON_diag_stop_invert :=
 freeze_ASIMON_automat      :=
 freeze_ASIMON_manual       :=
 unfreeze_if_chann_1_off :=
 unfreeze_if_chann_2_off :=
 unfreeze_if_device_wait :=
 retval                     :=
 diag_done_puls_general     :=
 diag_done_puls_tripped_1:=
```

Interpretation of retval

The bit of the highest value indicates that an error condition has been signaled: e.g. 8xxx (hex).

The second highest hexadecimal digit identifies the block parameter to which the message refers. For example: x1xx (hex) means that the first parameter (ASIMON_in_0) has caused the message.

The further hexadecimals only contain an error / message number.

Status of retval

The values of **retval** are defined as follows:

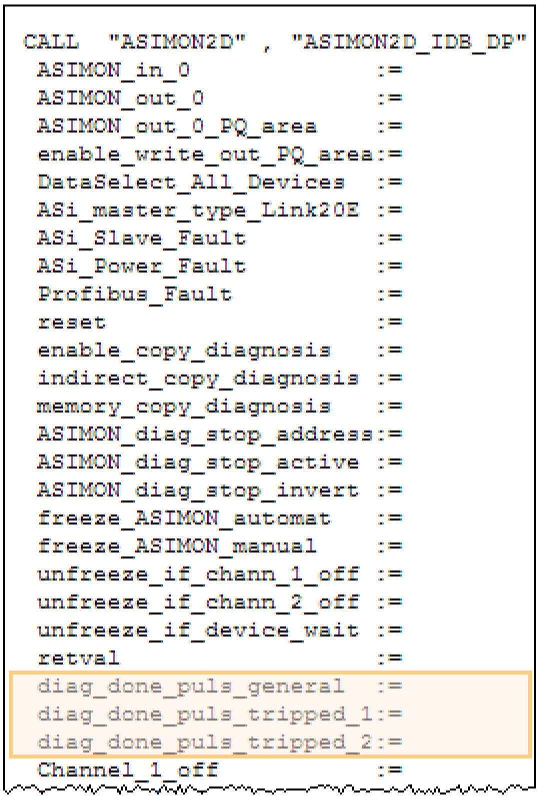
Table 4-10

Value	Meaning
8010	Time monitoring tripped; no communication to safety monitor
8020	Internal error / no Request active
813A	Parameter ASIMON_in_0; DB number missing
8225	Parameter ASIMON_out_0; I/O area not allowed
823A	Parameter ASIMON_out_0; DB number missing.
833A	Parameter ASIMON_out_0_PQ_area; DB number missing.
8E25	Parameter ASIMON_diag_stop_address; I/O area not allowed
8E3A	Parameter ASIMON_diag_stop_address; DB number missing.
8701	Diagnostic sequence aborted; parameter ASi_Slave_Fault:= TRUE
8801	Diagnostic sequence aborted; parameter ASi_Power_Fault:= TRUE
8901	Diagnostic sequence aborted; parameter Profibus_Fault:= TRUE
8D01	Diagnostic data could not be copied; Inadmissible area at parameter memory_copy_diagnosis; see error message in parameter Copy_Retval
8D02	Diagnostic data could not be copied; indirect parameter memory_copy_diagnosis cannot be accepted; see error message in parameter Copy_Retval
8D03	Diagnostic data could not be copied; the ANY pointer pointing to the indirect parameter memory_copy_diagnosis points to the inadmissible area; see error message in parameter Copy_Retval
8D04	Diagnostic data could not be copied; the indirect parameter memory_copy_diagnosis points to a too short area (no ANY pointer)
7A01	No error; parameter RESET:= TRUE
00x	No error; xx stands for the number of calls for which the function block is waiting for answer from the safety monitor. xx = 0: No delay / optimal diagnosis run; if xx >0: then perhaps direct I/O accesses to the parameter

4.5.2 Status of the diagnostic sequence (pulse)

Three output variables provide feedback on the development of the diagnostic sequence. The message appears as short pulse, e.g. the Boolean variables are set to true for a single cycle only.

Figure 4-13



```
CALL  "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0             :=
 ASIMON_out_0            :=
 ASIMON_out_0_PQ_area    :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices  :=
 ASi_master_type_Link20E :=
 ASi_Slave_Fault         :=
 ASi_Power_Fault         :=
 Profibus_Fault          :=
 reset                   :=
 enable_copy_diagnosis   :=
 indirect_copy_diagnosis :=
 memory_copy_diagnosis   :=
 ASIMON_diag_stop_address:=
 ASIMON_diag_stop_active :=
 ASIMON_diag_stop_invert :=
 freeze_ASIMON_automat   :=
 freeze_ASIMON_manual    :=
 unfreeze_if_chann_1_off :=
 unfreeze_if_chann_2_off :=
 unfreeze_if_device_wait :=
 retval                  :=
 diag_done_puls_general  :=
 diag_done_puls_tripped_1:=
 diag_done_puls_tripped_2:=
 Channel_1_off           :=
```

Parameter **diag_done_puls_general** enters the **true** status for the duration of one cycle if one diagnostic sequence has been successfully completed or aborted with error. This helps trigger the further processing of the diagnostic data.

The parameter **diag_done_puls_tripped_1** is set for one cycle if one diagnostic sequence has been successfully completed or aborted with error and a disconnection (change over from ON to OFF) in enable circuit 1 has been logged. This for example helps trigger the filing of the diagnostic data.

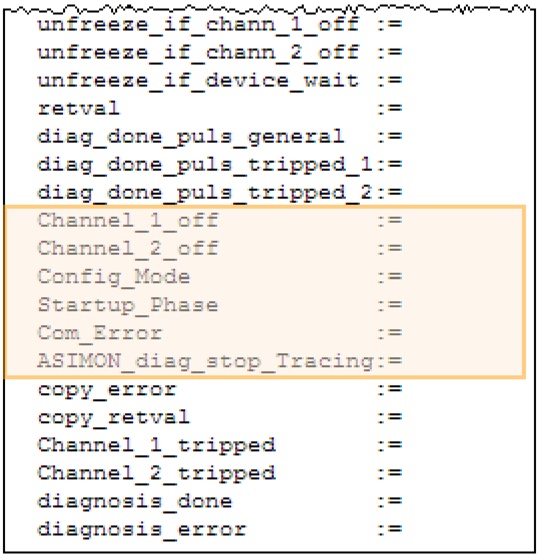
Analogously, **diag_done_puls_tripped_2** for enable circuit 2.

4.5.3 Status of the AS-i safety monitor

All diagnostic information of the AS-i safety monitor and the enable circuits' blocks will be stored in the instance data block of FB102 as well as - if activated - in a further storage area.

Certain statuses will additionally be made available as output parameters.

Figure 4-14



```
unfreeze_if_chann_1_off  :=
unfreeze_if_chann_2_off  :=
unfreeze_if_device_wait  :=
retval                   :=
diag_done_puls_general   :=
diag_done_puls_tripped_1:=
diag_done_puls_tripped_2:=
Channel_1_off            :=
Channel_2_off            :=
Config_Mode              :=
Startup_Phase            :=
Com_Error                :=
ASIMON_diag_stop_Tracing:=
copy_error               :=
copy_retval              :=
Channel_1_tripped        :=
Channel_2_tripped        :=
diagnosis_done           :=
diagnosis_error          :=
```

Note

The edged variables change their status directly after having the monitor status read in and not at the end of a diagnostic sequence.

Table 4-11

Variable	Value	Meaning
Channel_1_off	True	Enable circuit 1 is configured and disconnected. The parameter is TRUE even though the safety monitor is in configuration mode or initialization.
Channel_2_off	True	Enable circuit 2 is configured and disconnected. The parameter is TRUE even though the safety monitor is in configuration mode or initialization.
Config_mode	True	The safety monitor is in configuration mode (not in initialization).
Startup_Phase	True	The safety monitor is in initialization.
Com_Error	True	Communication to AS-i safety monitor interrupted.
ASIMON_diag_stop_Tracing	True	The diagnostic stop condition is activated; the safety monitor will "freeze" a device after its disconnection.

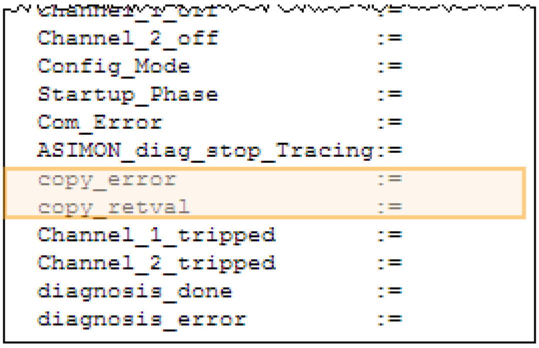
4.5.4 Status of the copy process

As we already learned in chapter 4.3 (Forwarding of diagnostic data

FB102 offers a copy function. By activating this option the diagnostic data will be stored, besides the instance data block, also in a storage area which the user is free to select.

Two output parameters provide feedback on the copy process.

Figure 4-15



```
Channel_1_off              :=
Channel_2_off              :=
Config_Mode                :=
Startup_Phase              :=
Com_Error                  :=
ASIMON_diag_stop_Tracing:=
copy_error                 :=
copy_retval                :=
Channel_1_tripped          :=
Channel_2_tripped          :=
diagnosis_done             :=
diagnosis_error            :=
```

The variable **copy_error** signals if the copy process has been aborted with error. The Boolean variable switches to the **true** status.

If **copy_error** is in the **true** condition the error cause can be retrieved via the parameter **copy_retval**. This parameter is an image of the RETVAL status of the block-internal BLKMOV system function (SFC20). For detailed information of the status messages refer to the description of the system function.
Unique exception: **Copy_retval = 80FF** (hex) if the indirect parameter **memory_copy_diagnosis** points to a too short area (no ANY pointer). BLKMOV will not be called in this case.

4.6 IN/OUT parameters for status monitoring

Note

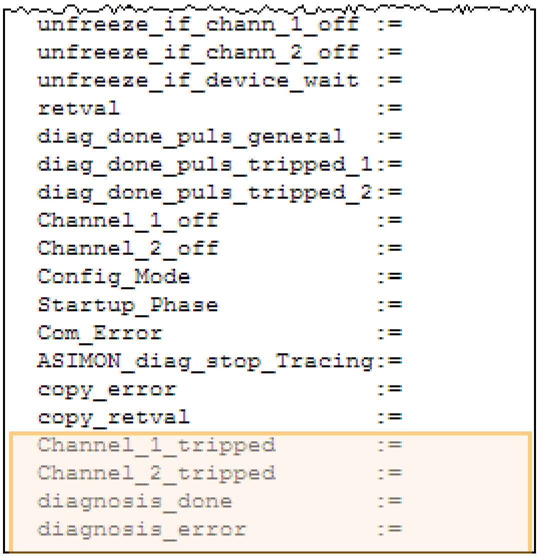
The function block's IN / OUT parameters will only be set (to true) block-internally.

Resetting (to false) must occur in the user program.

The function block ASIMOND2D furthermore provides four IN/OUT parameters which give feedback on the enable circuits and the diagnostic sequence.

Unlike the status bits outlined in chapter 4.5.2 (Status of the diagnostic sequence (pulse)
, these Boolean variables are not a pulse but keep their "true" status as long as they are reset externally.

Figure 4-16



```
unfreeze_if_chann_1_off  :=
unfreeze_if_chann_2_off  :=
unfreeze_if_device_wait  :=
retval                   :=
diag_done_puls_general   :=
diag_done_puls_tripped_1:=
diag_done_puls_tripped_2:=
Channel_1_off            :=
Channel_2_off            :=
Config_Mode              :=
Startup_Phase            :=
Com_Error                :=
ASIMON_diag_stop_Tracing:=
copy_error               :=
copy_retval              :=
Channel_1_tripped        :=
Channel_2_tripped        :=
diagnosis_done           :=
diagnosis_error          :=
```

Table 4-12

Variable	Value	Meaning
Channel_1_tripped	True	A disconnection of enable circuit 1 has been logged.
Channel_2_tripped	True	A disconnection of enable circuit 2 has been logged.
diagnosis_done	True	The diagnostic sequence was finished successfully.
diagnosis_error	True	One error has occurred during the diagnostic sequence.

5 How to use the project

What will you learn here?

This chapter describes how the project can be integrated into STEP 7.

5.1 Open the project in STEP 7 V5.5

The table below lists the steps required to open the project.

Table 5-1

Step	Function	Figure/Information
1.	Unzip the assigned **51339169_ASI_SECMON_CODE_V20.zip** project via **File -> Retrieve** and select a target directory.	The project opens.
2.	Besides the STEP 7 user program the user will also get the integrated WinCC flexible projects.	

5.2 Project customizing

The directions below show how and where you can customize the project.

5.2.1 Modifications in the STEP 7 project

Customizing the hardware configuration

The hardware of the assigned STEP 7 project is configured for the components below:

Table 5-2

No.	Component	MLFB	Addressing
1.	CPU317-2 PN/DP	6ES7 317-2EK14-0AB0	IP address: 192.168.22.11 DP address: 1
2.	DI16xDC24V; alarm	6ES7 321-7BH01-0AB0	
3.	DO8XDC24V/0.5A	6ES7 322-8BF00-0AB0	
4.	CP343-2P	6GK7 343-2AH11-0XA0	Device address: 288
5.	DP/AS-i Link Advanced	6GK1 415-2BA20	Device address: 69 DP address: 3 Diagnostic address: 8186
6.	AS-i safety monitor V3.0 basic	3RK1105-1AE04-2CA0	AS-i address: 4 (ASIMON) AS-i address: 5 (virtual slave) Input address: 71.4 Output address: 71.4
7.	3 safe AS-i slaves		AS-i address: 2, 6, 10
8.	2 standard AS-i slaves		AS-i address: 8, 12

If your configuration differs it must be adapted accordingly.

Change the hardware configuration according to your requirements. Then compile and save changes.

Adaptations in the program code

The user program requires in certain places that information be entered by the user according to the hardware configuration.

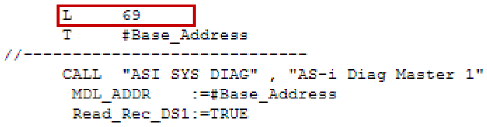
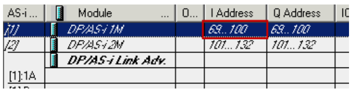
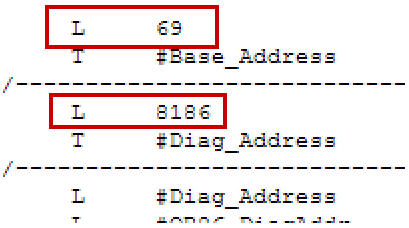
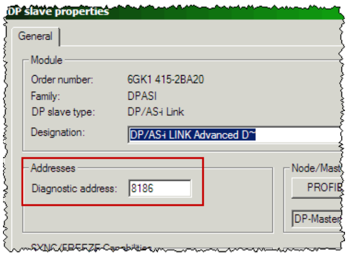
The table below lists these places and shows from where to get the required information.

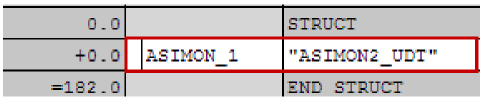
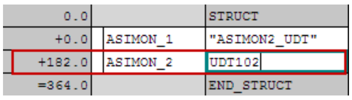
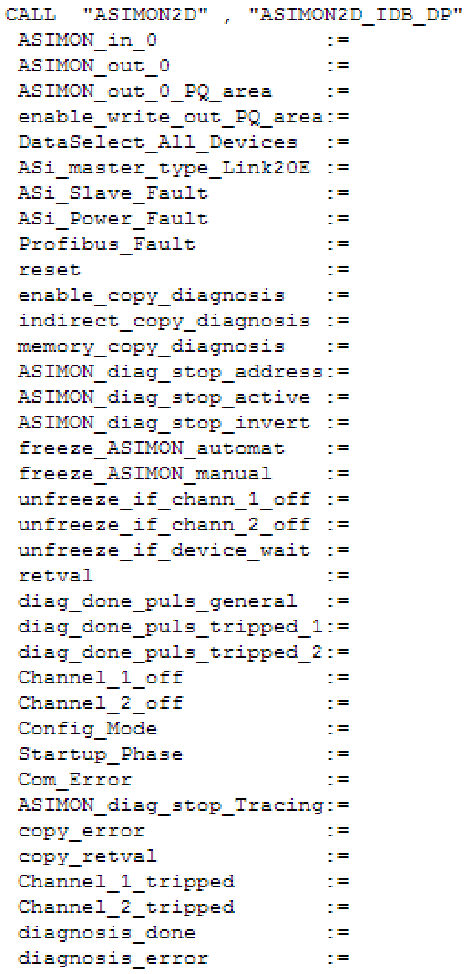
Note

Addressing by the user program of such AS-i masters which have an AS-i safety monitor as slave only will be enough.

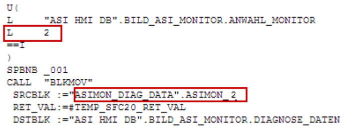
The DP/AS-i Link will take the AS-i master function of the AS-I safety monitor in this project.

Table 5-3

Modification	Expected information	Note
FC127 and OB82		
Network 2: Initialization diagnostic for AS-i master 1  L 69 T #Base_Address //----------------------------- CALL "ASI SYS DIAG" , "AS-i Diag Master 1" MDL_ADDR :=#Base_Address Read_Rec_DS1:=TRUE	Start address of AS-i master 1	In hardware configuration:  AS-i ... | Module ... | O... | I Address | Q Address | I([1] | DP/AS-i 1M | | 69...100 | 69...100 [2] | DP/AS-i 2M | | 101...132 | 101...132 | DP/AS-i Link Adv. [1]:1A
Network 3/4: Initialization diagnostic for further AS-i masters	Start address of AS-i master n	Any further AS-i master requires its own FB100 call with a new instance data block.
OB86		
Network 2: Diagnostic for AS-i master  L 69 T #Base_Address /----------------------------- L 8186 T #Diag_Address /----------------------------- L #Diag_Address T #OB86_DiagAddr	Start and diagnostic address of AS-i master 1	In hardware configuration:  DP slave properties General Module Order number: 6GK1 415-2BA20 Family: DPASI DP slave type: DP/AS-i Link Designation: DP/AS-i LINK Advanced D~ Addresses Diagnostic address: 8186 Node/Mast PROFIE DP-Master SYNC/FREEZE Capabilities
Network 3/4: Initialization diagnostic for further AS-i masters	Start and diagnostic address of AS-i master n	

<table>
<tr><th>Modification</th><th>Expected information</th><th>Note</th></tr>
<tr><th colspan="3">DB70</th></tr>
<tr><td>
0.0 | | STRUCT
+0.0 | ASIMON_1 | "ASIMON2_UDT"
=182.0 | | END_STRUCT</td><td>Any AS-i safety monitor requires its own data structure.</td><td>Create further data ranges of type UDT102 for any further AS-i safety monitor.

0.0 | | STRUCT
+0.0 | ASIMON_1 | "ASIMON2_UDT"
+182.0 | ASIMON_2 | UDT102
=364.0 | | END_STRUCT</td></tr>
<tr><th colspan="3">OB1</th></tr>
<tr><td><b>Network 3:</b> Call of FB102 (ASIMON2D)
<pre>
CALL "ASIMON2D" , "ASIMON2D_IDB_DP"
 ASIMON_in_0   :=
 ASIMON_out_0   :=
 ASIMON_out_0_PQ_area   :=
 enable_write_out_PQ_area:=
 DataSelect_All_Devices   :=
 ASi_master_type_Link20E   :=
 ASi_Slave_Fault   :=
 ASi_Power_Fault   :=
 Profibus_Fault   :=
 reset   :=
 enable_copy_diagnosis   :=
 indirect_copy_diagnosis   :=
 memory_copy_diagnosis   :=
 ASIMON_diag_stop_address:=
 ASIMON_diag_stop_active   :=
 ASIMON_diag_stop_invert   :=
 freeze_ASIMON_automat   :=
 freeze_ASIMON_manual   :=
 unfreeze_if_chann_1_off   :=
 unfreeze_if_chann_2_off   :=
 unfreeze_if_device_wait   :=
 retval   :=
 diag_done_puls_general   :=
 diag_done_puls_tripped_1:=
 diag_done_puls_tripped_2:=
 Channel_1_off   :=
 Channel_2_off   :=
 Config_Mode   :=
 Startup_Phase   :=
 Com_Error   :=
 ASIMON_diag_stop_Tracing:=
 copy_error   :=
 copy_retval   :=
 Channel_1_tripped   :=
 Channel_2_tripped   :=
 diagnosis_done   :=
 diagnosis_error   :=
</pre></td><td>• Mapping of the parameters acc. to chapter 4 (ASIMON2D interface description
• The <b>memory_copy_ diagnosis</b> parameter points to the first data structure in DB70</td><td>Refer to the interface description in chapter 4 (ASIMON2D interface description</td></tr>
<tr><td><b>Network 4:</b> Diagnostic for further AS-i safety monitors</td><td>• Mapping of the parameters acc. to chapter 4 (ASIMON2D interface description
• The <b>memory_copy_ diagnosis</b> parameter points to the nth data structure in DB70</td><td>Any further AS-i safety monitor requires its own FB102 call with a new instance data block.</td></tr>
</table>

Modification	Expected information	Note

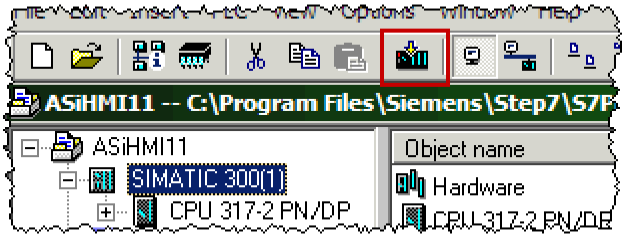
Network 6: Copy ASIMON diagnostic data	Number of the AS-i safety monitor
	Source range of the data to be copied (corresponding data structure in DB70)
		Example for AS-i safety monitor 2:
		
		`U(`
		`L      "ASI HMI DB".BILD_ASI_MONITOR.ANWAHL_MONITOR`
		`L      2`
		`==I`
		`)`
		`SPBNB _001`
		`CALL  "BLKMOV"`
		` SRCBLK :="ASIMON_DIAG_DATA".ASIMON_2`
		` RET_VAL:=#TEMP_SFC20_RET_VAL`
		` DSTBLK :="ASI HMI DB".BILD_ASI_MONITOR.DIAGNOSE_DATEN`

5.2.2 Downloading the blocks into the CPU

Save all blocks once the modifications finished.

Select the SIMATIC 300 station and download to your CPU.

Figure 5-1


File Edit Insert PLC View Options Window Help
ASiHMI11 -- C:\Program Files\Siemens\Step7\S7P
ASiHMI11
SIMATIC 300(1)
CPU 317-2 PN/DP
Object name
Hardware
CPU 317-2 PN/DP

5.2.3 Modifications in the WinCC flexible project

Description

The WinCC flexible projects are integrated in the STEP 7 project. The integrated configuring allows direct access to the STEP 7 configuration data. This offers the following advantages:

- SIMATIC MANAGER is the central coordination point for configuring SIMATIC controllers and WinCC flexible projects.
- When configuring variables and area pointers, WinCC flexible provides direct access to the STEP 7 icons.
- Symbolic names in STEP 7 can be used in WinCC flexible.

Appropriate operator panels

The visualization pictures were created for and adjusted to the following operator panels:

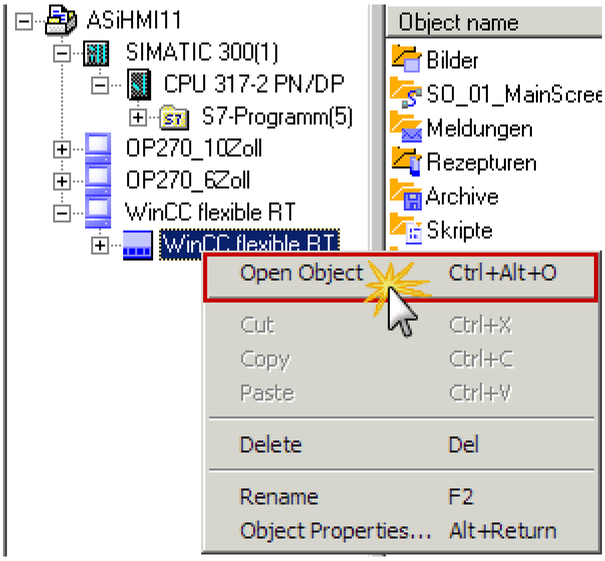
- MP177 6''
- MP277 8'' (resolution corresponds to the 10'' panel)
- Runtime 15''

Note The pictures in the chapters below were all taken with Runtime 15''.

Opening the WinCC flexible project

Open the SIMATIC MANAGER. Select a WinCC flexible project and open it via the context menu.

Figure 5-2

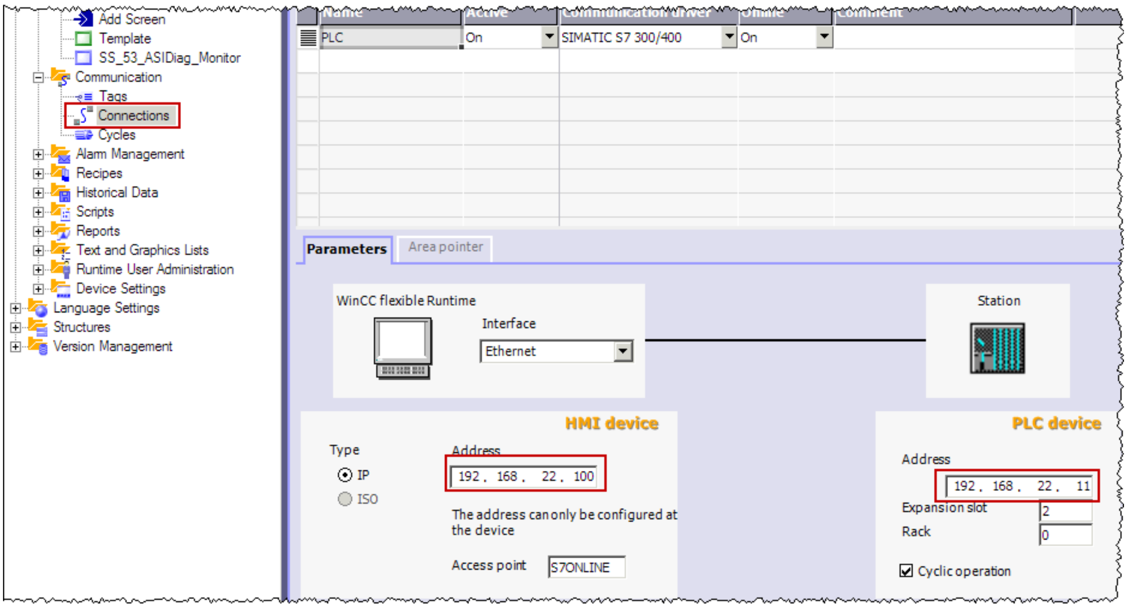


Configuring a connection between CPU and panel

The Ethernet-based connection between CPU and panel must be correctly configured to allow data exchange.

Open the WinCC flexible project and navigate to **Connections**. Adapt the panel's and CPU's IP addresses to your requirements.

Figure 5-3



Name	Active	Communication driver	Online	Comment
PLC	On	SIMATIC S7 300/400	On	

Interface: Ethernet

HMI device: Type ● IP ○ ISO; Address 192 . 168 . 22 . 100

The address can only be configured at the device

Access point: S7ONLINE

PLC device: Address 192 . 168 . 22 . 11; Expansion slot 2; Rack 0; ☑ Cyclic operation

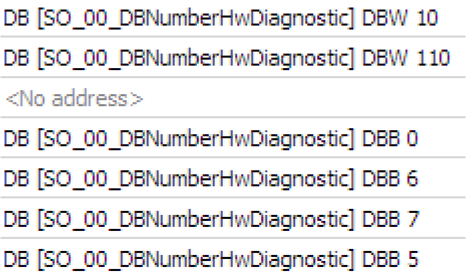
Coordinating the access to variables

The instance data block of the ASI HMI DB (DB69) controls the display screens of the AS-i monitor status.

To make the project as flexible as possible for the user, the variables are not linked directly to an address (e.g. DB69.DBW2), but addressed indirectly via variables multiplexing.

This means that the variable address is adjusted during runtime, in function of the value of the **SO__00_DBNumberHwDiagnostic** index variable.

Figure 5-4

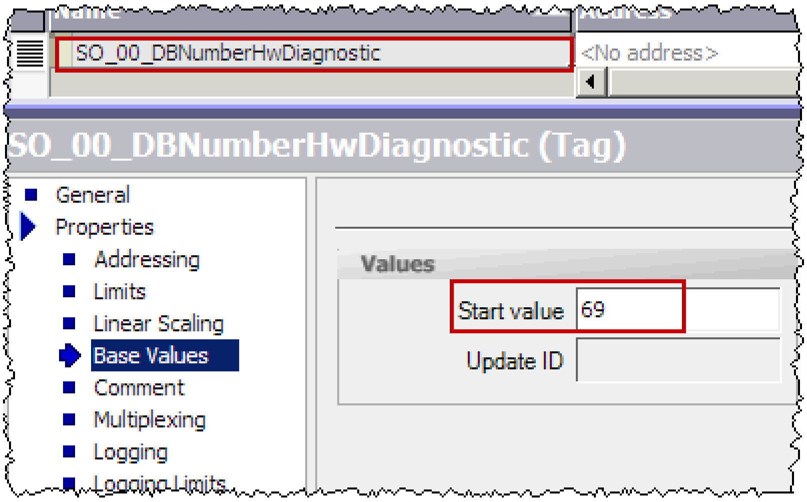


DB [SO_00_DBNumberHwDiagnostic] DBW 10
DB [SO_00_DBNumberHwDiagnostic] DBW 110
<No address>
DB [SO_00_DBNumberHwDiagnostic] DBB 0
DB [SO_00_DBNumberHwDiagnostic] DBB 6
DB [SO_00_DBNumberHwDiagnostic] DBB 7
DB [SO_00_DBNumberHwDiagnostic] DBB 5

Variables multiplexing has the advantage that the user is free in defining the data block number for visualization. Instead of adjusting all WinCC flexible variables it is done by modifying the index variable only.

In WinCC flexible, open the **Variables list** via **Communication** for this purpose. Select the **SO_00_DBNumberHwDiagnostic** index variable and in the variable's Properties, enter the number of your data block for the HMI visualization as a start value.

Figure 5-5



SO_00_DBNumberHwDiagnostic <No address>

SO_00_DBNumberHwDiagnostic (Tag)

Start value: 69

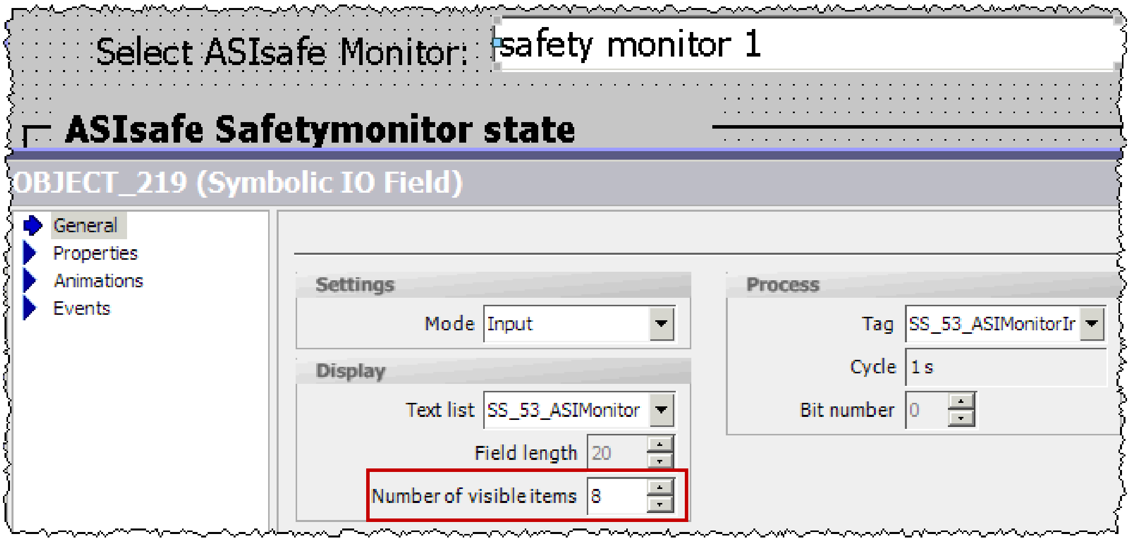
Update ID:

Adjusting the AS-i safety monitor selection list

The next step is to expand the WinCC flexible project by the number of selectable AS-i safety monitors. This requires adjustments at several locations in the project.

The selection list can manage up to eight AS-i masters as default setting. Should more devices be managed you have to adjust the threshold.

Figure 5-6



Select ASIsafe Monitor: safety monitor 1

ASIsafe Safetymonitor state

OBJECT_219 (Symbolic IO Field)

Mode: Input

Text list: SS_53_ASIMonitor

Field length: 20

Number of visible items: 8

Tag: SS_53_ASIMonitorIr

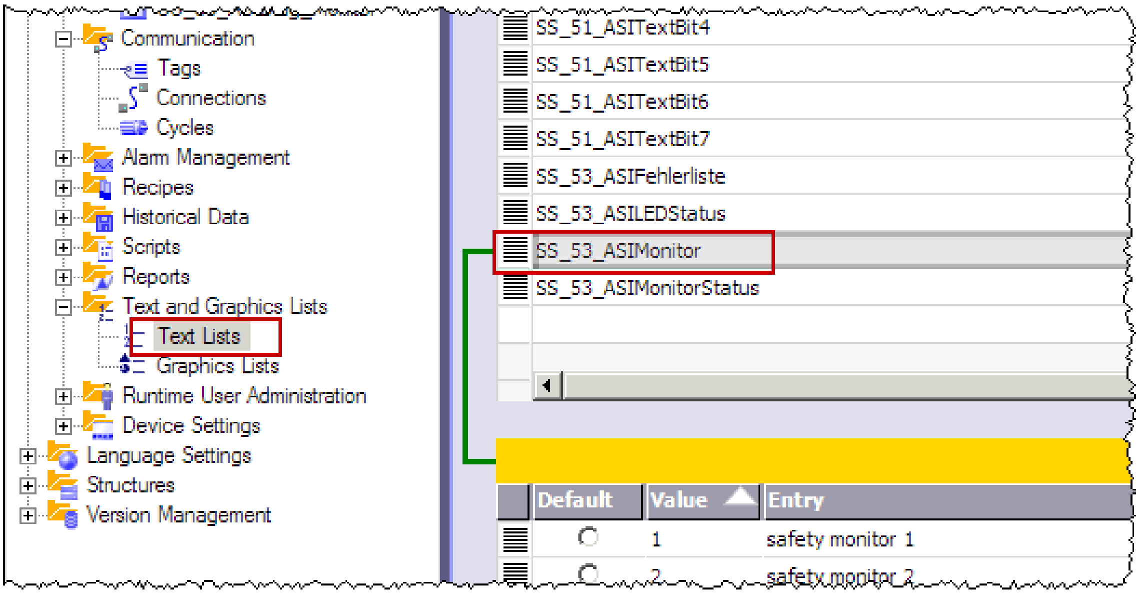
Cycle: 1 s

Bit number: 0

The **SS_53_ASIMonitor** text lists manage the display texts of the AS-i safety monitors in the selection list.

Open the text lists in **Text and Graphics lists** and select the **SS_53_ASIMonitor** text list.

Figure 5-7

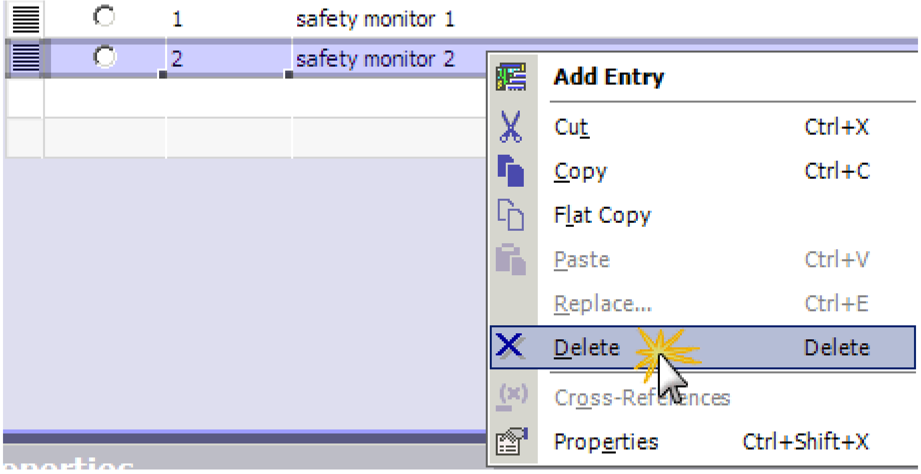


Default	Value	Entry
○	1	safety monitor 1
○	2	safety monitor 2

The lists already contain pre-configured entries for the first two monitors. Delete superfluous entries if you have fewer AS-I safety monitors; expand the list if there are more.

To delete superfluous entries, select and remove them from the text list:

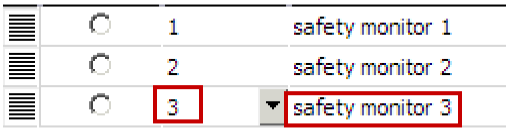
Figure 5-8



Default	Value	Entry
○	1	safety monitor 1
○	2	safety monitor 2

If you wish to add further AS-i monitors select the last text list entry, duplicate it by copy & paste and increment the entry in **Value** and assign a **display text**.

Figure 5-9



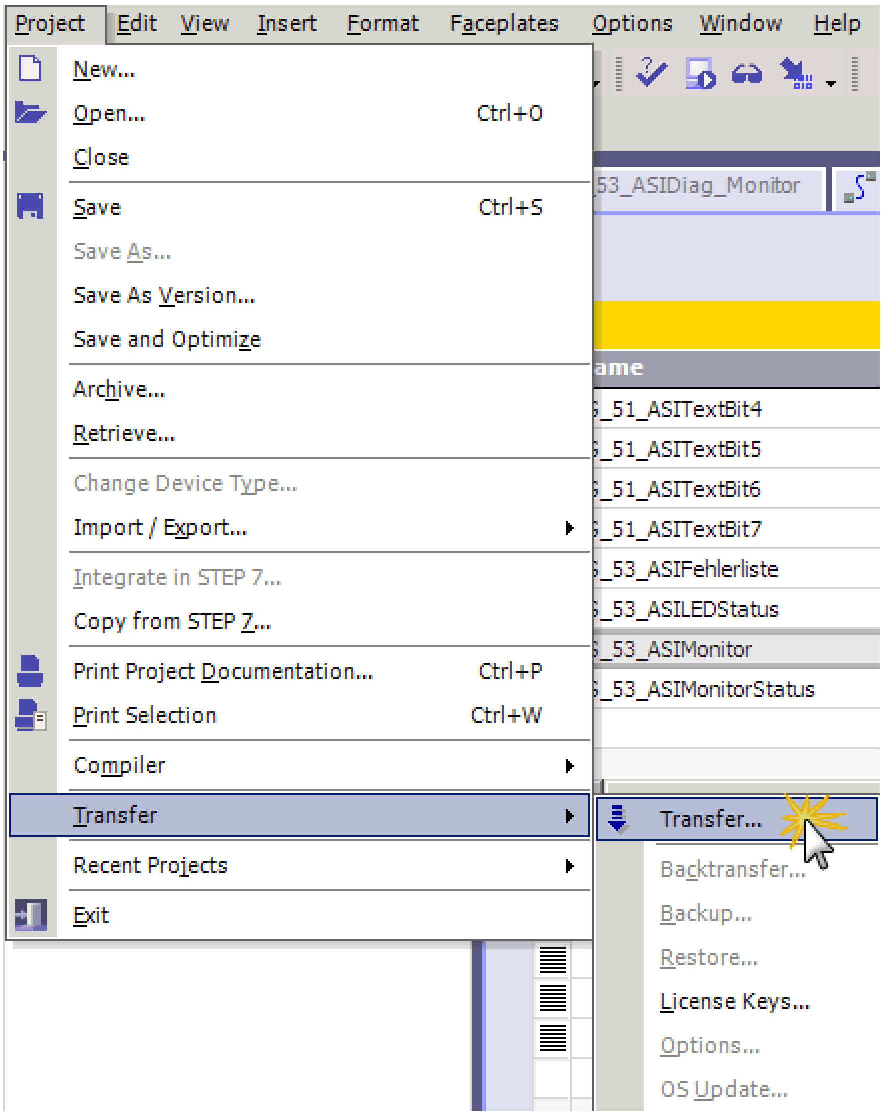
☰	○	1	safety monitor 1
☰	○	2	safety monitor 2
☰	○	3	safety monitor 3

5.2.4 Downloading the WinCC flexible project

Once you have your modifications finished save the WinCC flexible project.

Generate the project and transfer the project data to the panel.

Figure 5-10



Appendix

6 The AS-i safety monitor

What will you learn here?

This chapter gives the user a short introduction to the AS-i safety monitor in terms of advantage, functionality and configuration. It also includes an explanation of certain terms relevant for use.

6.1 Terminology

For good understanding it makes sense to explain the most important terms relating to the AS-i safety monitor.

Table 6-1

Term	Meaning
Safety output	The monitor includes type-specific output control elements (relays our AS-i output). The logic in the monitor determines whether these outputs must safely shut down the outputs of subsequent control elements or remain in ON condition.
Output circuit	Consists of two logically connected output control elements.
Enable circuit	This term comprises all safe AS-i slaves and function blocks of an output circuit. The logic of the enable circuit unlocks / locks within the AS-i system the machine part with dangerous movements.
Configuration mode	Operating mode of the safety monitor to download and check the configuration.
Feedback circuit	Monitors the switching function of the contactors connected to the monitor.

6.2 The monitor as local ASIsafe solution

Advantage

An AS-i safety monitor and a safe AS-i slave help configure quickly and easily small safety islands within an AS-i system and assign them safety-relevant functions.

Neither fail-safe PLC nor specific AS-i masters are required for such purpose.

Description

As integral part of ASIsafe the AS-i safety monitor monitors the data exchange between AS-i master and the safe slaves within an AS-i system.

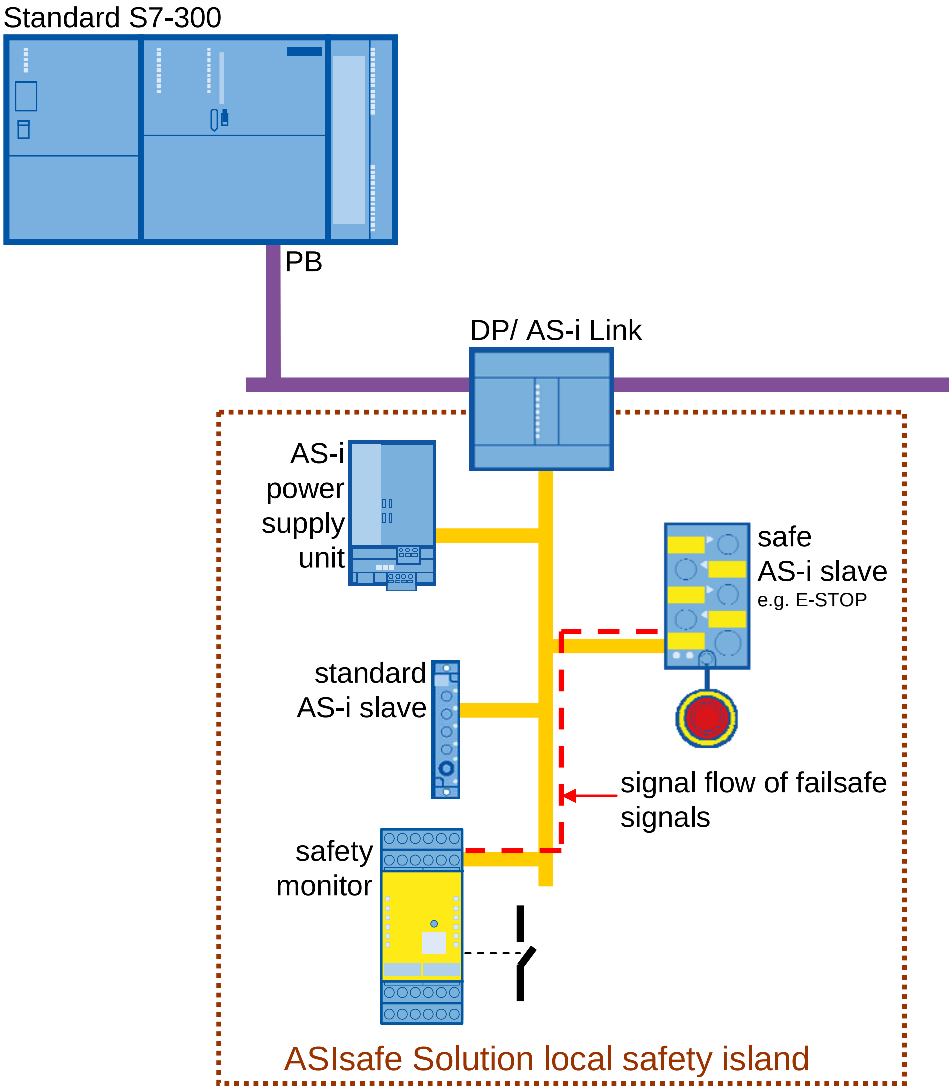
The monitor links the gathered information (e. g. the status of the safe inputs) with configurable disconnection logic and thus, provides for safe disconnection of dangerous machine parts by means of the incorporated safety relay.

The user creates the disconnection logic with configuration software and downloads it to the safety monitor.

ASIsafe safety island

An ASIsafe safety island may be configured as follows:

Figure 6-1

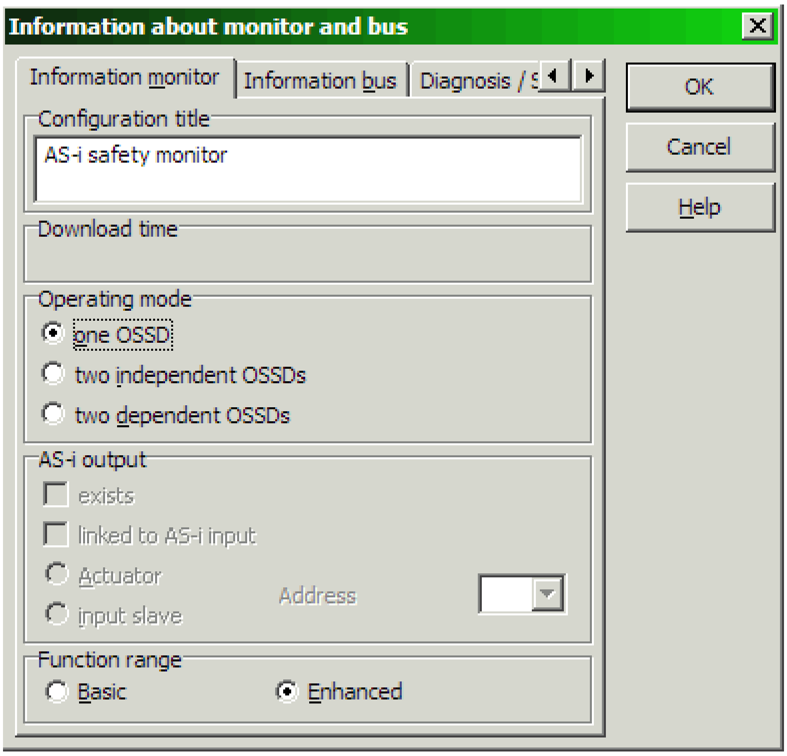


6.3 Configuring with ASIMON

The safety monitor's task is to continuously determine the statuses of the safe AS-i slaves, to link them with the user-defined logic and thus, activate or lock the output control elements.

The ASIMON configuration software manages this disconnection logic and the setup of the AS-i safety monitor.

Figure 6-2



Information about monitor and bus

Information monitor | Information bus | Diagnosis / S

Configuration title: AS-i safety monitor

Download time:

Operating mode
- ● one OSSD
- ○ two independent OSSDs
- ○ two dependent OSSDs

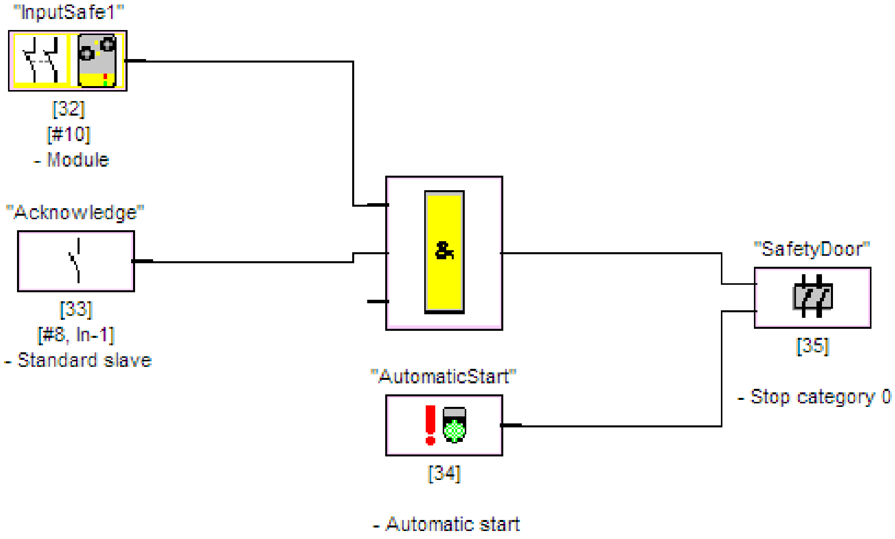
AS-i output
- □ exists
- □ linked to AS-i input
- ○ Actuator
- ○ input slave

Address

Function range
- ○ Basic
- ● Enhanced

Completely configured disconnection logic could be the following one:

Figure 6-3



6.4 Diagnostic options

Requirements

The AS-i safety monitor must have assigned its own AS-i bus address to allow it's diagnostic.

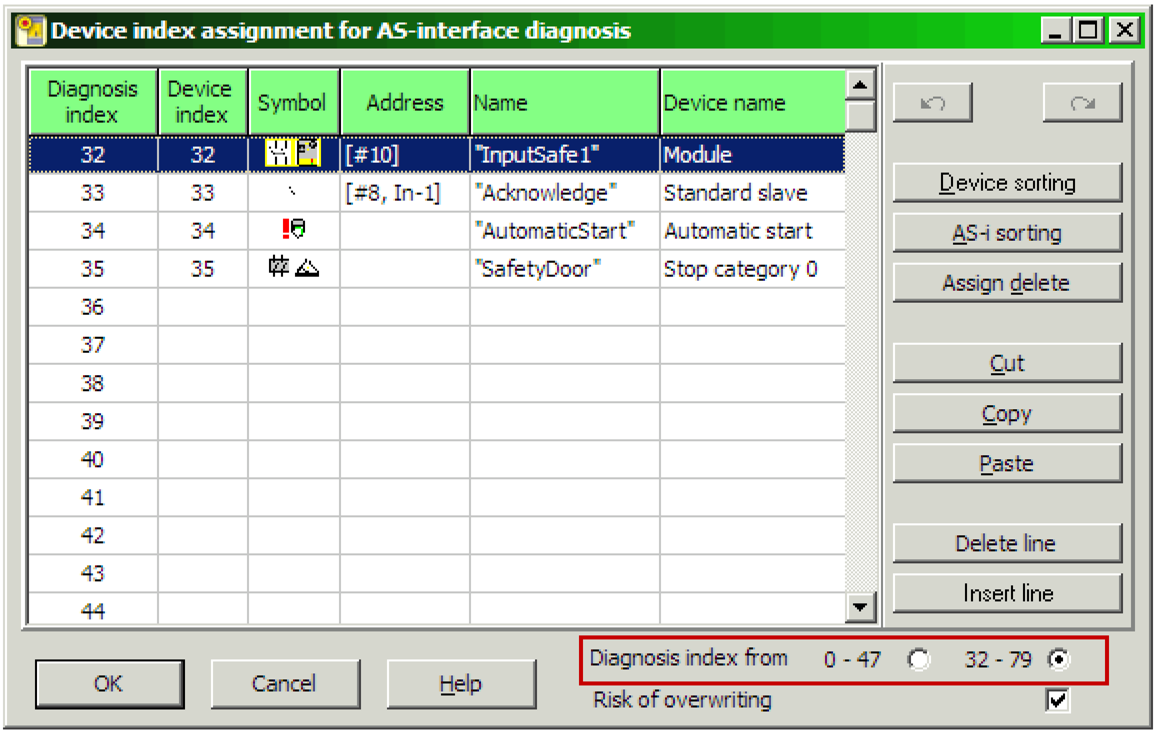
The AS-i master uses this address to diagnose the device itself as well as the configured blocks.

6.4.1 Allocation of the AS-i diagnostic indices

The unique diagnostic index number is sent to the AS-i master to diagnose the function blocks.

The user can decide here whether or not the diagnostic indices correspond with the block indices (area from 32 … 79). If not, diagnostic indices from 0 … 47 are assigned to the block.

Figure 6-4



Diagnosis index	Device index	Symbol	Address	Name	Device name
32	32		[#10]	"InputSafe1"	Module
33	33		[#8, In-1]	"Acknowledge"	Standard slave
34	34			"AutomaticStart"	Automatic start
35	35			"SafetyDoor"	Stop category 0
36					
37					
38					
39					
40					
41					
42					
43					
44					

Diagnosis index from 0 - 47 ○ 32 - 79 ●

Risk of overwriting ☑

Note

The ASIMON2D diagnostic block can work with both assignments; the value 32 will be added automatically to all device numbers if "0 - 47" was selected. The device numbers remain unchanged if "32 - 79" has been selected.

We suggest that "32 - 79" be selected.

6.4.2 Defining the data format for diagnostic

Note This option is available for AS-i safety monitors from version 2.0 on only.

Apart from the diagnostic indices the user may additionally determine the format of the diagnostic information. Two methods are available:

- Sorted by enable circuits (OSSD) or
- All devices.

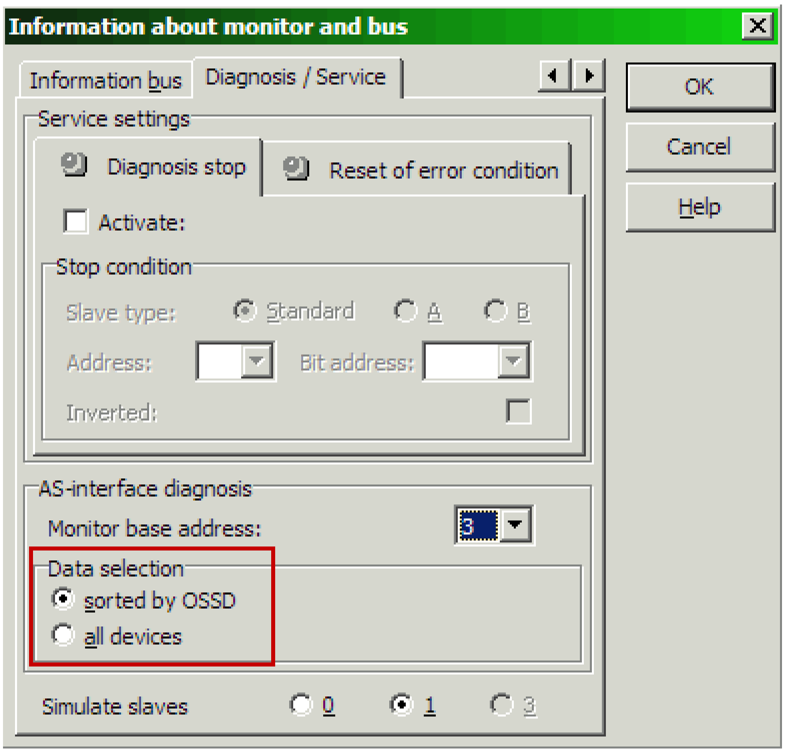
The formats differ in the order in which the blocks' statuses are to be read out from the AS-i safety monitor.

In "sorted by enable circuits" the block is diagnosed at first for output circuit 1 and then for output circuit 2.

In "All Devices" the diagnostic data of the blocks will be read out in ascendant order according to the diagnostic index.

The user selects the data format to be used in ASIMON during the setup of the AS-i safety monitor.

Figure 6-5



Information about monitor and bus

Information bus | Diagnosis / Service

OK | Cancel | Help

Service settings

Diagnosis stop | Reset of error condition

☐ Activate:

Stop condition

Slave type: ● Standard ○ A ○ B

Address:

Bit address:

Inverted: ☐

AS-interface diagnosis

Monitor base address: 3

Data selection

● sorted by OSSD

○ all devices

Simulate slaves ○ 0 ● 1 ○ 3

Note This data selection must also correspond with the input variable **DataSelect_All_Devices** of the ASIMON2D block (FB102).

DataSelect_All_Devices:=false must be set when using a safety monitor < V2.0 and "Sorted by OSSD" selected.

DataSelect_All_Devices:=true is required if „All Devices“ is selected.

6.4.3 Diagnostic stop function

Description

The diagnostic stop function is helpful to identify the block and the safe input slave having caused the disconnection, e.g. at very short shutdowns.

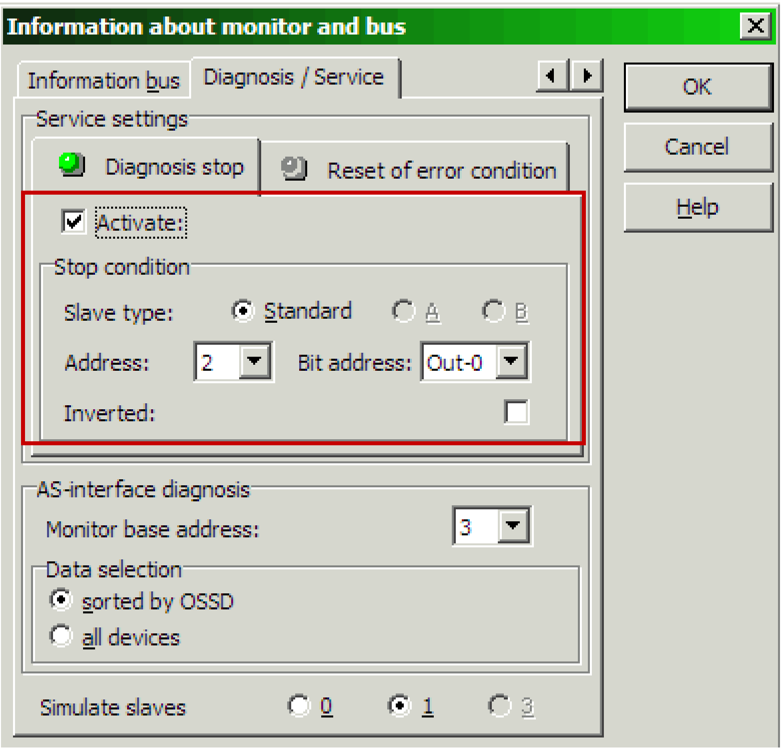
If the stop condition is fulfilled the function freezes the status of any device after the latter has logged a disconnection. The device remains in the "wait" condition even if it could switch on later again. A "frozen" device can be enabled again by deactivating the diagnostic stop function.

Activating and configuring

If the user wishes the diagnostic stop function, he must activate it in the ASIMON configuration program and additionally define a stop condition. The stop condition can be the input or output bit of an AS-i slave.

In interaction with FB102, a bit address should be indicated as output to allow the PLC to control this block.

Figure 6-6



☑ Activate:

Stop condition

Slave type: ● Standard ○ A ○ B

Address: 2 Bit address: Out-0

Inverted: □

Monitor base address: 3

Data selection

● sorted by OSSD

○ all devices

Simulate slaves ○ 0 ● 1 ○ 3

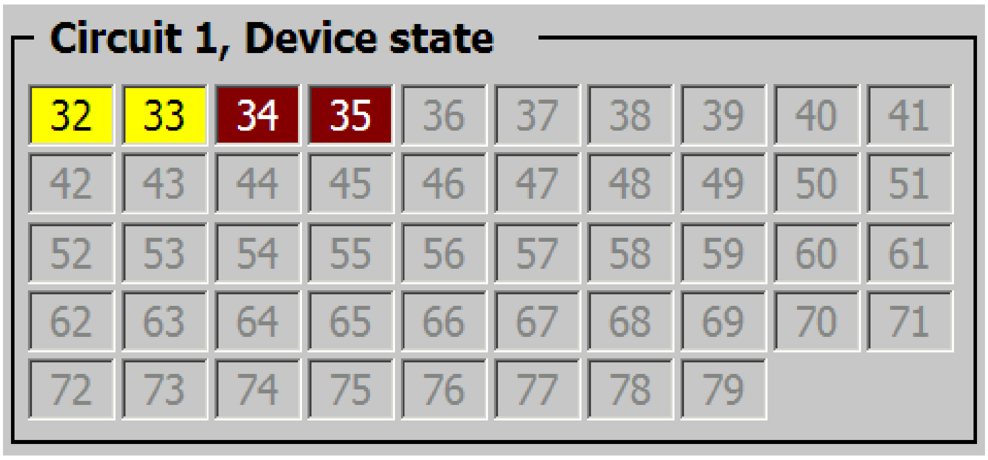
Note The diagnostic stop function does not work fail-safe and may only be used for the purpose of diagnostic.

How it works

The AS-i safety monitor disconnects the output circuit upon a change logged in an AS-i slave status, e.g. by opening a switch. The pertaining block is displayed red (OFF condition; disconnected) in ASIMON.

If the AS-i slave returns to the initial condition, e.g. by closing the switch and if the stop condition is fulfilled (in this case: output D0 of slave 2 is true), the block remains in a 'ready' condition (diagnostic LED yellow; waiting for acknowledgment). The output circuit continues being switched off.

Figure 6-7



Circuit 1, Device state

32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61
62	63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79		

A "frozen" device can be enabled again by deactivating the diagnostic stop function (in our case: output D0 of slave 2 is false).

Condition to trigger the diagnostic stop function

The diagnostic stop must be activated in any case to "freeze" a device's status.

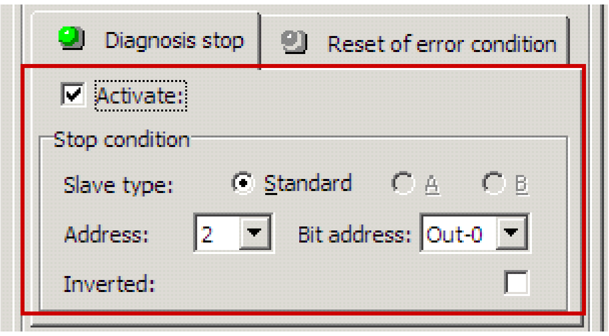
This process additionally depends from the diagnostic stop condition. The device is switched to the ready status only if this condition is fulfilled.

The example below describes all possible scenarios and the required reaction.

All cases are based on the configuration below:

- Diagnostic stop function is activated.
- Output bit D0 of AS-i slave 2 is used as diagnostic stop condition.

Figure 6-8



Diagnosis stop | Reset of error condition

☑ Activate:

Stop condition

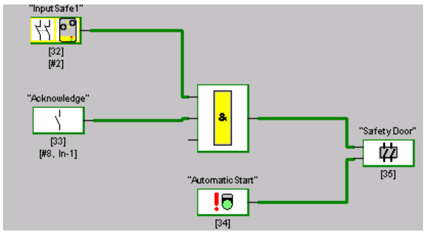
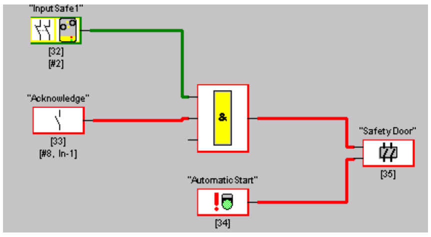
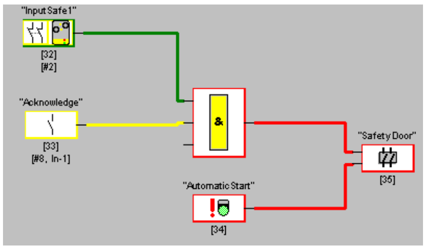
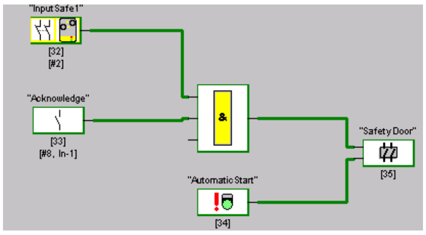
Slave type: ● Standard ○ A ○ B

Address: 2 Bit address: Out-0

Inverted: □

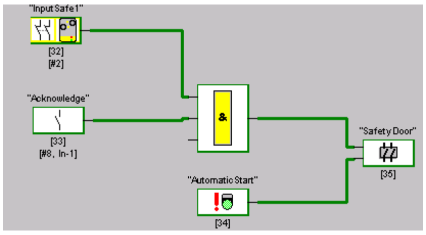
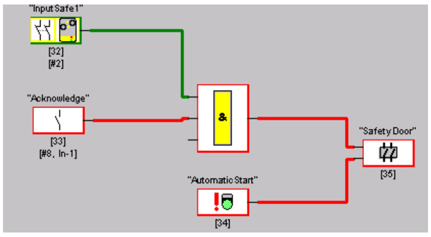
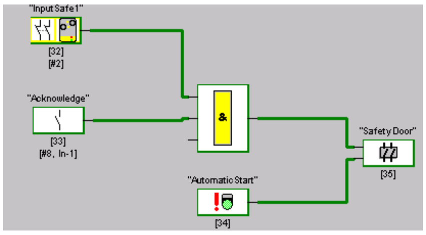
The cases below show reactions with **activated diagnostic stop condition** (output bit D0 of slave 2 is true):

Table 6-2

Case	Description	Reaction
 "Input Safe1" [32] [#2] "Acknowledge" [33] [#8, In-1] & "Safety Door" [35] "Automatic Start" [34]	All AS-i slaves switched on and ready.	• The blocks are switched on. • The enable circuit is switched on.
 "Input Safe1" [32] [#2] "Acknowledge" [33] [#8, In-1] & "Safety Door" [35] "Automatic Start" [34]	Switch at AS-i slave 8 is opened.	• The block referenced to AS-i slave 8 is switched off. • The enable circuit will be switched off via the disconnection logic.
 "Input Safe1" [32] [#2] "Acknowledge" [33] [#8, In-1] & "Safety Door" [35] "Automatic Start" [34]	Switch at AS-i slave 8 reclosed; all AS-i slaves are in normal condition.	• The block referencing to AS-i slave 8 will be frozen and switched to the ready condition. • The enable circuit remains switched off via the disconnection logic.
 "Input Safe1" [32] [#2] "Acknowledge" [33] [#8, In-1] & "Safety Door" [35] "Automatic Start" [34]	The diagnostic stop condition is deactivated (D0 output bit of slave 2 is false).	• The blocks are switched on. • The enable circuit is switched on.

The cases below show reactions with **deactivated diagnostic stop condition** (output bit D0 of slave 2 is false):

Table 6-3

Case	Description	Reaction
 "Input Safe 1" [32] [#2] "Acknowledge" [33] [#8, In-1] & "Safety Door" [35] "Automatic Start" [34]	All AS-i slaves are in normal condition.	- The blocks are switched on. - The enable circuit is switched on.
 "Input Safe 1" [32] [#2] "Acknowledge" [33] [#8, In-1] & "Safety Door" [35] "Automatic Start" [34]	Switch at AS-i slave 8 is opened.	- The block referenced to AS-i slave 8 is switched off. - The enable circuit will be switched off via the disconnection logic.
 "Input Safe 1" [32] [#2] "Acknowledge" [33] [#8, In-1] & "Safety Door" [35] "Automatic Start" [34]	Switch at AS-i slave 8 reclosed; all AS-i slaves are in normal condition.	- The blocks are switched on. - The enable circuit is switched on.

6.4.4 Diagnostic via ASIMON

The user may keep the blocks' statuses under review in the diagnostic view of the ASIMON configuration software. The diagnostic information of any block will be translated into virtual LED (tree structure) or represented as colored block edging and block connections (circuit diagram).

The LED / block edgings may take the statuses below (also see variable "Device[m].status in Table 2-3).

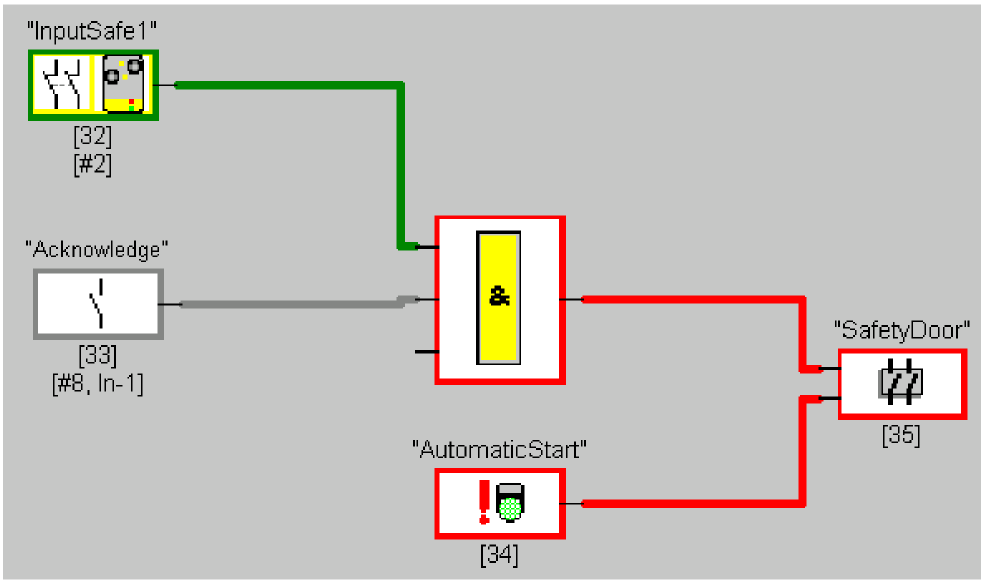
Table 6-4

Color	Code	Description
green	000	Block in ON condition
green flashing	001	Block in ON condition but already passing into OFF (e.g. in case of power-off delays)
yellow	010	Block ready but still in the waiting position (e.g. at pre-acknowledgment)
yellow flashing	011	Timeout. Action must be repeated.
red	100	Block in OFF condition
red flashing	101	Error lock active
gray	110	No communication to AS-i slave

Note The AS-i safety monitor must run in protected mode to be able to open the diagnostic view.

The chart below shows the diagnostic view as circuit diagram:

Figure 6-9



In this example the output control element is not activated. This is caused by the negative result of the AND operation and the missing "Acknowledge" contact.

6.4.5 Diagnostic via AS-i bus

The AS-i bus diagnostic provides further diagnostic information. Apart from information about the blocks the user may also acquire here the conditions of the AS-Interface bus and the devices' LED of the AS-Interface safety monitor.

Diagnostic process

The readout of the diagnostic information follows a fixed procedure including various data calls.

The communication for sending the data calls and receiving the diagnostic information is carried out with the I/O data (each 4 bit) of the AS-i safety monitor's basic address. The internal course of the communication can be gathered from the manual to the AS-I safety monitor.

7 References and History

References

Table 7-1

No.	Document/Link
/1/	Manual DP/AS-Interface Link Advanced http://support.automation.siemens.com/WW/view/en/22710305
/2/	Manual DP/AS-Interface Link 20E acc. to V3.0 http://support.automation.siemens.com/WW/view/en/33563718
/3/	Manual AS-Interface ASIsafe DP / AS-i F-Link V1.0 http://support.automation.siemens.com/WW/view/en/24196041
/4/	Manual CP 343-2 / CP 343-2 P AS-Interface Master (Edition 08/2008) with Supplements (Edition 08/2010) http://support.automation.siemens.com/WW/view/en/5581657
/5/	System Manual AS-Interface (Edition 11/2008) with Supplements (Edition 09/2010 - for displaying and configuring see Entry ID 44365425) http://support.automation.siemens.com/WW/view/en/26250840
/6/	Manuals of the AS-Interface Slaves http://support.automation.siemens.com/WW/view/en/10805898/133300
/7/	System Software for S7-300/400 System and Standard Functions Volume 1 and Volume 2 http://support.automation.siemens.com/WW/view/en/44240604
/8/	ASIsafe circuits for safety technology http://support.automation.siemens.com/WW/view/en/24509484

History

Table 7-2

Version	Date	Revisions
V1.0		
V2.0	September 2011	Complete revision of the documentation.