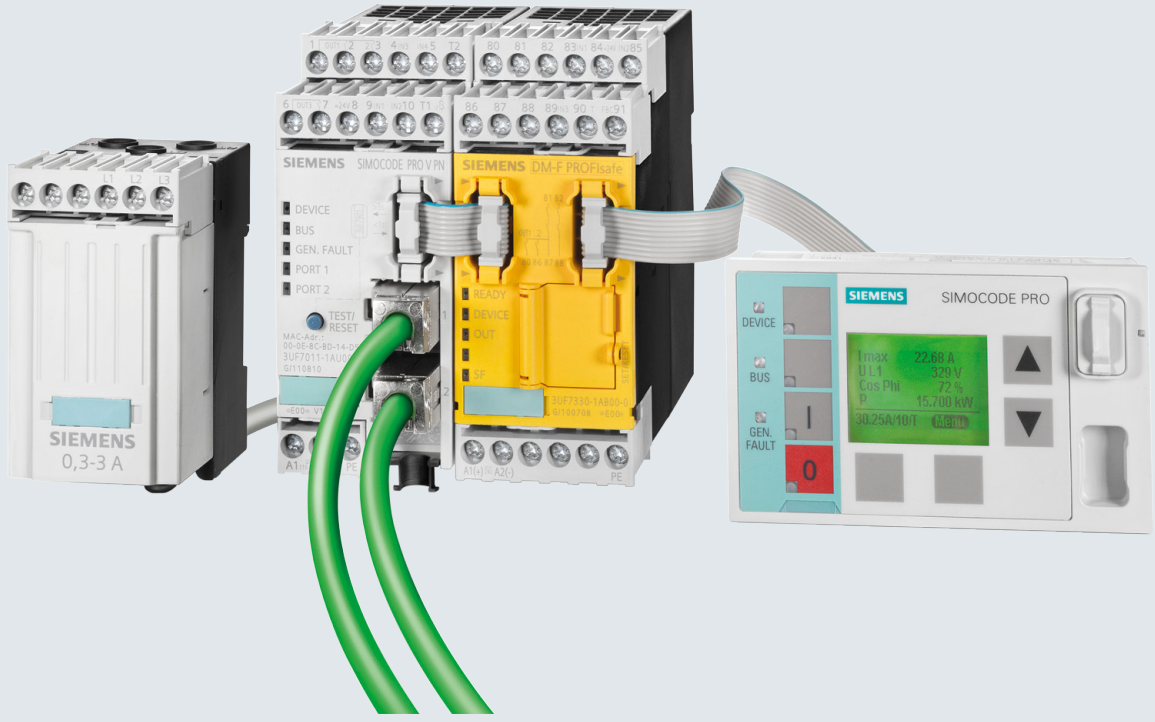
SIEMENS



SIMOCODE pro

Motor Management and Control Devices

SIMOCODE pro for PROFINET

System Manual

Edition 10/2015

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SIMOCODE pro

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SIMOCODE pro PROFINET

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Introduction 1

1.1 Important information

Purpose of this manual

The SIMOCODE pro system manual describes in detail the motor management system and its functions. It contains information about configuring, commissioning, service and maintenance. A typical example of a reversing starter application is used to teach the user quickly and practically how to use the system.

In addition to help on how to identify and rectify faults in the event of a malfunction, the manual also contains specific information for servicing and maintenance.

Furthermore, the manual contains circuit diagrams, dimension drawings and technical data of the system components as configuring aids.

Required basic knowledge

To understand this manual you will require basic knowledge of low-voltage controls and distribution, digital circuit engineering and automation technology.

Topics

This manual consists of instructive chapters for reference purposes. The following table lists the most relevant topics. The highlighted topics correspond largely with the content structure of the "SIMOCODE ES" parameterization and service software:

Topic	Target group
System description	Configuring engineers, planners
Short instructions for commissioning a reversing starter	Configuring engineers, planners, technicians, commissioning engineers
Motor protection	Configuring engineers, commissioning engineers
Motor control	Configuring engineers, PLC programmers
Monitoring functions	Configuring engineers, programmers, commissioning engineers, service personnel
Outputs	Configuring engineers, planners, programmers
Inputs	Configuring engineers, planners, programmers
Analog value recording	Configuring engineers, programmers, commissioning engineers, service personnel
Standard functions	Configuring engineers, programmers
Logic modules	Configuring engineers, programmers
Communication	Configuring engineers, PLC programmers
Mounting, wiring, interfaces	Technicians, electricians, service and maintenance personnel
Commissioning and service	Commissioning engineers, technicians, service and maintenance personnel
Alarm, fault, and system events	Commissioning engineers, maintenance and service personnel, configuring engineers, PLC programmers

Scope of application

This manual is applicable to the listed SIMOCODE pro system components. It contains a description of the components applicable at the time of printing the manual. SIEMENS reserves the right to include updated information about new components or new versions of components in a Product Information.

Definitions

When reference is made to "SIMOCODE pro", the reference also includes the device series "SIMOCODE pro V PN".

SIMOCODE pro response tables

Specific responses (deactivated, signaling, warning, tripping) can be parameterized for various SIMOCODE pro functions, such as overload. These are always displayed in tabular form:

- "X" = Applicable
- "—" = not applicable
- Default values are marked "d" for "default" in parentheses:

Response	Function 1	Function 2	Function 3
Tripping	—	X (d)	X
Warning	X (d)	X	—
Signaling	X	X	—
Deactivated	X	X	X (d)
Delay	0 to 25.5 s (default: 0).	—	—

Brief description of the responses:

- Tripping: The contactor controls QE* are tripped. A fault message is generated which is available as diagnostics via PROFINET. The fault message and the device-internal signal remain on until the appropriate length of time has elapsed or the cause of the fault has been eliminated and acknowledged.
- Warning: In addition to the device-internal signal, a warning signal is generated that is available as diagnostics via PROFINET.
- Signaling: Only a device-internal signal is generated, which can be further processed as required.
- Deactivated: The appropriate function is switched off, no signals are generated.

A delay time can also be set for specific responses.

Further information

- Please read the operating instructions of the respective components. You can find the operating instructions for SIMOCODE pro at: SIMOCODE pro operating instructions (http://www.siemens.com/sirius/manuals)
- You will need the following manuals in addition to this system manual:
  - "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852)
  - The appropriate manual for the DP master

You will find further information on the Internet:

- Internet (http://www.siemens.com/simocode)
- Information and Download Center (http://www.siemens.com/sirius/infomaterial)
- Product Information System (ProdIS) (http://www.siemens.com/sirius/support)
- Certificates (http://www.siemens.com/sirius/approvals)

Further support (Service and Support)

Technical Assistance (http://www.siemens.com/sirius/technical-assistance)

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Correction sheet

A correction sheet is included at the end of this manual. Please use it to enter your suggestions for improvements, additions and corrections, and send it back to us. This will help us to improve the next edition of the manual.

Disclaimer of liability

The products described here have been developed to carry out safety-related functions as part of a complete plant or machine. In general, a complete safety system consists of sensors, evaluation units, signaling devices and methods for safe tripping. The manufacturer is responsible for ensuring safe functioning of the complete plant or machine. Siemens AG, its subsidiaries, and associated companies (hereinafter referred to as "Siemens") are not in a position to guarantee every characteristic of a complete plant or machine not designed by Siemens.

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1.2 IT security information

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For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. You will find more information about industrial security at Industrial Security (http://www.siemens.com/industrialsecurity).

To stay informed about product updates as they occur, sign up for a product-specific newsletter. You will find more information on this at Support (http://support.automation.siemens.com).

1.3 Current information about operational safety

Important note for maintaining operational safety of your system

DANGER

Hazardous Voltage

Can Cause Death, Serious Injury or Risk of Property Damage

Please take note of our latest information!

Systems with safety-related characteristics are subject to special operational safety requirements on the part of the operator. The supplier is also obliged to comply with special product monitoring measures. For this reason, we publish a special newsletter containing information on product developments and features that are (or could be) relevant to operation of safety-related systems. By subscribing to the appropriate newsletter in the Industry newsletter system (https://www.industry.siemens.com/newsletter), you will ensure that you are always up-to-date and able to make changes to your system, when necessary. Sign on to the following newsletter under "Products & Solutions":

- Control Components and System Engineering News
- Safety Integrated Newsletter.

System description

2

In this chapter

In this chapter you will find an introduction and general information about the SIMOCODE pro system including e.g.

- Properties of the SIMOCODE pro V PN device series
- Simplification of SIMOCODE pro circuits
- Overview of functions
- An overview of system components

Target groups

This chapter addresses the following target groups:

- Planners and configuring engineers
- Commissioning engineers, service and maintenance personnel
- System integrators/process technology

Required knowledge

You will require the following knowledge:

- Basic knowledge about load feeders
- Basic knowledge about motor protection
- Basic knowledge of control engineering
- Basic knowledge of industrial bus technology

2.1 Overview

Overview

SIMOCODE pro (**SI**RIUS **Mo**tor Management and **Co**ntrol **De**vice) is a flexible and modular motor management system for motors with constant speeds in low-voltage applications. It optimizes the link between the control system and the motor feeder, increases plant availability and allows significant savings to be made during installation, commissioning, operation and maintenance. SIMOCODE pro is installed in the low-voltage switchgear system and links the higher-level automation system (via PROFINET) and the motor feeder intelligently. It comprises the following functions:

- Multifunctional, solid-state full motor protection which is independent of the automation system
- Integrated control functions for motor control (instead of hardware)
- Detailed operating, service and diagnostics data
- Open communication via Ethernet/PROFINET
- Parameterization with the SIMOCODE ES software package.

Only the switching and short-circuit protection mechanisms of the main circuit (contactors, circuit breakers, fuses) are additionally needed.

2.2 Benefits

Benefits

- The quantity of cabling required between the motor feeder and the PLC is reduced significantly by connecting the entire motor feeder to the process control system via the bus (see Fig. "SIMOCODE pro, integrated in the main circuit, control circuit and at automation level (PLC)")
- Automated processes are decentralized by means of configurable control and monitoring functions in the feeder. This saves automation system resources and ensures that the feeder is fully functional and protected even if the control system or bus system fails.
- By recording and monitoring operating, service and diagnostics data in the feeder and process control system, plant availability is increased, and the feeder is easier to service and maintain.
- The user can implement plant-specific requirements for every motor feeder thanks to the high degree of modularity.
- SIMOCODE pro provides compact solutions and different levels of functions for every customer application.
- By replacing the control circuit hardware with an integrated control function, the quantity of required hardware components with wiring is reduced. This drives down storage costs and limits potential wiring errors.
- Using electronic full motor protection allows the motors to be used more efficiently and ensures that the tripping characteristic remains stable and the tripping response stays the same, even after many years.

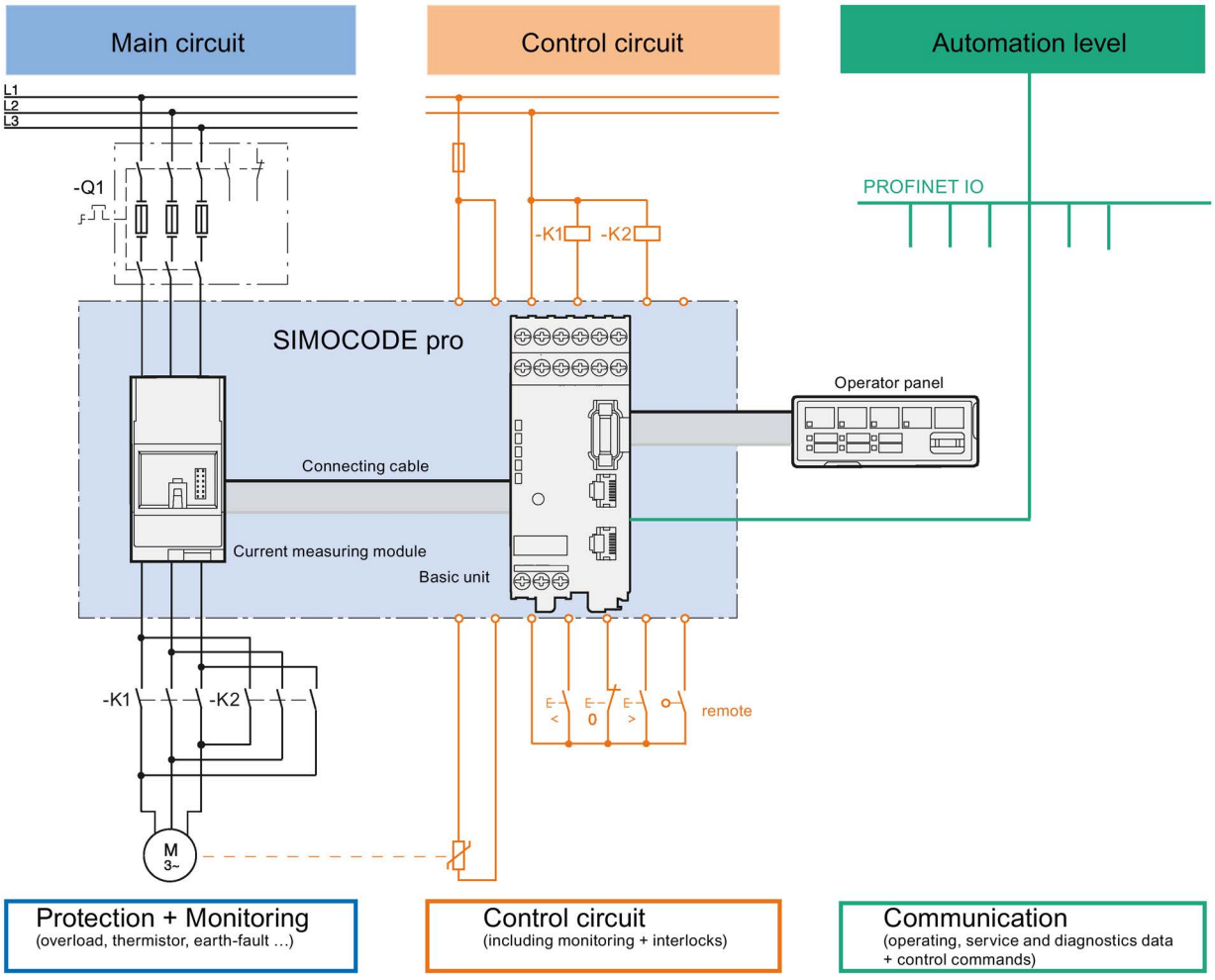


Figure 2-1 SIMOCODE pro, integrated in the main circuit, control circuit and at automation level (PLC)

2.3 Features

Features

Multifunctional, solid-state full motor protection for rated motor currents up to 820 A

SIMOCODE pro provides comprehensive protection of the motor feeder by means of a combination of delayable, multi-level protection and monitoring functions:

- Current-dependent electronic overload protection (CLASS 5 to 40) (see Chapter Overload protection (Page 159))
- Thermistor motor protection (see Chapter Thermistor protection (Page 170))
- Phase failure/phase unbalance protection (see Chapter Unbalance protection (Page 168))
- Stalled rotor protection (see Chapter Stalled rotor protection (Page 169))
- Monitoring of adjustable limit values for the motor current (see Chapter Current limit monitoring (Page 249))
- Voltage monitoring (see Chapter Voltage monitoring (Page 254))
- Power monitoring (see Chapter Active power monitoring (Page 259))
- Monitoring of cos phi (no-load operation/load shedding) (see Chapter Cos phi monitoring (Page 257))
- Ground-fault monitoring (see Chapter Earth-fault monitoring (Page 240))
- Temperature monitoring, e.g. using Pt100 / Pt1000 (see Chapter Temperature monitoring (Page 269))
- Monitoring of operating hours (see Chapter Operating hours monitoring (Page 266))
- Motor stop time monitoring (see Chapter Motor stop time monitoring (Page 267))
- Monitoring the number of starts within a specific period of time (see Chapter Monitoring the number of starts (Page 267))
- Safety-related tripping of motor feeders, e.g. fail-safe tripping in the process industry, locally or via PROFINET (see system manual SIMOCODE pro Safety fail-safe digital modules (http://support.automation.siemens.com/WW/view/en/50564852))

Recording of measured curves

SIMOCODE pro is able to record measured curves and can, for example, illustrate the characteristic curve of the motor current during motor startup. For additional information on this topic, refer to the Analog value recording (Page 313) section.

Flexible motor control with integrated control functions (instead of extensive hardware interlocks):

SIMOCODE pro has many pre-defined, integrated motor control functions, including all necessary connections and interlocks:

- Overload relays (see Chapter "Overload relay" control function (Page 193))
- Direct starters (see Chapter "Direct starter" control function (Page 195))
- Reversing starters (see Chapter "Reversing starter" control function (Page 197))
- Star-delta starters, possibly combined with reversing starters (see Chapters "Star-delta starter" control function (Page 202) and "Star delta reversing starter" control function (Page 205))
- Two speeds, motors with separate windings (pole-changing starters), possibly combined with reversing starter (see Chapters "Pole-changing starter" control function (Page 216) and "Pole-changing reversing starter" control function (Page 219))
- Two speeds, motors with separate Dahlander windings, possibly combined with reversing starter (see Chapters "Dahlander" control function (Page 209) and "Dahlander reversing starter" control function (Page 212))
- Positioner control (see Chapter "Positioner" control function (Page 225))
- Solenoid valve control (see Chapter "Solenoid valve" control function (Page 223))
- Circuit breaker control (see Chapter "Molded case circuit breaker (MCCB)" control function (Page 199))
- Soft starter control, possibly combined with reversing starter (see Chapters "Soft starter" control function (Page 230) and "Soft starter with reversing contactor" control function (Page 232))

These control functions are pre-defined in SIMOCODE pro and can be assigned freely to device inputs and outputs (including PROFINET).

These pre-defined control functions can also be adjusted flexibly to meet customer requirements of the motor feeder, without requiring additional auxiliary relays in the control circuit. This is achieved by means of freely parameterizable logic modules (truth tables, counters, timers, pulse width modulators, etc.) (see Chapter Logic modules (Page 343)) and standard functions (power failure monitoring, emergency start, external fault monitoring) (see Chapter Standard functions (Page 317)).

Detailed operating, service and diagnostics data:

SIMOCODE pro provides a range of operating, service and diagnostics data and helps to detect impending faults in good time and stop these occurring with preventative measures. If a fault occurs, it can be diagnosed, traced and resolved within a short period of time. Plant downtime is thus reduced to a minimum or does not occur at all. See Chapter Overview of functions (Page 39).

Communication

SIMOCODE pro V PN has an integrated PROFINET interface and provides communication functions via PROFINET IO with the following properties:

- Integrated switch with two ports
- Device replacement without removable medium/programming device
- Shared device
- Media redundancy
- RT communication
- Support for PROFIenergy

See Chapter Communication (Page 379).

2.4 Areas of application

Areas of application

SIMOCODE pro is often used for automated processes where plant downtimes are very expensive (e.g. steel or cement industry) and where it is important to prevent plant downtimes through detailed operating, service and diagnostics data or to localize the fault very quickly in the event of a fault.

SIMOCODE pro is modular and space-saving and suited especially for operation in motor control centers (MCC) in the process industry and in power plants.

Protection and control of motors:

- In potentially explosive areas for type of protection EEx e/d according to ATEX directive 94 / 9 / EC (see also Chapter Safety and commissioning information for EEx areas (Page 705))
- Heavy-starting motors (paper, cement and metal industries; water management)
- In high-availability plants (chemical, oil, and raw material processing industry, power plants)

SIMOCODE pro is especially designed for the chemical industry (including oil and gas), the steel industry, water management, and the paper, pharmaceutical, cement and glass industries. Further applications include power plant engineering and diamond, gold and platinum mines. Based on the experience gained with the predecessor system SIMOCODE DP, SIMOCODE pro has been tailored even more specifically to the requirements of these industries. The availability of motors and thus the entire process plays an important role in these industries. Downtimes caused by faults often lead to high costs. This is why it is even more important to detect potential faults early on and to initiate targeted, preventative measures. SIMOCODE pro provides the user with a motor management system based on years of experience and the latest technology.

2.5 SIMOCODE pro V PN device series

SIMOCODE pro V PN basic unit

For the SIMOCODE system, not only the basic unit with PROFINET communication (SIMOCODE pro V PN), but also basic units with PROFIBUS DP communication are available (SIMOCODE pro C, SIMOCODE pro S and SIMOCODE pro V). See SIMOCODE pro PROFIBUS System Manual (http://support.automation.siemens.com/WW/view/en/20017780).

For each feeder, every system comprises a basic unit and a separate current measuring module. Both modules are connected to each other electrically via the system interface, by means of a connecting cable, and can be installed together as a unit (behind one another) or separately (side-by-side). An operator panel can also be connected optionally via the second system interface on the basic unit, and installed in the control cabinet door. Both the current measuring module and the operator panel are connected to the basic unit via connecting cables, which also supply the power. More inputs, outputs and functions can be added to the SIMOCODE pro S and SIMOCODE pro V basic units by means of optional expansion modules, thus supplementing the inputs and outputs already existing on the basic unit. All modules are interconnected by connecting cables. The connecting cables are available with different lengths (ribbon cable 0.025 m, 0.1 m, 0.3 m, 0.5 m; round cable 0.5 m, 1.0 m, 2.5 m).

NOTICE
Maximum length of connecting cables The total length of all connecting cables must not exceed 3 m on either of the system interfaces of the basic unit!

NOTICE
The maximum distance between modules The maximum distance between modules (e.g. between the basic unit and the current measuring module) must not exceed 2.5 m.

Additional control programs (star-delta starters, Dahlanders, pole-changing starters, soft starters) are integrated in SIMOCODE pro V, each program also possible in combination with reversing starter, solenoid valve and positioner). SIMOCODE pro V is also particularly versatile. Its functionality can be expanded, if required, for example:

- The number and type of binary inputs and outputs can be increased and adapted in stages
- A current / voltage measuring module can be used for additional voltage measurement and for monitoring power-related measured values (power management)
- A temperature module enables the evaluation of several analog temperature sensors
- A ground-fault detection system can be integrated together with a residual current transformer
- An analog module expands the system by additional analog inputs and outputs, for example, for fill-level or flow-rate monitoring
- An operator panel with display (OPD) is available as an alternative to the standard operator panel (OP)

2.6 Independent operation

Independent operation

SIMOCODE pro V PN protects and controls the motor feeder independently of the automation system. Even if the automation system (PLC) fails, or if communication is disrupted, the motor feeder remains fully protected and controllable. SIMOCODE pro V PN can be used without a connection to the PROFINET. This can easily be connected later, if required.

2.7 Typical configuration

Typical configuration

The following schematic shows a typical SIMOCODE pro V PN hardware configuration:

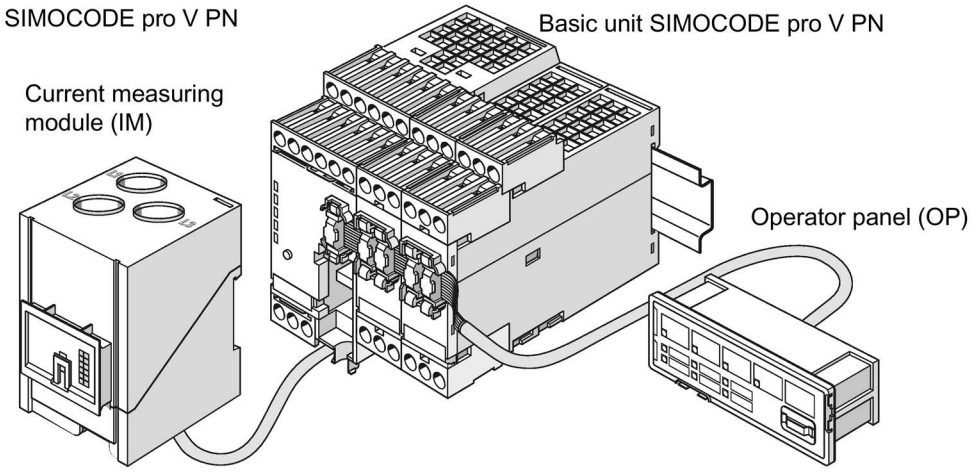


Figure 2-2 Typical SIMOCODE pro V PN hardware configuration

For information about system components, see Chapter Description of system components (Page 58).

2.8 Simplifying configuration with SIMOCODE pro

Conventional configuration without SIMOCODE pro

Individual components are used for control, monitoring and signal pre-processing. The component and wiring requirements for this type of configuration are as follows:

- Use and wiring of overload relays, thermistor evaluation devices, current transformers and analog/digital converters
- Wiring of the control circuit
- Connection of start/stop control devices
- The contactor must be brought into locking mode via the auxiliary switches
- Wiring of the interlocks

The following figure illustrates the conventional configuration of a direct starter:

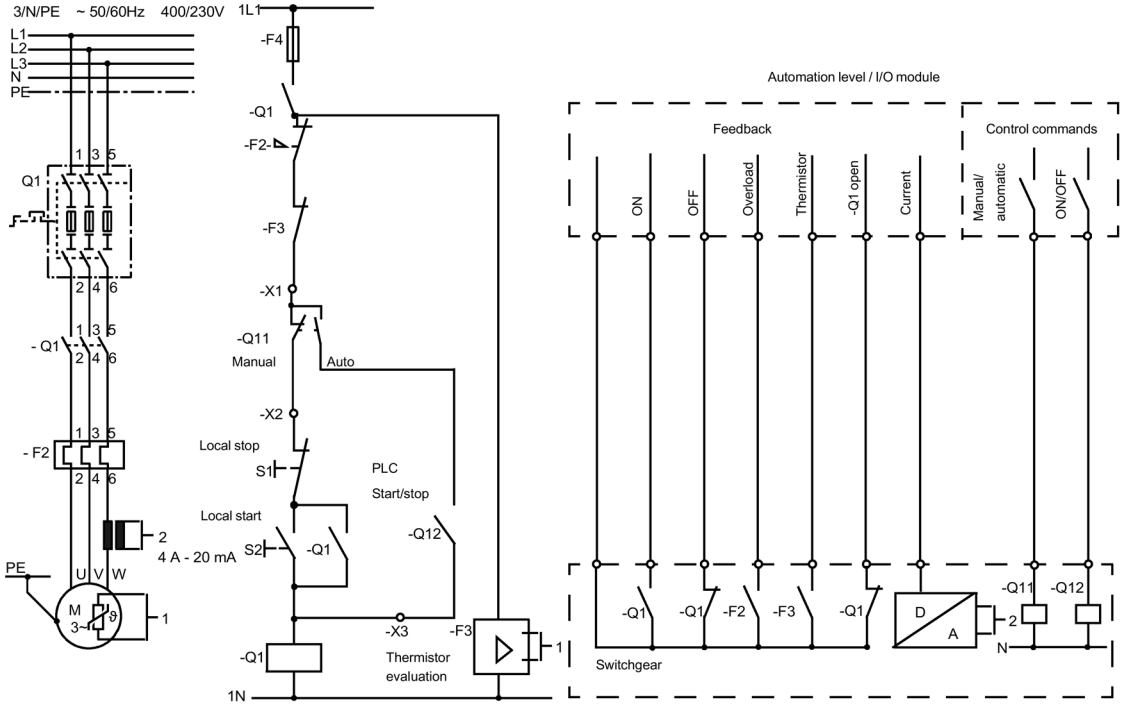


Figure 2-3 Conventional configuration of a motor feeder (direct starter)

Configuration with SIMOCODE pro

All control, monitoring and signal pre-processing functions are only performed by SIMOCODE pro. This provides the following advantages:

- Additional overload relays, thermistor evaluation devices, current transformers and analog/digital converters are not necessary
- The wiring of the control circuit (interlocking) is simplified
- The start and stop switches are wired directly to the inputs of the basic unit
- The contactor coil is energized via the output of the basic unit. An auxiliary contact for locking is not required

The following figure illustrates a configuration with SIMOCODE pro:

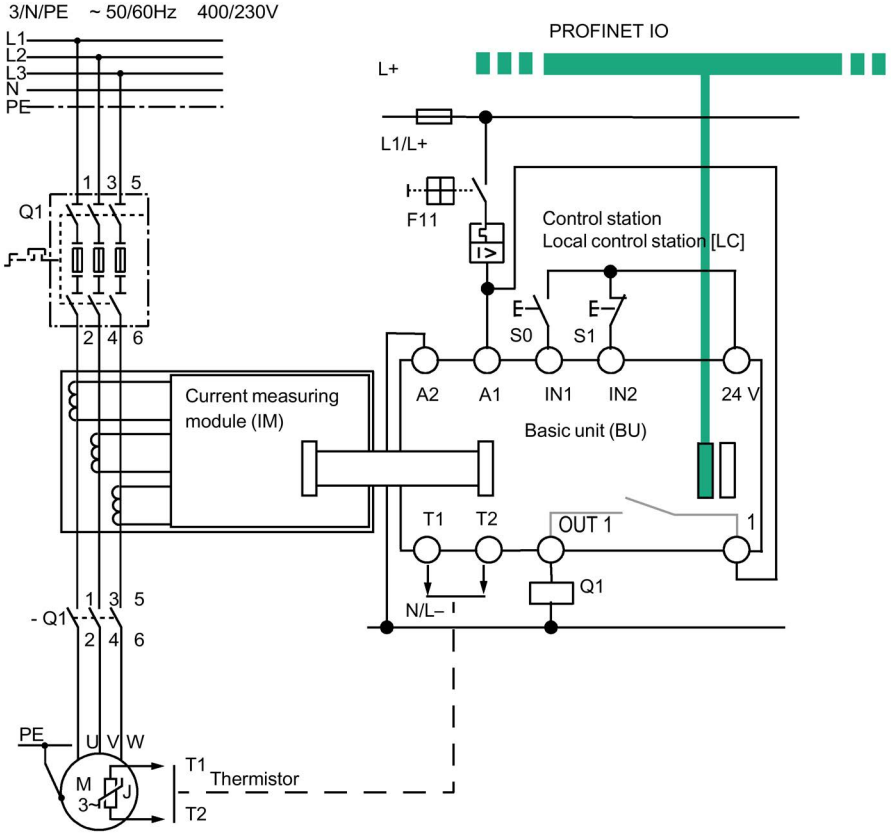


Figure 2-4 Configuration of a load feeder (direct starter) with SIMOCODE pro

2.9 Application example

Description

The fill level of a liquid container is being monitored. A pump keeps the liquid level (reference value) almost constant by pumping more liquid into the container. The fill level (actual value) is measured by the fill level indicator and output as an analog signal. When the fill level sinks below a specific level, the pump is switched on by SIMOCODE pro. Liquid is pumped in until the reference value is re-attained. The pump is then switched off.

Controlling the pump

The pump can be controlled as follows:

- Locally: Local control [LC] station for manual switching on and off (by visual contact)
- In the control cabinet door: Control station operator panel [OP] for manual switching on and off
- At automation level: Control station PLC / PCS (DP) for remote-controlled switching on and off (automatic operation) via PROFINET
- Via SIMOCODE pro, by means of internal fill-level or limit value monitoring

Schematic

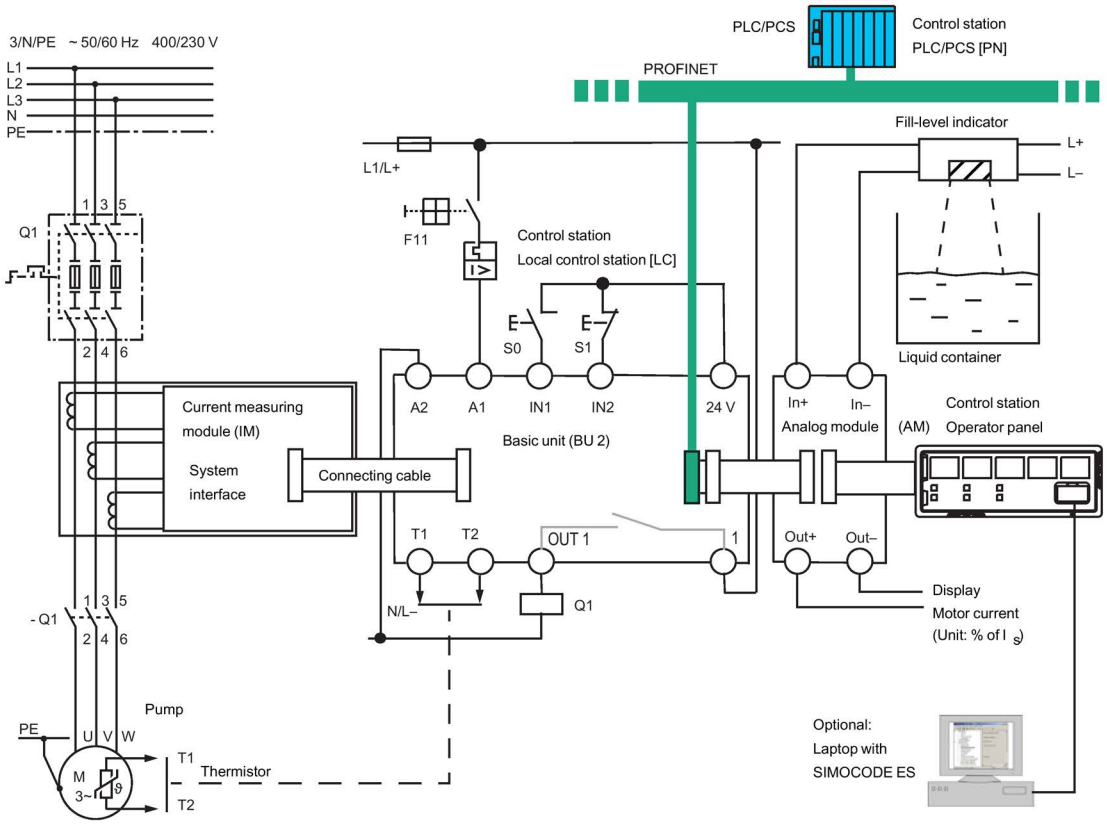


Figure 2-5 Schematic of a typical application example

Recording, displaying and evaluating measured values

The following measured values are required for monitoring the process:

- Motor current of the pump is measured by the current measuring module.
- Analog value of the fill-level sensor is acquired by the analog module

The measured values are evaluated directly by SIMOCODE pro and/or transferred via PROFINET to the PLC/PCS.

Any measured value can be output via the analog module, e.g. the actual motor current to a connected pointer instrument.

Optionally, a laptop with the SIMOCODE ES software, for example, can be connected to the operator panel so that further process data can be locally evaluated.

2.10 Check list for selecting a device series

The following check list should help you decide upon the optimum device series for your requirements:

Function/component		pro C	pro S	pro V	pro V PN
Control functions	Intelligent overload relay	✓	✓	✓	✓
	Direct starter, reversing starter	✓	✓	✓	✓
	Star-delta starter	—	✓	✓	✓
	Dahlander	—	—	✓	✓
	Pole-changing starter	—	—	✓	✓
	Soft starter	—	✓	✓	✓
	Solenoid valve	—	—	✓	✓
	Positioner	—	—	✓	✓
	Can be combined with reversing function	—	—	✓	✓
Protection functions	Overload protection	✓	✓	✓	✓
	Thermistor motor protection with PTC (binary)	✓	✓	✓	✓
	Stalled rotor	✓	✓	✓	✓
	Unbalance	✓	✓	✓	✓
	Phase failure	✓	✓	✓	✓
Measurement functions	Current measurement	✓	✓	✓	✓
	Current / voltage / power measurement	—	—	✓	✓
Monitoring functions	Current limits	✓	✓	✓	✓
	Ground-fault monitoring (internal)	✓	✓	✓	✓
	Ground-fault monitoring (residual current transformer)	—	✓	✓	✓
	Voltage monitoring	—	—	✓	✓
	Temperature monitoring	—	✓	✓	✓
	Active power monitoring	—	—	✓	✓
	Cos phi monitoring	—	—	✓	✓
	Monitoring operating hours, motor stop time and number of starts	✓	✓	✓	✓
	Monitoring additional process variables via the analog module	—	—	✓	✓
	Phase sequence detection	—	—	✓	✓
	Monitoring any measured values using unrestricted limit monitors	—	—	✓	✓
Safety functions	Safety-related tripping	—	—	✓	✓
Number of inputs/outputs	Number of digital inputs of basic unit	4	4	4	4
	Max. number of digital inputs with expansion modules	4	8	12	12
	Number of outputs of basic unit	3	2	3	3
	Max. number of digital outputs with expansion modules	3	4	7	7

Function/component		pro C	pro S	pro V	pro V PN
Expansion modules	Multifunction module; monostable relay; 24 V DC inputs, temperature measurement, ground-fault monitoring	—	✓	—	—
	Multifunction module; monostable relay; 110 - 240 V AC/DC inputs, temperature measurement, ground-fault monitoring	—	✓	—	—
	Digital module; monostable relay; 24 V DC inputs	—	—	✓	✓
	Digital module; bistable relay; 24 V DC inputs	—	—	✓	✓
	Digital module; monostable relay; 110 to 240 V AC/DC inputs	—	—	✓	✓
	Digital module; bistable relay; 110 to 240 V AC/DC inputs	—	—	✓	✓
	DM-F LOCAL fail-safe digital module	—	—	✓	✓
	DM-F PROFIsafe fail-safe digital module	—	—	✓	✓
	Analog module: Measuring, processing and outputting analog values	—	—	✓	✓
	Ground-fault module: Residual current monitoring using a residual current transformer	—	—	✓	✓
	Temperature module: Analog temperature monitoring of three measuring circuits with NTC, PT100, PT1000, and KTY	—	—	✓	✓

2.11 Overview of functions

2.11.1 Protection functions

Detailed description: See Chapter Motor protection (Page 155).

Overload protection

Current-dependent electronic protection of three-phase and AC motors with adjustable tripping characteristics (class times) according to IEC 60947-4-1 requirements.

Unbalance protection

Protects motors from excessive temperatures caused by excessive phase unbalance.

Phase failure protection

Protects motors from excessive temperatures caused by phase failure.

Stalled rotor protection

Immediate trip after the motor current overshoots an adjustable threshold.

Thermistor protection

The SIMOCODE pro V PN basic unit provides the option of connecting thermistor sensors (binary PTC) for monitoring the motor temperature.

2.11.2 Monitoring functions

Detailed description: See Chapter Monitoring functions (Page 239) and Logic modules (Page 343).

Current limit monitoring

Current limit monitoring is used for process monitoring. This enables incipient anomalies in the system to be detected in good time. If a current limit is exceeded but is still below the overload limit, it can, for example, indicate a dirty filter on a pump, or an increasingly sluggish motor bearing. If the current limit is undershot, it can be the first sign of a worn-out drive motor belt.

Ground-fault monitoring

Residual current monitoring relays are used in industry to

- Protect systems from damage caused by residual currents
- Prevent production losses caused by unplanned downtime
- Perform maintenance to meet all demands

Basic units have:

- An internal ground-fault monitoring system: For motors with a 3-wire connection, the basic unit calculates a possible residual current / ground-fault current from the total current via current measuring modules or current / voltage measuring modules. Internal ground-fault monitoring is only possible for motors with a 3-phase connection in power systems that are either grounded solidly or grounded with low impedance.
- External ground-fault monitoring with SIMOCODE pro V PN [4]: The external ground-fault monitoring using 3UL23 residual current transformer and ground-fault module is normally used in the following cases:
  - In cases in which power systems are grounded with high impedance
  - Where precise measurement of the ground-fault current is necessary, e.g. for the purpose of condition monitoring

  A ground-fault module can be used to create an additional input on the SIMOCODE pro V PN basic unit to connect a 3UL23 residual current transformer.

  With ground-fault detection using the 3UL23 residual current transformer, it is possible to determine the precise residual current as a measured value, and to define freely selectable warning and trip limits in a wide range from 30 mA - 40 A.

  See also External ground-fault monitoring (with residual current transformer 3UL23) (Page 246) for more information.

Voltage monitoring[1]

SIMOCODE pro V PN allows voltage monitoring of a three-phase current network or a single-phase network for undervoltage or further availability:

- Monitoring for undervoltage: Two-level monitoring for freely selectable limits. The response of SIMOCODE pro V PN on reaching a prewarning level or trip level can be freely parameterized.
- Monitoring for further availability: Even when the motor is switched off, SIMOCODE pro V PN can indicate the further availability of the feeder by measuring the voltage directly at the circuit breaker or fuses.

Temperature monitoring [2)]

Using the SIMOCODE pro V PN temperature module, it is possible to implement an analog temperature monitoring system in order to monitor, for example, the motor windings or bearings by up to 3 sensor measuring circuits. SIMOCODE pro V PN supports two-level overtemperature monitoring for freely selectable limit values. The response of SIMOCODE pro on reaching a prewarning level or trip level can be freely parameterized and delayed. Temperature monitoring takes into account the highest temperature of all the sensor measuring circuits in use.

Active power monitoring[1)]

The active power curve of a motor reflects its actual load. Excess load results in increased wear of the motor and, thus, may lead to premature motor failure. Insufficient active power can, for example, be a sign of no-load motor operation.
SIMOCODE pro V PN allows two-level active power monitoring for freely selectable upper and lower limits. The response of SIMOCODE pro V PN on reaching a prewarning level or trip level can be freely parameterized and delayed.

Cos phi monitoring[1)]

The power factor fluctuates more than either the motor current or the active power does, particularly in the low-end performance range of a motor. Monitoring the power factor is therefore a particularly suitable way of distinguishing between no-load motor operation and faults, e.g. a broken drive belt or drive shaft.
SIMOCODE pro V PN enables two-level monitoring of the power factor (cos phi) for freely selectable minimum limits. The response of SIMOCODE pro V PN on reaching a prewarning level or trip level can be freely parameterized and delayed.

Monitoring operating hours, motor stop time and number of starts

SIMOCODE pro V PN can monitor the operating hours and stop times of a motor in order to avoid plant downtimes due to failed motors caused by either running too long (wearing out) or being stopped for too long. For example, if an adjustable limit value is exceeded, a message indicating that the relevant motor requires maintenance or replacement can be generated. After replacing the motor, the operating hours and motor stop times can be reset.
To avoid excessive thermal strain and premature aging of a motor, the number of motor starts in a selected time frame can be limited. The limited number of possible starts can be indicated by prewarnings.

Monitoring additional process variables via the analog module [3)]

SIMOCODE pro V PN allows measuring and monitoring of any other process variables via the analog module.
For example, the fill level can be monitored to protect a pump against dry operation, or a differential pressure transducer can be used to monitor the degree of pollution in a filter. If the fill level undershoots a specified level, the pump can be switched off and, if a specific differential pressure value is exceeded, the filter must be cleaned.
SIMOCODE pro V PN supports two-level monitoring of the corresponding process variable for freely selectable upper and lower limits. The response of SIMOCODE pro V PN on reaching a prewarning level or trip level can be freely parameterized and delayed.

Phase sequence identification[1)]

SIMOCODE pro allows the direction of rotation of a motor to be determined by identification of the phase sequence. If the direction of rotation is wrong, a signal can be generated or the motor switched off. See Chapter Menu of the operator panel with display (Page 68).

Monitoring any measured values using unrestricted limit monitors

SIMOCODE pro can monitor every measured value in the system for undershooting or overshooting a set threshold value by means of unrestricted limit monitors. See section "Limit monitor."

1) For use with current / voltage measuring module

2) Temperature module additionally required

3) Analog module additionally required

4) Ground-fault module and residual current transformer additionally required

2.11.3 Safety-oriented tripping

Safety-related tripping

The SIMOCODE pro V PN motor management system has two modules for the safety-related tripping of motors:

- DM-F local fail-safe digital module For applications requiring safety-related tripping of a motor feeder via a hardware signal that is acquired and evaluated by the module.
- DM-F PROFIsafe fail-safe digital module: For applications requiring safety-related tripping of a motor feeder by a fail-safe control (F-CPU) via PROFINET with the fail-safe PROFIsafe profile.

These modules fulfill the general requirements for EMERGENCY STOP mechanisms or safety circuits, as described in EN 418 and EN 60204-1 (06.2006).

Depending on the external circuit, the following Performance Level/Safety Integrity Level can be achieved:

- PL e with Category 4 according to ISO 13849-1
- SIL 3 according to IEC 61508/62061

Safety technology and safety-related functions

- Are exclusively restricted to the fail-safe digital modules
- Do not directly affect existing SIMOCODE pro components and concepts

A more detailed description is provided in the documentation listed below:

- Handbuch "Fehlersichere Digitalmodule SIMOCODE pro Safety" (German) (http://support.automation.siemens.com/WW/view/de/50564852)
- Manual "Fail-Safe Digital Modules SIMOCODE pro Safety" (English) (http://support.automation.siemens.com/WW/view/de/50564852/0/en)
- Manuel "Modules TOR de sécurité SIMOCODE pro Safety" (French) (http://support.automation.siemens.com/WW/view/de/50564852/0/fr)
- Manual "Módulos digitales de seguridad SIMOCODE pro Safety " (Spanish) (http://support.automation.siemens.com/WW/view/de/50564852/0/es)
- Operating Instructions "Fail-safe Digital Module DM-F Local" (http://support.automation.siemens.com/WW/view/en/49222263)
- Operating Instructions "Fail-safe Digital Module DM-F PROFIsafe" (http://support.automation.siemens.com/WW/view/en/49222281)

You will find the System Manuals and Operating Instructions at Manuals/operating instructions (http://www.siemens.com/sirius/manuals)

⚠ CAUTION

Loss of safety function is possible

Always only use an SELV or PELV power supply unit for the 24 V DC power supply!

For capacitive and inductive loads, an adequate protective circuit is required!

2.11.4 Control functions

The following parameterizable control functions are available:

Table 2- 1 Control functions

Control function	SIMOCODE pro V PN
Overload relay	✓
Direct starter	✓
Reversing starter	✓
Molded-case circuit breaker (MCCB)	✓
Star-delta starter, combinable with reversing starter	✓
Dahlander starter, combinable with reversing starter	✓
Pole-changing starter, combinable with reversing starter	✓
Solenoid valve	✓
Positioner	✓
Soft starter, combinable with reversing starter	✓

All the necessary protection functions and interlocks are already available and can be flexibly adapted and expanded.

For a detailed description of the individual control functions: See Chapter Motor control (Page 173).

2.11.5 ETHERNET communication

PROFINET IO

SIMOCODE pro V PN has integrated PROFINET IO device communication functions, such as:

- Integrated switch with two RJ45 ports
- Ethernet services: ping, arp, network diagnostics (SNMP) / BIB-2, LLDP, NTP
- Port diagnostics
- Deactivation of ports
- Media redundancy
- Shared device
- Device replacement without PG/PC
- I/O data
- Diagnostics and maintenance alarms
- Data records
- PROFIenergy
- PROFIsafe

Detailed description: See Chapter Communication (Page 379).

OPC UA

In addition to the PROFINET IO device communication functions, SIMOCODE pro V PN also has OPC UA server functions. Using these functions, an OPC UA client can access SIMOCODE pro V PN data.

Detailed description: See Chapter Communication (Page 379).

Web server

In addition to the PROFINET IO device communication functions, SIMOCODE pro V PN has an integrated web server function that permits access to the service and diagnostic data from a PC on which a web browser is installed.

Detailed description: See Chapter Communication (Page 379).

2.11.6 Standard functions

Standard functions are pre-defined functions that can be easily activated, e.g. time-staggered restart of the drives after a power failure. SIMOCODE pro has the following standard functions:

Table 2- 2 Standard functions

Standard function	SIMOCODE pro V PN Number
Test	2
Reset	3
Test position feedback (TPF)	1
External fault	6
Operational Protection OFF (OPO)	1
Power failure monitoring (UVO)	1
Emergency start	1
Watchdog (PLC/PCS monitoring)	1
Safety-related tripping "Local"	1

Detailed description: See Chapter Standard functions (Page 317).

2.11.7 Freely programmable logic modules

If you need any other additional functions for your application, you can use the freely programmable logic modules. These can be used, for example, to implement logical operations, time relay functions and counter functions. Limit monitors can monitor any value in SIMOCODE pro for undershooting or overshooting of a freely selected limit. Depending on the device series, the system provides several freely parameterizable logic modules:

Table 2- 3 Freely programmable logic modules

Logic module	SIMOCODE pro V PN Number
Truth tables 3 inputs /1 output	8
Truth tables 2 inputs /1 output	2
Truth tables 5 inputs / 2 outputs	1
Timer	6
Counter	6
Signal conditioning	6
Non-volatile elements	4
Flashing	3
Flicker	3
Limit monitor	6
Calculation modules (calculators)	4
Analog multiplexer	1
Pulse width modulator PWM	1

Detailed description: See Chapter Logic modules (Page 343).

2.11.8 Operating, service and diagnostics data

SIMOCODE pro supplies a large amount of detailed operating, service and diagnostics data.

Operating data

- Motor switching state (ON, OFF, LEFT, RIGHT, SLOW, FAST), derived from the current flow in the main circuit: thus, feedback via auxiliary contacts of circuit breakers and contactors is not necessary.
- Current in phases 1, 2 and 3 and maximum current in % of set current
- Voltage in phases 1, 2 and 3 in V [2)]
- Active power in W [2)]
- Apparent power in VA [2)]
- Power factor in % [2)]
- Phase unbalance in %
- Phase sequence [2)]
- Ground-fault current [7)]
- Temperature in the respective sensor measuring circuits, and maximum temperature in K [1) 4)]
- Actual analog signal values [1) 5)]
- Time to trip in s
- Temperature rise for motor model in %
- Remaining cooling down period of the motor in s, etc.

It is possible to adapt the units via the device-internal conversion of individual measured values with the help of the logic modules (calculators) provided by SIMOCODE pro V PN. For example, the temperature recorded by SIMOCODE pro can be calculated in either °F or °C and transmitted to the automation system via PROFINET.

Service data

Among other things, SIMOCODE pro provides the following relevant data for maintenance:

- Number of motor operating hours, also resettable
- Motor stop times, also resettable
- Number of motor starts, also resettable
- Number of permissible starts remaining
- Number of overload trips, also resettable
- Feeder power consumption in kWh, also resettable[3)]
- Internal feeder-related comments stored in the device, e.g. information regarding maintenance events, etc.
- Safety-related tripping monitoring in h, also resettable[6)]

Diagnostics data

- Numerous detailed early warning and fault messages, also for further processing in the device or in the control system
- Device-internal error logging with time stamp
- Value of the last trip current
- Feedback faults (e.g. no current flow in the main circuit after switch-on command), etc.
- "Local" and "PROFIsafe" diagnostic messages

1) When using SIMOCODE pro V PN basic unit

2) When using SIMOCODE pro V PN basic unit with current / voltage measuring module

3) When using SIMOCODE pro V PN basic unit with current / voltage measuring module

4) When using SIMOCODE pro V PN basic unit with 3UF77 temperature module

5) Analog module additionally required

6) SIMOCODE pro V PN together with DM-F

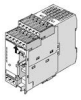
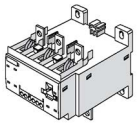
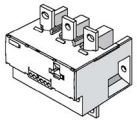
7) When using SIMOCODE pro V basic unit with 3UF7510 ground-fault module

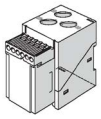
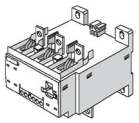
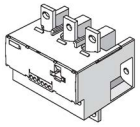
2.12 An overview of system components

Devices

Selection and ordering data: See also Catalog IC10 (http://www.siemens.com/ic10).

Table 2- 4 System components, devices

System component	Control supply voltage	MLFB	Diagram	Number that can be connected
Basic unit (BU)				
SIMOCODE pro V PN basic unit The variable system for PROFINET with extensive functions. 4 inputs/3 outputs freely parameterizable, input for thermistor, monostable relay outputs, expandable with expansion modules				—
	24 V DC	3UF7011-1AB000		
	110- 240 V AC/DC	3UF7011-1AU000		
Operator panel (OP) Installation in control cabinet door or front plate, for connection to basic unit, system interface for connecting a PC, 10 LEDs for status indication and user-assignable buttons for controlling the motor.				
	—	3UF7 200-1AA00-0		1
	—	3UF7 200-1AA01-0		1
Operator panel with display (OPD) Installation in control cabinet door or front panel, for connection to a pro V PN basic unit, system interface for connecting a PC, 7 LEDs for status indication and user-assignable buttons for controlling the motor, multiple-language display, e.g. for indication of measured values, status information or fault messages.				
	—	3UF7 210-1AA00		1
Current measuring module (IM) Current measuring with through-hole or bus connection system.				
0.3 A to 3 A (through-hole transformer) 2.4 A to 25 A (through-hole transformer) 10 A to 100 A (through-hole transformer) 20 A to 200 A (through-hole transformer) 20 A to 200 A (bus connection) 63 A to 630 A (bus connection)	—	3UF7 100-1AA00-0 3UF7 101-1AA00-0 3UF7 102-1AA00-0 3UF7 103-1AA00-0 3UF7 103-1BA00-0 3UF7 104-1BA00-0	  	1 1 1 1 1 1

System component	Control supply voltage	MLFB	Diagram	Number that can be connected
Current / voltage measuring module (UM) Can only be mounted next to the basic unit, otherwise like current measuring modules. Additionally: • Voltage measurement • Power measurement • Power factor (cos phi) measurement • Phase sequence			 	
0.3 A to 3 A (through-hole transformer) 2.4 A to 25 A (through-hole transformer) 10 A to 100 A (through-hole transformer) 20 A to 200 A (through-hole transformer) 20 A to 200 A (bus connection) 63 A to 630 A (bus connection)	—	3UF7 110-1AA00-0 3UF7 111-1AA00-0 3UF7 112-1AA00-0 3UF7 113-1AA00-0 3UF7 113-1BA00-0 3UF7 114-1BA00-0	 	1 1 1 1 1 1
Decoupling module (DCM) For connecting on the line side of a current/voltage measurement module at the system interface for use of voltage measurement in isolated-neutral systems, systems with high-impedance resistive or asymmetrical grounding, and in single-phase systems.				
	—	3UF7 150-1AA00-0		—
Digital modules (DM)				
Up to two digital modules can be used to add additional binary inputs and relay outputs to the basic unit. The input circuits of the digital modules are supplied from an external power supply. 4 binary inputs and 2 relay outputs.				
Input voltage 24 V DC; monostable relay outputs Input voltage 110 V-240 V AC/DC; monostable relay outputs	—	3UF7 300-1AB00-0 3UF7 300-1AU00-0		2 2
Input voltage 24 V DC; bistable relay outputs Input voltage 110 V-240 V AC/DC; bistable relay outputs	—	3UF7 310-1AB00-0 3UF7 310-1AU00-0		2 2

System component	Control supply voltage	MLFB	Diagram	Number that can be connected
Fail-safe digital module (DM-F)				
DM-F Local fail-safe digital module For fail-safe tripping via hardware signal. 2 relay enabling circuits, wired in parallel; 2 relay outputs, common ground, fail-safe tripping. Inputs for sensor circuit, start signal, cascading and feedback circuit Safety function via DIP switch				
	Rated control supply voltage Us:			
	24 V DC	3UF7 320-1AB00-0		1
	110 to 240 V AC/DC	3UF7 320-1AU00-0		1
DM-F PROFIsafe fail-safe digital module For fail-safe tripping via PROFIBUS/PROFIsafe: 2 relay enabling circuits, wired in parallel 2 relay outputs, common ground, fail-safe tripping 1 input for feedback circuit; 3 binary standard inputs.				
	Rated control supply voltage Us:			
	24 V DC	3UF7 330-1AB00-0		1
	110 to 240 V AC/DC	3UF7 330-1AU00-0		1
Analog module (AM)				
By means of the analog module, the basic unit can be optionally expanded by analog inputs and outputs (0 to 20 mA). 2 inputs (passive) for inputting and 1 output for outputting 0/4 to 20 mA signals.				
	—	3UF7 400-1AA00-0		2
Ground-fault module (EM)				
The external ground-fault monitoring using residual current transformer and ground-fault module is normally used in the following cases: • In cases in which power systems are grounded with high impedance • in cases, in which precise detection of the ground-fault current is necessary, for example, for condition monitoring.				
	—	3UF7 500-1AA00-0 for connecting a 3UL22 residual current transformer		1
	—	3UF7 510-1AA00-0 for connecting a 3UL23 residual current transformer		1 (as from product version *E04*)

System component	Control supply voltage	MLFB	Diagram	Number that can be connected
Temperature module (TM)				
Irrespective of the thermistor protection of the basic units, an additional max. 3 analog temperature sensors can be evaluated using a temperature module. Sensor types: PT100/PT1000, KTY83/KTY84 or NTC 3 inputs for connecting up to 3 analog temperature sensors.				
	—	3UF7 700-1AA00-0		2

For a detailed description of the system components: See Chapter Description of system components (Page 58).

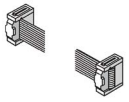
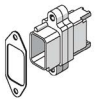
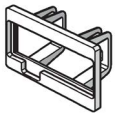
Dimension drawings: See Chapter Dimension drawings (Page 609).

Mounting instructions See Chapter Mounting, wiring, interfaces (Page 439).

Accessories

Selection and ordering data: See also Catalog IC10 (http://www.siemens.com/ic10).

Table 2- 5 System components, accessories that can be connected

System component, accessory		MLFB	Diagram
Connecting cable for connecting the basic unit, current measuring module, current / voltage measuring module, operator panel, and decoupling module			
0.025 m ribbon		3UF7 930-0AA00-0	
0.1 m ribbon		3UF7 931-0AA00-0	
0.3 m ribbon		3UF7 935-0AA00-0	
0.5 m ribbon		3UF7 932-0AA00-0	
0.5 m round		3UF7 932-0BA00-0	
1.0 m round		3UF7 937-0BA00-0	
2.5 m round		3UF7 933-0BA00-0	
Interface covers For covering unused system interfaces		3UF7 950-0AA00-0 3RA69 36-0B	
Memory module Backup of the full set of parameters of a SIMOCODE pro V PN system when the device is replaced. If a device is replaced, parameter transfer without PC.		3UF7901-0AA00-0	
Initialization module Storage and initialization of device parameters and device addressing in motor control centers.		3UF7 902-0AA00-0	
Y connecting cable Connection of the basic unit and current or current / voltage measuring module with the initialization module when using the initialization module			
Length of system interface	Length of open cable end		
0.1 m	1.0 m	3UF7 931-0CA00-0	
0.5 m	1.0 m	3UF7 932-0CA00-0	
1.0 m	1.0 m	3UF7 937-0CA00-0	
USB PC cable for connecting SIMOCODE pro to the USB interface of a PC/PG		3UF7 941-0AA00-A	
USB-to-serial adapter For connecting an RS 232 PC cable to the interface of a PC.		3UF7 946-0AA0-0	
Door adapter for bringing out the system interface, for example, out of a cabinet		3UF7 920-0AA00-0	
Adapter for operator panel Enables use of the smaller operator panel (OP) after system replacement in a front panel cutout in which a larger 3UF5 2 operator panel of SIMOCODE DP had previously been used. Degree of protection: IP54.		3UF7 922-0AA00-0	

System component, accessory	MLFB	Diagram
Labeling strips		
for pushbuttons of the 3UF7 20 operator panel	3UF7 925-0AA00-0	
for pushbuttons of the 3UF7 21 operator panel with display	3UF7 925-0AA01-0	
for LEDs of the 3UF7 20 operator panel	3UF7 925-0AA02-0	
Push-in lugs for screw mounting		
e. g. on mounting plate; 2 units required per device		
can be used for 3UF7 1.0, 3UF7 1.1 and 3UF7 1.2	3RV2928-0B	
can be used for 3UF700, 3UF701, 3UF7 3, 3UF7 4, 3UF7 5 and 3UF7 7	3RP19 03	
Terminal covers		
Covers for cable lug and busbar connections:		
Length 100 mm, can be used for 3UF7 1.3-1BA00-0	3RT19 56-4EA1	
Length 120 mm, can be used for 3UF7 1.4-1BA00-0	3RT19 66-4EA1	
Covers for box terminals:		
Length 25 mm, can be used for 3UF7 1.3-1BA00-0	3RT19 56-4EA2	
Length 30 mm, can be used for 3UF7 1.4-1BA00-0	3RT19 66-4EA2	
Covers for screw terminals:		
between contactor and current measuring module or		
between current / voltage measuring module with direct mounting		
can be used for 3UF7 1.3-1BA00-0	3RT19 56-4EA3	
can be used for 3UF7 1.4-1BA00-0	3RT19 66-4EA3	
Box terminal blocks		
for round and ribbon cable conductors		
up to 70 mm2, can be used for 3UF7 1.3-1BA00-0	3RT19 55-4G	
up to 120 mm2, can be used for 3UF7 1.3-1BA00-0	3RT19 56-4G	
up to 240 mm2, can be used for 3UF7 1.4-1BA00-0	3RT19 66-4G	
Bus termination module		
with dedicated power supply;		
for bus connection after the last device on the bus		
Supply voltage:		
115/230 V AC	3UF1 900-1KA00	
24 V DC	3UF1 900-1KB00	

Software

For parameterization, control, diagnostics and testing.

Selection and ordering data: See also Catalog IC10 (http://www.siemens.com/ic10).

Software components	MLFB
SIMOCODE ES V13 Basic: Floating License for one user • Combo license for parallel use of versions 2007 and V13 of SIRIUS ES, license key on USB stick, Class A • License key download, Class A	 3ZS1322-4CC11-0YA5 3ZS1322-4CE11-0YB5
SIMOCODE ES V13 Standard Floating License for one user • Combo license for parallel use of versions 2007 and V13 of SIRIUS ES, license key on USB stick, Class A • License key download, Class A	 3ZS1322-5CC11-0YA5 3ZS1322-5CE11-0YB5
Upgrade for SIMOCODE ES 2007 Floating license for one user, combo license for parallel use of versions 2007 and V13 of SIRIUS ES, license key on USB stick, Class A	3ZS1322-5CC11-0YE5
Powerpack for SIMOCODE ES V13 Basic Floating license for one user, license key on USB stick, Class A	3ZS1322-5CC11-0YD5
Software Update Service for 1 year with automatic extension, requires software version of SIMOCODE ES (TIA Portal)	3ZS1322-5CC11-0YL5
SIMOCODE ES V13 Premium Floating license for one user, parameterizing with the integrated graphics editor (CFC-based) • Combo license for parallel use of versions 2007 and V13 of SIRIUS ES, license key on USB stick, Class A • License key download, Class A	 3ZS1322-6CC11-0YA5 3ZS1322-6CE11-0YB5
Upgrade for SIMOCODE ES 2007 Floating license for one user, combo license for parallel use of versions 2007 and V13 of SIRIUS ES, license key on USB stick, Class A	3ZS1322-6CC11-0YE5
Powerpack for SIMOCODE ES V13 Standard Floating license for one user, license key on USB stick, Class A	3ZS1322-6CC11-0YD5
Software Update Service [1)] for 1 year with automatic extension, requires software version of SIMOCODE ES (TIA Portal)	3ZS1322-6CC11-0YL5
SIMOCODE ES V13 software download	
Trial license, Class A, parameterizing with the integrated graphics editor (CFC-based)	3ZS1322-6CE11-0YG8

Software components	MLFB
SIMOCODE ES 2007 Basic • Complete device parameterization • Online access through local device interface	
Floating License for one user License key on USB stick, Class A License key download, Class A	 3ZS1312-4CC10-0YA5 3ZS1312-4CE10-0YB5
SIMOCODE ES 2007 Standard • Complete device parameterization • Online access through local device interface • Graphic editor • Extended monitoring and diagnostic functions	
Floating License for one user License key on USB stick, Class A License key download, Class A	 3ZS1312-5CC10-0YA5 3ZS1312-5CE10-0YB5
Upgrade for SIMOCODE ES as from 2004 Floating License for one user	3ZS1312-5CC10-0YE5
Powerpack for SIMOCODE ES 2007 Basic Floating License for one user	3ZS1312-5CC10-0YD5
Software Update Service [1] for 1 year with automatic extension, requires the current software version.	3ZS1312-5CC10-0YL5
SIMOCODE ES 2007 Premium • Complete device parameterization • Online access through local device interface • Graphic editor • Extended monitoring and diagnostic functions • Convenience functions • Online access via PROFIBUS DP • Online access via remote access • STEP 7 integration	
Floating License for one user License key on USB stick, Class A License key download, Class A	 3ZS1312-6CC10-0YA5 3ZS1312-6CE10-0YB5
Upgrade for SIMOCODE ES as from 2004 Floating License for one user	3ZS1312-6CC10-0YE5
Powerpack for SIMOCODE ES 2007 Standard Floating License for one user	3ZS1312-6CC10-0YD5
Software Update Service [1] for 1 year with automatic extension, requires the current software version.	3ZS1312-6CC10-0YL5

Software components	MLFB
SIMOCODE pro block library for SIMATIC PCS 7 Version V8 with Advanced Process Library (APL)	
Engineering software V8 for an engineering station (single license), including runtime software for running the AS blocks in an automation system (single license).	3ZS1632-1XX02-0YA0
Runtime license V8 for running the AS modules in an automation system (single license) required for use of the AS modules of the engineering software V7 or engineering software migration V8 on an additional automation system within a plant.	3ZS1632-2XX02-0YB0
Upgrade for PCS 7 block library SIMOCODE pro, V 6.0 or V 7 to version SIMOCODE pro V 8 for an engineering station (single license), including runtime software for running the AS blocks in an automation system (single license)	3ZS1632-1XX02-0YE0
SIMOCODE pro block library for SIMATIC PCS 7 Version V7	
Engineering software V7 for an engineering station (single license), including runtime software for running the AS modules in an automation system (single license)	3UF7982-0AA10-0
Runtime license V7 for running the AS modules in an automation system (single license) required for using the AS modules of the engineering software V7 or the engineering software migration V7-V8 on an additional automation system within a plant	3UF7982-0AA11-0
Upgrade for SIMOCODE pro PCS 7 block library, V6.0 or V6.1 to version SIMOCODE pro V7.0/V7.1 for an engineering station (single license), including runtime software for running the AS modules in an automation system (single license)	3UF7982-0AA13-0
Engineering software migration from V7 to V8 for upgrading (migrating) an existing engineering software V7 of the SIMOCODE pro block library for PCS 7	3UF7982-0AA20-0

1) The Software Update Service for the SIRIUS ES software family (e.g. SIMOCODE ES 2007) is not automatically transferred to the TIA Portal software family (e.g. SIMOCODE ES 2013).

See also

Technical documentation (http://www.siemens.com/sirius/infomaterial)

2.13 Description of system components

2.13.1 Basic units (BU)

The SIMOCODE pro V PN basic unit is the basic component. It is always necessary when SIMOCODE pro is used. It has a standard housing width of 45 mm and detachable terminals

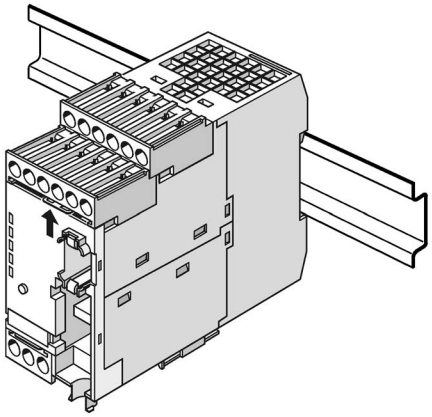


Figure 2-6 SIMOCODE pro V PN basic unit

The SIMOCODE pro V PN basic unit is suitable for DIN rail mounting or with additional push-in lugs for mounting on a mounting plate. Two different variants of the basic unit for the following supply voltages are available:

- 24 V DC
- 110 to 240 V AC/DC

SIMOCODE pro V PN basic unit

The SIMOCODE pro V PN basic unit is the fundamental component of the SIMOCODE pro device series with PROFINET communication interface and is used in conjunction with a current measuring module or current / voltage measuring module and optional operator panels. The following motor control functions are supported:

- Overload relay
- Direct starter and reversing starter
- Star-delta starter, possibly combined with reversing starter
- 2 speeds, motors with separate windings (pole-changing starters), possibly combined with reversing starter

- 2 speeds, motors with separate Dahlander windings, possibly combined with reversing starter
- Positioner control
- Solenoid valve control
- Circuit breaker control (MCCB)
- Soft starter control, possibly combined with reversing starter

Operator controls and display elements, system interfaces basic unit

These LEDs on the front of the device are used for device and fault diagnostics, and indicate the basic status:

- Of the device itself via the "DEVICE" LED
- Of PROFINET communication via the "BUS" LED
- Of any motor feeder faults via the "GEN. FAULT" LED
- By displaying the activity at the two ports via the LEDs "PORT 1" and "PORT 2"

For more information, see Chapter Diagnostics via LED display on the basic unit and on the operator panel (Page 488).

"TEST/RESET" button

Enables the device to be reset after tripping or after a fault has occurred and makes it possible to test the device/motor feeder with or without tripping the contactor control. If a memory module or addressing plug is plugged in, parameterization can be initiated via the "TEST/RESET" button.

For further information, refer to Chapters Test / Reset (Page 319) and Backing up and saving parameters (Page 492).

System interfaces

2 system interfaces for connecting

- a current measuring module or a current / voltage measuring module
- expansion modules and
- an operator panel

2.13.2 Operator panel (OP)

The operator panel controls the motor feeder from the control cabinet. It has an external system interface on the front to allow easier parameterization or diagnostics via a PC/programming device. A PC with the "SIMOCODE ES" software or the memory module can be connected via this system interface (with a cover for IP54) using a PC cable.

On the rear system interface, it is connected to the basic unit or to an expansion module via a connecting cable. It is supplied with power via the basic unit.

The operator panel is frequently installed in the front panels of motor control centers. It also contains all the status LEDs available on the basic unit and the "TEST/RESET" button, and facilitates access to the system interface from outside the control cabinet.

The following are available:

- 5 buttons, of which 4 are freely parameterizable
- 10 LEDs, of which 7 are freely parameterizable

The following figure shows an operator panel:

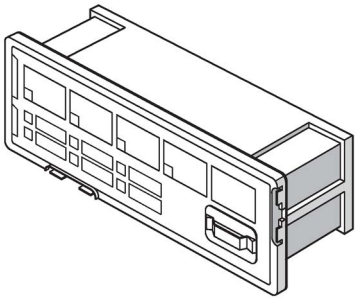


Figure 2-7 Operator panel

Labeling strips

Labeling strips are enclosed for designating buttons 1 to 4 and the yellow LEDs 1 to 3:

- Buttons 1 to 4: 6 pre-assigned labeling strips and 1 individually inscribable labeling strip
- LEDs 1 to 3: 1 individually inscribable labeling strip

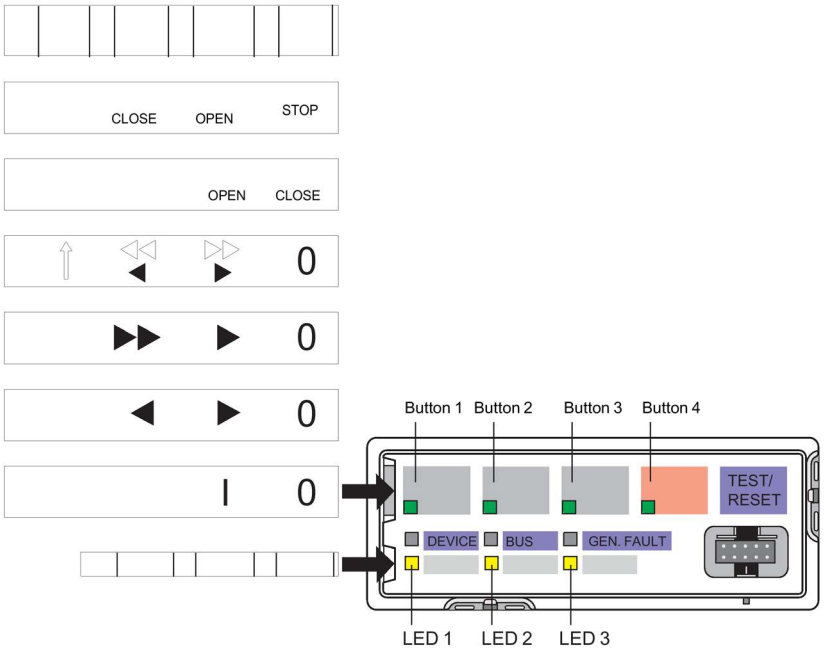


Figure 2-8 Labeling strips for operator panel buttons and LEDs

Unused labeling strips can be stored on the back of the operator panel:

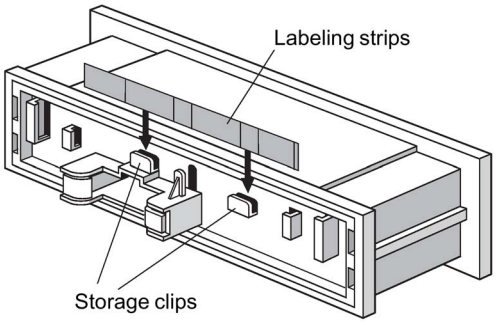


Figure 2-9 Storage clips for labeling strips

Memory module "park position"

The memory module can be protected from unauthorized use by "parking" it on the rear of the operator panel inside the control cabinet. In this case, the storage clips for the labeling strips cannot be used.

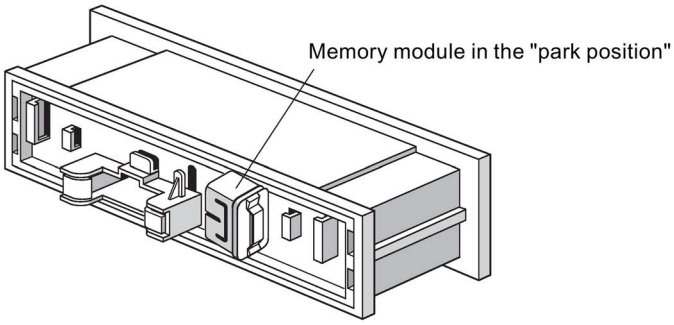


Figure 2-10 Memory module "park position"

2.13.3 Operator panel with display (OPD)

As an alternative to the standard operator panel (OP), an optional operator panel with display (OPD) is also available for SIMOCODE pro V. This operator panel can display actual measured values, operating and diagnostics data, or status information of the motor feeder on the control cabinet. It also contains all status LEDs present on the basic unit and facilitates access to the system interface from outside the control cabinet. The motor can be controlled via the buttons on the operator panel. Actual measured values, status information, fault messages or the device-internal error log are simultaneously shown on the display.

Note

Product version of the operator panel with display

For use with the SIMOCODE pro V PN basic unit, an operator panel with display version *E07* or higher is required.

The following are available:

- 4 freely parameterizable buttons for controlling the motor feeder
- 4 keys for navigating the display menu, 2 of these are softkeys with different functions (e g. test/reset)
- 2 system interfaces (front and back)
- 7 LEDs, 4 of which are freely parameterizable (4 green LEDs integrated in the motor control buttons, primarily for feedback regarding the switching state, e.g. ON, OFF, LEFT, RIGHT, etc.)

The operator panel with display also permits modification of selected device parameters.

The following figure shows an operator panel with display:

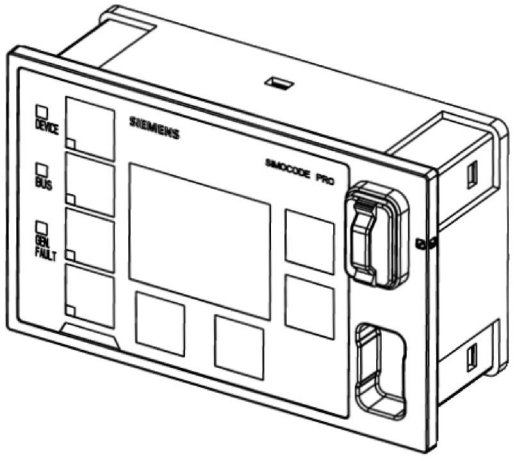


Figure 2-11 Operator panel with display

The operator panel with display can be connected directly to the SIMOCODE pro V PN basic unit or an expansion module via the rear system interface. Voltage is supplied by the basic unit. This front system interface (with cover for IP54) can be used to connect (by means of the PC cable) a PC with the SIMOCODE ES software installed or the memory module.

NOTICE
Live operation The operator panel with display may not be removed or plugged in during operation!

Labeling strips:

Labeling strips for labeling buttons 1 to 4 are included:

- 6 pre-assigned labeling strips and 1 individually inscribable labeling strip

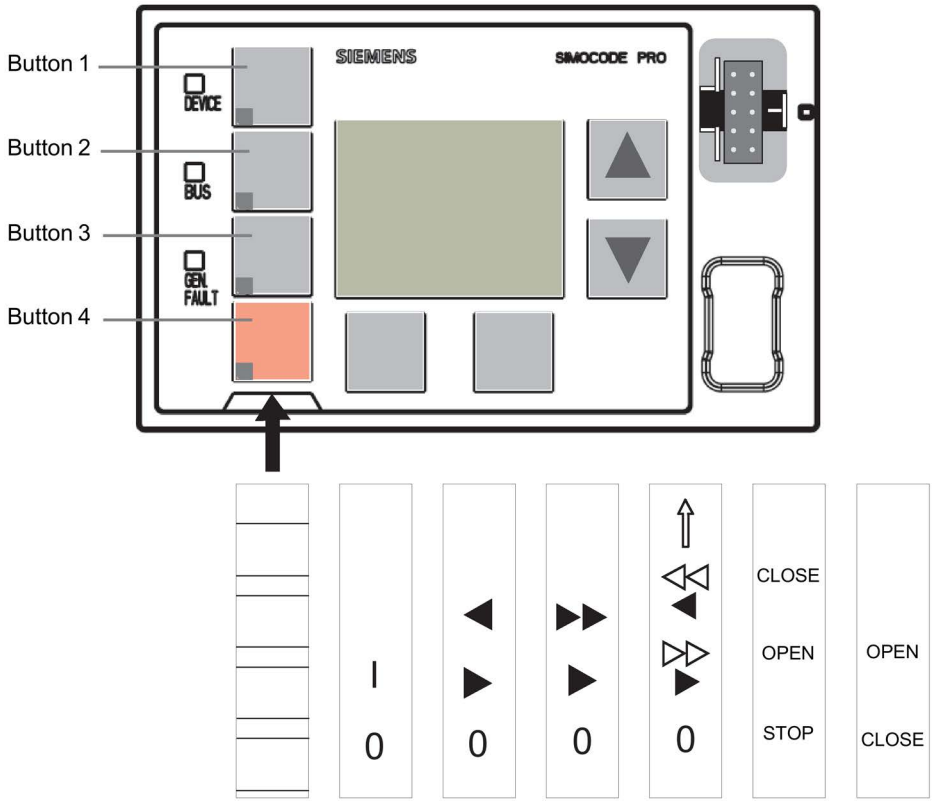


Figure 2-12 Labeling strips for operator panel with display

Unused labeling strips can be stored on the back of the operator panel with display:

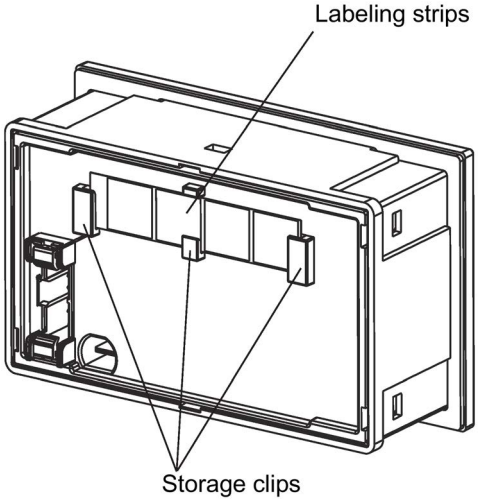


Figure 2-13 Storage clips for labeling strips

Memory module "park position"

The memory module can be "parked" on the front of the operator panel with display beneath the system interface:

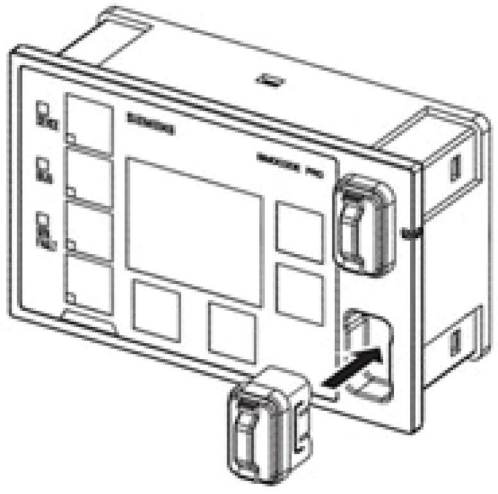


Figure 2-14 Memory module "park position"

2.13.4 Operator controls and display elements of the operator panel with display

Displays of the operator panel with display

The display shows actual measured values, operating data and diagnostics data as well as the status information of the motor feeder in plain text or with the aid of symbols.

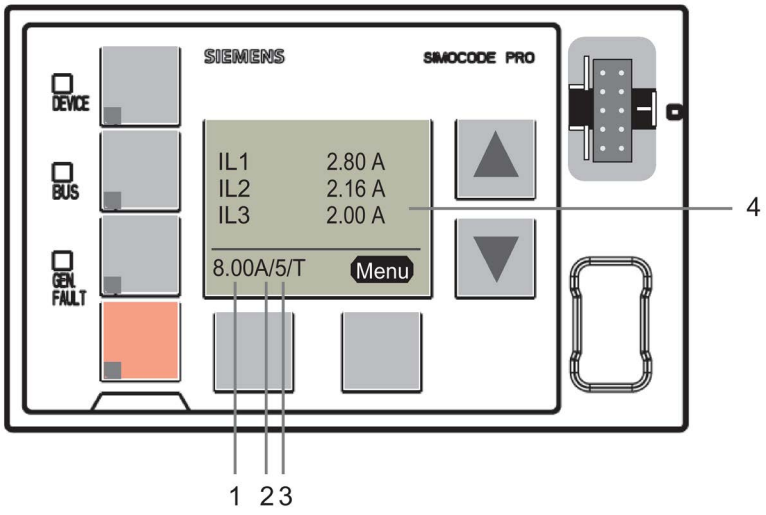


Figure 2-15 Display elements of the operator panel with display

1

Shows the **set current Is** / rated motor current in A. For motors with two speeds, the relevant set current Is1 or Is2 is always displayed depending on whether the current speed is slow or fast, e.g. **8 A.**For motors with two speeds, the left-hand softkey can be used when the motor is stopped to alternate between the display of the two set currents. When running, the set current for the active motor speed is always displayed.

2

Shows the set **class time** of the overload protection system, e.g.:**10** = class 10 (class = trip class)

3

Indicates that temperature monitoring is active, e.g. the motor temperature is being monitored by thermistors or analog temperature sensors (Pt100, Pt1000, KTY, NTC). (**T** = temperature monitoring active.)

4

The **main display** enables customized depiction of different measured values when running. This is the standard display at the topmost menu level. Predefined profiles in the display settings can be selected for this purpose. By pressing the "Menu" softkey on the right, you can navigate through the submenus of the main display (see Chapter Read and adapt main display (Page 81)).

Operator controls of the operator panel with display

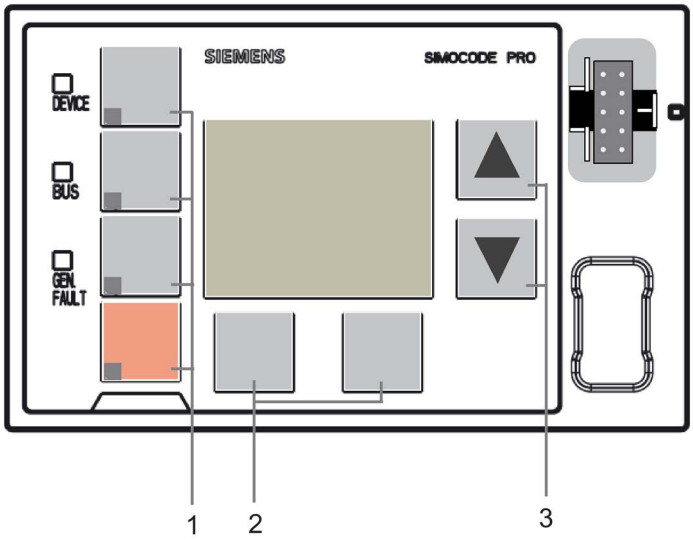


Figure 2-16 Operator controls of the operator panel with display

1

Four freely parameterizable **operator keys** with status LED. These operator keys are used to control the motor with integrated status LEDs for any status feedback. The functions can be user-defined. Labeling can be either freely chosen or achieved using the labeling strips supplied with the device (see also Chapter Operator panel with display (OPD) (Page 62) and Chapter Operator panel LEDs (with OPD) (Page 280) and Chapter Operator panel buttons (Page 299)).

2

Two **softkeys.** They can have different functions depending on the menu displayed (e.g. open menu, exit menu, TEST/RESET). The currently assigned functions are shown on the lower left or right edge of the display.

3

Two **arrow keys** (one upwards arrow and one downwards arrow). They serve to navigate the menu or change the display settings, e.g. to adjust the contrast or to select a profile for the main display.

2.13.5 Menu of the operator panel with display

Menu of the operator panel with display

Navigating the menu of the operator panel with display

Main menu, operator panel with display

For details: See Displays of the operator panel with display (Page 79).

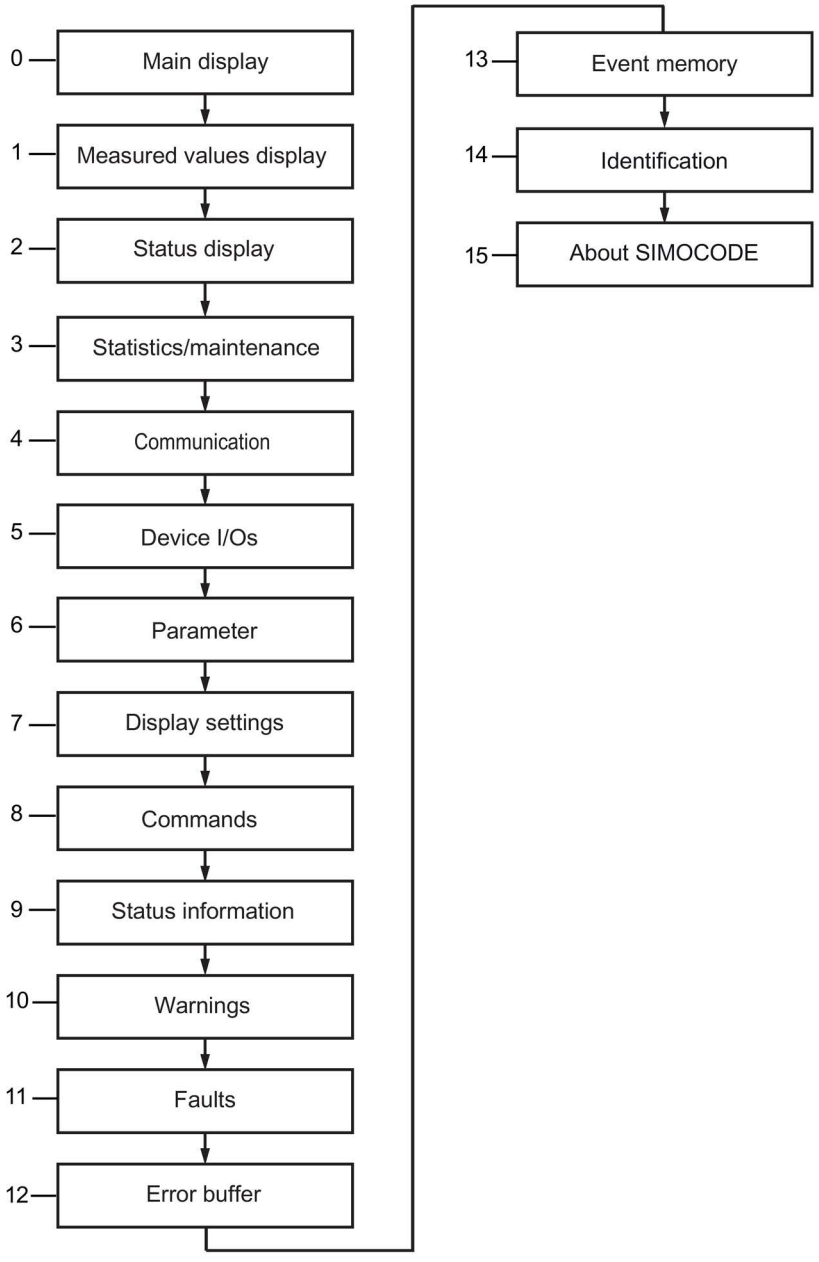


Figure 2-17 Main menu, operator panel with display

Main display, operator panel with display

For details: See Read and adapt main display (Page 81).

1 Measured values, operator panel with display

For details: See Display of measured values in the measured values display (Page 84).

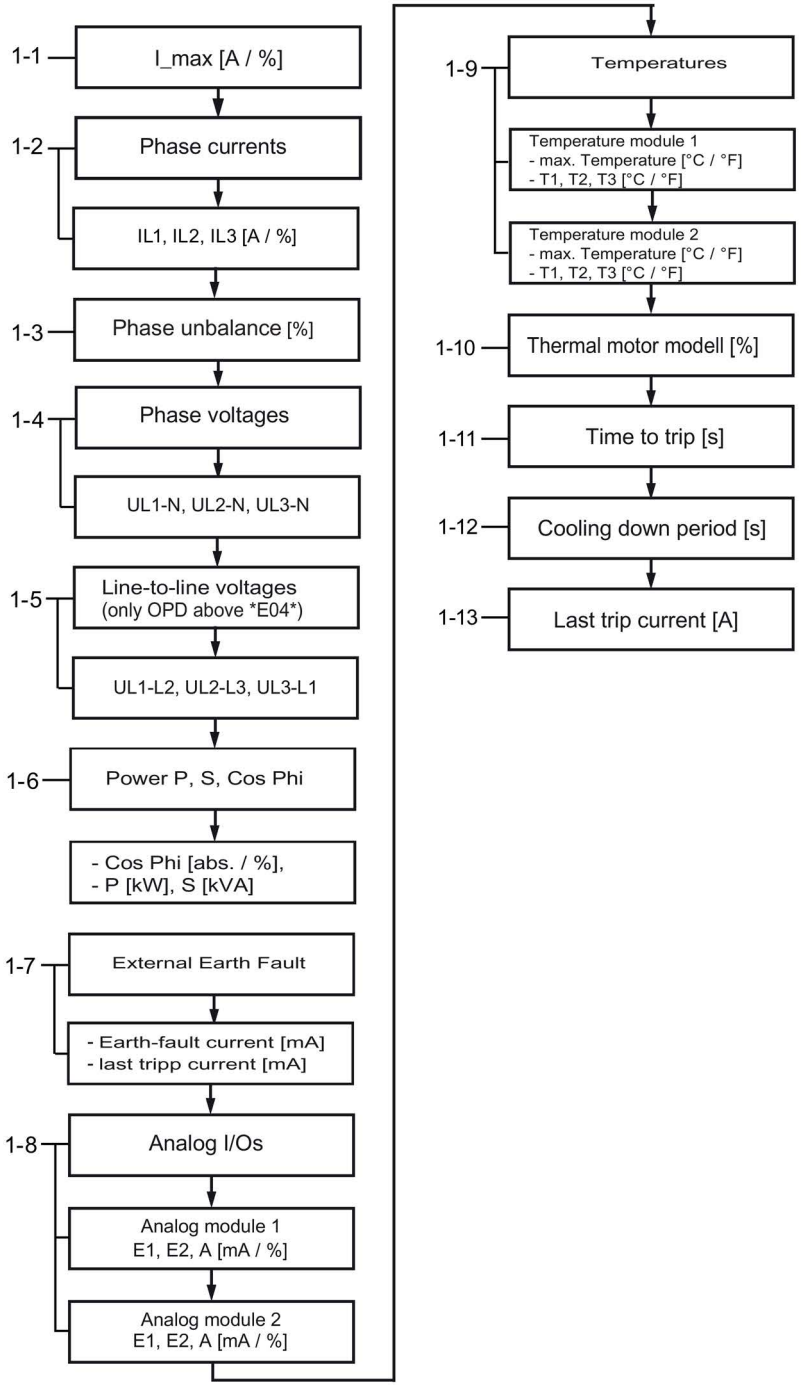


Figure 2-18 Measured values display, operator panel with display

2 Status motor protection/motor control, operator panel with display

For details: See Motor protection and motor control status (Page 85).

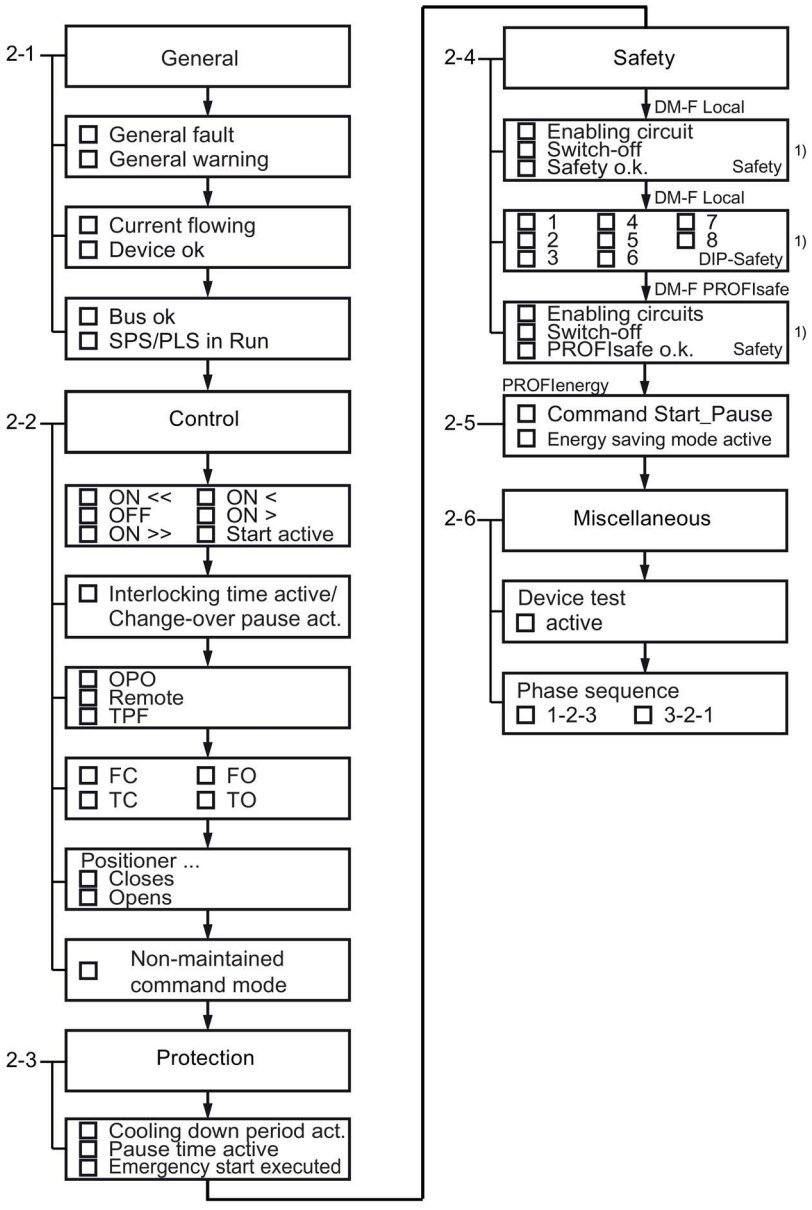


Figure 2-19 Status display motor protection/motor control, operator panel with display

3 Statistics/maintenance, operator panel with display

For details: See Display of statistical and maintenance-relevant information on the statistics/maintenance display (Page 87).

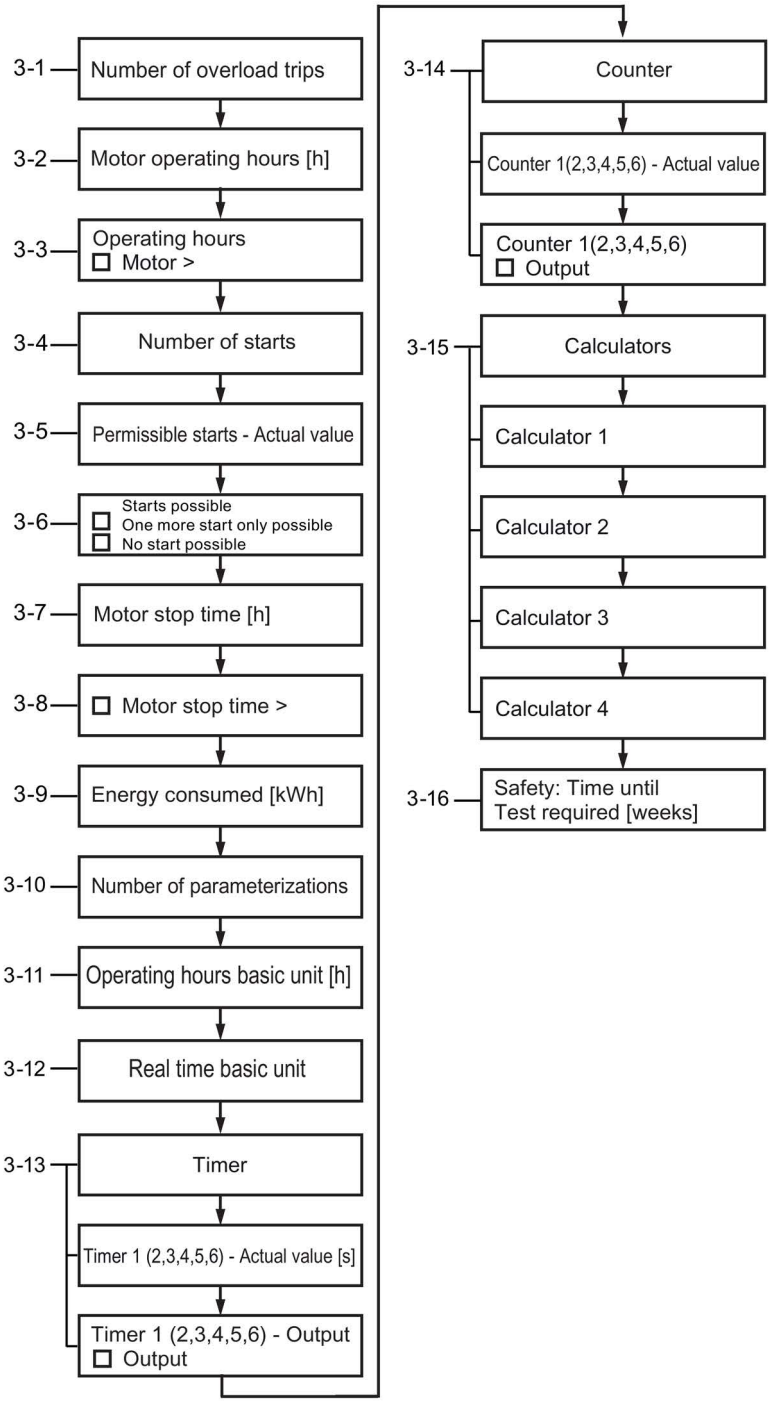


Figure 2-20 Statistics/maintenance, operator panel with display

4 Communication, operator panel with display

For details: See Status display about PROFINET communication (Page 88).

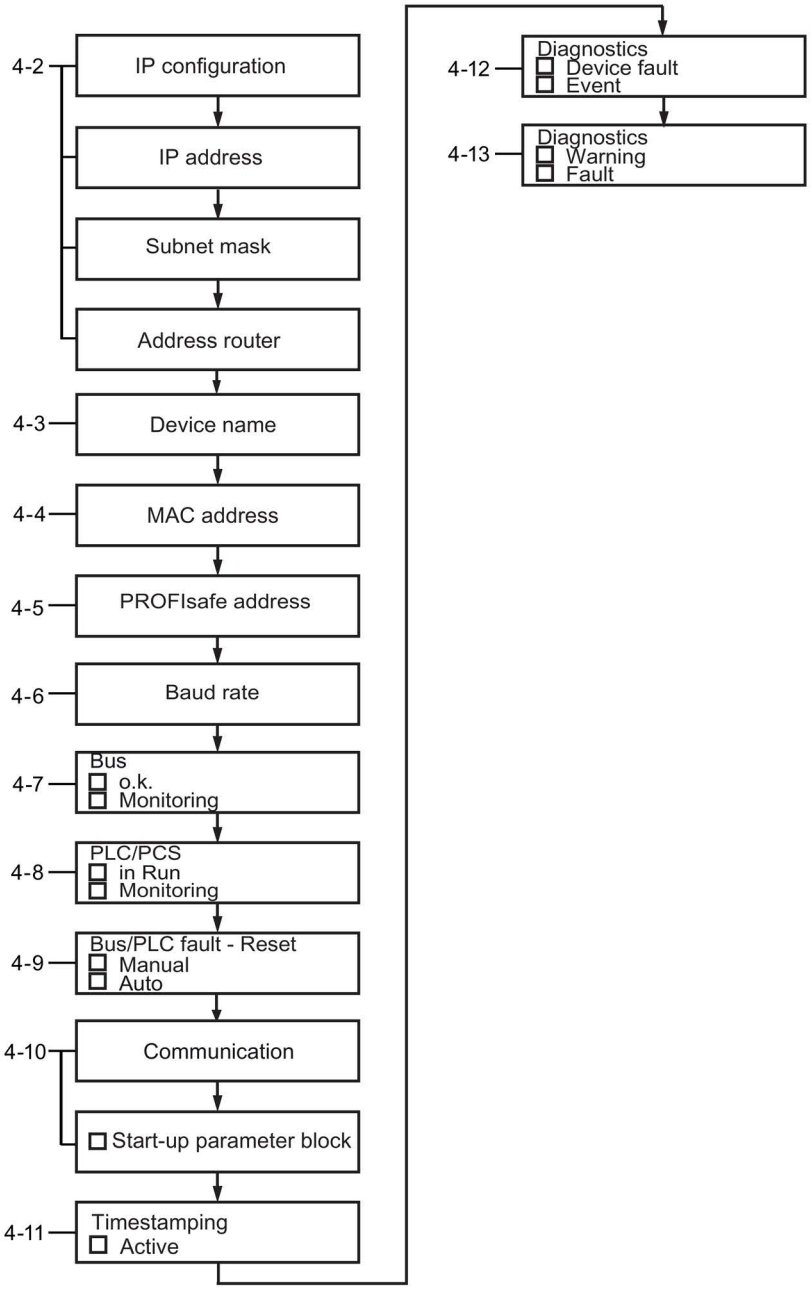


Figure 2-21 Communication on the PROFINET, operator panel with display

5 Device I/Os, operator panel with display

For details: See Displays the current status of all device I/Os (Page 89).

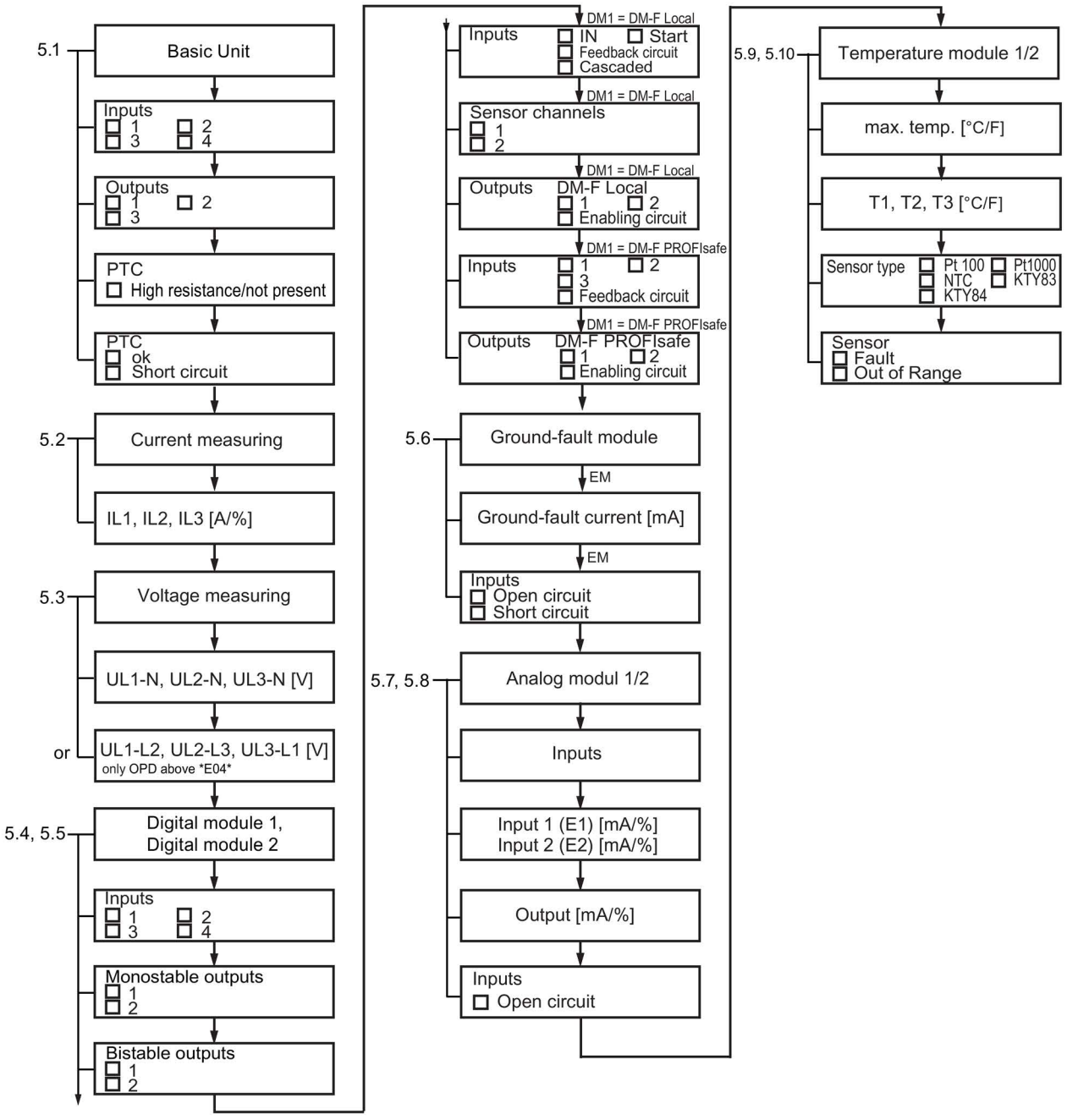


Figure 2-22 Device I/Os, operator panel with display

6 Parameters, operator panel with display

SIMOCODE pro V PN allows selected parameters to be set using the operator panel with display.

List of parameters: See Parameters (Page 91).

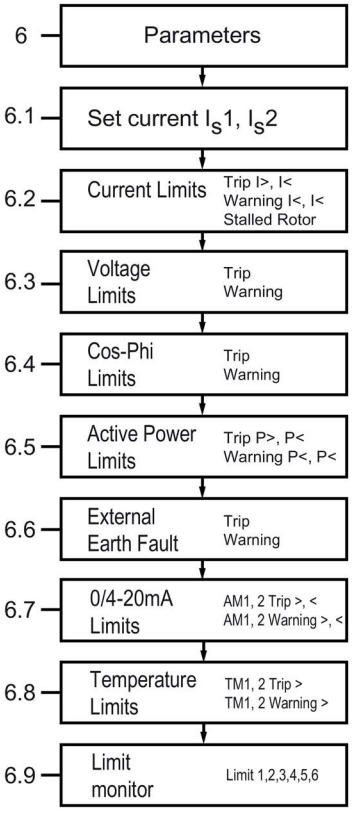


Figure 2-23 Parameters, operator panel with display

7 Display settings, operator panel with display

For details: See Adapt display settings (Page 93).

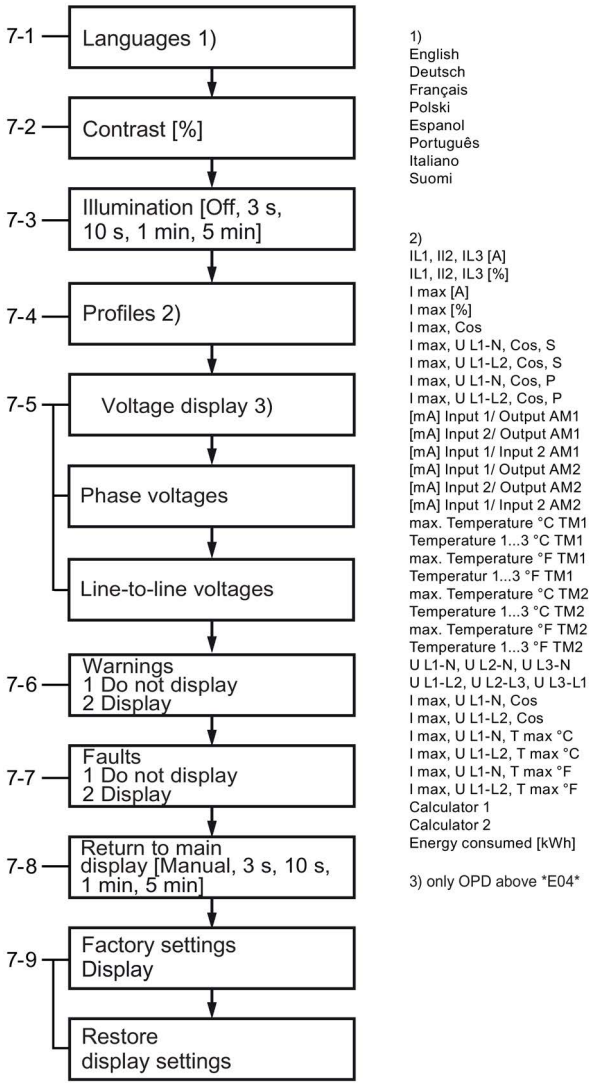


Figure 2-24 Display settings, operator panel with display

8 Commands, operator panel with display

For details: See Resetting, testing and parameterizing via commands (Page 95).

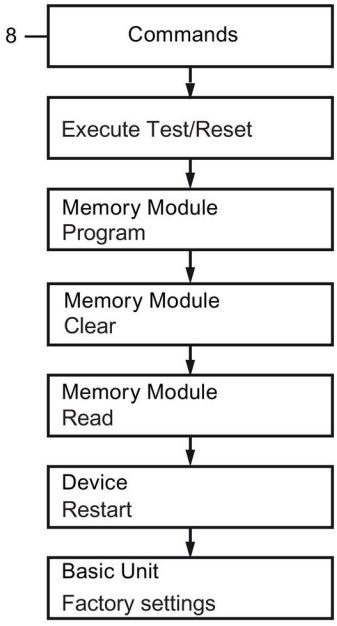


Figure 2-25 Commands, operator panel with display

9 Messages, operator panel with display

For details: See Display of all pending messages (Page 97).

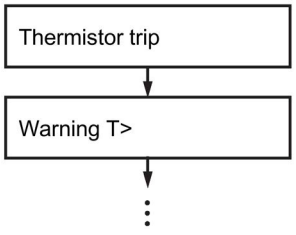


Figure 2-26 Messages, operator panel with display

10 Warnings, operator panel with display

For details: See Display of all pending warnings (Page 97).

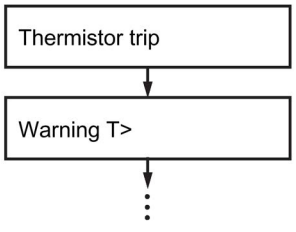


Figure 2-27 Warnings, operator panel with display

11 Faults, operator panel with display

For details: See Display of all pending faults (Page 97).

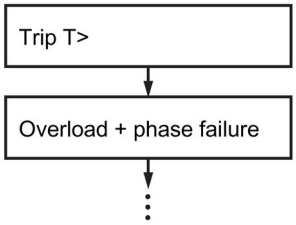


Figure 2-28 Faults, operator panel with display

12 Fault memory, operator panel with display

For details: See Reading out the device-internal error buffer (Page 97).

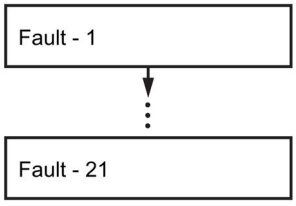


Figure 2-29 Fault memory, operator panel with display

13 Event memory, operator panel with display

For details: See Reading out the device-internal event memory (Page 98).

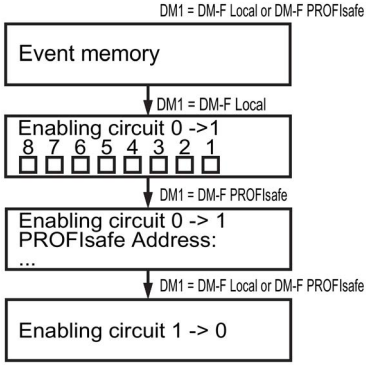


Figure 2-30 Event memory, operator panel with display

14 Identification, operator panel with display

For details: See Identification of the motor feeder and the SIMOCODE pro components (Page 99).

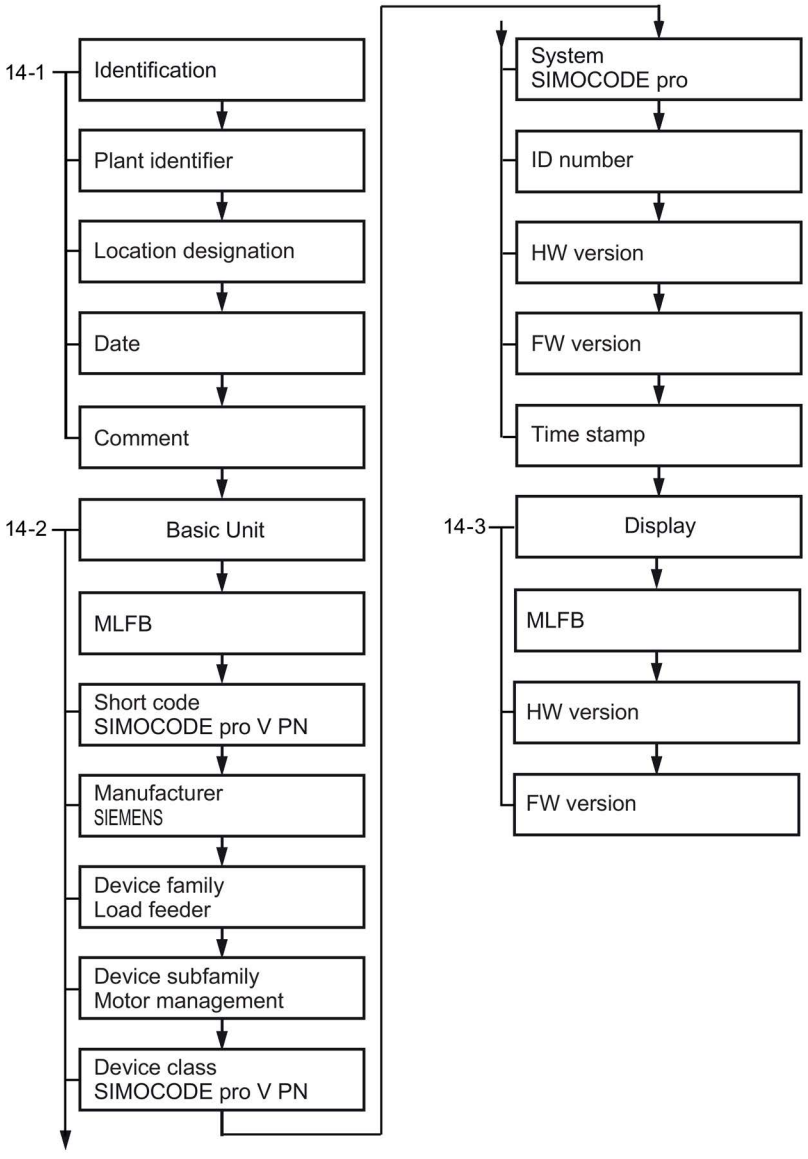


Figure 2-31 Identification, operator panel with display

2.13.6 Displays of the operator panel with display

You can navigate through the menu using the arrow keys and softkeys. Each menu item may have one or more submenus. The menu structure and display are, in part, directly dependent on the device parameterization (e. g. selected control function) and hardware configuration (e.g. type and number of expansion modules used).

- Main display

The "main display" is the standard display of the SIMOCODE pro. It displays current measured values, which can be selected via profiles predefined to meet user-specific requirements. For detailed information: See Read and adapt main display (Page 81).

- Measured values display

The "Measured values display" provides an overview of all values measured by SIMOCODE pro. For example, all phase currents, phase voltages, power-related measured values or temperatures. For detailed information: See Display of measured values in the measured values display (Page 84).

- Status display

The "Status display" shows all higher-level status information, i.e. all status information relevant to the protection and control of the motor. For detailed information: See Motor protection and motor control status (Page 85).

- Statistics/Maintenance

The "Statistics/Maintenance" menu item provides an overview of all SIMOCODE pro information that is primarily relevant to maintenance. For detailed information: See Display of statistical and maintenance-relevant information on the statistics/maintenance display (Page 87).

- Communication

The "Communication" menu item displays all important information relating to communication. For detailed information: See Status display about PROFINET communication (Page 88).

- Device I/Os

The "Device I/Os" menu item provides a complete overview of the current status of all inputs and outputs of the basic unit as well as any connected expansion modules. For detailed information: See Displays the current status of all device I/Os (Page 89).

- Parameters

SIMOCODE pro V PN allows selected parameters to be set using the operator panel with display: For detailed information: See Parameters (Page 91)

- Display settings

All settings relevant to the operator panel with display can be carried out via "Display Settings". In addition to selecting the language and adjusting the contrast or illumination, it is also possible to select the profiles here which are relevant for adjusting the main display. For detailed information: See Adapt display settings (Page 93)

- Commands

The "Commands" menu item contains all commands relating to SIMOCODE pro, e.g. for testing the feeder, resetting after tripping and/or transferring parameters into the memory module or into SIMOCODE pro. For detailed information: See Resetting, testing and parameterizing via commands (Page 95).

- Events

The "Status Information" menu item provides an overview of all pending status information. For detailed information: See Display of all pending messages (Page 97)

- Warnings

The "Warnings" menu item provides an overview of all pending warnings. For detailed information: See Display of all pending warnings (Page 97).

- Faults

The "Faults" menu item provides an overview of all pending faults. For detailed information: See Display of all pending faults (Page 97).

- Error buffer

The "Error buffer" menu item displays the SIMOCODE pro device-internal error buffer. For detailed information: See Reading out the device-internal error buffer (Page 97).

- Event memory

The "Event Memory" menu item enables access to the SIMOCODE pro device-internal event memory. For detailed information: See Reading out the device-internal event memory (Page 98).

Note

Precondition for event memory display

Is only displayed if DM-F present

- Identification

In the "Identification" menu item, you will find detailed information/labeling regarding SIMOCODE pro hardware components (basic unit, operator panel with display). For detailed information: See Identification of the motor feeder and the SIMOCODE pro components (Page 99).

- About SIMOCODE

The "About SIMOCODE" menu item displays further information about SIMOCODE pro. For detailed information: See Menu of the operator panel with display (Page 68).

2.13.7 Read and adapt main display

To enable users speedy viewing of the measured values typically shown on their switchboard, various profiles are stored in the operator panel with display that enable user-specific adaptation of the standard measured values displayed in the SIMOCODE pro main display. The profile is selected in the menu "Display settings" → Profiles (see Section Adapt display settings (Page 93)).

The set current, the selected class time for the overload protection system and the use of temperature monitoring based on thermistors or analog temperature sensors are displayed (if programmed) at the bottom left of the main display. The submenus of the main display can be navigated with the right-hand softkey. For motors with two speeds, the left-hand softkey can be used to alternate between the display of the two set currents.

- **IL1, IL2, IL3 [A]** [1)]

Shows the currents in all three phases in A.

- **IL1, IL2, IL3 [%]** [1)]

Displays the currents in all three phases as a percentage of the set current.

- **Imax [A]** [1)]

Shows the maximum current of all three phases in A.

- **Imax [%]** [1)]

Displays the maximum current of all three phases as a percentage of the set current.

- **Imax, Cos phi** [2)]

Displays the maximum current of all three phases in amps and the power factor.

- **Imax, UL1-N, Cos phi, S** [3)]

Shows the maximum current of all three phases in amps, the phase voltage UL1 in V, the power factor, and the apparent power in kVA.

- **Imax, UL1-L2, Cos phi, S** [4)]

Shows the maximum current of all three phases in A, the line-to-line voltage UL1-L2 in V, the power factor, and the apparent power in kVA.

- **Imax, UL1-N, Cos phi, P** [3)]

Shows the maximum current of all three phases in amps, the phase voltage UL1 in V, the power factor, and the active power in kW.

- **Imax, UL1-L2, Cos phi, P** [4)]

Shows the maximum current of all three phases in A, the line-to-line voltage UL1-L2 in V, the power factor, and the active power in W.

- **In1/output AM1 / In1/output AM2** [5)] **[mA]**

Shows the current value at input 1 of analog module 1 / 2 and at the output of analog module 1 / 2 in mA.

- **In2/output AM1 / In2/output AM2** [5] **[mA]**

Shows the current value at input 2 of analog module 1 / 2 and at the output of analog module 1 / 2 in mA.

- **Inputs AM 1 / inputs AM2** [5] **[mA]**

Shows the current value at the two inputs of analog module 1 / 2 in mA.

- **Max. temp. °C TM 1 / TM2** [6]

Shows the maximum temperature of all used sensor measuring circuits of the temperature module 1 / 2 in °C.

- **Temperatures °C TM 1 / TM2** [6]

Shows the individual temperatures of all used sensor measuring circuits of the temperature module 1 / 2 in °C.

- **Max. temp. °F TM 1 / TM2** [6]

Shows the maximum temperature of all used sensor measuring circuits of the temperature module 1 / 2 in °F.

- **Temperatures °F TM 1 / TM2** [6]

Shows the individual temperatures of all used sensor measuring circuits of the temperature module 1 / 2 in °F.

- **UL1-N, UL2-N, UL3-N** [3]

Shows all phase voltages in V.

- **UL1-L1, UL2-L3, UL3-L1** [4]

Shows line-to-line voltages UL1-L2, UL2-L3, UL3-L1 in V.

- **Imax, UL1-N, Cos phi** [3]

Shows the maximum current of all three phases in amps, the phase voltage UL1-N in V, and the power factor as absolute values.

- **Imax, UL1-L2, Cos phi** [4]

Shows the maximum current of all three phases in A, the line-to-line voltage UL1-L2 in V and the power factor.

- **Imax, UL1-N, °C** [7]

Shows the maximum current of all three phases in amps, the phase voltage UL1-N in V, and the maximum temperature of all used sensor measuring circuits of the temperature module in °C.

- **Imax, UL1-L2, °F** [7]

Shows the maximum current of all three phases in A, the line-to-line voltage UL1-L2 in V, and the maximum temperature of all used sensor measuring circuits of the temperature module in °F.

- **Calculator 1**

Shows the calculated result that the function block Calculator 1 provides without units in the range 0 ... 65535.

Permits display, for example, of a 2-byte value sent directly from the automation system on the display of the switchboard or the display without units of each 2-byte value in SIMOCODE pro.

- **Calculator 2**

Shows the calculated result that the function block Calculator 2 provides without units in the range 0 ... 65535.

Permits display, for example, of a 2-byte or 4-byte value sent directly from the automation system on the display of the switchboard or the display without units of each 2-byte and 4-byte value in SIMOCODE pro.

- **Energy consumed** 2)

Note

Modified system expansion or hardware configuration

If the main display permanently fails to show measured values, this indicates that a profile has been selected in the display settings that is no longer supported, due, for example, to a changed system expansion or changed hardware configuration. The profile must be reselected.

1) Possible only if a current measuring module or current / voltage measuring module is used

2) Possible only if a current / voltage measuring module is used

3) Possible only if a current / voltage measuring module is used Values will only be displayed if phase voltage is set/configured

4) Possible only if a current / voltage measuring module is used and line-to-line voltage is set/configured

5) Possible only if the analog module is used

6) Possible only if the temperature module is used

7) Possible only if a current / voltage measuring module and temperature module are used Values will only be displayed if phase voltage is set/configured

2.13.8 Display of measured values in the measured values display

The "Measured Values" menu item displays all current SIMOCODE pro measured values. Depending upon the type of expansion modules used, all or only some of the values listed here will be available. These are the most important menus by way of example:

- Imax [1)]

  Shows the maximum current of all three phases and can be switched between A or % of I_s

- IL1, IL2, IL3 [1)]

  Shows the currents of all three phases and can be switched between A or % of I_s.

- Phase unbalance [1)]

  Shows the current phase unbalance as a percentage.

- UL1-N, UL2-N, UL3-N [2)]

  Shows all phase voltages in V.

- U L1-L2, U L2-L3, U L3-L1 [3)]

  Shows all line-to-line voltages in V.

- Cos phi, P, S [4)]

  Shows the power factor (0 to 100 % or absolute, switchable using the right softkey), the active power in kW, and the apparent power in kVA.

- Ground-fault current [mA]

  Shows the measured value of the residual current.

- Last trip current [mA]

  Shows the last measured value of the residual current.

- Analog input 1, analog input 2, analog output (for AM1) [5)]

  Shows the current values at both inputs and the actual value at the output of analog module 1 and can be switched over between mA and %.

- Analog input 1, analog input 2, analog output (for AM2) [5)]

  Shows the actual values at both inputs and the actual value at the output of analog module 2 and can be switched over between mA and %.

- Max. temperature [6)]

  Shows the maximum temperature of all used sensor measuring circuits of the temperature module 1 in °C (can be switched to °F).

- Max. temperature [6)]

  Shows the maximum temperature of all used sensor measuring circuits of the temperature module 2 in °C (can be switched to °F).

- T1, T2, T3 [6)]

  Shows the individual temperatures of all used sensor measuring circuits of the temperature module 1 in °C (can be switched to °F).

- T1, T2, T3 [6)]

  Shows the individual temperatures of all used sensor measuring circuits of the temperature module 2 in °C (can be switched to °F).

- Thermal motor model

  Shows the current temperature rise of the internal thermal motor model in %.

- Time to trip

  Shows the estimated time to trip.

- Cooling down period

  Shows the cooling down period remaining before the motor can be switched on again after an overload trip.

- Last trip current

  Shows the magnitude of the current that was measured at the moment of the overload trip, unit of measurement can be switched between A and % of I_s.

1) Possible only if a current measuring module or current / voltage measuring module is used

2) Possible only if a current / voltage measuring module is used Values will only be displayed if phase voltage is set/configured

3) Possible only if a current / voltage measuring module is used and line-to-line voltage is set/configured

4) Possible only if a current / voltage measuring module is used

5) Possible only if the analog module is used

6) Possible only if the temperature module is used

2.13.9 Motor protection and motor control status

The status display shows all higher-level status information, i.e. all status information relevant to the protection and controlling of the motor. The type of status information depicted is, therefore, in part directly dependent upon the parameterized control function and the hardware configuration of SIMOCODE pro, and may vary.

These are the most important menus by way of example:

General

- General fault, general warning
- Current flowing, device ok
- Bus ok, PLC/PCS in run

Control

Note

Display status information

The display of the status information can vary according to the control function.

- ON <<, ON <, OFF, ON >, ON >>, start active
- Interlocking time active, change-over pause active
- OPO, Remote, TPF
- FC, FO, TC, TO: Only for "Positioner" control functions.
- Positioner runs in CLOSED direction, positioner runs in OPEN direction: Only for "Positioner" control functions.
- Non-maintained command mode

Protection

- Cooling down period active, pause time active, emergency start executed

Other

- Device test active
- Phase sequence 1-2-3, phase sequence 3-2-1

Possible only if a current / voltage measuring module is used.

Safety

- Safety DM-F Local: Status enabling circuit, trip "Safety", "Safety o.k." (only when DM-F Local is installed)
- DIP switches, DM-F Local: Status of DIP switches 1, 2, 3, 4, 5, 6, 7, 8 (only when DM-F Local is installed)
- Safety DM-F PROFIsafe: Status enabling circuit, trip "Safety", "PROFIsafe active" (only when DM-F PROFIsafe is installed)

2.13.10 Display of statistical and maintenance-relevant information on the statistics/maintenance display

The "Statistics/Maintenance" menu item gives an overview of all SIMOCODE pro information that is primarily relevant to maintenance. The states of timers and counters, etc. are displayed, as well as operating hours, stop times and the number of starts.

These are the most important menus by way of example:

General

- Number of overload trips
- Motor operating hours
- Motor operating hours >: Displays overshooting of the set limit for operating hours monitoring.
- No. of starts - actual value
- Permissible starts - actual value
- One more start only, no start
- Stop time: Displays overshooting of the set limit for motor stop time monitoring.
- Energy consumed (possible only if a current / voltage measuring module is used)
- Number of parameterizations
- Motor operating hours basic unit
- Real time basic unit
- Timer
- Timer 1 (2, 3, 4, 5, 6) actual value
- Timer 1 (2, 3, 4, 5, 6) output
- Counter
- Counter 1 (2, 3, 4, 5, 6) actual value
- Counter 1 (2, 3, 4, 5, 6) output

Calculators

- Calculator 1
- Calculator 2
- Calculator 3
- Calculator 4

Safety

- Time until test requirement: Remaining time until next test requirement in weeks (displayed only when DM-F is installed).

2.13.11 Status display about PROFINET communication

The "Communication" menu item displays all important information relating to PROFINET communication. Not only information about IP configuration, device name, MAC address, PROFIsafe address but also settings about the status of communication and the response of SIMOCODE pro if communication failures are displayed.

These are the most important menus by way of example:

- IP configuration
- Device name
- MAC address
- PROFIsafe address: Shows the PROFIsafe address (only when DM-F PROFIsafe is installed)
- Baud rate
- Bus OK, bus monitoring
- PLC/PCS in Run, PLC/PCS monitoring
- Bus / PLC fault - Reset
- Startup parameter block
- Diagnostics device error, diagnostics message: Shows which type of diagnostic information is sent by SIMOCODE pro to a higher-level automation system via PROFINET.
- Diagnostics warning, diagnostics fault: Shows which type of diagnostic information is sent by SIMOCODE pro to a higher-level automation system via PROFINET.

2.13.12 Displays the current status of all device I/Os

The "Device I/Os" menu item gives a complete overview of the current status of all inputs and outputs of the basic unit and any connected expansion modules (except for the ground-fault module). The type of displayed status information is directly dependent on the SIMOCODE pro hardware configuration.

These are the most important menus by way of example:

Basic unit

- Inputs 1 (2, 3, 4)
- Outputs 1 (2, 3)
- PTC high resistance/not present
- PTC o. k., PTC short circuit

Current measurement

IL1, IL2, IL3: Shows the currents (in A) in all three phases (possible only if a current measuring module or current / voltage measuring module is used).

Voltage measurement

- UL1-N, UL2-N, UL3-N: Shows all phase voltages in V (possible only if a current / voltage measuring module is used and phase voltage has been set/configured)
- U L1-L2, U L2-L3, U L3-L1: Shows all line-to-line voltages in V (possible only if a current / voltage measuring module is used and line-to-line voltage has been set/configured)

Digital module 1, digital module 2

- Inputs 1 (2, 3, 4): Inputs 1, 2, 3, 4 "monostable" or "bistable."
- Outputs 1, 2 monostable: Outputs 1, 2 "monostable" (possible only if digital module 1 is used as "monostable")
- Outputs 1, 2 "bistable" (possible only if digital module 1 is used as "monostable" or "bistable")

Digital module 1 as DM-F Local

Possible only if a DM-F Local module is used as digital module 1.

- Inputs DM-F Local: Inputs "IN," "Start," "Feedback circuit," "Cascaded."
- Sensor channels DM-F Local: Sensor channels 1, 2
- Outputs DM-F Local: Outputs 1, 2, "Enabling circuit"

Digital module 1 as DM-F PROFIsafe

Possible only if a DM-F PROFIsafe is used as digital module 1.

- Inputs DM-F PROFIsafe: Inputs 1, 2, 3, "feedback circuit"
- Outputs DM-F PROFIsafe: Outputs 1, 2, "Enabling circuit"

Ground-fault module

Possible only if the ground-fault module is used.

- Ground-fault current [mA]
- Inputs
  - Open circuit
  - Short circuit

Analog module

Possible only if the analog module is used.

- Input 1, input 2
- Output
- Open circuit

Temperature module

Possible only if the temperature module is used.

- Max. temperature
- T1, T2, T3
- Sensor type PT 100, PT 1000, NTC, KTY83, KTY85
- Sensor fault sensor out of range

2.13.13 Parameters

You can set the following parameters using the operator panel with display:

Parameters	Range	Note
Overload protection → set currents		Possible only if a current measuring module is configured
Set current Is1	0.00 - 9,999.00 A	-
Set current Is2	0.00 - 9,999.00 A	Possible only in conjunction with the following control functions: • Dahlander • Dahlander reversing starter • Pole-changing starter • Pole-changing reversing starter
Current limits		Possible only if a current measuring module is configured
Monitoring of current limits → trip level I > (upper limit)	0 - 1020 % of Is	-
Monitoring of current limits → warning level I > (upper limit)	0 - 1020 % of Is	-
Monitoring of current limits → trip level I < (lower limit)	0 - 1020 % of Is	-
Monitoring of current limits → warning level I < (lower limit)	0 - 1020 % of Is	-
Motor protection → stalled rotor protection level	0 - 1020 % of Is	-
Voltage monitoring → voltage limits		Possible only if a current / voltage measuring module is configured
Trip level U < (lower limit)	0 - 2040 V	-
Warning level U < (lower limit)	0 - 2040 V	-
Cos phi monitoring → Cos phi limits		Possible only if a current / voltage measuring module is configured
Trip level cos phi < (lower limit)	0 - 100 %	-
Warning level cos phi < (lower limit)	0 - 100 %	-
Active power monitoring → Active power limits		Possible only if a current / voltage measuring module is configured
Trip level P > (upper limit)	0.000 - 9999.000 kW	-
Warning level P > (upper limit)	0.000 - 9999.000 kW	-
Trip level P < (lower limit)	0.000 - 9999.000 kW	-
Warning level P < (lower limit)	0.000 - 9999.000 kW	-
Ground fault monitoring → Ground fault limits		Possible only if a 3UF7510 ground-fault module is configured
Trip level	0.00 - 40.00 A	-
Warning level	0.00 - 40.00 A	-

Parameters	Range	Note
0/4-20 mA monitoring → 0/4-20 mA limits		Possible only if analog module 1 and/or 2 is configured
Analog module 1 - trip level 0/4-20 mA > (upper limit)	0 - 255	Represented in 0/4 - 20 mA similar to "Measured values" menu
Analog module 1 - warning level 0/4-20 mA > (upper limit)	0 - 255	Represented in 0/4 - 20 mA similar to "Measured values" menu
Analog module 1 - trip level 0/4-20 mA < (lower limit)	0 - 255	Represented in 0/4 - 20 mA similar to "Measured values" menu
Analog module 1 - warning level 0/4-20 mA < (lower limit)	0 - 255	Represented in 0/4 - 20 mA similar to "Measured values" menu
Analog module 1 - trip level 0/4-20 mA > (upper limit)	0 - 255	Represented in 0/4 - 20 mA similar to "Measured values" menu
Analog module 1 - warning level 0/4-20 mA > (upper limit)	0 - 255	Represented in 0/4 - 20 mA similar to "Measured values" menu
Analog module 1 - trip level 0/4-20 mA < (lower limit)	0 - 255	Represented in 0/4 - 20 mA similar to "Measured values" menu
Analog module 1 - warning level 0/4-20 mA < (lower limit)	0 - 255	Represented in 0/4 - 20 mA similar to "Measured values" menu
Temperature monitoring → temperature limits		Possible only if temperature module 1 and/or 2 is configured
Temperature module 1 - trip level > (upper limit)	0 - 65,535 K	Represented in °C/F similar to "Measured values" menu
Temperature module 1 - warning level > (upper limit)	0 - 65,535 K	Represented in °C/F similar to "Measured values" menu
Temperature module 2 - trip level > (upper limit)	0 - 65,535 K	Represented in °C/F similar to "Measured values" menu
Temperature module 2 - warning level > (upper limit)	0 - 65,535 K	Represented in °C/F similar to "Measured values" menu
Limit monitor - limit monitor limit	0 - 65535	-
Limit 1	0 - 65535	-
Limit 2	0 - 65535	-
Limit 3	0 - 65535	-
Limit 4	0 - 65535	-
Limit 5	0 - 65535	-
Limit 6	0 - 65535	-

Note

Password protection

It is only possible to change these parameters if password protection is not active. Only then can you choose the parameter to be modified with the "OK" button.

Proceed as follows to change a parameter:

- Choose menu item "Parameters" from the main menu
- Then choose the parameter to be changed in the relevant submenu
- Click OK to confirm the selection

You can now change the value with the ▲ and ▼ buttons. The longer you hold these buttons for, the larger the step by which the value changes.

2.13.14 Adapt display settings

The default settings configured in the basic unit can be modified via the display settings. However, changes made in this way do not result in a change to the configured defaults. In addition to selecting the language and adjusting the contrast or illumination, it is also possible to select the profiles here which are relevant for adjusting the main display. In the factory settings menu item, the changes made to the display settings can be reset to the values configured in the basic unit.

These are the most important menus by way of example:

Languages

English, German, French, Polish, Spanish, Portuguese, Italian, Finnish

Contrast

0 % to 100 % (default: 50 %)

Illumination

Specifies how long the backlit display will remain on on the operator panel with display after the last keystroke and enables permanent activation or deactivation of the backlit display. Off, 3 s, 10 s (default), 1 min, 5 min

Profiles

Enables selection of the display profiles for the main display. If a defined profile is no longer supported by SIMOCODE pro, for example, due to a changed hardware configuration, the start display will be shown instead of the default main display:

- IL1, IL2, IL3 [A] (default)
- Imax [A]
- IL1, IL2, IL3 [%]
- Imax [%]
- Imax, Cos phi
- Imax, UL1-N, Cos phi, S
- Imax, UL1-L2, Cos phi, S
- Imax, UL1-N, Cos phi, P
- Imax, UL1-L2, Cos phi, P
- In1/output AM1 [mA] (only if analog module 1 is present and configured)
- In2/output AM1 [mA] (only if analog module 1 is present and configured)
- In1/output AM2 [mA] (only if analog module 2 is present and configured)
- In2/output AM2 [mA] (only if analog module 2 is present and configured)
- Inputs AM 1 / inputs AM2 [mA]
- Max. temp. °C/°F TM1 (only if temperature module 1 is present and configured)
- Temperatures °C/°F TM1 (only if temperature module 1 is present and configured)
- Max. temp. °C/°F TM2 (only if temperature module 2 is present and configured)
- Temperatures °C/°F TM2 (only if temperature module 2 is present and configured)
- UL1-N, UL2-N, UL3-N
- UL1-L2, UL2-L3, UL3-L1
- Imax, UL1-N, Cos phi
- Imax, UL1-L2, Cos phi
- Imax, UL1-N °C/°F (temperature display TM1! [1])
- Imax, UL1-L2, °C/°F [1] (temperature display TM1! [1])
- Calculator 1
- Calculator 2
- Energy consumed (only if a current / voltage measuring module is configured).

See Section Read and adapt main display (Page 81).

NOTICE
1) Temperatures
The temperature from temperature module 1 is always shown in this display profile.
The temperature from temperature module 2 is not shown in this profile.

Warnings

Determines whether, in the case of a pending general warning, the display is switched over to the menu item "Warnings" so that details are displayed (not activated per default): Do not display (default) - Display

Faults

Determines whether, in the case of a pending general fault, the display is switched over to the menu item "Faults" so that details are displayed (switched on per default, higher priority than pending warnings): Do not display - Display (default)

Return to main display

Determines whether and when to return from the current menu to the main display:

Manual, 3 s, 10 s (default), 1 min, 5 min

2.13.15 Resetting, testing and parameterizing via commands

The "Commands" menu item contains all commands relating to SIMOCODE pro, e.g. for testing the feeder, resetting after tripping and/or transferring parameters into the memory module or into SIMOCODE pro. By safeguarding the device-internal parameterization against external access, e.g. via a password stipulated in SIMOCODE pro, individual commands and/or even the entire "Commands" menu item can be blocked.

Program memory module

Parameters are transferred to memory module The memory module must be plugged into the system interface for this purpose.

Clear memory module

Parameters in memory module are reset. The memory module must be plugged into the system interface for this purpose.

Read memory module

Acceptance of the parameters from the memory module into the basic unit. The memory module must be plugged into the system interface for this purpose.

Memory module write protection on

All contents of the memory module are write-protected. This prevents any inadvertent changes to the contents of the memory module and any parameter changes for the connected SIMOCODE pro V PN basic unit.

An inadvertent change of parameters for a motor feeder is prevented.

SIMOCODE pro signals the successful execution of the command with the event "Memory module write-protected".

Memory module write protection off

With this command you can cancel the write protection of the memory module.

Restart

Initialization of SIMOCODE pro. New start.

Factory settings

All parameters have their factory setting again, except for the password. Only possible if password protection is not active or the password is known.

Set time (= PC time)

If no NTP server address has been configured or no server has been found in the network, you can set the time of day here, that is, the real-time clock of SIMOCODE pro is set to the system time of the computer.

Test

Execute the test function. Same function as "TEST/RESET" button on the basic unit and operator panel

Reset

Execute a reset operation. Same function at "TEST/RESET" button on the basic unit and operator panel.

2.13.16 Display of all pending messages

This menu item provides an overview of all pending status information. A precise description of the pending status information messages can be found in Chapter Alarm, fault, and system events (Page 501).

2.13.17 Display of all pending warnings

This menu item provides an overview of all pending warnings. In the case of a newly pending general warning, it is possible to switch to this menu item automatically (this must be set via the display settings) so that the exact cause of the general warning can be displayed. A precise description of the pending warnings can be found in Chapter Alarm, fault, and system events (Page 501).

2.13.18 Display of all pending faults

This menu item provides an overview of all pending faults. In the case of a newly pending general fault, it is possible to switch to this menu item automatically (this must be set via the display settings) so that the exact cause of the general faults can be displayed. A precise description of the pending faults can be found in Chapter Alarm, fault, and system events (Page 501).

2.13.19 Reading out the device-internal error buffer

The "Error buffer" menu item enables access to the internal error buffer of SIMOCODE pro. The time and cause of the last 21 faults are displayed here. See also Chapter Reading our error buffer / error log (protocol) (Page 498). A precise description of the faults can be found in Chapter Alarm, fault, and system events (Page 501).

2.13.20 Reading out the device-internal event memory

The "Event Memory" menu item enables access to the SIMOCODE pro device-internal event memory. The two most recent events "DM-F enabling circuit closed" and "DM-F enabling circuit open" are displayed, together with the time, for both digital modules "DM-F Local" and "DM-F PROFIsafe".

Event memory

Switch to event memory display.

Last event "Enabling circuit closed," DM-F Local

The entry contains the last event "DM-F enabling circuit closed," the time and the related DIP switch configuration.

Note

Requirement

Possible only if digital module 1 is used as a DM-F Local module.

Last event "Enabling circuit closed," DM-F PROFIsafe

The entry contains the last event "DM-F enabling circuit closed", the time and the related PROFIsafe address.

Note

Requirement

Possible only if digital module 1 is used as a DM-F PROFIsafe module.

Last event "Enabling circuit open"

The entry contains the last event "DM-F enabling circuit open" and the corresponding time.

Note

Requirement

Possible only if digital module 1 is used as a DM-F Local or DM-F PROFIsafe module.

2.13.21 Identification of the motor feeder and the SIMOCODE pro components

In the "Identification" menu item, you will find detailed information about the SIMOCODE pro hardware components used, e.g. hardware and firmware versions. Furthermore, this dialog box enables the identification of the motor feeder via a plant identifier stored in SIMOCODE pro, as well as a request for the location designation and display of the device-internal comment.

These are the most important menus by way of example:

Identification

- Plant identifier
- Location designation
- Date
- Comment

Basic unit

- MLFB (order number)
- Short designation
- Manufacturer
- Device subfamily
- Device class
- System
- Identification number
- HW revision level
- FW revision level
- Time stamp

Display

- MLFB (order number)
- HW revision level
- FW revision level

2.13.22 Current measuring module (IM)

The current measuring module must be selected according to the current setting to be monitored for each feeder (rated operating current of the motor). The current measuring modules cover current ranges between 0.3 A and 630 A, with intermediate transformers up to 820 A.

Current measuring modules for the following current ranges are available (see diagram below):

- 0.3 to 3 A with through-hole technology
- 2.4 to 25 A with through-hole technology
- 10 to 100 A with through-hole technology
- 20 to 200 A with through-hole technology or bus connection system
- 63 to 630 A with bus connection system

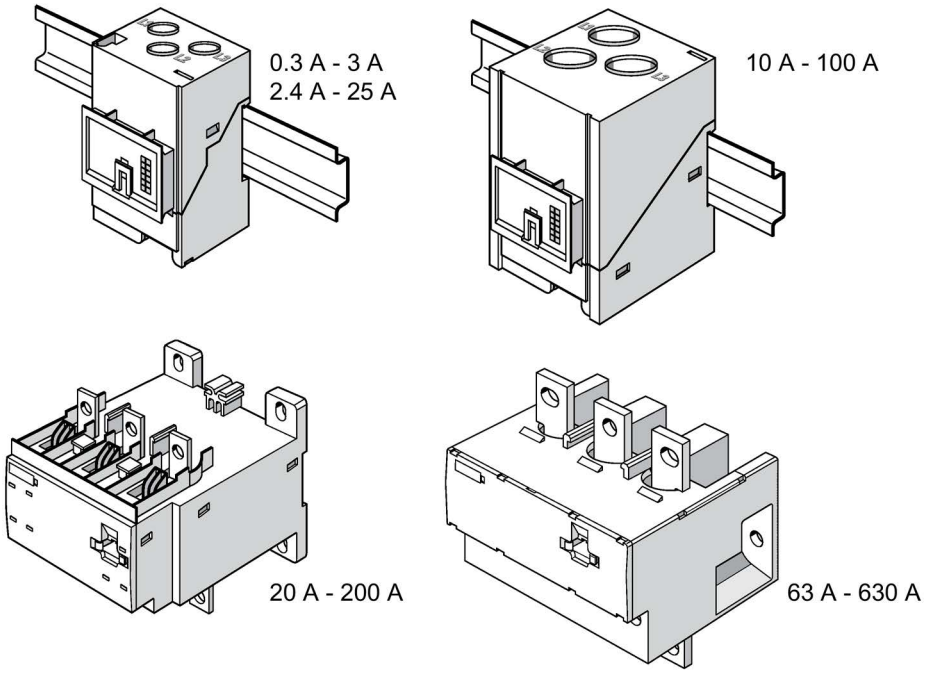


Figure 2-32 Variants of current measuring modules

The current measuring module is connected to the basic unit via a connecting cable, which also supplies the power. Current measuring modules up to 100 A are suitable for standard rail mounting or can be fixed directly to the mounting plate using additional push-in lugs. Basic units can be snapped directly onto the current measuring modules. Current measuring modules up to 200 A can also be mounted on the standard mounting rail or, optionally, they can be fixed directly to the mounting plate with the screw attachments that are integrated in the enclosure. The current measuring module up to 630 A can only be mounted using the integrated screw attachments.

Note

Current measuring modules with a set current of up to 100 A can be connected to the basic unit mechanically and be installed as a unit (behind one another). Larger current measuring modules can only be mounted separately.

2.13.23 Current / voltage measuring module (UM)

It allows a current / voltage measuring module to be used instead of a current measuring module. In addition to measuring the motor current, current / voltage measuring modules also enable:

- Monitoring of voltages up to 690 V
- Calculation and monitoring of power and cos phi
- Monitoring of the phase sequence

With SIMOCODE ES, you can define under "Device configuration → Display voltage" whether the phase voltage or line-to-line voltage will be used system-wide.

Note

Change of parameter "Device configuration → Display voltage"

Each change to this parameter requires that the communication interface be restarted when the web server is active. A new start interrupts all Ethernet and PROFINET links and reestablishes them afterward.

The following figure shows the various current / voltage measuring modules:

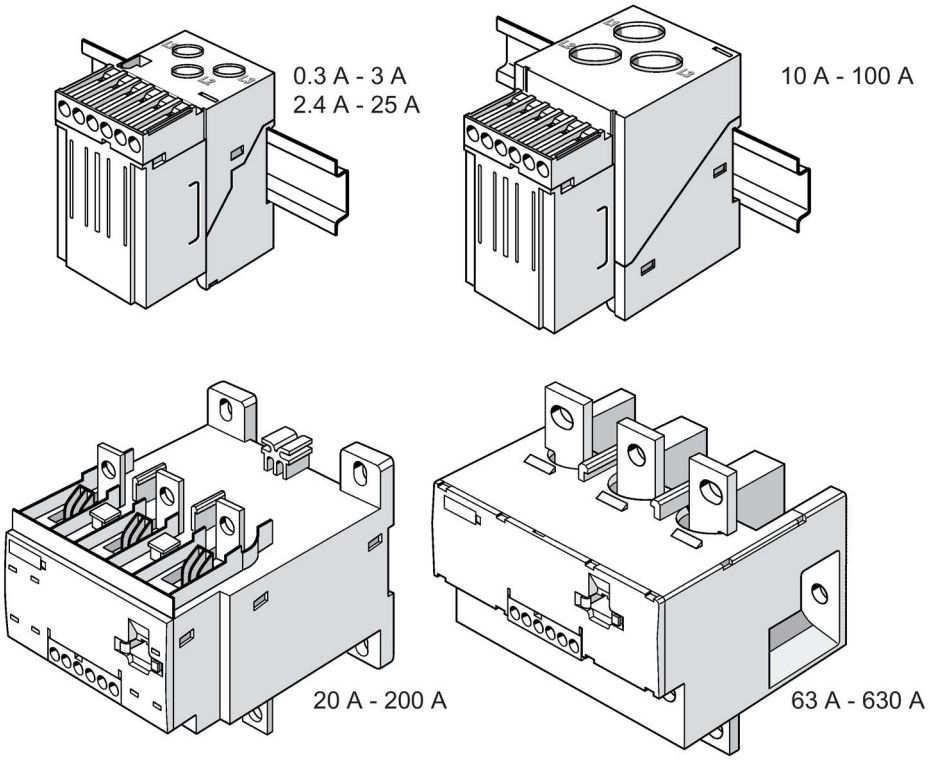


Figure 2-33 Current / voltage measuring modules

The current / voltage measuring module is connected to the basic unit via a connecting cable, which also supplies the power. Current / voltage measuring modules up to 100 A are suitable for standard rail mounting or can be fixed directly to the mounting plate using additional push-in lugs. Current / voltage measuring modules up to 200 A can also be mounted on the standard mounting rail or, optionally, they can be fixed directly to the mounting plate with the screw attachments that are integrated in the enclosure. The current / voltage measuring module up to 630 A can only be mounted using the integrated screw attachments. Basic units must always be installed separately next to the current / voltage measuring modules.

For the purpose of calculating or monitoring power-related measured values, current / voltage measuring modules are equipped with additional, removable terminals to which the voltages of all three phases of the main circuit are connected. An additional 3-core cable can be used, for example, to connect the main circuit directly from the bus connections of the current / voltage measuring module with the connection terminals of the voltage measuring module.

Using a decoupling module

A decoupling module may be required when using a voltage measuring module. See Chapter Decoupling module (DCM) for current / voltage measuring modules (Page 103), device series SIMOCODE pro V PN.

2.13.24 Decoupling module (DCM) for current / voltage measuring modules

When measuring voltage and power with SIMOCODE pro in ungrounded networks, each current / voltage measuring module must have a decoupling module connected upstream in series at the system interface. When measuring voltage and power with SIMOCODE pro in networks with additional insulation measurement or insulation monitoring, each current / voltage measuring module must be connected to a preceding decoupling module. If using the 3UF710 current measuring modules in these networks, it is imperative that additional decoupling modules are not used.

1 decoupling module for connection in series upstream from a current / voltage measuring module at the system interface

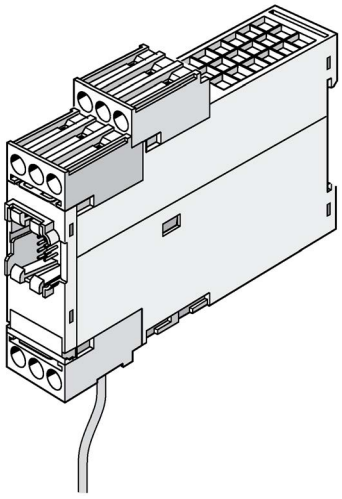


Figure 2-34 Decoupling module, SIMOCODE pro V PN device series

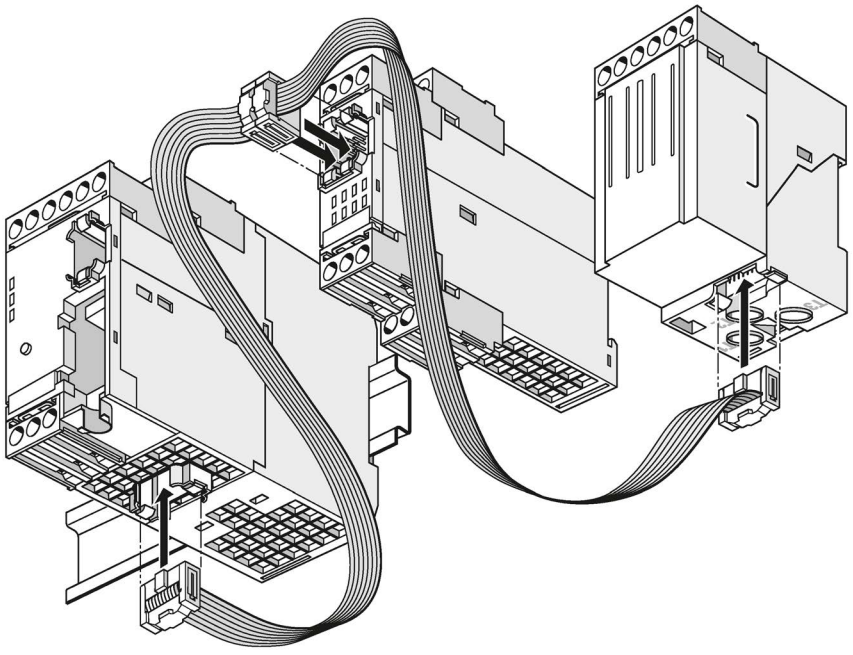


Figure 2-35 Decoupling module - configuration with basic unit and current measuring module

Using the decoupling module in different networks

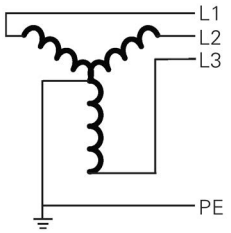
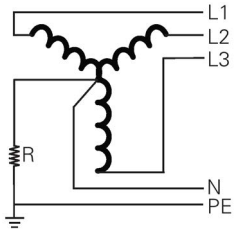
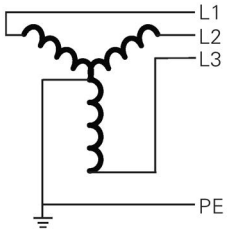
A decoupling module may be required when using a voltage measuring module, especially for the following networks:

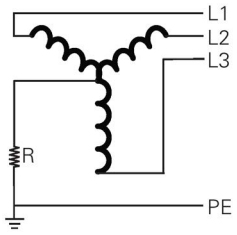
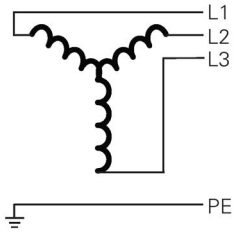
- Insulated networks
- High-resistance networks
- Asymmetrically grounded networks
- Single-phase networks

The table below shows decoupling module requirements for different network types and configurations (star networks, delta networks and single-phase networks):

Star networks:

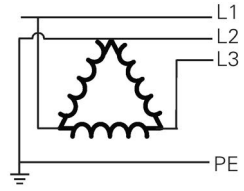
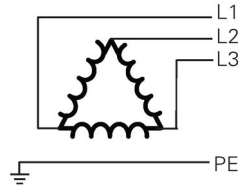
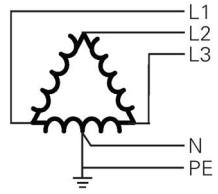
Table 2- 6 Decoupling module requirements for star networks

Star network	Network configuration	Decoupling module required?	Note
4-wire, star, grounded with low impedance		No	"TN-S system" according to IEC 60364
4-wire, star, grounded with high impedance		Yes	—
3-wire, star, grounded with low impedance		No	"TN-C system" according to IEC 60364

Star network	Network configuration	Decoupling module required?	Note
3-wire, star, grounded with high impedance		Yes	—
3-wire, star, with isolated neutral		Yes	"IT system" according to IEC 60364

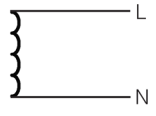
Delta networks

Table 2- 7 Decoupling module requirements for delta networks

Delta network[1)]	Network configuration	Decoupling module required?	Note
3-wire, delta, one phase grounded		Yes	Parameter "Voltage display → line-to-line voltages" must be active.
3-wire, delta, isolated		Yes	Parameter "Voltage display → line-to-line voltages" must be active.
Center tap grounded		Yes	Parameter "Voltage display → line-to-line voltages" must be active.
1) Mainly in North America			

Single-phase networks

Table 2- 8 Decoupling module requirements for single-phase networks

Single-phase network	Network configuration	Decoupling module required?	Note
		Yes	Parameter "Voltage display → line-to-line voltages" must be active.

2.13.25 Expansion modules

Expansion modules are intended as optional additions for the SIMOCODE pro V PN basic unit. The following expansion modules are available:

- Digital modules (DM)
- Fail-safe Local (DM-F Local) fail-safe digital module
- PROFIsafe fail-safe digital module (DM-F PROFIsafe)
- Analog modules (AM)
- Ground-fault module (EM)
- Temperature modules (TM)

All expansion modules have an enclosure width of 22.5 mm or 45 mm. They are equipped with 2 system interfaces (incoming/outgoing) and removable terminals on the front panel. The expansion module is connected, for example, to the system interface of the basic unit via the first system interface using a connecting cable. For example, further expansion modules or the operator panel can be connected via the second system interface.

All expansion modules are suitable for DIN rail mounting or can be fastened directly to a mounting plate using additional push-in lugs.

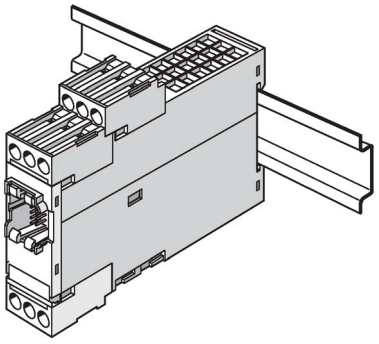


Figure 2-36 Expansion module, SIMOCODE pro V PN device series

Up to 5 expansion modules can be connected in any sequence to a basic unit.

Digital module (DM)

Digital modules offer the option of further increasing the types and number of binary inputs and relay outputs available at the SIMOCODE pro V PN basic unit.

The following digital modules are available for the SIMOCODE pro V PN basic unit:

Table 2- 9 Versions of digital modules

Inputs	Supply	Outputs
4 inputs	External 24 V DC	2 monostable relay outputs
4 inputs	External 110 to 240 V AC / DC	2 monostable relay outputs
4 inputs	External 24 V DC	2 bistable relay outputs
4 inputs	External 110 to 240 V AC / DC	2 bistable relay outputs

Up to two digital modules can be connected to one SIMOCODE pro V PN basic unit.
4 additional binary inputs and 2 additional binary outputs are thus provided by each module. All versions can be combined with each other. SIMOCODE pro can therefore be expanded to provide a maximum of 12 binary inputs and 7 relay outputs.

With the monostable version, the relay outputs open after disconnection / failure / interruption of the supply voltage. With the bistable version, the switching state of the relay outputs is maintained even after disconnection / failure / interruption of the supply voltage.

You can set delays (debounce time) for the digital module inputs if required (see Chapter Digital module inputs (Page 302)).

Supplying the inputs: See Chapter Wiring (Page 449).

Note

To implement some motor control functions, at least one further digital module is required in addition to the relay outputs of the SIMOCODE pro V PN basic unit.

Note

If 2 digital modules are being used, the digital module connected the closest to the basic unit via the system interface will be identified as digital module 1. The digital module connected next in line will be identified as digital module 2. If one digital module is connected to the front and another to the lower system interface of the basic unit, the digital module on the front system interface of the basic unit will always be identified as digital module 1.

Fail-safe digital module DM-F

The fail-safe digital module DM-F extends the SIMOCODE pro motor management system with fail-safe functions for switching off motors:

- DM-F Local fail-safe digital module
- DM-F PROFIsafe fail-safe digital module

These modules conform to the general requirements for EMERGENCY STOP devices or safety circuits described in EN 418 and EN 60204-1 (06.2006).

The maximum performance / safety integrity levels are as follows, depending on the external circuitry:

- PL e with Category 4 according to ISO 13849-4
- SIL 3 according to IEC 61508/62061

Safety engineering and safety-related functions:

- These are exclusively restricted to the fail-safe digital modules
- They therefore have no direct impact on existing SIMOCODE pro components and concepts

LEDs for DM-F device diagnostics

See Chapter Technical data of the DM-F LOCAL digital module (Page 641) and Technical data of the DM-F-PROFIsafe digital module (Page 643) and/or Manual SIMOCODE pro Safety fail-safe digital modules (http://support.automation.siemens.com/WW/view/en/50564852)).

"TEST/RESET" DM-F button

See Manual SIMOCODE pro Safety fail-safe digital modules (http://support.automation.siemens.com/WW/view/en/50564852).

Setting the DM-F DIP switches

See Chapter Safety-oriented tripping (Page 334) and/or Manual SIMOCODE pro Safety fail-safe digital modules (http://support.automation.siemens.com/WW/view/en/50564852)

DM-F system interfaces

See Manual SIMOCODE pro Safety fail-safe digital modules (http://support.automation.siemens.com/WW/view/en/50564852).

Documentation for safety-related functions and fail-safe digital modules

Safety-related functions and additional information on fail-safe digital modules can be found in the following documentation:

- Manual "Fail-safe Digital Modules SIMOCODE pro Safety"
- Operating Instructions "Fail-safe Digital Module DM-F Local"
- Operating Instructions "Fail-safe Digital Module DM-F PROFIsafe"

You will find the System Manuals and Operating Instructions at Manuals/operating instructions (http://www.siemens.com/industrial-controls/manuals)

The fail-safe **DM-F LOCAL digital module** facilitates safety-related tripping of a motor feeder by means of a hardware signal that is detected and evaluated by the module.

From a non-safety-related perspective, the DM-F module comprises:

Table 2- 10 Inputs, outputs and voltage supply to the DM-F Local digital module

Inputs	Supply[1)]	Outputs
4 digital inputs (non-safety-related): • Input 1: Sensor circuit • Input 2: Start input • Input 3: Feedback circuit • Input 4: Cascade input	24 V DC	2 non-safety-related monostable relay outputs

1)

The fail-safe digital module DM-F PROFIsafe provides safety-related tripping of a motor feeder by a fail-safe controller (F-CPU) via PROFIBUS with the fail-safe PROFIsafe profile.

From a non-safety-related perspective, the DM-PROFIsafe module comprises:

Table 2- 11 Inputs, outputs and voltage supply to the DM-F PROFIsafe digital module

Inputs	Supply[1)]	Outputs
4 non-safety-related digital inputs	24 V DC	2 non-safety-related monostable relay outputs

1)

⚠ WARNING

Hazardous Voltage.

For the 24 V DC power supply, always use an SELV or PELV power supply unit.

Surge suppressors are required for inductive loads!

Analog module (AM)

By means of the analog module, the basic unit can be optionally expanded by analog inputs and outputs (0 / 4 mA to 20 mA). This makes it possible to detect and monitor any process variables that can be mapped onto a 0/4 to 20 mA signal.

Typical applications are, for example, fill-level monitoring for protecting pumps from dry operation, or the monitoring of pollution in a filter using a differential pressure transducer. The automation system has free access to the measured process variables. The analog output can, for example, be used for the visualization of any process variables on a pointer instrument. The automation system can also freely access the output via PROFINET.

- 2 analog modules can be connected
- For each analog module, 2 analog inputs (passive) for detecting 0 / 4 mA to 20 mA signals. Both inputs are set either to 0 mA to 20 mA or to 4 mA to 20 mA
- For each analog module, 1 output for outputting a 0 / 4 mA to 20 mA signal

Note

The inputs of the analog module are passive inputs that have to be supplied in each case by an external, isolated current source (e.g. isolating transducer). If the output of the analog module is not being utilized, it can be used as current source for an input.

Ground-fault module (EM)

The 3UF7 500-1AA00-0 and 3UF7 510-1AA00-0 ground-fault modules are suitable for use with the SIMOCODE pro V PN basic unit. 1 ground-fault module can be connected to each SIMOCODE pro V PN basic unit.

NOTICE
Use of residual current transformers The 3UF7 500-1AA00-0 ground-fault module requires the 3UL22 residual current transformer. The 3UF7 510-1AA00-0 ground-fault module requires the 3UL23 residual current transformer.

Detailed information on ground-fault monitoring: See Monitoring functions (Page 39) and Earth-fault monitoring (Page 240).

Temperature module (TM)

The temperature module offers the option of expanding SIMOCODE pro V PN with an analog temperature monitoring system. In addition to the thermistor monitoring system for the basic units, up to 3 analog sensor measuring circuits per temperature module (per temperature module in two or three-wire systems) can be connected, the temperatures in the 3 sensor measuring circuits can be measured, and the highest temperature in all sensor measuring circuits can be determined. The temperatures recorded can be fully integrated and monitored in the process and can also be transferred to a higher-level automation system via PROFINET. You can, for example, implement analog temperature monitoring of the motor windings, bearings, coolant or gearbox oil. SIMOCODE pro V PN supports various sensor types (NTC, KTY83/84, PT100, and PT1000) for use with solid, fluid or gaseous media.

Note

The same sensor type must be used in all sensor measuring circuits.

- 2 temperature modules can be connected
- 3 sensor measuring circuits per temperature module in 2 or 3-wire systems

2.13.26 Accessories

The following figure shows the series-neutral accessories:

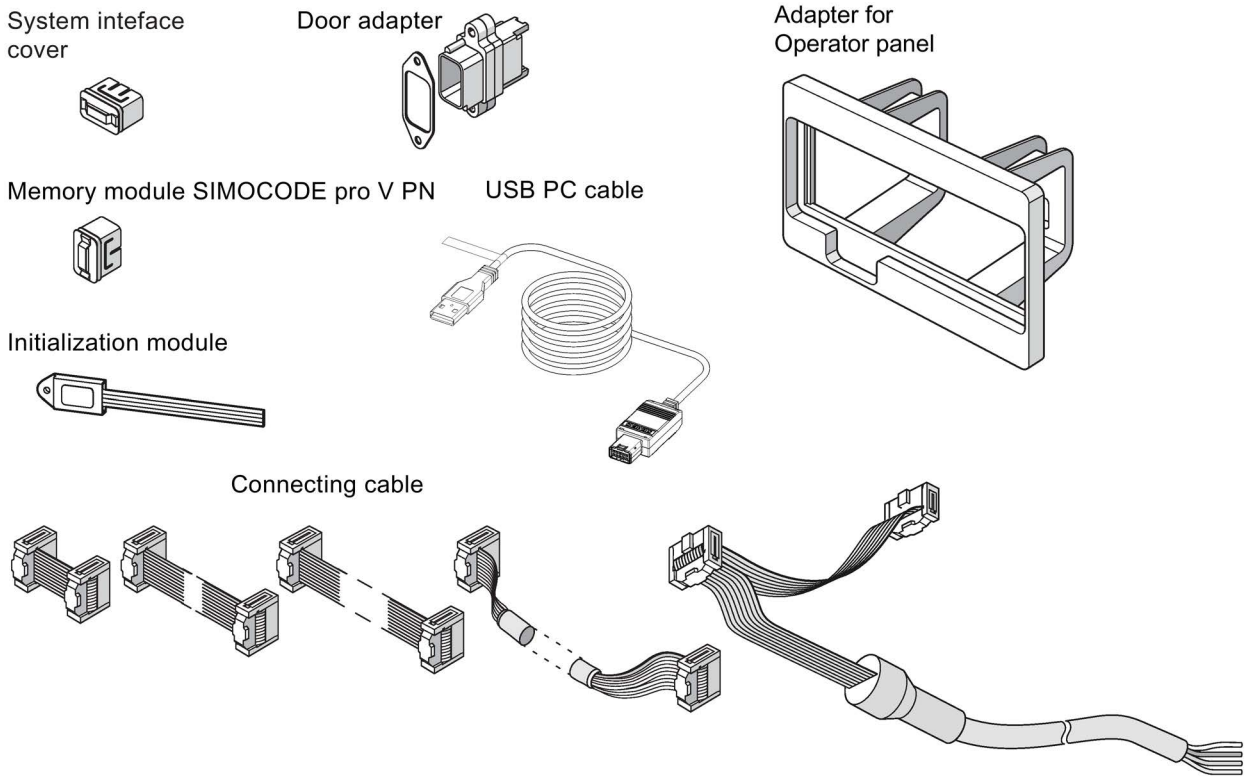


Figure 2-37 Accessories

USB PC cable

With the USB PC cable for device parameterization, a PC is connected via its USB interface to the SIMOCODE pro system interface.

Note

PC cable variant

For SIMOCODE pro V PN, a PC cable serial 3UF7940-0AA00-0 as from product version *E02* or a USB PC cable USB 3UF7941-0AA00-0 can be used.

SIMOCODE pro V PN memory module

The memory module allows all system parameter settings to be backed up and transferred to a new system without the need for additional resources or specialist expertise, for example, if the device is replaced (see also Chapter Replacing SIMOCODE pro components (Page 494)).

Note

Memory module variant

For SIMOCODE pro V PN, the 3UF7901-0AA00-0 memory module is required.

The 3UF7900-0AA00-0 memory module is not supported.

Initialization module

The initialization module enables all system parameter settings to be backed up and transferred to a new system without the need for additional resources or specialist expertise, for example, if the device is replaced. It can be installed permanently in the switchgear.

Further information: See Chapter Compartment identification (PROFINET) (Page 717)

Connecting cable

Different types and lengths of connecting cable are available. It is required to connect the basic unit to its current measuring module and, if applicable, to its expansion modules or to the operator panel.

Note

The total length of all connecting cables must not exceed 3 m on either of the system interfaces of the basic unit.

Door adapter

The door adapter is used to facilitate access to the SIMOCODE pro system interface, for example via the front panel, to ensure fast parameterization.

System interface cover

The system interface cover helps to protect and/or seal the system interfaces against the ingress of dirt. In normal operation, unused system interfaces must be closed.

Operator panel adapter

The operator panel adapter enables the use of the SIMOCODE pro 3UF720 operator panel in a front panel cutout, in which a SIMOCODE DP 3UF52 operator panel (IP54 degree of protection) was previously used, e.g. after system replacement.

2.13.27 Software

Software overview

With the communication-capable switching devices, the user-friendliness of the parameterization software and good system integration (in other words, the ability to integrate optimally and quickly into the most diverse plant configurations and process automation systems) also play an important role alongside the device functionalities and the hardware configuration.

For this reason, the SIMOCODE pro system provides suitable software tools for consistent, time-saving parameterization, configuring and diagnostics:

- SIMOCODE ES for totally integrated commissioning and service
- SIMOCODE pro PCS 7 function block library for total integration into PCS 7

SIMOCODE ES

SIMOCODE ES is the standard parameterization software for SIMOCODE pro.

SIMOCODE ES is a user-friendly, clearly structured user interface for the SIMOCODE pro motor management system

for parameterizing, operating, monitoring and testing SIMOCODE pro in the field or from a central location via PROFIBUS. By displaying all operating, service and diagnostics data, SIMOCODE ES supplies important information when maintenance is required or a fault occurs. It helps to prevent faults or to localize and rectify them once they have occurred.

Unnecessary plant downtimes can be prevented by changing parameters online (even during operation).

In addition, the graphic editor enables extremely ergonomic and user-friendly parameterization by dragging and dropping: Inputs and outputs of function blocks can be

linked graphically and the parameters set. Configured functions can be described in detail and device parameterization can be documented graphically using comments.

The printing function integrated in SIMOCODE ES allows all parameters to be fully documented in compliance with DIN EN ISO 7200.

In addition, the graphic editor enables extremely ergonomic and user-friendly parameterization by dragging and dropping: Inputs and outputs of function blocks can be linked graphically and the parameters set. Configured functions can be described in detail and device parameterization can be documented graphically using comments. This speeds up commissioning and simplifies plant documentation. The optimized user interface and integrated graphic editor are used to assign parameters.

Further functions: Operation, diagnostics, testing, S7 routing, teleservice via MPI, STEP 7 Object Manager.

Versions:

- SIMOCODE ES 2007 Basic
- SIMOCODE ES 2007 Standard
- SIMOCODE ES 2007 Premium.
- SIMOCODE ES in the TIA Portal

Note

SIMOCODE ES 2007

The operating procedures described in this manual are based on SIMOCODE ES 2007.

See also An overview of system components (Page 49) for more information.

You will find a demo version and the latest updates on the Internet at SIMOCODE ES (http://support.automation.siemens.com/WW/view/en/20356462/133100)

Note

SIMOCODE ES is updated and improved continually. You can download the current service packs and hot fixes from SIMOCODE ES (http://support.automation.siemens.com/WW/view/en/20356462/133100).

OM SIMOCODE pro Object Manager

The OM SIMOCODE pro Object Manager is a component of SIMOCODE ES. When SIMOCODE ES and OM SIMOCODE pro are installed on a PC / PG, SIMOCODE ES can be called directly from STEP 7 HW Config, allowing simple and standardized SIMATIC S7 configuring procedures to be employed.

SIMOCODE pro PCS 7 library

The PCS 7 block libraries for SIMOCODE, motor starters, soft starters and AS-Interface can be used for simple and easy integration of the corresponding devices into the SIMATIC PCS 7 process control system. PCS 7 block libraries contain the diagnostics and driver blocks corresponding with the diagnostics and driver concept of SIMATIC PCS 7 as well as the elements (icons and faceplates) required for operator control and process monitoring.

Types of delivery and license:

The PCS 7 block libraries supplied on CD-ROM allow the user to run the required engineering software on one engineering station (single license) including the runtime software for executing the AS blocks in one automation system (single license). If the AS blocks are to be used in additional automation systems, the corresponding number of runtime licenses are required which are supplied without a data carrier.

Note

The PCS 7 libraries are subject to continual updating and improvement.

You can download the current service packs and hot fixes from Support (http://www.siemens.com/simocode)→ Software.

Note

Observe the respective system versions!

GSD file

GSD files are used for integration into SIMATIC S7 or any automation system with PROFINET IO. The latest version is on the Internet at PROFINET GSD files (http://support.automation.siemens.com/WW/view/en/38702563). Further information on integrating PROFINET IO devices can be found in the automation system documentation.

2.14 Structural configuration of SIMOCODE pro

2.14.1 Function blocks

See also Chapter Overview of function blocks (alphabetical) (Page 122).

Properties

Function blocks are stored internally in the SIMOCODE pro system, e.g. for the administration of various control stations, for the set control function, or for motor protection. Every function block has a name and can be equipped with inputs and outputs. The inputs and outputs are used for the internal connection of the various function blocks and, thus, the setup of a device-internal logic instead of an externally wired logic in the control circuit.

The following table shows the possible input types of the internal function blocks of SIMOCODE pro:

Table 2- 12 Input types of the internal function blocks of SIMOCODE pro

Input	Symbol	Example
Plugs (binary)		Function blocks **in** the basic unit may have binary plugs. These are connected to binary sockets via software. **They are relevant for parameterization, e.g. with SIMOCODE ES.**
Plugs (analog)		Function blocks **in** the basic unit may have analog plugs. These are connected via software to analog sockets. **They are relevant for parameterization, e.g. with SIMOCODE ES.** Example: 2-byte word for cyclic send data.
Screw terminals		Screw terminals are **outside**, e.g. "BU Input" function block. Control devices and auxiliary switches are normally connected there.
Receive data **from the** IO controller		**From the IO controller to SIMOCODE pro,** e.g. "Cyclic Receive" function block.

The following table shows the possible output types of the internal function blocks of SIMOCODE pro:

Table 2- 13 Output types of the internal function blocks of SIMOCODE pro

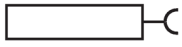
Output	Symbol	Example
Sockets (binary)		Function blocks in the basic units may have binary sockets. These are assigned via software to binary plugs. **They are relevant for parameterization, e.g. with SIMOCODE ES.**
Sockets (analog)		Function blocks in the basic units may have analog sockets. These are assigned via software to analog plugs. **They are relevant for parameterization, e.g. with SIMOCODE ES.** Example: 2-byte word, max. current I_max.
Screw terminals		Screw terminals are **outside**, e.g. "BU Output" function block. The contactors, for example, are connected here.
Send data **to the** IO controller		**From SIMOCODE pro to the IO controller**, e.g."Cyclic Send" function block.
Binary terminal block		Internal binary signals (binary sockets) that are not assigned to a function block (fault, status, other), e.g. "Status - Device OK" (in the graphic editor).
Analog terminal block		Internal analog signals (analog sockets) that are not assigned to a function block, e.g. "Phase Unbalance" (in the graphic editor).

Diagram of basic structure

The following function block diagram shows the basic structure of SIMOCODE pro with its external inputs and outputs and internally stored function blocks:

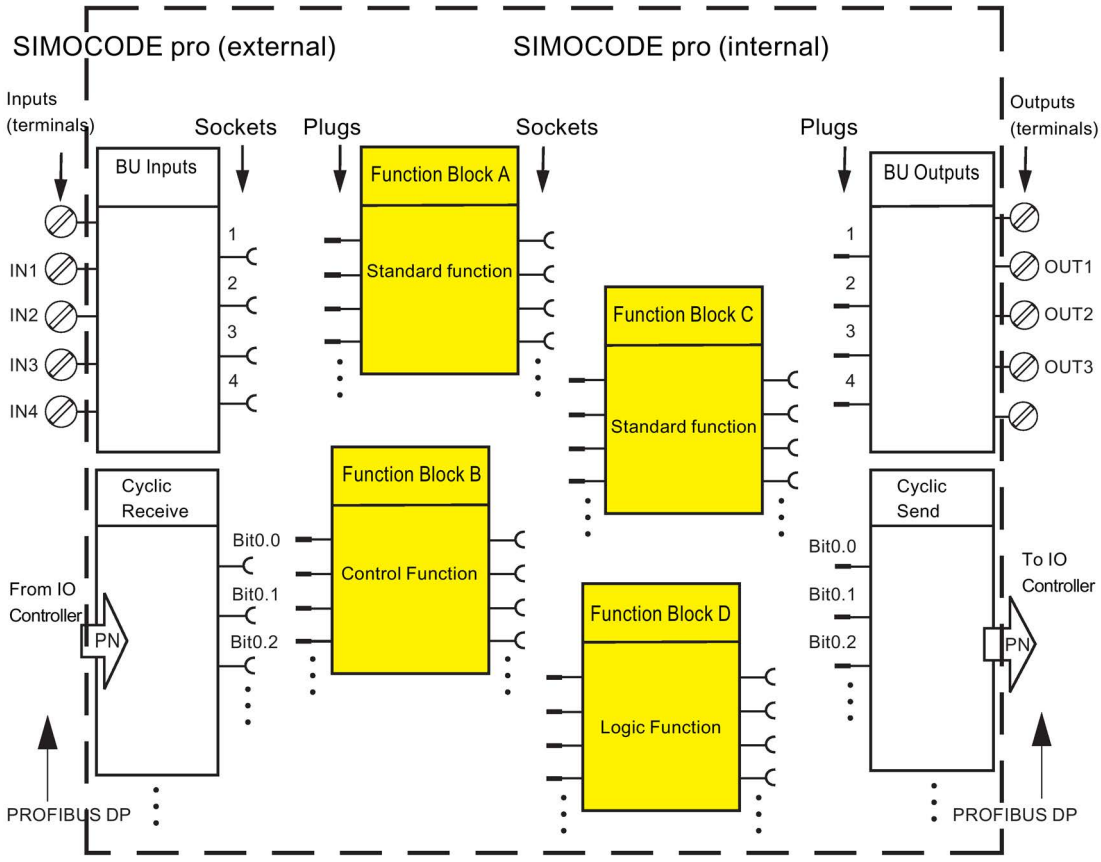


Figure 2-38 Principal configuration of SIMOCODE pro

Connecting plugs with sockets

Note

The function block plugs and sockets have **not** already been connected at the factory with the binary inputs and the relay outputs of the basic unit. The internal wiring (connection between plugs and sockets) is determined by the selected application. [1)]

Note

When you have already installed external wiring, but have not yet parameterized SIMOCODE pro:

If you press a button now, the contactors will not be energized! [1)]

1) If you select and load a preset application to the switching device (e.g. reversing starter) in SIMOCODE ES, all links and interlocks for the reversing starter are set up in the basic unit.

2.15 Overview of function blocks (alphabetical)

Analog value recording

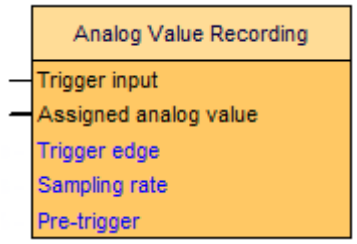


Figure 2-39 Analog value recording

See Chapter Analog value recording (Page 313).

AM 1/2 output

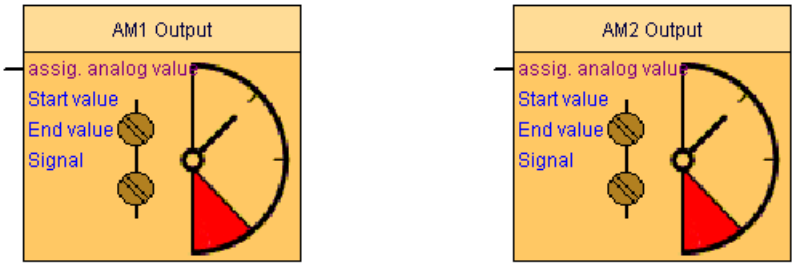


Figure 2-40 AM1/2 output

See Chapter Outputs (Page 275).

AM 1/2 inputs

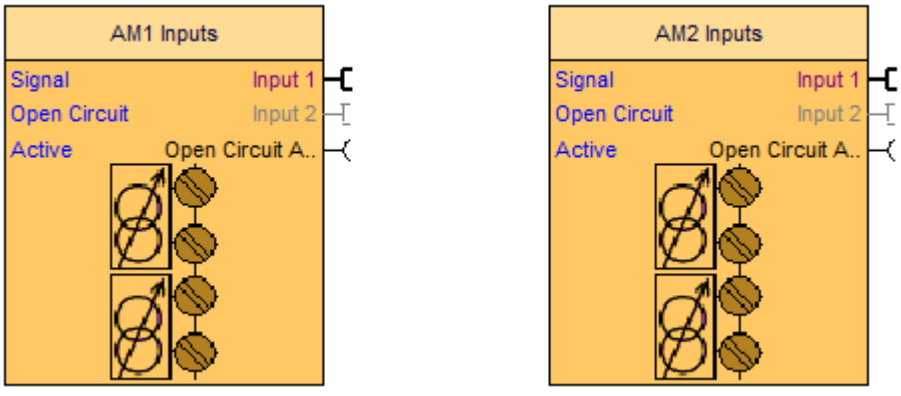


Figure 2-41 AM1/2 inputs

See Chapter Inputs (Page 293).

Analog multiplexer

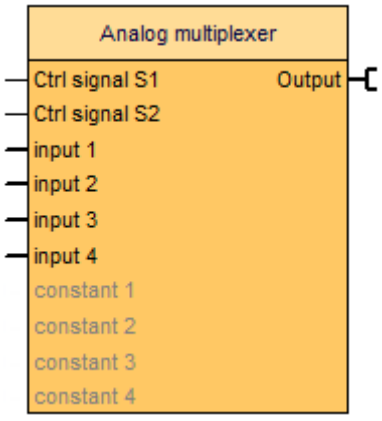


Figure 2-42 Analog multiplexer

See Chapter Logic modules (Page 343).

OP LED

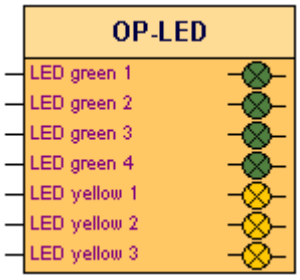


Figure 2-43 OP LED

See Chapter Outputs (Page 275).

OP buttons

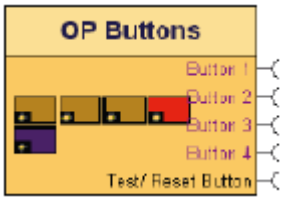


Figure 2-44 OP buttons

See Chapter Inputs (Page 293).

Operation monitoring

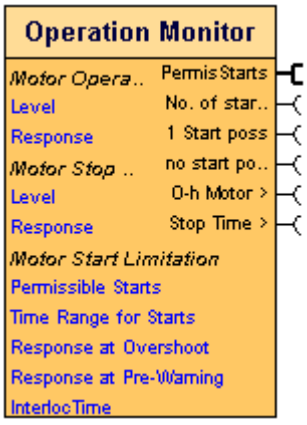


Figure 2-45 Operation monitoring

See Chapter Monitoring functions (Page 239).

Flashing 1 (2, 3)



Figure 2-46 Flashing 1

See Chapter Logic modules (Page 343).

OPO

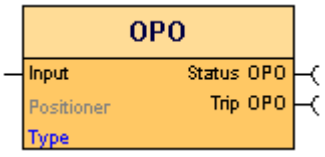


Figure 2-47 OPO

See Chapter Standard functions (Page 317).

Calculator 1

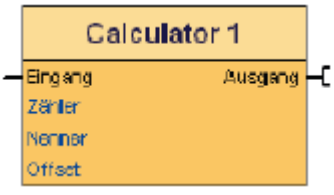


Figure 2-48 Calculator 1

See Chapter Logic modules (Page 343).

Calculator 2

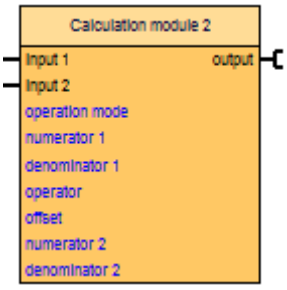


Figure 2-49 Calculator 2

See Chapter Logic modules (Page 343).

Calculators 3, 4

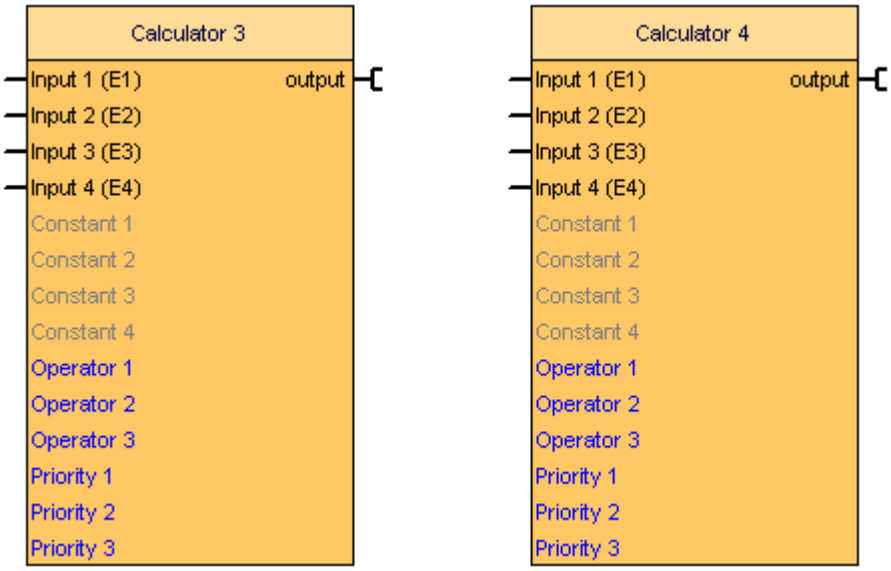


Figure 2-50 Calculator 3.4

See Chapter Logic modules (Page 343)

DM1(2) outputs

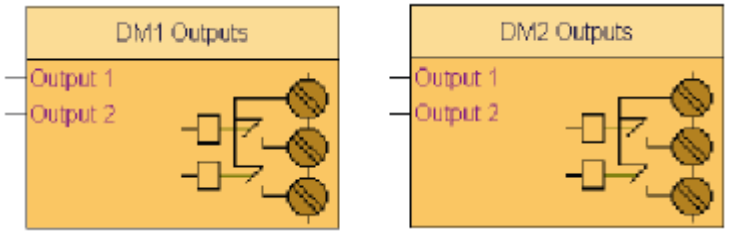


Figure 2-51 DM1(2) outputs

See Chapter Outputs (Page 275).

DM1(2) inputs

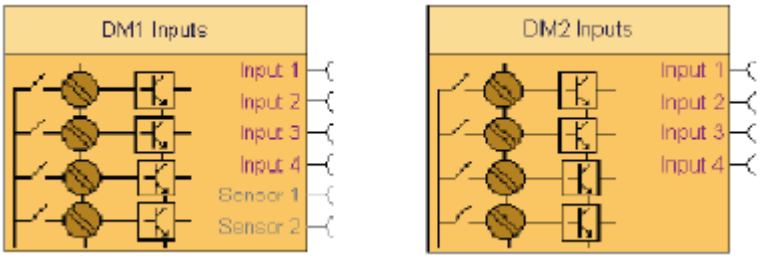


Figure 2-52 DM1(2) inputs

See Chapter Inputs (Page 293).

DM1(2) inputs, DM-F = DM-F Local or DM-F PROFIsafe

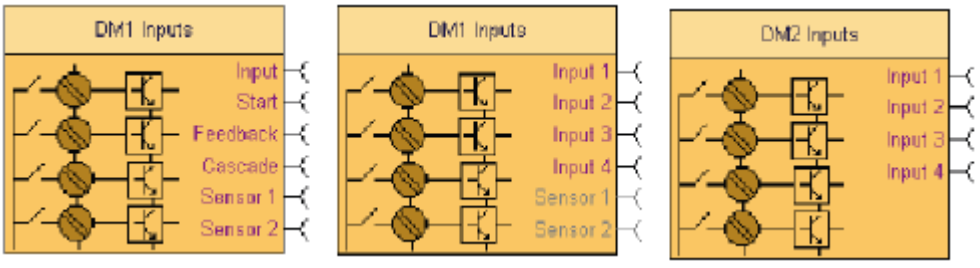


Figure 2-53 DM1(2) inputs, DM-F = DM-F Local or DM-F PROFIsafe

See Chapter Inputs (Page 293).

Extended protection

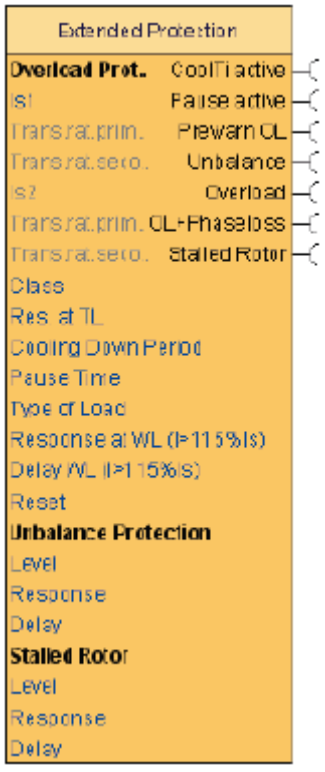


Figure 2-54 Extended protection

See Chapter Motor control (Page 173).

Extended control

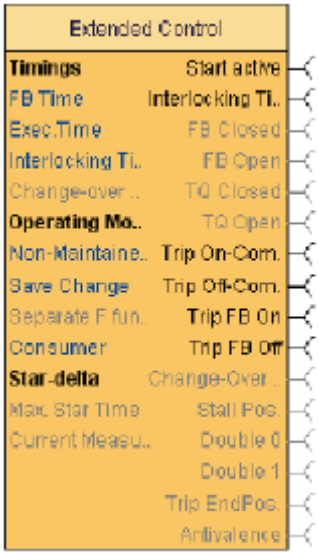


Figure 2-55 Extended control
See Chapter Motor control (Page 173).

External fault 1 (2, 3, 4, 5, 6)

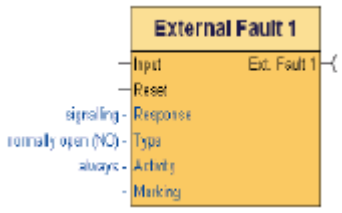


Figure 2-56 External fault 1

See Chapter Standard functions (Page 317).

Flicker 1 (2, 3)



Figure 2-57 Flicker 1

See Chapter Logic modules (Page 343).

BU outputs

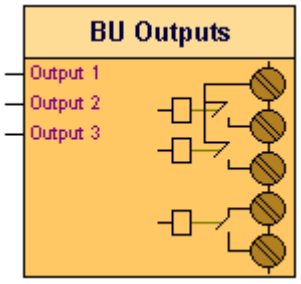


Figure 2-58 BU outputs

See Chapter Outputs (Page 275).

BU inputs

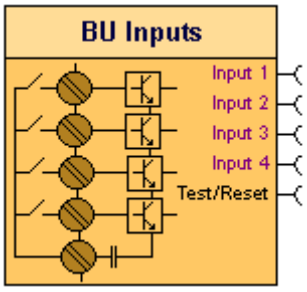


Figure 2-59 BU inputs

See Chapter Inputs (Page 293).

Limit monitor 1 (2, 3, 4, 5, 6)

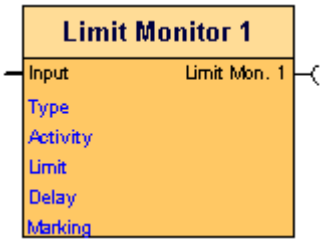


Figure 2-60 Limit monitor 1

See Chapter Logic modules (Page 343).

Emergency start



Figure 2-61 Emergency start

See Chapter Standard functions (Page 317).

Non-volatile element 1 (2, 3, 4)



Figure 2-62 Non-volatile element 1

See Chapter Logic modules (Page 343).

OPC UA send data 0 (1)

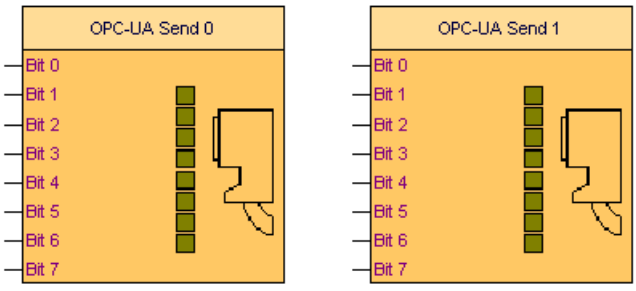


Figure 2-63 OPC UA send byte 0 (1)

See Chapter Outputs (Page 275).

OPC UA receive data 0 (1, 2/3)

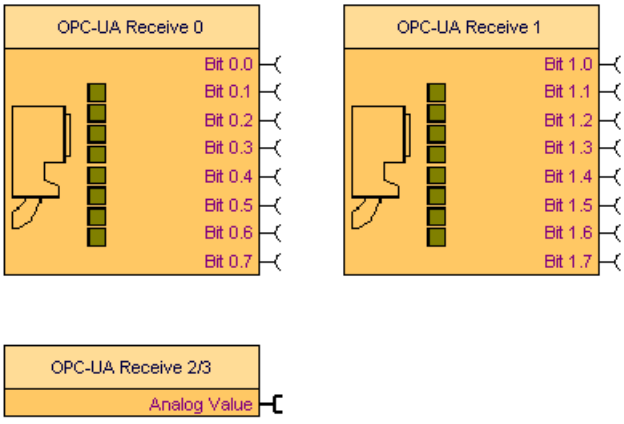


Figure 2-64 OPC UA control byte 0 (1, 2/3)

See Chapter Inputs (Page 293).

Pulse width modulator

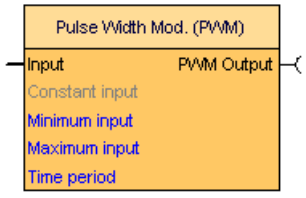


Figure 2-65 Pulse width modulator

See Chapter Logic modules (Page 343).

TPF

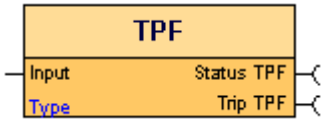


Figure 2-66 TPF

See Chapter Standard functions (Page 317).

Protection/Control

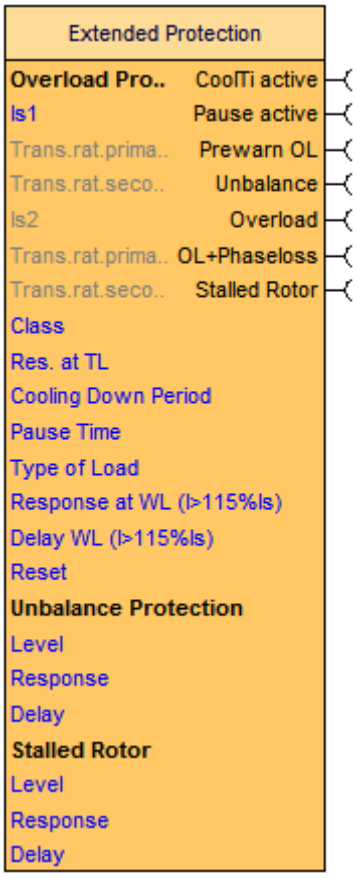


Figure 2-67 Protection/Control

See Chapter Motor control (Page 173).

Signal conditioning 1 (and 2, 3, 4, 5, 6)

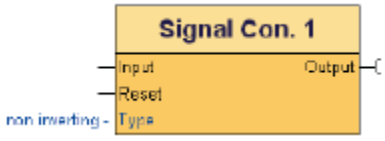


Figure 2-68 Signal conditioning 1

See Chapter Logic modules (Page 343).

Safe tripping, DM-F Local

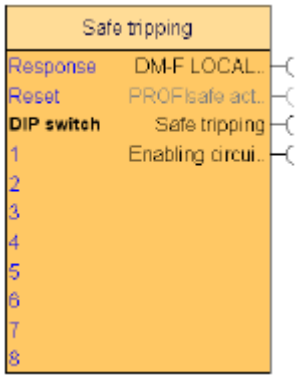


Figure 2-69 Safe tripping, DM-F Local

See Chapter Standard functions (Page 317).

Safe tripping, DM-F PROFIsafe

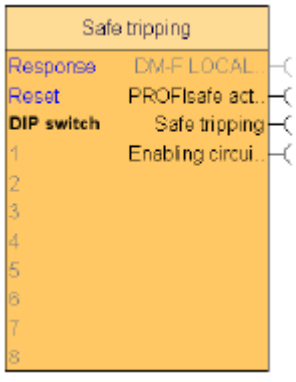


Figure 2-70 Safe tripping, DM-F PROFIsafe

See Chapter Standard functions (Page 317).

Control stations

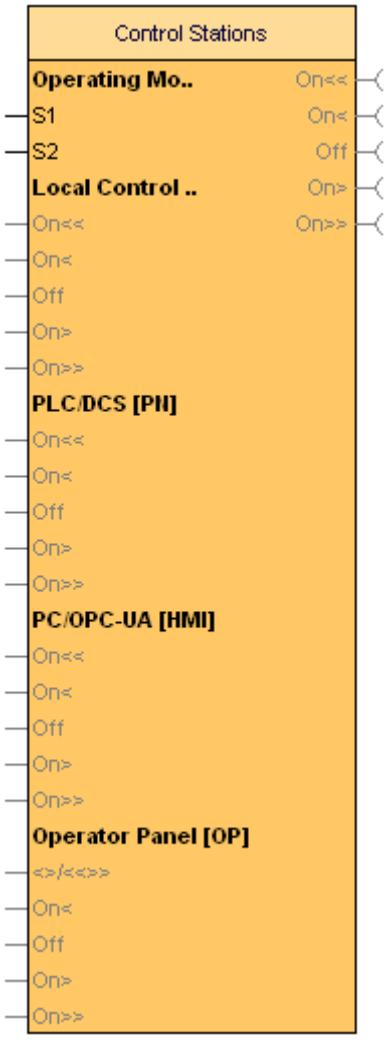


Figure 2-71 Control stations

See Chapter Motor control (Page 173).

Current limits

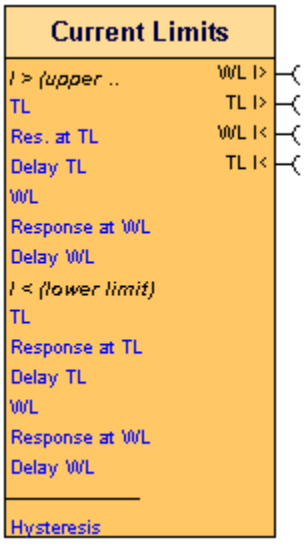


Figure 2-72 Current limits

See Chapter Monitoring functions (Page 239).

Test 1 (2) and Reset 1 (2, 3)



Figure 2-73 Test 1, reset 1

See Chapter Standard functions (Page 317).

Thermistor

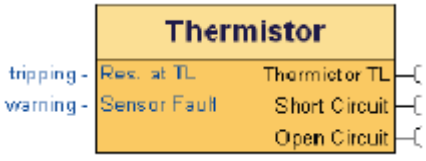


Figure 2-74 Thermistor

See Chapter Motor protection (Page 155).

Timer 1 (and 2, 3, 4, 5, 6)

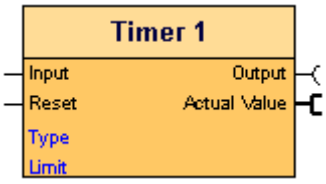


Figure 2-75 Timer 1

See Chapter Logic modules (Page 343).

TM1/2 inputs

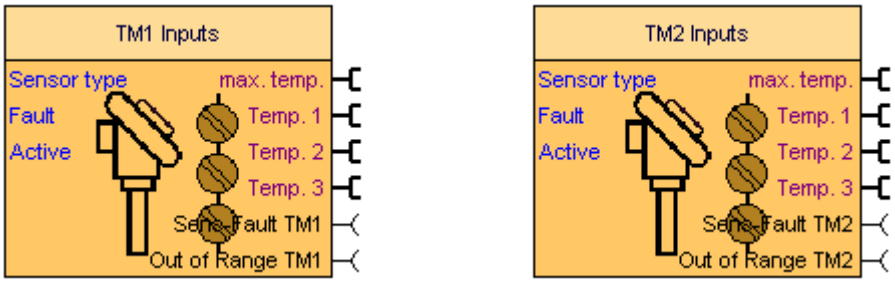


Figure 2-76 TM1/2 inputs

See Chapter Inputs (Page 293).

Monitor 0/4-20 mA AM1-2

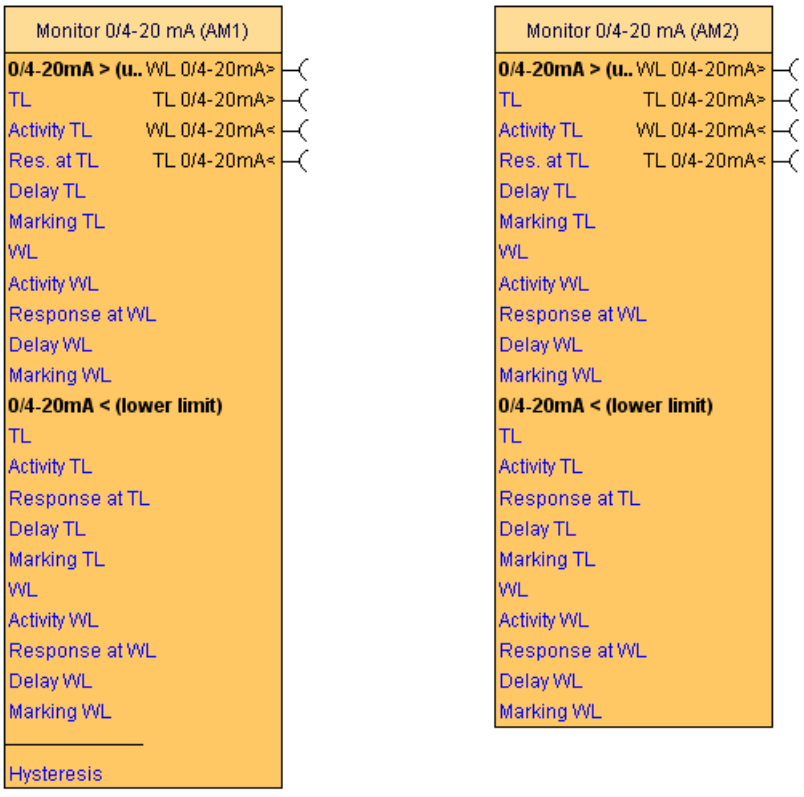


Figure 2-77 Monitor 0/4-20 mA AM1-2

See Chapter Monitoring functions (Page 239).

Cos phi monitoring

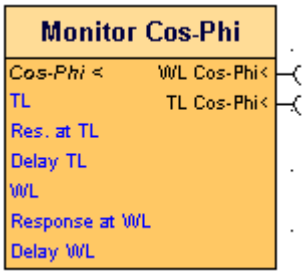


Figure 2-78 Cos phi monitoring

See Chapter Monitoring functions (Page 239).

Ground-fault monitoring with 3UF7500 ground-fault module

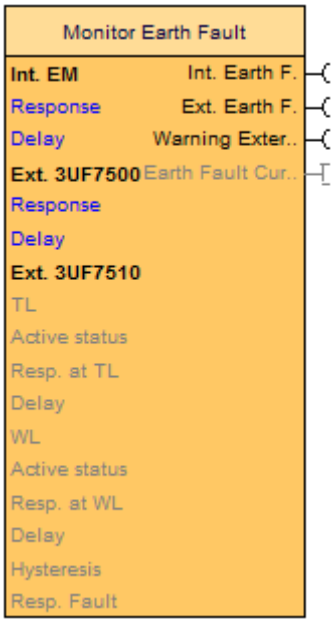


Figure 2-79 Ground-fault monitoring with 3UF7500 ground-fault module

See Chapter Monitoring functions (Page 239).

Ground-fault monitoring with 3UF7510 ground-fault module



Figure 2-80 Ground-fault monitoring with 3UF7510 ground-fault module

See Chapter Monitoring functions (Page 239).

Power monitoring

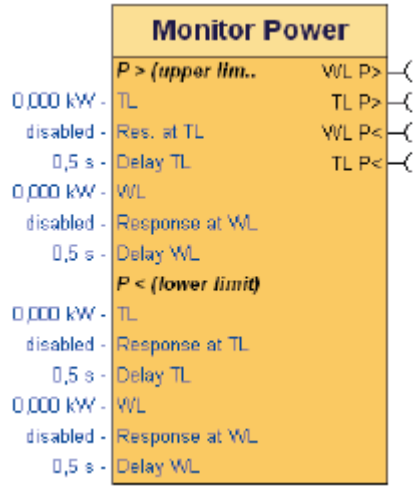


Figure 2-81 Power monitoring

See Chapter Monitoring functions (Page 239).

Monitoring interval for mandatory testing

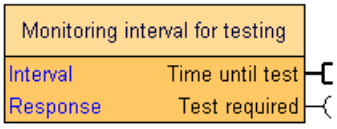


Figure 2-82 Monitoring interval for mandatory testing

See Chapter Monitoring functions (Page 239).

Voltage monitoring

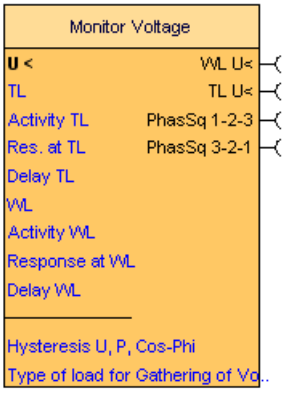


Figure 2-83 Voltage monitoring

See Chapter Monitoring functions (Page 239).

Temperature TM1/2 monitoring

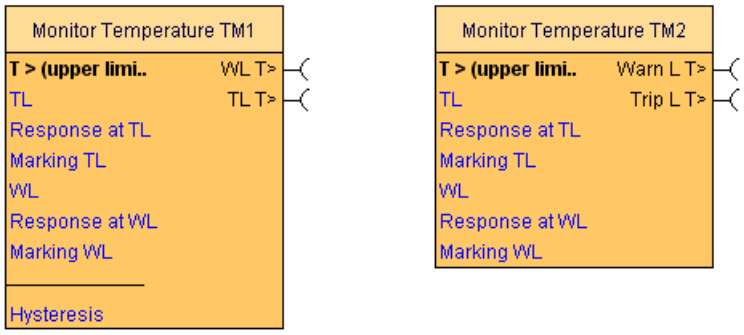


Figure 2-84 Temperature TM1/2 monitoring

See Chapter Monitoring functions (Page 239).

UVO

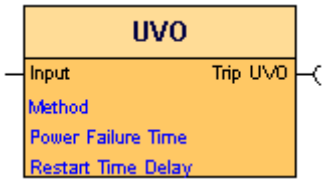


Figure 2-85 UVO

See Chapter Standard functions (Page 317).

Truth table TT 3I/1O (TT 2, 3, 4, 5, 6, 10, 11 3I/1O)

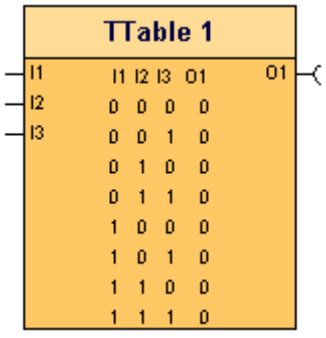


Figure 2-86 Truth table TT 3I/1O

See Chapter Logic modules (Page 343).

Truth table TT 7 2I/1O (TT 8 2I/1O)

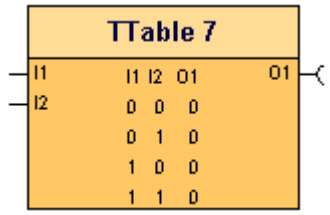


Figure 2-87 Truth table TT 7 2I/1O

See Chapter Logic modules (Page 343).

Truth table TT 9 5I/2O

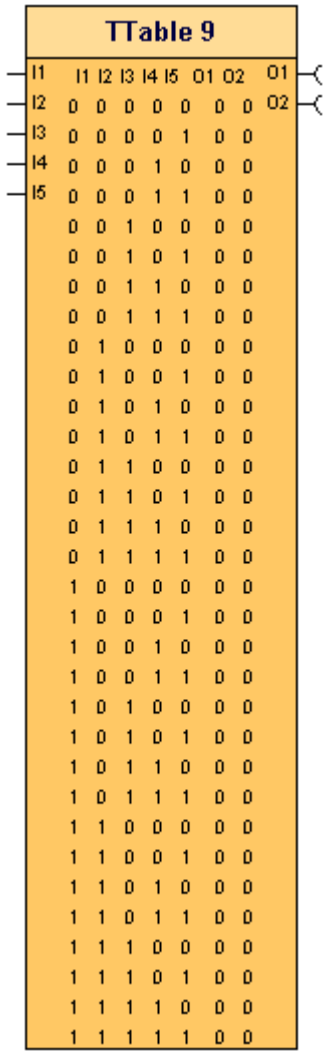


Figure 2-88 Truth table TT 9 5I/2O

See Chapter Logic modules (Page 343).

Watchdog

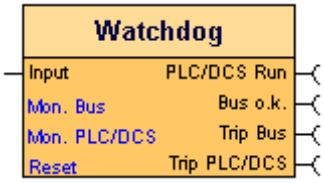


Figure 2-89 Watchdog

See Chapter Standard functions (Page 317).

Counter 1 (2, 3, 4, 5, 6)

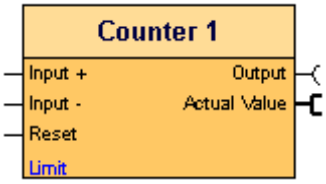


Figure 2-90 Counter 1

See Chapter Logic modules (Page 343).

Cyclic send byte 0 (1, 2/3, 4/9, 10/19)

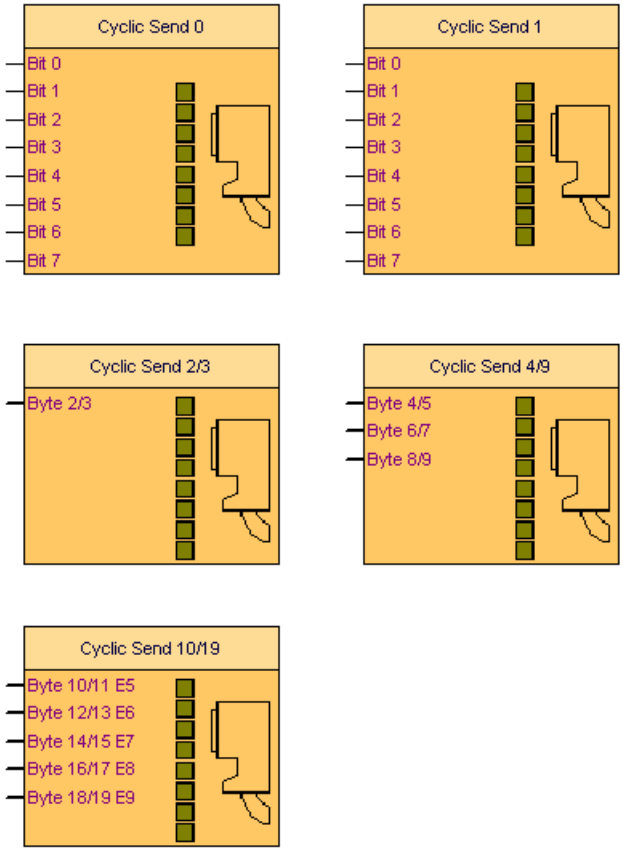


Figure 2-91 Cyclic send

See Chapter Outputs (Page 275).

Cyclic receive byte 0 (1, 2/3, 4/5)

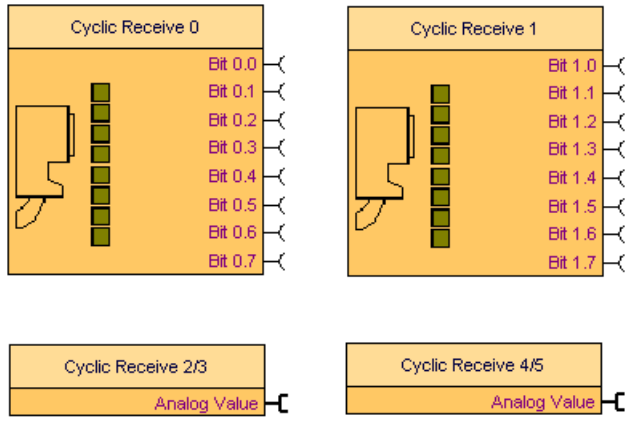


Figure 2-92 Cyclic receive

See Chapter Inputs (Page 293).

Short instructions for configuring a reversing starter 3

In this chapter

In this chapter you will find short instructions for configuring a reversing starter, with the aid of a practical example. The majority of the parameters have been appropriately preset at the factory for most applications.

You only need to set a few parameters.

Target groups

This chapter addresses the following target groups:

- Planners
- Configuring engineers
- Technicians
- Electricians
- Commissioning engineers

Required knowledge

You will require the following knowledge:

- Basic SIMOCODE pro knowledge (see Chapter System description (Page 21))
- Basic knowledge about SIMOCODE ES parameterization software (see Chapter Software (Page 116))
- Basic knowledge of PROFINET IO (integration into the automation system)

3.1 Introduction and objective of the example

Introduction

The following simple example of a reversing starter demonstrates step-by-step how to commission SIMOCODE pro. In this context, the reversing starter will be equipped with:

- Initially, one local control station - Local control.
- Followed by a second control station with PROFINET IO.

SIMOCODE ES software is used for parameterization. The PC / PG is connected to the basic unit via a PC cable.

Objective of the example

This example is intended to:

1. Show you how to implement a standard switching operation with a reversing starter using SIMOCODE pro in just a few steps.
2. Help you modify this example for your application.
3. Help you implement other applications easily.

Fundamental steps

The two fundamental SIMOCODE pro steps are always:

- Implementation of external wiring (for control and feedback of main current switching devices and control and signaling devices)
- Implementation/activation of internal SIMOCODE pro functions (function blocks), with control and evaluation of the SIMOCODE pro inputs/outputs (internal SIMOCODE pro wiring).

Requirements

- Load feeder / motor is present
- PLC/PCS with PROFINET interface is present
- The main circuit of the reversing circuit, including the current measuring module, has already been wired. In this case, the 3 cables leading to the motor must be led through the feed-through openings of the current measuring module.
- PC / PG is present
- SIMOCODE ES software is installed
- The basic unit has the factory settings. You can find out how to restore the basic factory settings in Chapter Restoring factory settings (Page 497).

3.2 Reversing starter with motor feeder and local control station

Required components

The following table lists the components required for this example:

Table 3- 1 Components required for this "reversing starter" example

Item	Ordering data	Order number
1	SIMOCODE pro V PN basic unit	3UF7011-1AU00-0
2	0.3 A to 3 A current measuring module	3UF7100-1AA00-0
3	Connecting cable for connecting basic unit to the current measuring module, depending on length	3UF793.-1AA00-0
4	"SIMOCODE ES 2007 Basic" software for parameterization via the system interface	3ZS1312-4CC10-0YA5
	Or: "SIMOCODE ES 2007 Standard" software for parameterization via the system interface with graphic editor	3ZS1312-5CC10-0YA5
	Or: "SIMOCODE ES 2007 Premium" software for parameterization via PROFINET and the system interface with the graphic editor, includes STEP 7 Object Manager	3ZS1312-6CC10-0YA5
5	PC cable for connecting the basic unit to a PC / PG	3UF7940-0AA00-0 (RS232) (as from product version *E02*) or 3UF7941-0AA00-0 (USB)

Reversing starter circuitry with SIMOCODE pro

The following schematic shows the circuitry of the main circuit and the control circuit:

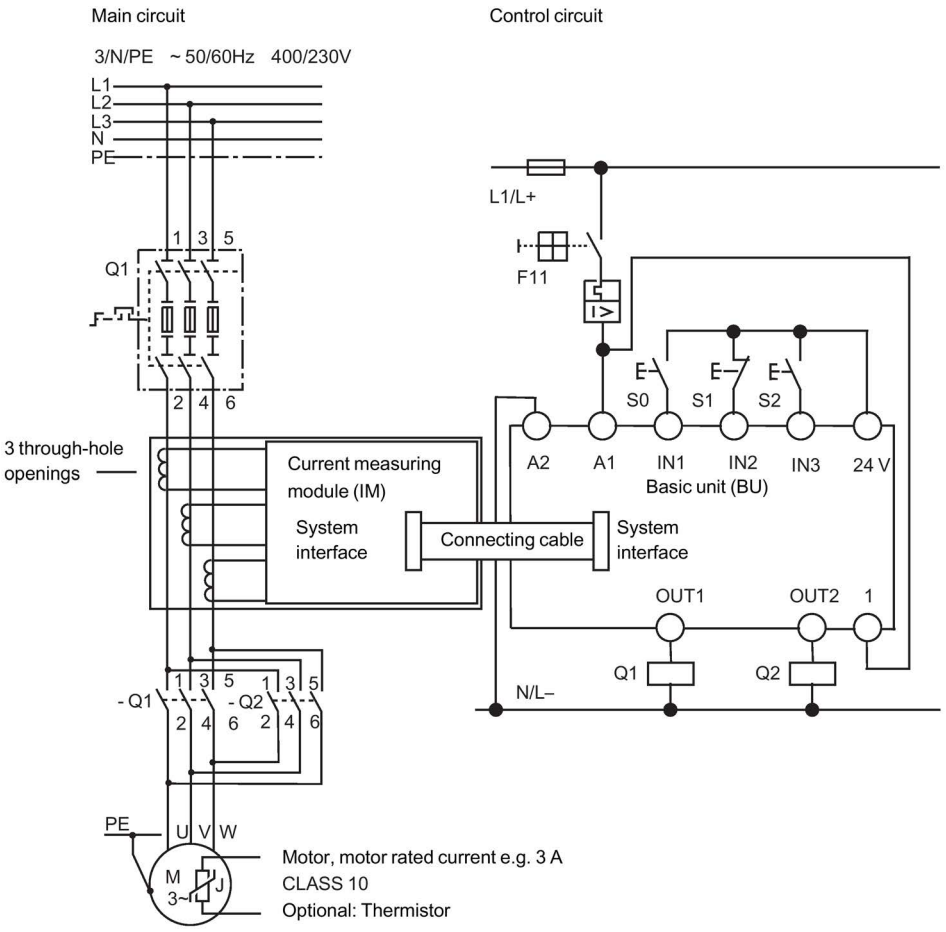


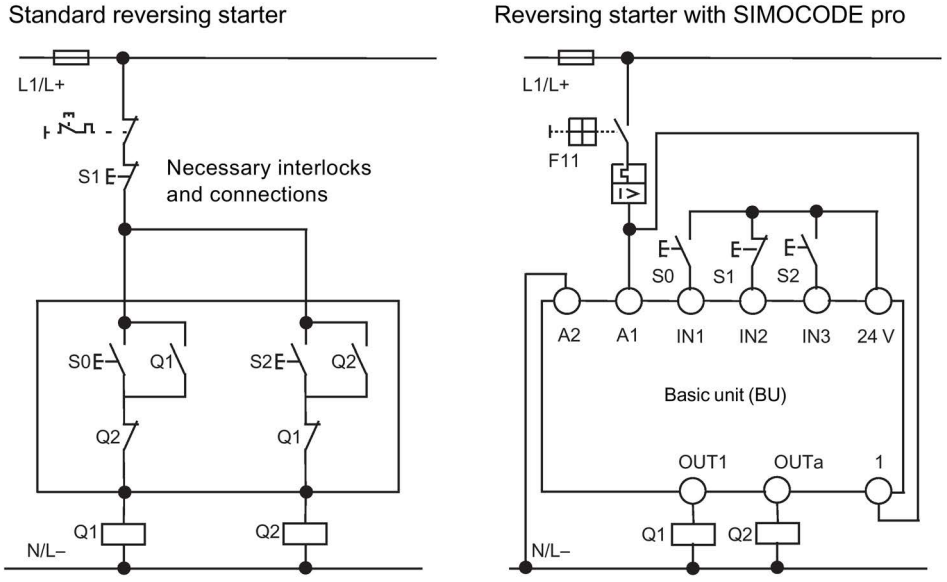
Figure 3-1 Wiring of the main circuit and the control circuit with SIMOCODE pro

Circuit diagram of a reversing starter control circuit

The following schematic shows the circuit diagram of the control circuit with a local control station for the commands:

- LEFT
- OFF
- RIGHT

Displays, messages, etc, have not been taken into account.



S0: "LEFT" button
S1: "OFF" button
S2: "RIGHT" button

Q1: Contactor clockwise rotation
Q2: Contactor counterclockwise rotation

Figure 3-2 Circuit diagram of a reversing starter control circuit

The necessary interlocks and connections are carried out in the basic unit via software.

3.3 Parameterization

The basics of parameterization

After the external wiring connections have been made (contactor coils connected, current measuring module integrated in the main circuit), SIMOCODE pro is then parameterized.

For this purpose, you need to understand the following points:

Table 3- 2 Schematic of the various SIMOCODE pro function blocks

Point	Description
1	Function blocks are stored internally in the SIMOCODE pro system, e.g. for control stations, control functions and motor protection.
2	Function blocks have names.
3	Function blocks may have set values, e.g. the type of control function and the set current for overload protection.
4	Function blocks are equipped with plugs and sockets. These are clearly designated.
5	To achieve the desired functionality, proceed as follows: 1. Interconnect the function blocks by connecting specific plugs to specific sockets (i.e "plug the plugs into the sockets"). 2. If required, set values in the function blocks, e.g. the set current, type of control function.
6	The inputs of the function blocks in the basic unit are designated as plugs and labeled as follows:
7	The outputs of the function blocks in the basic unit are designated as sockets and labeled as follows: 
8	The plugs and sockets of the device inputs and outputs are not connected as factory defaults. If you press a button now, the contactors will not be energized.

General procedure for parameterizing the reversing starter

Parameterization means:

- Setting values
- Connecting function blocks.

Where this example is concerned, this means:

1. Select the control function "Reversing Starter". This establishes all the interlocks and connections for the reversing starter in the basic unit.
2. Determine the set current I_s for motor protection. In this case, the set current corresponds to the rated motor current, i.e. 3 A.

3. The "BU Outputs" function block must be connected to the sockets of the "Protection/Control" function block via the software, i.e:
   - "BU Output 1" plug to "Contactor Control QE1" socket (right)
   - "BU Output 2" plug to "Contactor Control QE2" socket (left)
4. The plugs on the "Protection/Control" function block must be connected via software to the sockets on the "BU Inputs" function block, i.e.
   - Control station plug - Local Control [LC] ON< to "BU Input 1" socket
   - Control station plug - Local Control [LC] OFF to "BU Input 2" socket
   - Control station plug - Local Control [LC] ON> to "BU Input 3" socket

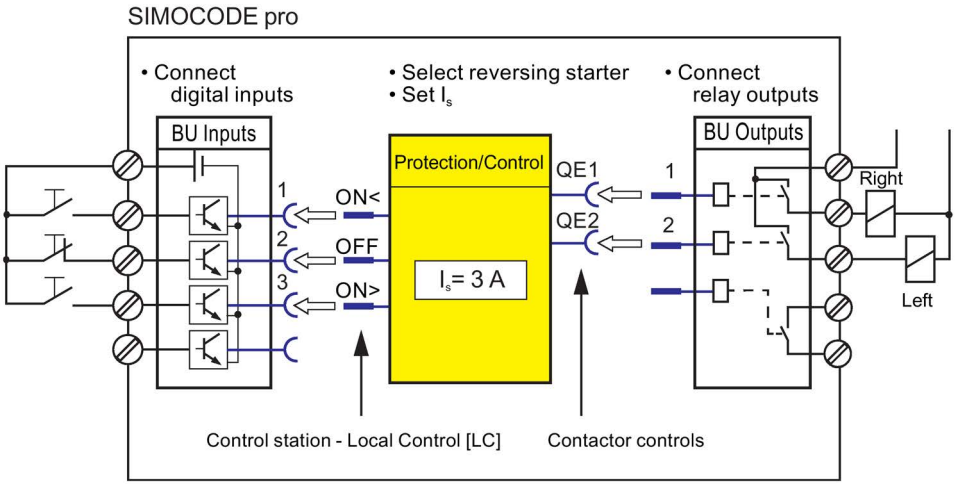


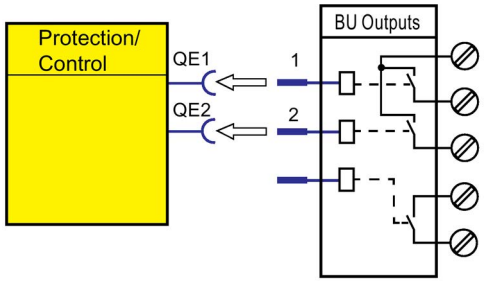
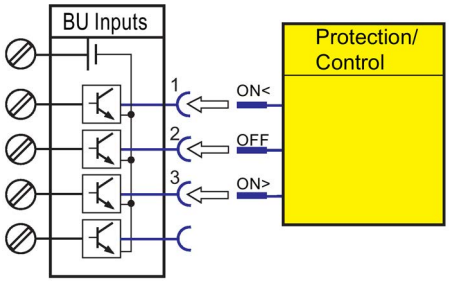
Figure 3-3 Schematic of the parameterization example "reversing starter"

The assignment of the contactor controls QE depends on the parameterized control function. See Chapter Active control stations, contactor controls, lamp controls and status information for the control functions (Page 236)

Concrete procedure for parameterization with SIMOCODE ES

Proceed as follows:

Table 3- 3 Parameterization with SIMOCODE ES

Step	Description
1	Start SIMOCODE ES on your PC / PG.
2	Choose PROFINET → Switching devices → Monitoring and control devices → Motor management system SIMOCODE → SIMOCODE pro V PN.
3	Select the control function "Reversing Starter" as application. When you select this application, a range of presets will be automatically carried out that you will have to check later.
4	Under "Device configuration," choose SIMOCODE pro V PN, Version 1.0. Deactivate the operator panel if none is installed.
5	Open the **Device Parameters** → **Motor Protection** → **Overload / Unbalance / Stalled Rotor** dialog box. Set the set current I_s1 to 3 A.
6	Open the **Further Function Blocks** → **Outputs** → **Basic Unit** dialog box and check the following settings: • **BU Output 1** → **Contactor Control QE1** • **BU Output 2** → **Contactor Control QE2**  The relay outputs are connected to the contactor controls. **Note** By choosing a preset application (Step 2), other presets might be made when the BU outputs are assigned to the contactor controls.
7	Open the **Device Parameters** → **Motor Control** → **Control Stations** dialog box and check the following settings: • Local Control [LC] ON<: **BU - Input 1** • Local Control [LC] OFF: **BU - Input 2** • Local Control [LC] ON>: **BU - Input 3**  The control station "Local Control" is now connected with the binary inputs of the basic unit. Check whether the enables for "ON" and "OFF" for operating mode "Local2" are set.
8	Parameterization is complete. Save the parameter file on your PC / PG using **Device** → **Save**.

Transferring the parameters to the basic unit and commissioning

After creating the parameter file, you can then transfer it to SIMOCODE pro and commission the reversing starter.

To do so, proceed as follows:

Table 3- 4 Transferring the parameters to the basic unit and commissioning

Step	Description
1	Switch on the power supply of the basic unit.
2	Connect the serial interface of the PC / PG to the system interface of the basic unit using the PC cable.
3	Observe the status LED on the basic unit. The "Device" LED should light up green. SIMOCODE pro can be started up.
4	Transfer the parameter file to the basic unit via the menu, e.g. using **Target System → Load to Switching Device**. Use the interface with which SIMOCODE pro is connected to the PC via the PC cable.
5	After transferring the data to the basic unit, you will receive the message "Download to device successfully accomplished".

Note

Switching between "RIGHT" and "LEFT" is only possible via "OFF" after the preset, 5-second interlocking time has expired.

Configuration with local control station completed

The configuration with SIMOCODE pro is now complete. You now have a functional reversing starter with a local control station. If the wiring and parameterization are correct, the contactors for clockwise and counterclockwise rotation will be activated when the corresponding buttons are pushed.

3.4 Adding a control station to the reversing starter using PROFINET

In this section

In this section, you will find out how a control station can be added to the previously configured example by means of PROFINET. You can switch between the local control station (local) and PLC/PCS (remote). SIMOCODE pro can then be controlled locally via the buttons and via the PLC/PCS.

The necessary connections are preset as factory defaults in SIMOCODE pro.

Requirements

The following requirements must be fulfilled:

- The motor is switched off.
- The supply voltage for the basic unit is switched on. The "Device" LED lights up green
- You have connected the basic unit to the automation system via PROFINET. The two PROFINET interfaces are located on the front (RJ-45 female connector). It is immaterial which of the two PROFINET interfaces you use.
- You have integrated SIMOCODE pro into your automation system and defined the IP configuration and the PROFINET IO station name for SIMOCODE pro V PN and transferred it into the device. Further information on integrating PROFINET IO devices can be found in the automation system documentation.

Setting the IP configuration and station name

The precondition for communication between the automation system and SIMOCODE pro via PROFINET is definition of the IP configuration and the PROFINET station name. This can be done in the following ways:

- With the configuration tool of your automation system
- Via SIMOCODE ES.

Proceed as follows:

Table 3- 5 Set IP parameters and PROFINET IO device names with SIMOCODE ES

Step	Description
1	Plug the PC cable into the system interface.
2	Start SIMOCODE ES.
3	Open menu **Switching device → Open online**.
4	Select "Local device interface" and the corresponding COM interface. Confirm with OK.
5	Open the **Device Parameters → PROFINET Parameters** dialog box.
6	Choose the IP parameters to match the configuration in the automation system. Select the "Overwrite IP parameters in device" parameter. If the IP parameters are assigned by the IO Controller in the automation system, no setting is necessary here and the "Overwrite IP parameters in device" parameter must not be selected.
7	Select the PROFINET device name to match the configuration in the automation system. Select the "Overwrite device name in device" parameter. If the device name is assigned by the configuration tool of the automation system (e.g. STEP 7), no setting is required here and the parameter "Overwrite device names in device" must not be set.
8	Save the data in the basic unit with Target System → Load to Device. The address is set. Confirm the change of address.

Set IP parameters and PROFINET device names with STEP 7 HW Config

It is possible to set this parameter with the STEP 7 HW config function "Target system → Edit Ethernet station."

The precondition for using this function is that the PG or the PC is also connected to SIMOCODE pro via Ethernet.

If the MAC address of the SIMOCODE pro V PN basic unit is used, you can assign the IP parameters and the PROFINET device names. You will find the MAC address on the front of the basic unit.

Alternately, you can read the MAC address out via the local device interface with SIMOCODE ES with "Switching device → Open online" under PROFINET parameters.

Additional internal components of the basic unit

The local control [LC] station is already wired, the external components are connected and the necessary internal connections have been made. The following additional internal components, which have already been connected as factory defaults and do not have to be parameterized, are now required:

- Cycl. Receive bit 0.0, bit 0.1 and bit 0.2 for the commands "LEFT," "OFF," and "RIGHT"
- Cycl. Receive bit 0.5 for switching between the local control station [LC] and PLC/PCS [DP] (remote)
  - Bit 0.5=0: Local control station [LC] active
  - Bit 0.5=1: PLC/PCS [PN] control station active.

The PLC/PCS [PN] control station and the change-over (plug S1) have already been connected as factory defaults with the bits (sockets) of the cyclic receive data. The assignments can be found in SIMOCODE ES under **Device Parameters → Motor Control → Control Stations.**

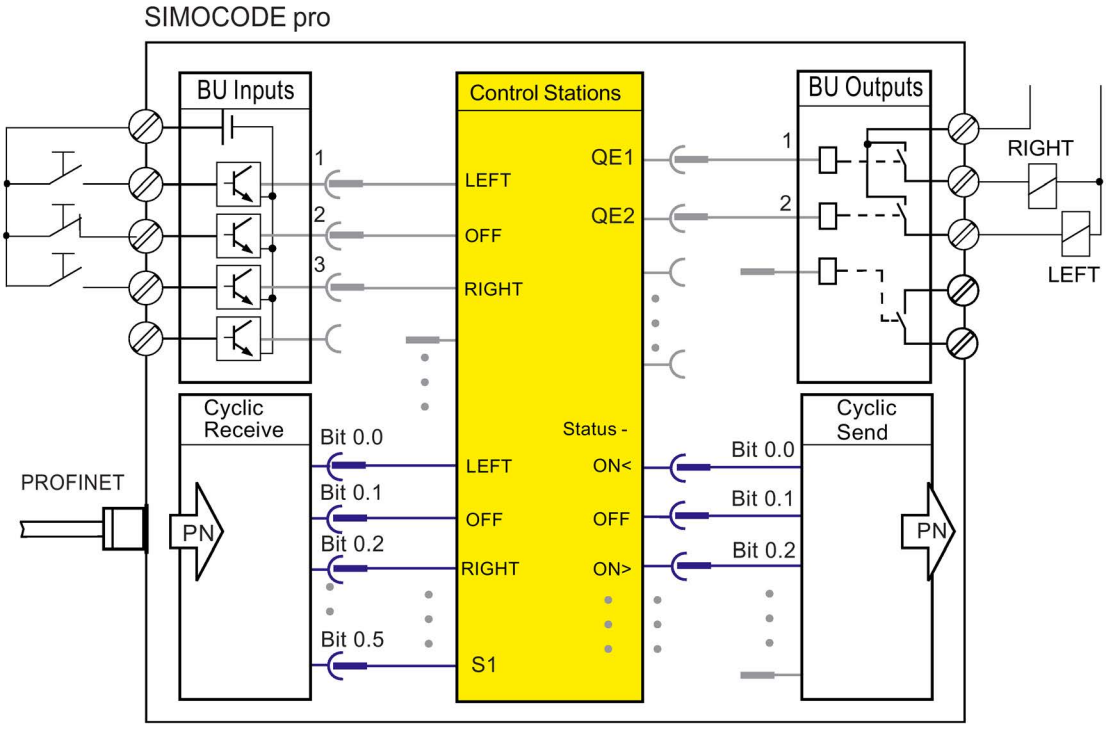


Figure 3-4 Schematic of basic unit internal components for this example

Not all pre-assigned cyclic send data is shown here. Assignments can be found in SIMOCODE ES under Further Function Blocks > Outputs > Cyclic Send Data.

Configuration with PLC/PCS [PN] control station is complete

The configuration with SIMOCODE pro is now complete. You now have a reversing starter with an additional control station implemented via PROFINET.

The contactors for clockwise and counterclockwise rotation are controlled by setting the corresponding bits.

Motor protection

4

In this chapter

In this chapter you will find information about motor protection.

Motor protection includes:

- Overload protection
- Unbalance protection
- Stalled rotor protection
- Thermistor protection

Motor protection operates alongside motor control "at a higher level in the background". All motor protection parameters are explained here. They can be active or not, according to the control function selected.

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- Commissioning engineers

Required knowledge

You will require the following knowledge:

- In-depth knowledge about SIMOCODE pro
- The principle of connecting plugs to sockets
- Electrical drive engineering

Navigation in SIMOCODE ES

You will find the dialog boxes in SIMOCODE ES under "Device Parameters → Motor Protection".

4.1 Introduction

Description

The motor protection functions "Overload Protection," "Unbalance Protection," "Stalled Rotor Protection," and "Thermistor Protection" are described in the following chapters:

Overload protection (Page 159)

Unbalance protection (Page 168)

Stalled rotor protection (Page 169)

Thermistor protection (Page 170)

Schematic

The following schematic shows the "Extended Protection" function block ("Overload protection", "Unbalance protection", and "Stalled rotor protection") with optional parameter settings and events.

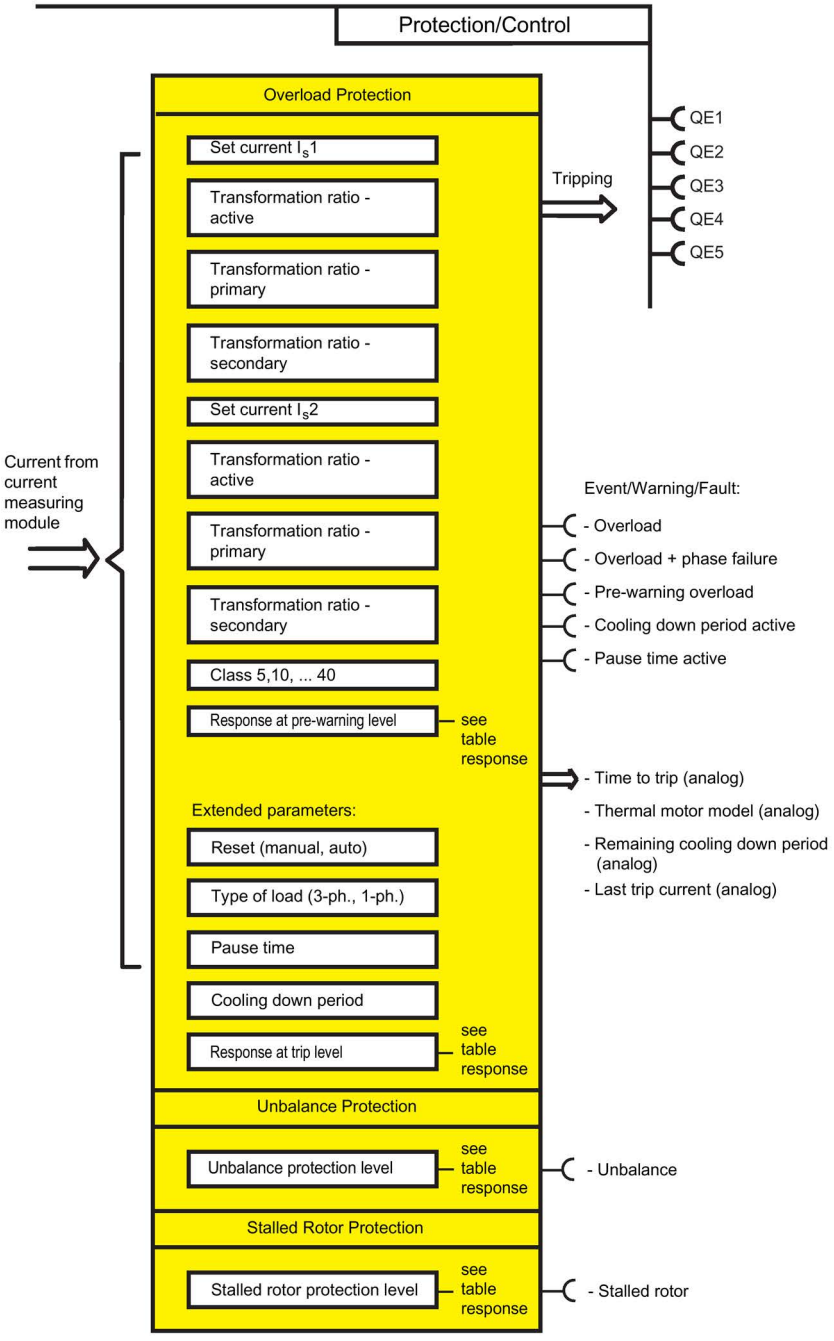


Figure 4-1 "Extended Protection" function block ("Overload Protection", "Unbalance Protection", and "Stalled Rotor Protection")

Adjustable responses "Overload Protection", "Unbalance Protection" and "Stalled Rotor Protection"

Response	Prewarning level "overload protection"	Trip level "overload protection"	Level "unbalance"	Level "stalled rotor protection"
Deactivated	X	X	X	X (d)
Signaling	X	X	X	X
Warning	X (d)	X	X (d)	X
Tripping	-	X (d)	X	X
Delay	0 to 25.5 s (**0.5 s**)	-	0 to 25.5 s (**0.5 s**)	0 to 25.5 s (**0.5 s**)

Responses for "Overload Protection", "Unbalance Protection" and "Stalled Rotor Protection"

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Note

Deactivate unbalance protection in SIMOCODE ES when the load type is set to single-phase!

4.2 Overload protection

4.2.1 Description

SIMOCODE pro protects three-phase or AC motors in accordance with IEC 60947-4-1 requirements. The trip class can be set to eight different settings, ranging from Class 5 to Class 40. Thus, the tripping time can be adapted precisely to the power-up behavior of the motor, improving utilization of the motor capacity. Additionally, the "Thermal motor model" and time to overload trip are calculated and made available to the control system. After an overload trip, the remaining cooling down period is displayed (see Class). The motor current is saved in the case of an overload trip.

Depending on the control function, the set current I_s is separately parameterizable for one or two speeds (I_s1 and I_s2).

The rated motor current is usually set with **set current I_s1**. This value can be found on the type plate of the motor. The overload trip characteristic is calculated based on this value.

The **set current I_s2** is only required for motors with two speeds to guarantee suitable overload protection for the higher speed too. Generally, I_s2 should be set higher than I_s1.

4.2.2 Set current Is1

Setting ranges for set current I_s1

Range: Depends on the selected current measuring module or current / voltage measuring module.

Set current I_s1:	0.3 to 3 A (default setting: 0.3)
	2.4 to 25 A
	10 to 100 A
	20 to 200 A
	63 to 630 A

Transformation ratio - active

When using an interposing transformer, or if the main supply cable is looped several times through the current measuring module or the current / voltage measuring module, you can enter the transformation ratio of the interposing transformer. Activate the checkbox if you wish to use this option. The parameterized set current corresponds here largely to the actual rated motor current and does not have to be converted.

The transformation ratio is calculated from the ratio between the rated motor current [A] and the measured current [A] or any multiple of the ratio.

Transformation ratio - primary

Enter the primary current here, with the "Transformation ratio - active" checkbox activated.

Range: 0 to 8191.875 (default setting: 0).

Transformation ratio - secondary

Enter the secondary current here, with the "Transformation ratio - active" checkbox activated.

Range: 0 to 15 (default setting: 0).

4.2.3 Set current Is2

Setting ranges for set current I_s2

Range: Depends on the selected current measuring module or current / voltage measuring module.

Set current I_s2:	0.3 to 3 A (default setting: 0.3 A)
	2.4 to 25 A
	10 to 100 A
	20 to 200 A
	63 to 630 A

Transformation ratio - active

When using an interposing transformer, or if the main supply cable is looped several times through the current measuring module or the current / voltage measuring module, you can enter the transformation ratio. Activate the checkbox if you wish to use this option. The parameterized set current corresponds here largely to the actual rated motor current and does not have to be converted.

The transformation ratio is calculated from the ratio between the rated motor current [A] and the measured current [A] or any multiple of the ratio.

Transformation ratio - primary

Enter the primary current here, with the "Transformation ratio - active" checkbox activated.

Range: 0 to 8191.875 (default setting: 0).

Transformation ratio - secondary

Enter the secondary current here, with the "Transformation ratio - active" checkbox activated.

Range: 0 to 15 (default setting: 0).

Note

In the case of motors with two speeds, the same or different transformation ratios can be set for each speed, depending upon whether the same or two different interposing transformers is/are used for each speed.

4.2.4 Application example

Example 1:

Rated motor current: 700 A.

A 3UF1868-3G current transformer (205 to 820 A) is used as interposing current transformer (transformation ratio 820 : 1), and the secondary side is routed once via a current measuring module 0.3 A to 3 A:

Transformation ratio for I_s = 820 : 1; I_s = 700 A

Settings (primary and secondary)

- Set current I_s1: 700 A
- I_s1 Transformation ratio primary: 820
- I_s1 transformation ratio secondary: 1

Example 2:

Rated motor current: 225 A.

A 3UF1868-3G current transformer (205 to 820 A) is used as interposing current transformer (transformation ratio 820 : 1), and the secondary side is routed twice via a current measuring module 0.3 A to 3 A:

Transformation ratio for I_s = 820 : 2; I_s = 225 A

Settings (primary and secondary)

- Set current I_s1: 225 A
- I_s1 Transformation ratio primary: 820
- I_s1 transformation ratio secondary: 2

Example 3:

The motor cable is routed twice via a current measuring module (0.3 to 3 A) for a motor with rated current 0.25 A:

Transformation ratio for I_s = 1 : 2; I_s = 0.25 A

Settings:

- Set current I_s1: 0.25 A
- I_s1 Transformation ratio primary: 1
- I_s1 transformation ratio secondary: 2

4.2.5 Further overload protection parameters

Class

The Class (trip class) defines the maximum time within which SIMOCODE pro must trip from cold at 7.2 times the set current I_s (motor protection to IEC 60947). SIMOCODE pro meets the requirements of tolerance band E according to IEC / EN 60947-4-1 in respect of the accuracy of the tripping times. Please note that with startups > "Class 10", the permissible AC3 current of the contactor may have to be reduced (derated), i.e. you must select a larger contactor.

The following figure shows trip classes 5, 10 (d), 15, 20, 25, 30, 35 and 40 for 3-pole balanced loads:

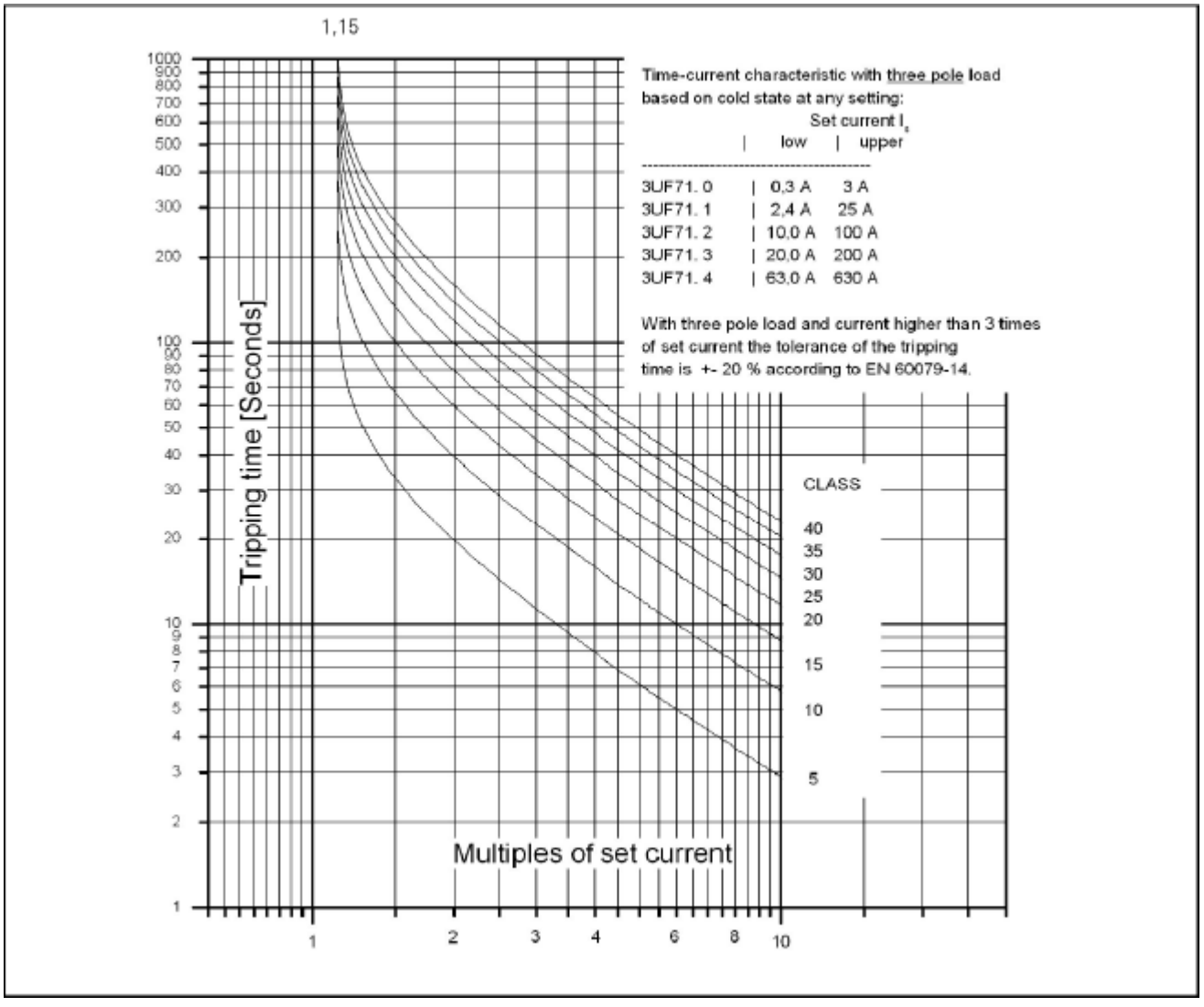


Figure 4-2 Trip classes for 3-pole symmetrical loads

The following figure shows trip classes 5, 10 (d), 15, 20, 25, 30, 35 and 40 for 2-pole loads:

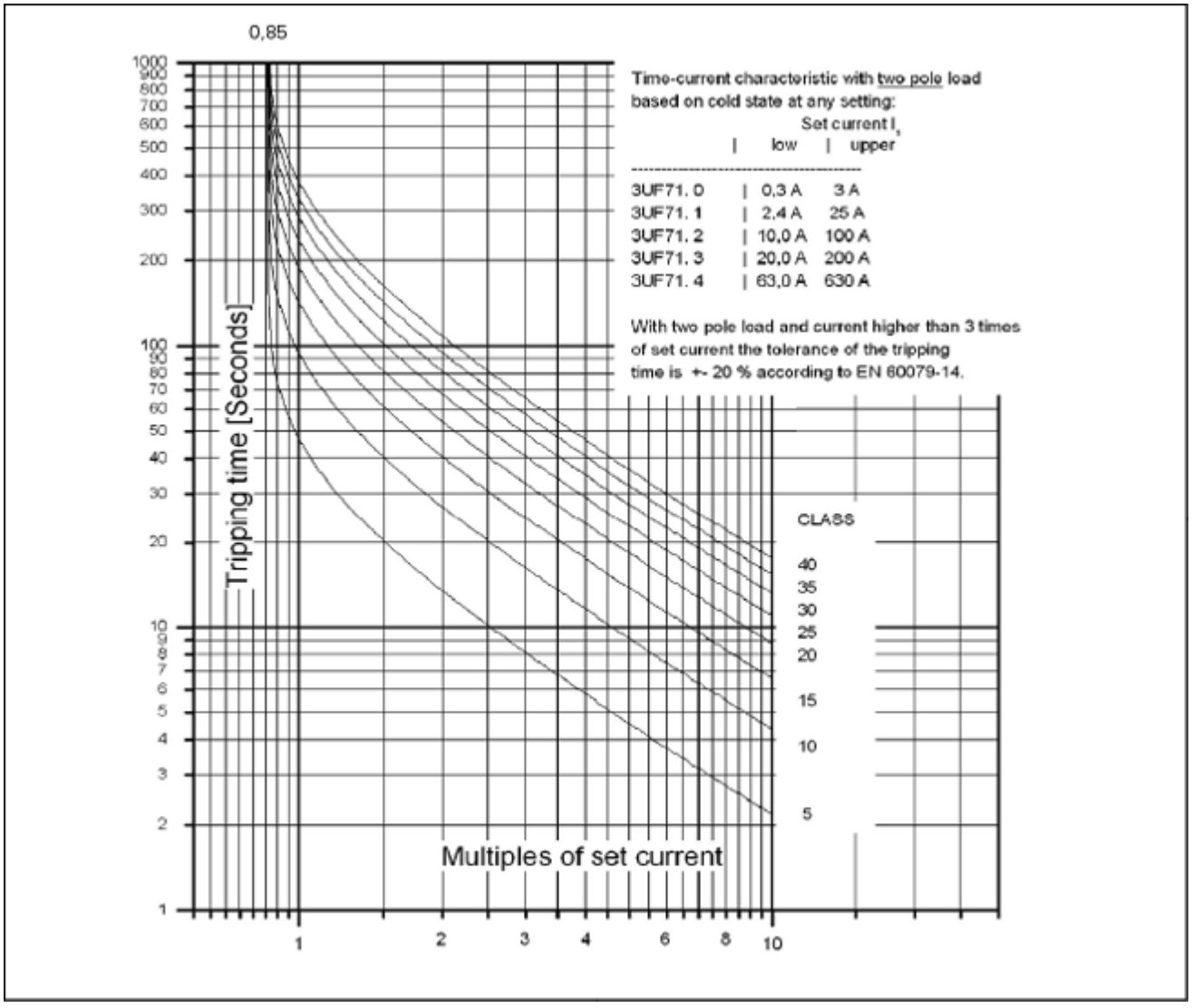


Figure 4-3 Trip classes for 2-pole loads

Response to overload

The SIMOCODE pro response to overload can be additionally adjusted here.

Further information: See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15) and Table "Responses" in Chapter Introduction (Page 156).

Note

With motors for EEx e applications, the response must remain set to "Tripping"!

Cooling down period

The cooling down period is the amount of time that must elapse before an overload trip can be reset. This is usually 5 minutes. The thermal memory (motor model – see below) is cleared after the cooling down period elapses. Supply voltage failures of SIMOCODE pro during this time extend the specified time correspondingly.

Range: 60 to 6553.5 s (default setting: 300).

Thermal motor model (thermal memory)

When the rated motor current (I_s) is at 100%, the value of "Thermal motor model" is 87% (1/1.15 x 100%) in a steady state, and 100% at the moment of an overload trip.

"At operating temperature" state

In the "At operating temperature" state, the tripping times are reduced by the factors listed in the table. These factors apply to 3-pole symmetrical loads, Class 5 to Class 40:

Table 4- 1 Factors for trip times at operating temperature

x I_s	Preload as a percentage of the set current I_s					
	0	20	40	60	80	100
1.15	1	1	1	1	1	1
1.5	1	0.90	0.78	0.64	0.57	0.24
2	1	0.88	0.74	0.58	0.40	0.19
4	1	0.85	0.69	0.52	0.35	0.16
6	1	0.84	0.68	0.51	0.34	0.15
7.2	1	0.84	0.68	0.51	0.33	0.15
8	1	0.84	0.67	0.51	0.33	0.15

Example:

You have operated and switched off a motor with set current 100% I_s.

You immediately switch the motor back on. This causes an overload trip with 2 x I_s, Class 10.

- Tripping time in cold state: approximately 40 s (acc. to tripping characteristic)
- Factor for tripping time with preload 100% I_s: 0.19 (see Table)
- Reduced tripping time: 0.19 x 40 s = 7.6 s.

Pause time

The pause time is the specified time for the cooling down response of the motor when tripped under normal operating conditions (not in the case of an overload trip). After this interval, the thermal memory in SIMOCODE pro is deleted and a new cold start is possible. This means that many startups can be performed in a short space of time.

The following schematic shows the cooling down response with and without pause time:

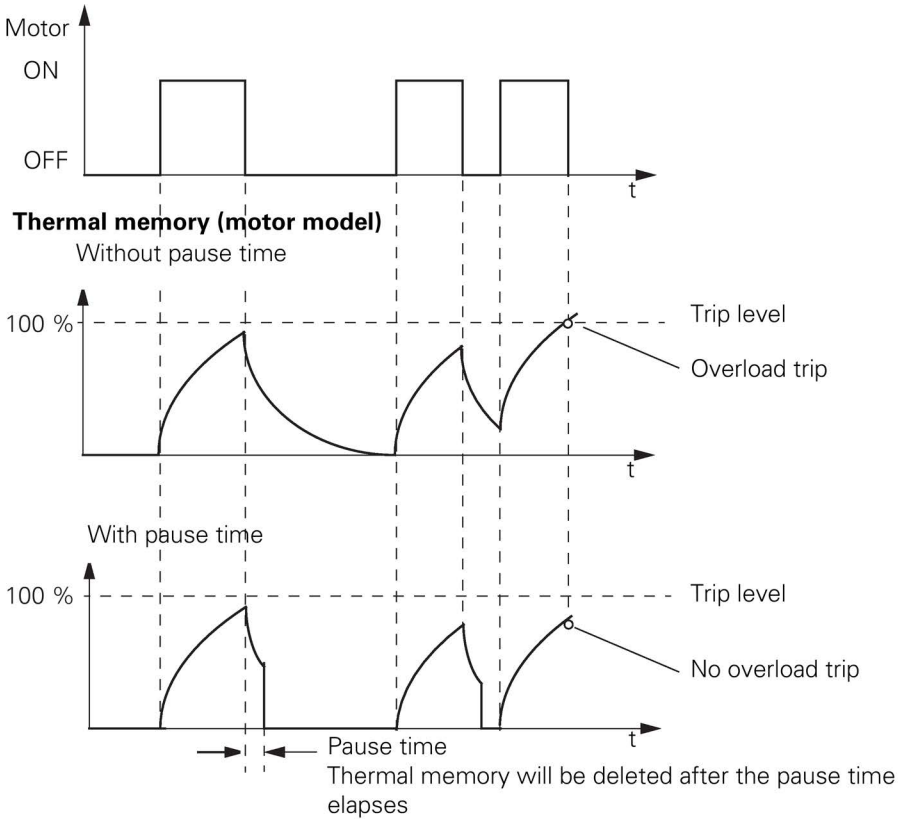


Figure 4-4 Cooling down response with and without pause time

Note

Both the motor and the switching devices must be dimensioned specifically for this load!

Load type

You can select whether SIMOCODE pro is to protect a 1-phase or a 3-phase load. For a 1-phase type of load, the internal ground-fault monitoring and the unbalance protection must be deactivated. Phase failure monitoring is deactivated automatically.

Load type 1-phase, 3-phase (default).

See also Table "Decoupling module requirements for star networks."

Delay prewarning

The "Delay" parameter (default: 0.5 s) defines the length of time for which the prewarning level (1.15 x I_s) must be permanently exceeded before SIMOCODE pro will execute the desired response. If no setting is made, there will be no response. In the event of a loss of phase or an unbalance > 50%, the prewarning level will be reached earlier, at approximately 0.85 x I_s.

Reset

If the "Reset" parameter is set to "Auto", the "Overload", "Overload + Unbalance" and "Thermistor" faults will be acknowledged automatically

- If the cooling down period has expired.
- If the thermistor value has dropped back down to the specified resetting value.

If the "Reset" parameter is set to "Manual", the faults must be acknowledged by a reset signal:

- "TEST/RESET" button on the basic unit
- "TEST/RESET" button on operator panel
- Standard functions "Reset."

For this, the "Reset - Input" (plugs) must be connected to the corresponding sockets, e.g. using reset via bus.

Reset: Manual, Auto (default setting: manual).

⚠ WARNING

Unexpected restart of the motor

The "Auto-Reset" mode must not be used for applications where an unexpected motor restart may cause personal injury or damage to property.

4.3 Unbalance protection

Description

The extent of the phase unbalance can be monitored and transmitted to the control system. If a specified limit value is violated, a defined and delayable response can be initiated. If the phase unbalance is more than 50%, the tripping time is also automatically reduced in accordance with the overload characteristic since the heat generation of the motors increases in asymmetrical conditions.

Phase unbalance formula

The phase unbalance is calculated using the following equation:

$$\text{Phase unbalance} = \frac{\max([I_{max} - I_{avg}] ; [I_{min} - I_{avg}])}{I_{avg}} \quad I_{avg} = \frac{I_1+I_2+I_3}{3}$$

Level

The level of unbalance to which SIMOCODE pro should react is set here.

Setting range: 0 to 100 % (default setting: **40 %**)

Response

Here you can select the response of SIMOCODE pro to phase unbalance: See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15) and Table "Responses" in Chapter Introduction (Page 156).

Delay

The unbalance level must be exceeded for the period of the set delay time before SIMOCODE pro executes the desired response. If no setting is made, there will be no response.

Setting range: 0 to 25.5 s (default setting: **0.5 s**)

4.4 Stalled rotor protection

Description

If the motor current rises above an adjustable stalled rotor protection level (current threshold), a defined and delayable response can be configured for SIMOCODE pro. In this case, for example, the motor can be shut down independently of the overload protection. The stalled rotor protection is only active after the parameterized class time has elapsed, e.g. for Class 10 after 10 seconds, and prevents unnecessarily high thermal and mechanical loads as well as premature aging of the motor.

Level

When the stalled rotor level is exceeded, SIMOCODE pro reacts according to the selected response.

Level: 0 to 1020 % of I_s (default: 0).

Note

Rounding

Intermediate values are automatically rounded.

Response

Here you can determine the response to violation of the stalled rotor level:
See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15) and Table "Responses" in Chapter Introduction (Page 156).

Delay

The "Delay" parameter determines the amount of time that the stalled rotor level must be permanently exceeded before SIMOCODE pro executes the desired response. If no setting is made, there will be no response.

Setting range: 0 to 25.5 s (default: **0.5 s**).

4.5 Thermistor protection

Description

Thermistor protection is based on a direct temperature measurement in the motor via binary PTC thermistors which can be connected to the SIMOCODE pro basic unit.

Thermistor protection is used for:

- Motors with high switching frequencies
- Converter operation
- Motors with heavy starting
- Intermittent duty and/or braking operation
- Restricted incoming air supply
- Speeds below the rated speed.

In this case, the sensors are mounted in the winding slot or bearing of the motor.

Schematic and characteristic curve

The resistance of the thermistors increases rapidly (abruptly) when the temperature limit is reached.

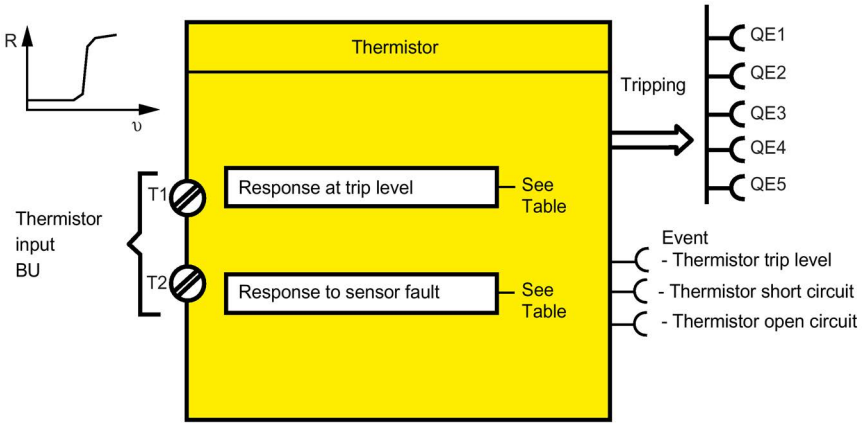


Figure 4-5 Thermistor function block (thermistor protection)

Response

- Overtemperature: Here you can select how SIMOCODE pro should respond when the temperature has overshot the trip level.

  Note

  With motors for EEx e applications, the response must be set to "Tripping"!

- Sensor fault (sensor circuit fault): Here you can select the SIMOCODE pro response in the case of a short circuit or a break in the thermistor sensor cable.

Table 4- 2 "Thermistor protection, binary" response

Response	Trip level	Sensor fault
Deactivated	-	X
Signaling	X	X
Warning	X	X (d)
Tripping	X (d)	X

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Motor control

5

In this chapter

In this chapter you will find information on:

- Control stations which you can select and enable according to need. The following related topics are explained:
  - How control stations, operating modes and enables work together
  - How control commands, e.g. "ON", "OFF", are switched through to the control function
- Control functions you can select according to need. The following related topics are explained:
  - How control commands, e.g. "ON," "OFF," are switched through from the control stations to the contactor controls/relay outputs
  - Which parameters apply depending on the control function chosen

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- PLC programmers

Required knowledge

You will require the following knowledge:

- The principle of connecting plugs to sockets
- Electrical drive engineering
- Motor protection

Navigation in SIMOCODE ES

You will find the dialog boxes in SIMOCODE ES under Device Parameters → Motor Control.

5.1 Control stations

5.1.1 Description

Control stations are places from which control commands are issued to the motor. The "Control Stations" function block is used for administration, switching and prioritization of these different control stations. SIMOCODE°pro allows parallel administration of up to four different control stations. Dependent on the set control function, up to five different control commands can be transmitted from every control station to SIMOCODE pro.

- Local in the direct vicinity of the motor; control commands via pushbuttons.
- PLC/PCS [PN], switching commands are issued by the automation system (remote)
- PC/OPC UA [OCM], control commands are issued via an operator control station or via OPC UA or via PROFINET with the SIMOCODE ES software
- Operator panel, control commands are issued via the buttons of the operator panel in the control cabinet door. Examples of control commands:
  - Motor ON (ON >), Motor OFF (OFF) for a direct starter
  - Motor LEFT (ON <), Motor OFF (OFF), Motor RIGHT (ON >) for a reversing starter
  - Motor SLOW (ON >), Motor FAST (ON >>), Motor OFF (OFF) for a Dahlander circuit.

The plugs of the "Control Stations" function block must be connected to any sockets (e.g. binary inputs on the basic unit, PROFINET control bits, etc.) for the control commands to take effect.

Up to five different control commands can come from each control station. Up to five plugs (plug ON <<, ON <, OFF, ON >, ON >>) are available on the function block for each control station. The number of active plugs depends on the control function selected. With a direct starter, for example, only the plugs "ON >" and "OFF" are active.

Control stations

- Control station - local control: In this case, the command devices are usually in the direct vicinity of the motor and are wired to the inputs of SIMOCODE pro. The plugs of the "Control Stations" function block must be connected to any sockets (normally the function blocks for the basic units or the digital module inputs – BU Inputs, DM Inputs) for the control commands to take effect.

Note

The OFF command "LC OFF" is 0-active. This ensures that SIMOCODE pro shuts the motor down safely if an open circuit occurs in the supply line, for example. The precondition is that the control station is active.

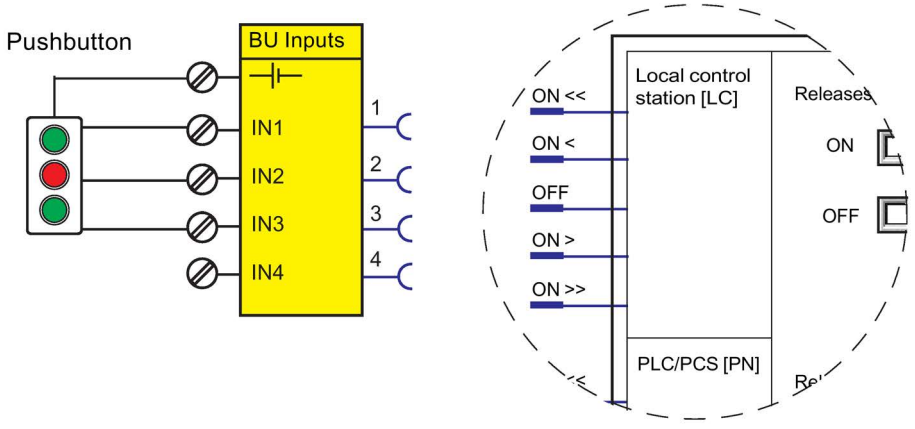


Figure 5-1 Control station - local control

- Control station - PLC/PCS [PN]: This control station is primarily intended for control commands from the automation system (PLC/PCS) via the Cyclic Receive telegram from PROFINET.
  The plugs of the "Control Stations" function block must be connected to any sockets, normally "Cyclic Receive," for the control commands to take effect.

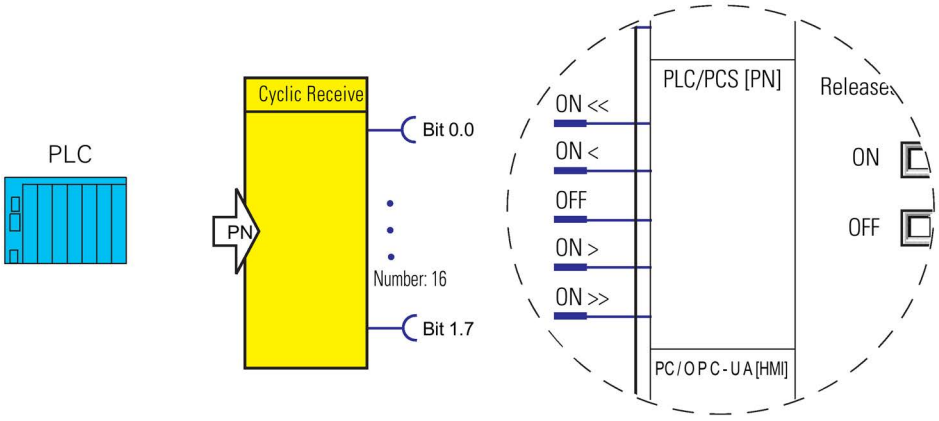


Figure 5-2 Control station - PLC/PCS [PN]:

- Control station - PC/OPC-UA [OCM]: This control station is primarily intended for switching commands from any PC which, as a client, accesses the data provided by SIMOCODE pro as the server via OPC UA. The control commands are thus transmitted on a client-server link via OPC UA.

Note

If the "SIMOCODE ES Professional" software is connected to SIMOCODE pro via PROFINET, its control commands automatically take effect via the "PC/OPC UA" control station. At the same time, the enabled commands for this control station also take effect for SIMOCODE ES.

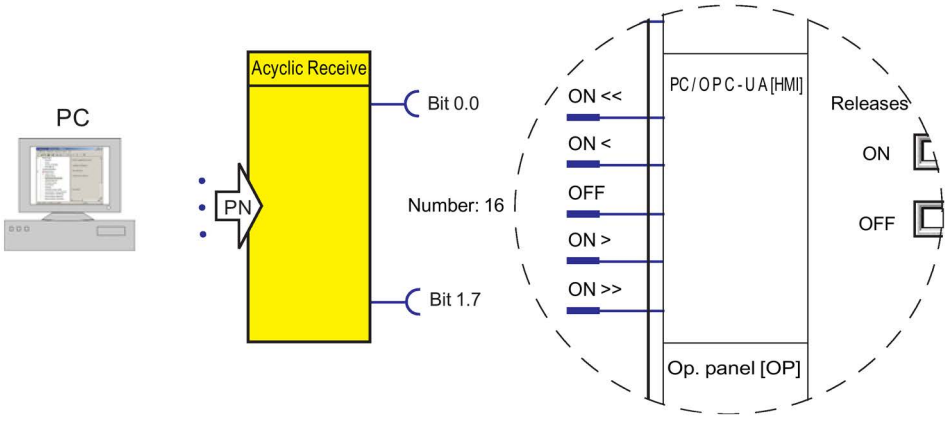


Figure 5-3 Control station - PC/OPC-UA [OCM]

- Control station - operator panel
  This control station is primarily intended for control commands issued via the buttons on the 3UF72 operator panel, which is mounted in a cabinet door, for example. The plugs of the "Control Stations" function block must be connected to any sockets (normally to the function block for the buttons of the operator panel - OP buttons) for the control commands to take effect.

Note

Since the operator panel only has four buttons for controlling the motor feeder, one button must be used as a speed changeover button for control functions with two speeds and two directions of rotation.

For this purpose, this button must be assigned to the internal control command "[OP]<>/<<>>".

Note

If the SIMOCODE ES PC software on a programming device is connected to SIMOCODE pro via the system interface, its control commands automatically take effect via the "operator panel [OP]" control station and must also be enabled here as applicable.

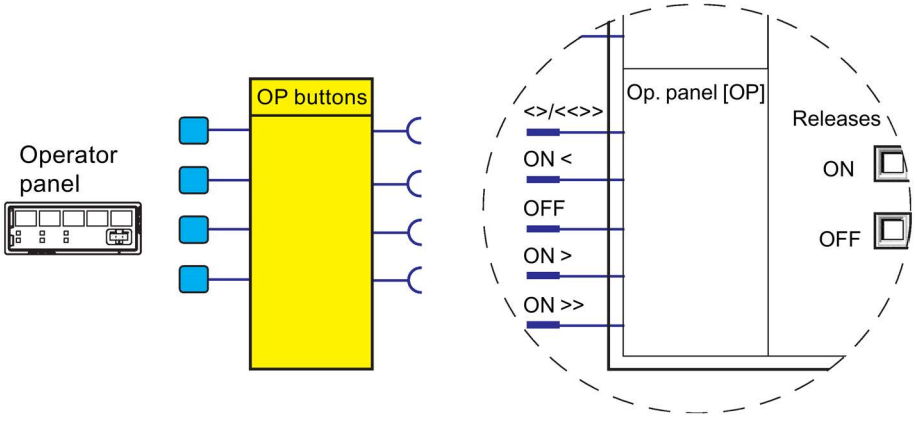


Figure 5-4 Control station - Operator panel

5.1.2 Operating modes and mode selectors

Operating modes

You can use the control stations either individually or in combination. There are four different operating modes available for selection:

- Local 1
- Local 2
- Local 3
- Remote/Automatic: In this operating mode, the system must communicate via PLC.

Not all control stations are usually connected. If more than one control station (e.g. local and PLC/PCS) is connected, it makes sense and is also mandatory to operate the control stations selectively. Four operating modes are provided for this purpose which can be selected via two control signals (mode selectors). For each individual control station in every operating mode, it can be stipulated if "ON commands" and/or "OFF commands" are to be accepted. The operating modes are controlled in such a way that only one operating mode is active at any one time.

Example: There are three operating modes in a system:

Table 5- 1 Operating modes

Operating mode	Description
Key-operated switch operation, e.g. Local 1	Only local control inputs are permitted! All other control stations are disabled.
Manual operation, e.g. Local 3	Only operator panel control commands and local control commands can be issued.
Remote operation, e.g. remote/automatic	Only PLC/PCS control commands are permitted; only OFF commands are permitted locally.

The key-operated switch must be read in via an input to select these operating modes. The remote switching operation should be controlled via the bus. The key-operated switch operation has priority over all other operating modes.

Mode selector

The S1/S2 mode selectors are used to switch between the operating modes "Local 1", "Local 2", "Local 3" and "Remote/Automatic". To do this, plugs S1 and S2 must be connected to any sockets (e.g. device inputs, PROFINET control bits, etc.).

The table below shows the operating modes depending on the signal states of mode selectors S1 and S2:

Table 5- 2 Operating modes depending on S1 and S2

Input	Operating mode			
	Local 1	Local 2	Local 3	Remote/Automatic
S1	0	0	1	1
S2	0	1	0	1

The different operating modes for enabling the control stations can be used to specify the switch authorizations for the individual control stations:

- Local control [LC]
- PLC/PCS [PN]
- PC/OPC-UA [OCM]
- Operator panel [OP]

Only the following are active:

- The operating mode set by the plugs S1 and S2 of the "Control Stations" function block
- The enables selected on "Control Stations".

Example of a dynamic mode selection as a function of time:

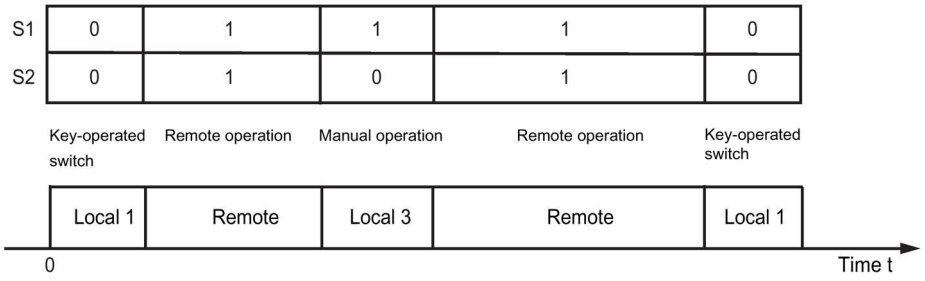


Figure 5-5 Example - mode selection

5.1.3 Enables and enabled control command

Enables

Enables, which must be activated, are assigned to the "ON" and "OFF" control commands for each control station in every operating mode. This means, depending on the operating mode, you can define for every control station whether the motor may be switched on only, off only, or on and off from the control station. The relevant checkbox is selected in the "Control stations" dialog box in SIMOCODE ES.

Enables and enabled control command schematic

The following diagram shows the "Control Stations" function block and the operating modes:

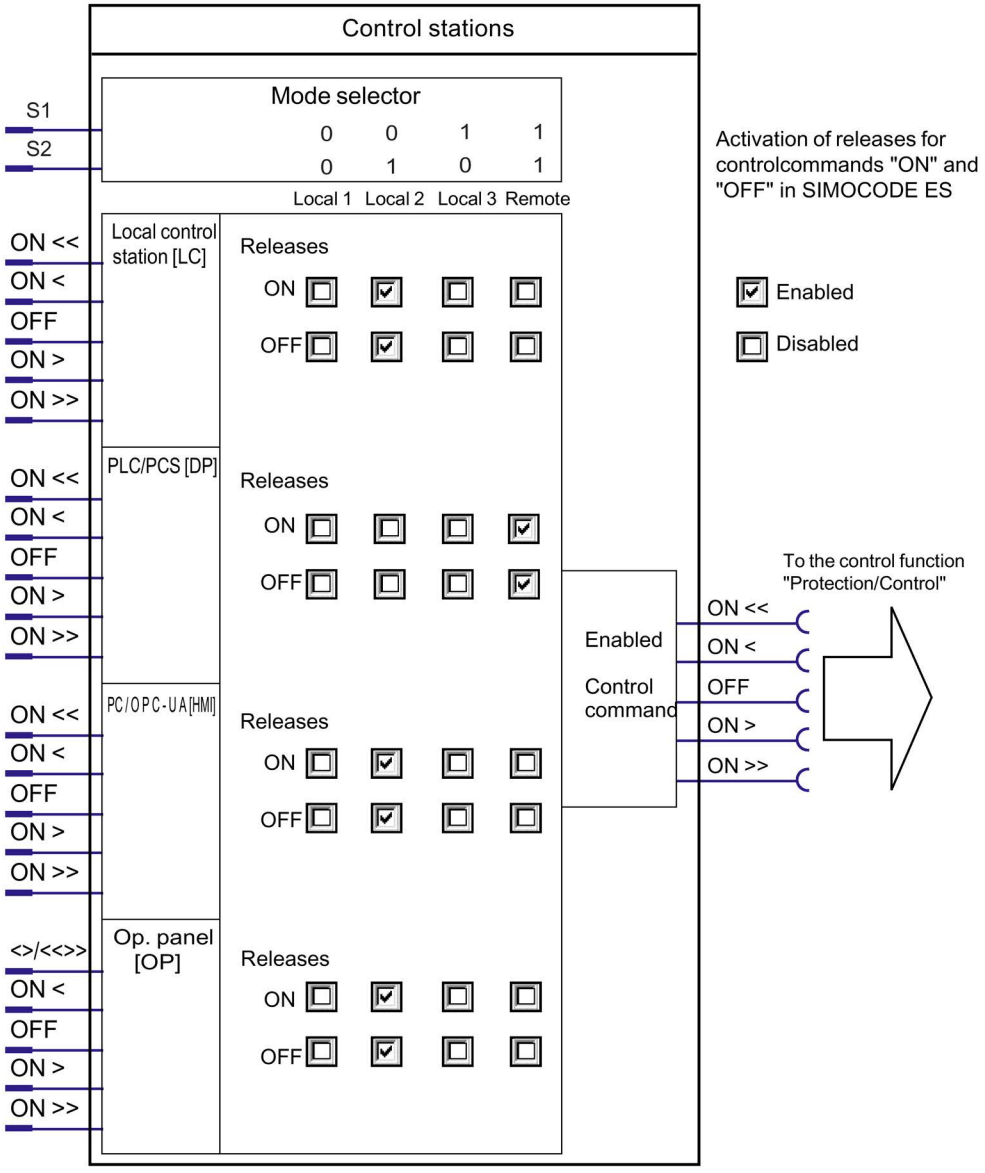


Figure 5-6 Function block "Control Stations"

Example of enabled commands

The following diagram shows an example of enabled commands for the "Local 2" operating mode, "Dahlander reversing starter" control function:

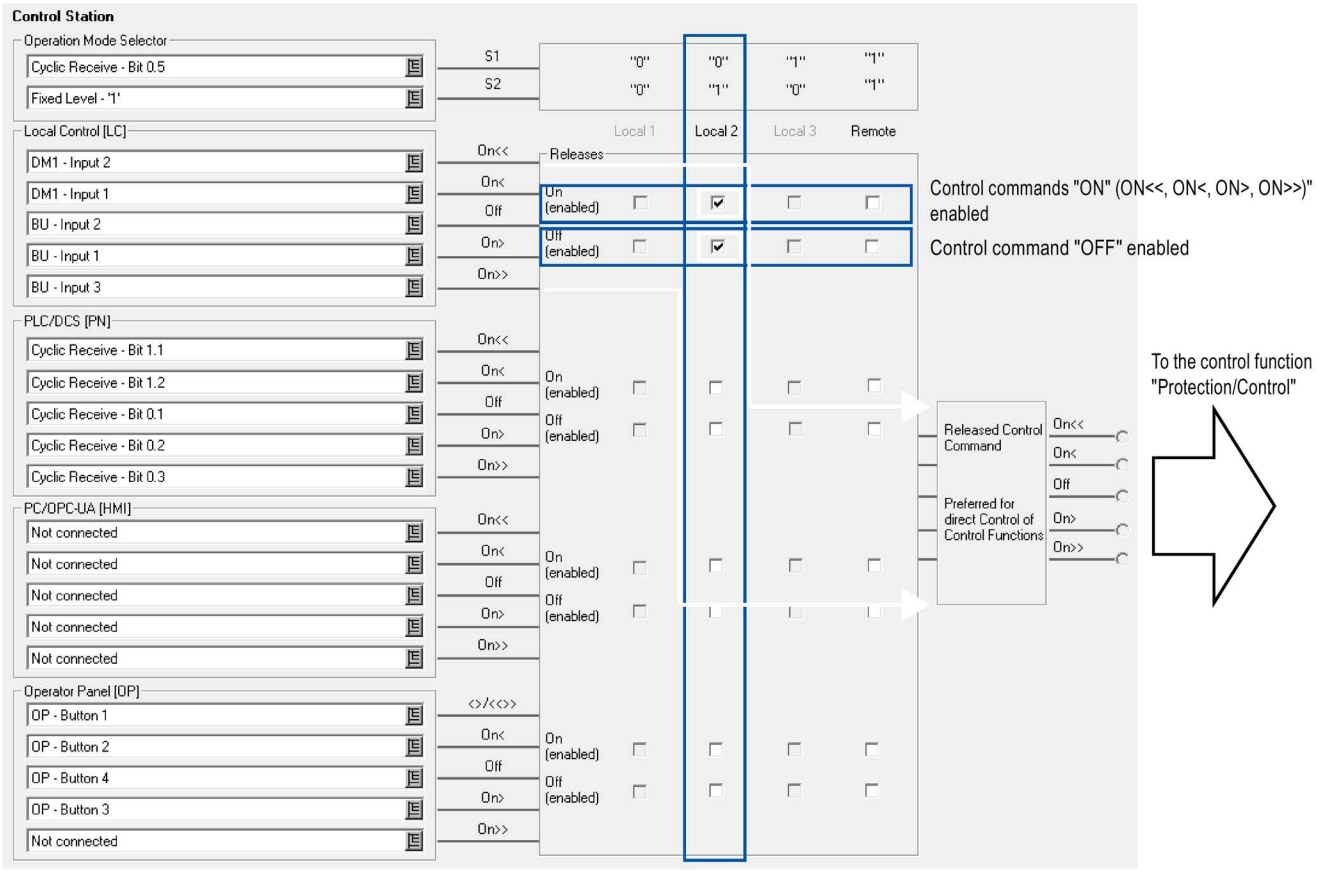


Figure 5-7 Example of enabled commands

In the example, the motor can only be switched on and off in the "Local 2" operating mode via the buttons (local) connected to the inputs of the basic unit and the digital module.

5.1.4 Control station settings

Table 5- 3 Control station settings

Control stations	Description
LC	Activates the control station via any signal (any sockets —C, but typically device inputs). The "OFF" plug is 0-active on the control station [LC].
ON <<	
ON <	
OFF	
ON >	
ON >>	
PLC/PCS [PN]	Activates the control station via any signal (any sockets —C, but typically control bits from PROFINET).
ON <<	
ON <	
OFF	
ON >	
ON >>	
PC/OPC-UA [OCM]	Activates the control stations via any signal (any sockets —C, but typically control bits via OPC UA).
ON <<	
ON <	
OFF	
ON >	
ON >>	

Control stations	Description
Operator panel [OP]	Activates the control stations via any signal (any sockets, but typically buttons on the operator panel).
<>/<<>>	
ON <	
OFF	
ON >	
ON >>	
Mode selector	For switching between the 4 operating modes Local 1, Local 2, Local 3 and remote with any signals (any sockets, e.g. device inputs, control bits from PROFINET, etc.).
S1	
S2	

5.2 Control functions

5.2.1 Description

Control functions - overview

Table 5- 4 Control functions

Control function	SIMOCODE pro V PN
Overload relay (Page 193)	✓
Direct starter (Page 195)	✓
Reversing starter (Page 197)	✓
Circuit breaker (Page 199)	✓
Star-delta starter (Page 202)	✓
Star-delta reversing starter (Page 205)	✓
Dahlander (Page 209)	✓
Dahlander reversing starter (Page 212)	✓
Pole-changing starter (Page 216)	✓
Pole-changing reversing starter (Page 219)	✓
Solenoid valve (Page 223)	✓
Positioner 1 to Positioner 5 (Page 225)	✓
Soft starter (Page 230)	✓
Soft starter with reversing contactor (Page 232)	✓

Control functions (e.g. direct starters, reversing starters) are used for controlling load feeders.

They are characterized by the following important features:

- Monitoring of the switch ON/OFF operation
- Monitoring the ON/OFF status
- Tripping if a fault occurs.

SIMOCODE pro monitors these statuses using the "Feedback ON" auxiliary control input, which is usually derived directly from the current flow in the main circuit, via the current measuring modules.

All the necessary interlocks and logic operations for the respective applications are already implemented in the control functions.

Control functions include:

- Plugs for
  - control commands (ON <<, ON <, OFF, ON >, ON >>) that are usually connected with the "Enabled control command" sockets
- Auxiliary control inputs (plug), e.g. Feedback ON
- Sockets for
  - Contactor controls QE1 to QE5.
  - Displays (lamp controls) QL, QLS.
  - Statuses, e.g. "Status - ON <<, Status - ON >>".
  - Faults, e.g. "Fault - Feedback (FB) On", "Fault - Antivalence"
- Settings, e.g. interlocking time, non-maintained command mode ON/OFF, etc.
- A logic component with all necessary interlocks and connections for the control function.
- Like control functions, the motor protection with its parameters and signals is active "at a higher level in the background". Motor protection and thermistor protection are independent functions that switch off the motor when activated via the control functions. Detailed description: See Chapter Motor protection (Page 155)

Control function schematic

The following schematic shows a general view of the control function ("Protection/Control" function blocks):

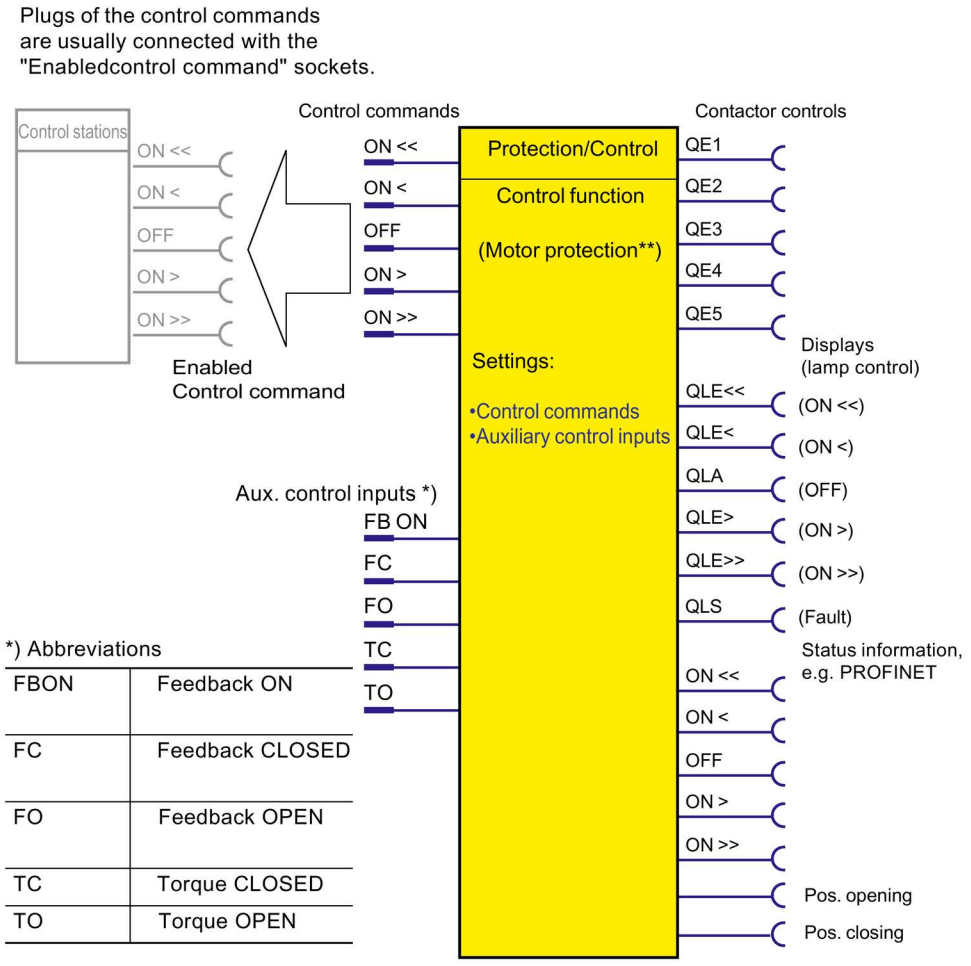


Figure 5-8 "Protection/Control" function block

**) See also Chapter Motor protection (Page 155).

Contactor controls

The QE contactor controls are switched dependent on the incoming control commands and taking the specified control function into consideration including all corresponding interlocks, feedbacks, corresponding parameters and the higher-level motor protection. In general, the QE contactor controls are directly connected to the outputs of the basic unit or the digital modules and switch the connected contactors using relays. The number of usable QE contactor controls is directly dependent on the set control function.

Lamp controls and status information:

The feeder status feedback is signaled via the status information or the QL lamp controls. They are all directly dependent on the status of the auxiliary control input "FB ON". The number of usable lamp controls and status information is directly dependent on the specified control function.

Feeder status feedback:

- Status information, e.g. "Status ON <": These are transmitted, for example, via PROFINET to the automation system and signal the status of the feeder there
- Displays (lamp control) "Display - QLE <": These can, for example, activate a signal lamp or a pushbutton lamp for status display

  Note

  If the motor is running in test operation, the QLE... / QLA lamp outputs show a different response (e.g. flashing).

- In addition to the status signals, the "QL..." lamp controls additionally indicate the following:
  - Unacknowledged fault (lamp output general fault QLS is flashing)
  - Save change-over command (QLE lamp outputs are flickering)
  - Lamp test: All QL outputs are activated for approx. 2 s

Extended status and fault messages

- Additional status information:
  - Start active: If "Motor" is selected as the load type, this signal is present during the start process of the motor for the duration of the specified class time (e.g. 10 s for Class 10). Exceptions are the "Overload relay" and "Solenoid valve" control functions.
  - Interlocking time active: For control functions with a change in the direction of rotation, the signal remains present until the specified interlocking time has elapsed.
  - Change-over pause active: For the "Dahlander," "Pole-changing starter," and "Star-delta" control functions the signal is present after changeover until the specified time has elapsed.
- Additional status information for the "Positioner" or "Solenoid valve" control function:
  - Feedback Closed (FC)
  - Feedback Open (FO)
  - Torque Closed (TC)
  - Torque Open (TO).

These feedback signals specify the present status of the corresponding limit switch and/or torque switch. The amount of usable status information is directly dependent on the selected control function.

- Additional fault information for the "Positioner" or "Solenoid valve" control function:
  - Stalled positioner: The torque switch has been activated before the corresponding limit switch. The positioner may have stalled
  - Double 0: Both torque switches have responded
  - Double 1: Both limit switches have responded
  - End position: Positioner has left the end position without receiving a control command
  - Antivalence: The changeover contacts of the limit switches do not issue an antivalent signal (only for the "Positioner 5" control function)

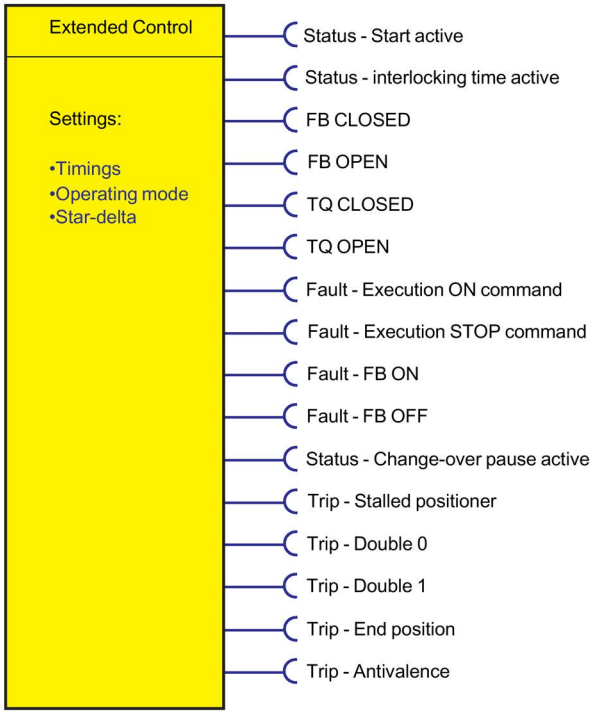


Figure 5-9 "Extended Control" function block

5.2.2 General settings and definitions

Application selection

The following dialog box opens

- when the SIMOCODE ES software starts and
- with menu command Switching Device > New in SIMOCODE ES.

If you select and load a preset application (e.g. the reversing starter) in SIMOCODE ES, all protective functions, links and interlocks for the reversing starter are set up in the basic unit. These can be flexibly adapted and expanded:

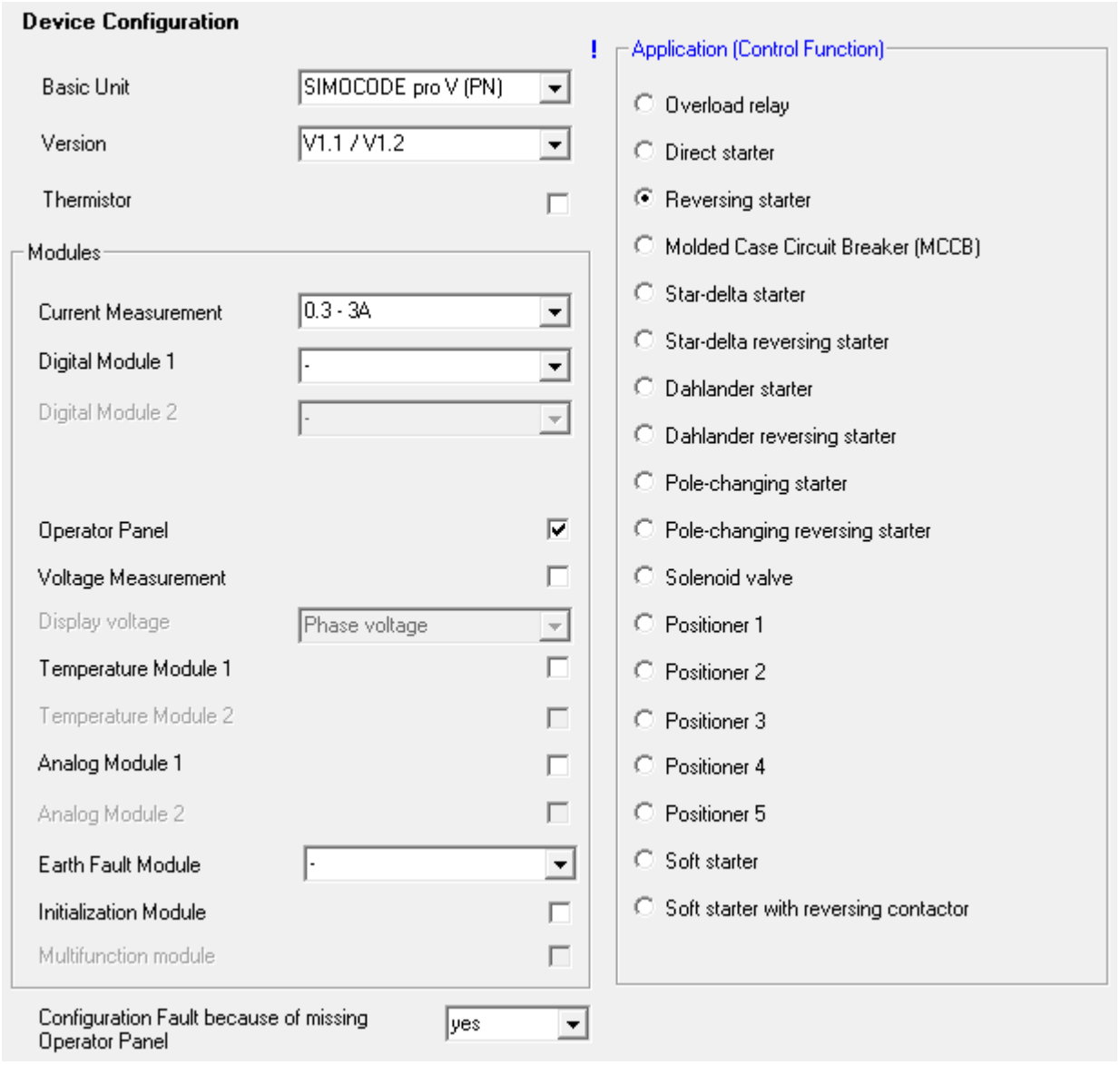


Figure 5-10 Application selection

Table 5- 5 Application selection

Control function	Brief description	Further information
Overload relay	SIMOCODE pro behaves like an overload relay.	See "Overload relay" control function (Page 193)
Direct starter	Switching motor on and off	See "Direct starter" control function (Page 195)
Reversing starter	Controlling the direction of rotation of motors (clockwise, counter-clockwise)	See "Reversing starter" control function (Page 197)
Molded-case circuit breaker (MCCB)	Switching a circuit breaker on and off (e.g. 3WL, 3VL)	See "Molded case circuit breaker (MCCB)" control function (Page 199)
Star-delta starter	To limit the starting current, SIMOCODE pro initially starts the motor with a star-connected stator winding and then switches it to delta.	See "Star-delta starter" control function (Page 202)
Star-delta reversing starter	Star-delta starter with both directions of rotation (clockwise, counter-clockwise)	See "Star delta reversing starter" control function (Page 205)
Dahlander	Controlling motors with only one stator winding in two speed steps (fast, slow)	See "Dahlander" control function (Page 209)
Dahlander reversing starter	Dahlander starter with both directions of rotation (clockwise, counter-clockwise)	See "Dahlander reversing starter" control function (Page 212)
Pole-changing starter	Controlling motors with two stator windings in two speed stages (fast, slow)	See "Pole-changing starter" control function (Page 216)
Pole-changing reversing starter	Pole-changing starter with both directions of rotation (clockwise, counter-clockwise)	See "Pole-changing reversing starter" control function (Page 219)
Solenoid valve	Activation of a solenoid valve	See "Solenoid valve" control function (Page 223)
Positioner (1, 2, 3, 4, 5)	Activation of positioners or actuators. Versions 1 to 5	See "Positioner" control function (Page 225)
Soft starter	Activation of the 3RW soft starter	See "Soft starter" control function (Page 230)
Soft starter with reversing contactor	Controlling the 3RW soft starter, including an additional reversing contactor	See "Soft starter with reversing contactor" control function (Page 232)

Parameters for control functions

Table 5- 6 General settings and definitions

Parameters	Description
ON <<, ON <, OFF, ON >, ON >>	Are usually connected with the "Enabled control command" sockets of the "Control Station" function block. From there, the control commands come from the different control stations. The number of active inputs depends on the control function chosen. With a direct starter, for example, only the inputs "ON >" and "OFF" are active. Default setting: Connected
FB ON	Auxiliary control input "Feedback ON" (connection with any socket, usually with "Status - Motor current flowing" socket) as factory default. An auxiliary contact from the contactor is not required for signaling. Depending on the control function chosen, this state is signaled by the QLE1 to QLE5 displays and by the "Status - ON <<, - ON <, - ON >, - ON >>" signals. "No motor current flowing" means: the motor is switched off. An auxiliary contact from the contactor is not required for signaling. This state is signaled by the QLA display and the "Status - OFF" signal. Default setting: Status - Motor current flowing
FC, FO, TC, TO	Auxiliary control inputs for the "Positioner" and "Solenoid valve" control functions that are normally connected with the inputs of the basic unit or the digital modules and are used to query the present status of the torque switch and the limit switches that are hard-wired to the inputs.
Non-maintained command mode	• Deactivated (default setting): The control command on the corresponding plug of the control stations "ON <, ON <<, ON >, ON >>" is saved. It can only be revoked by an "OFF" control command from the corresponding control station. An auxiliary contact for locking the contactor is not required. Motor feeders are usually operated in locking mode. Locking is preset. • Activated: Depending on the control function chosen, non-maintained command mode acts on the plugs of all control stations "ON <, ON <<, ON >, ON >>". A control command is only effective as long as there is a "high signal".
Save change-over command	• Deactivated (default setting): Change-over commands for switching from one direction of rotation/rotational speed to the other are only implemented with a previous "OFF" and after the interlocking time / change-over pause has elapsed. This setting is usually used and is preset. • Activated: Change-over commands for switching from one direction of rotation/rotational speed to the other are implemented without a previous "OFF" once the interlocking time/change-over pause has elapsed. If the selected direction/speed cannot be executed immediately due to a parameterized interlocking time/change-over pause, the selection is signaled by flickering QLE displays. Your selection can be cancelled at any time with "OFF".
Separate DM-FL/FP function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that the contactor control is always tripped, too. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping via the DM-F modules does not affect the SIMOCODE pro control function, so that the contactor control is not tripped. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.

Parameters	Description
Type of consumer load	You can select from the following: • Motor (default) • Resistive load (e.g. heater): Since overcurrent generally does not flow during startup on a resistive load, the "Start active" status is not signaled. In this case, the start-up override does not occur for the "Signaling", "Warning" and "Tripping" functions.
Feedback time	SIMOCODE pro monitors the status of the feeder (ON or OFF) via FB ON. If the status of FB ON changes - without a corresponding switching command - "Fault - Feedback (FB)" switches off the feeder. Default setting: 0.5 s The feedback time can be used to suppress such "feedback faults" for a defined period of time, e.g. in the case of network switchover. When the motor is switched off, SIMOCODE pro continuously checks whether FB ON = 0. If the current flows longer than the set feedback time without the "ON" control command being issued, a fault message "Fault - feedback (FB) ON" is issued. The contactor controls can only be connected after the fault has been rectified. When the motor is switched on, SIMOCODE pro continuously checks whether FB ON = 1. If no current flows for longer than the set feedback time without the "OFF" control command being issued, a fault message "Fault - feedback (FB) OFF" is issued. The contactor controls are deactivated.
Execution time	SIMOCODE pro monitors the switch-on and switch-off process. The switch-on or switch-off process must be completed within this time. Default setting: 1.0 s After the "ON" control command is issued, SIMOCODE pro must be able to detect current in the main circuit within the execution time. Otherwise, the fault message "Fault - Execution ON command" will be issued. SIMOCODE pro deactivates the contactor controls. After the "OFF" control command is issued, SIMOCODE pro must not be able to detect current in the main circuit after expiry of the execution time. Otherwise, the fault message "Fault - Execution STOP command" will be issued. The contactor controls can only be connected after the fault has been rectified.
Interlocking time	SIMOCODE pro prevents, e.g. in the case of reversing starters, both contactors from switching on at the same time. Changing from one direction of rotation to the other can be delayed via the interlocking time. Default setting: 0 s
Change-over pause	In the "Dahlander" and "Pole-changing starter" control functions, switching from FAST to SLOW can be delayed by the time configured. In the "Star-delta starter" control function, the change-over pause time extends the time between switching off the star contactor and switching on the delta contactor by the time configured. Default setting: 0.00 s
Max. star time	With the "Star-delta starter" or "Star-delta reversing starter" control function: Time-dependent switching from star to delta. Max. star time: 0 - 255 s (default setting: 20 s).
Current measuring module installed	With the "Star-delta starter" and the "Star-delta reversing starter" control functions: The set current and the switching levels for star-to-delta switching depend on the installation location of the current measuring module: • in delta circuit (default): Set current I_s is reduced to I_{rated} x $1/\sqrt{3}$ • In supply line: Set current

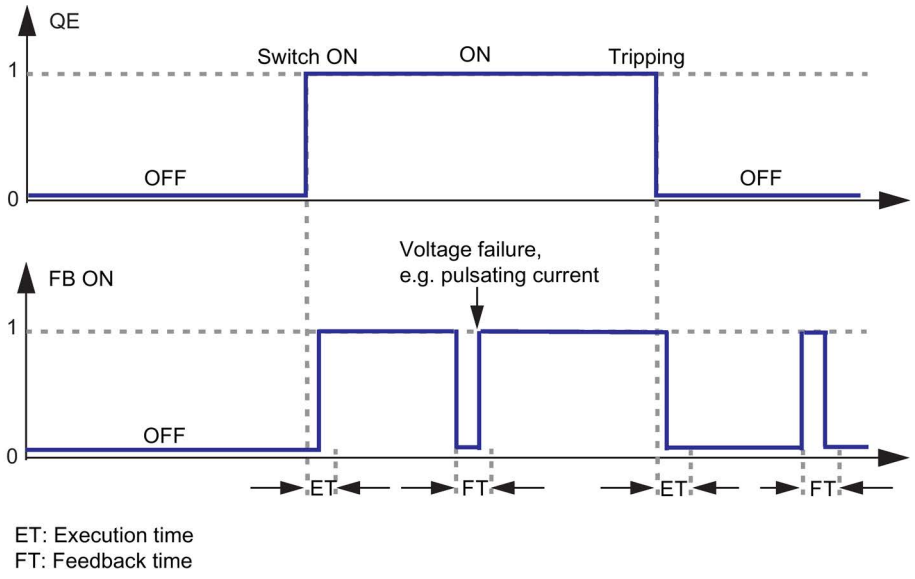


Figure 5-11 Execution time (ET) and feedback time (FT) in relation to FB ON

Faults

The contactor controls are deactivated.

The following signals are also output:

- A flashing signal on the QLS lamp control
- A flashing signal on the "GEN. FAULT" LED FAULT"
- The "Status - General fault" signal
- The corresponding signaling bit of the fault.

5.2.3 "Overload relay" control function

Description

With this control function, SIMOCODE pro functions like a solid-state overload relay. Control commands (e.g. ON, OFF) cannot be issued to the load. Control stations and inputs of the control function (e.g. ON >, OFF), do not have any function in the case of overload relays. When the control voltage is applied, SIMOCODE pro automatically closes the QE3 contactor control; it remains active until it is deactivated by the fault message of a protection or monitoring system.

The QE3 contactor control must be connected to any relay output that switches off the contactor coil of the motor contactor in case of overload.

Schematic

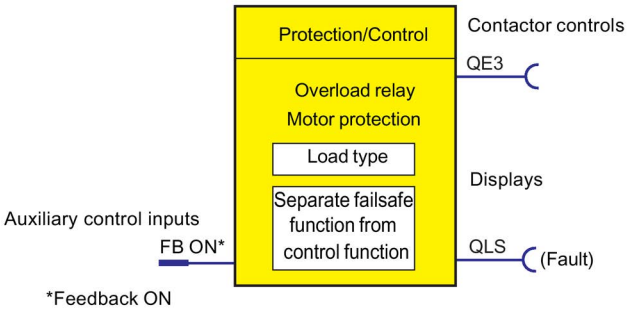


Figure 5-12 Schematic of the "Overload relay" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 7 Overload relay settings

Overload relay	Description
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189)).
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules affects the SIMOCODE pro control function, so that additional fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.

Note

In the case of overload, the QE3 output is set (=1) and is only reset after an overload trip (=0).

This output closes when the overload function is parameterized.

Note

Monitoring the number of starts is not possible for this control function.

5.2.4 "Direct starter" control function

Description

SIMOCODE pro can switch a motor on and off with this control function.

Control commands

- Start with "ON >" activates the QE1 internal contactor control.
- Stop with "OFF" deactivates the QE1 internal contactor control.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

Every fault message causes the QE1 contactor control to be deactivated.

Schematic

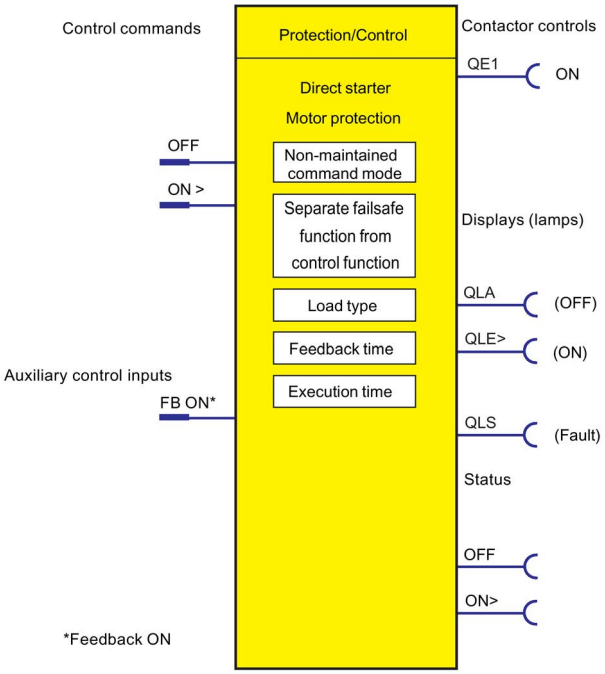


Figure 5-13 Schematic of the "Direct starter" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 8 Direct starter settings

Direct starter	Description
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command - OFF"
ON >	Control command ON Connection with any socket, usually with socket "Enabled control command - ON >"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189)).
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Range 0 to 6553.5 s (default setting: 1.0 s)

5.2.5 "Reversing starter" control function

Description

With this control function, SIMOCODE pro can control the direction of rotation of the motor (forwards and backwards).

Control commands

- Start with "ON >" activates the QE1 contactor control (clockwise, i.e. forwards)
- Start with "ON <" activates the QE2 contactor control (counter-clockwise, i.e. backwards)
- Stop with "OFF" deactivates the QE1 and QE2 internal contactor controls.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

Every fault message causes the QE1 and QE2 contactor controls to be deactivated.

Switching the direction of rotation

The direction of rotation can be switched once the "Status - ON >" or "Status - ON <" signal has expired (motor is switched off) **and** the interlocking time has elapsed:

- Via the "OFF" control command.
- Directly when "Save change-over command" is activated.

SIMOCODE pro prevents both contactors from switching on at the same time. Changing from one direction of rotation to the other can be delayed via the interlocking time.

Schematic

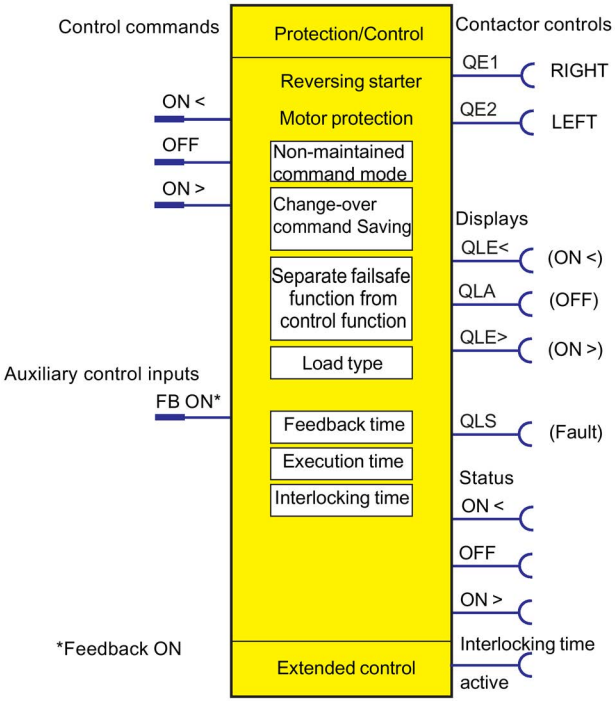


Figure 5-14 Schematic of the "Reversing starter" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 9 Reversing starter settings

Reversing starter	Description
ON < ▬	Control command ON <, counter-clockwise Connection with any socket —C, usually with socket "Enabled control command - ON <"
OFF ▬	Control command OFF Connection with any socket —C, usually with socket "Enabled control command OFF"
ON > ▬	Control command ON >, clockwise Connection with any socket —C, usually with socket "Enabled control command - ON >"
FB ON ▬	"Feedback ON" auxiliary control input Connection with any socket —C, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated

Reversing starter	Description
Save change-over command	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Range 0 to 6553.5 s (default setting: 1.0 s)
Interlocking time	Range 0 to 255 s (default setting: 0 s)

5.2.6 "Molded case circuit breaker (MCCB)" control function

Description

SIMOCODE pro can mainly switch circuit breakers (e.g. 3WL, 3VL) ON and OFF with this control function. The circuit breakers are then connected to PROFINET via SIMOCODE pro.

Control commands

- Start with "ON >" activates the QE1 contactor control for a pulse of 400 ms.
- Stop with "OFF" activates the QE3 contactor control for a pulse of 400 ms.
- With "Reset", the QE3 contactor control is activated for a pulse of 400 ms when the circuit breaker is tripped (alarm switch = ON).

The pulse of a control command is always fully executed before the "counter pulse" is set.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

Making internal assignments

You have to make the following assignments:

1. Assign the QE1 contactor control to the relay output that is connected to the "ON connection" of the motorized operating mechanism of the circuit breaker.
2. Assign the QE3 contactor control to the relay output that is connected to the "OFF connection" of the motorized operating mechanism of the circuit breaker.
3. Assign the SIMOCODE pro input that is connected to the auxiliary switch (AUXS) of the circuit breaker to the auxiliary control input "Feedback ON".
4. Assign the SIMOCODE pro input which is connected to the alarm switch (AS) of the circuit breaker to the input (socket) of the "External fault 1" standard function.

Schematic

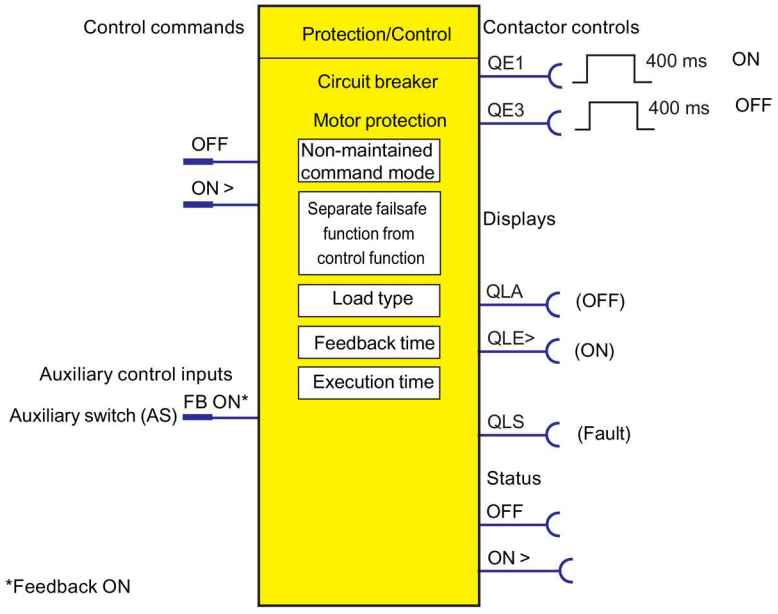


Figure 5-15 Schematic of the "circuit breaker" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 10 Circuit breaker settings

Circuit breaker	Description
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command OFF"
ON >	Control command ON Connection with any socket, usually with socket "Enabled control command - ON >"
FB ON	"Feedback ON" auxiliary control input Connection always with socket, (input) to which the auxiliary switch of the circuit breaker is connected
Non-maintained command mode	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	A repeated ON pulse is only output by the QE1 contactor control once the set feedback time has elapsed. The feedback time should therefore be set higher than the motor off time of the motor-operated mechanism of the circuit breaker. Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Range 0 to 6553.5 s (default setting: 1.0 s)

5.2.7 "Star-delta starter" control function

Description

Star-delta starting is used to limit the starting current and to avoid overloading the line supply. In this control function, SIMOCODE pro initially starts the motor with a star-connected stator winding and then switches it to delta.

Control commands

- Start with "ON" first activates the QE1 contactor control (star contactor) and then immediately activates the QE3 contactor control (line contactor)
- Stop with "OFF" deactivates contactor controls QE1, QE2, and QE3.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets. Every fault message causes the QE1, QE2 and QE3 contactor controls to be deactivated.

Switching from star to delta

For this purpose, SIMOCODE pro first deactivates contactor control QE1 before connecting contactor control QE2 (delta contactor).
SIMOCODE pro switches over from star to delta:

- Current-dependent, for decreasing current below the following thresholds:
  - Transformer installed in delta circuit: $I < 150\ \% I_s$
  - Transformer installed in supply line: $I < 90\ \% I_s$
- Time-dependent to the time set in the parameter "Max. star time" when the current in star operation does not sink below this threshold.

Safety information

Note

It is recommended that QE contactor controls are wired to the relay outputs of the basic unit.

Note

False tripping can occur if you use internal ground-fault detection for star-delta circuits. During delta operation, the summation current is non-zero due to harmonics.

Note

If the current measuring module is switched to delta (normal case), a current which is $1/\sqrt{3}$ times smaller must be set for the star-delta starter control function.

Example: $I_n = 100$ A

$I_s = I_n \times 1/\sqrt{3}$

$I_s = 100\ A \times 1/\sqrt{3} = 57.7$ A

Current to be set $I_s = 57.7$ A

Change-over pause

The switching time from star to delta can be extended by the change-over pause. Reason: For motors with a high ratio between starting current and rated current, the line voltage plus motor EMF might lead to a very high delta starting current if the change-over pause is too short. The motor EMF decreases if the pause is longer.

Schematic

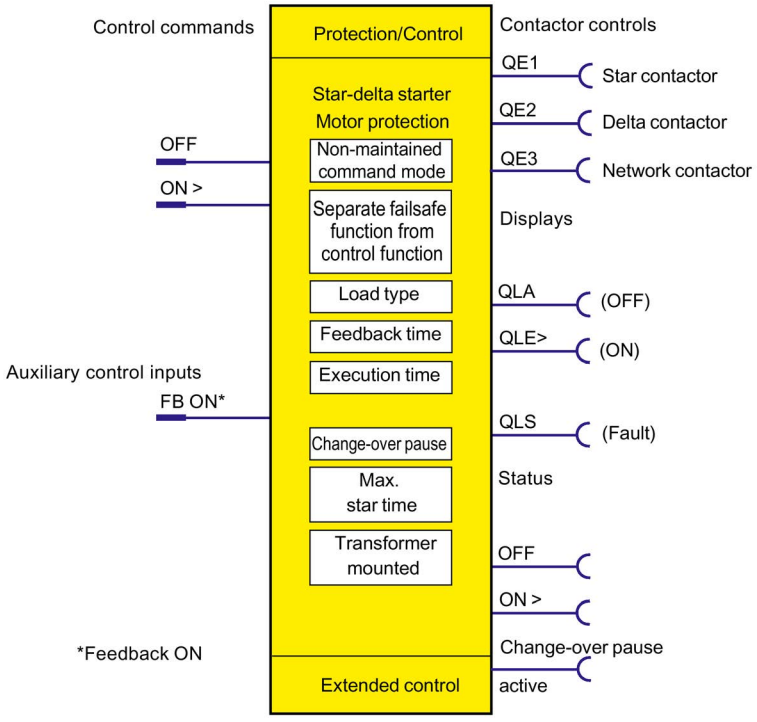


Figure 5-16 Schematic of the "Direct starter" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 11 Star-delta starter settings

Star-delta starter	Description
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command - OFF"
ON >	Control command ON Connection with any socket, usually with socket "Enabled control command - ON >"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules affects the SIMOCODE pro control function, so that additional fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can select from the following: • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Range 0 to 6553.5 s (default setting: 1 s)
Change-over pause	Range 0 to 655.3 s (10 ms steps) (default setting: 0.00 s)
Max. star time	Time-dependent switching from star to delta. Range 0 to 255 s (default setting: 20 s)
Current measuring module installed [1)]	The set current and the switching levels for star-to-delta switching depend on the installation location of the current measuring module: • In the delta circuit: Set current I_s is reduced to I_n x 1/√3 (default) • In supply line: Set current $I_s = I_n$ (rated current of the motor)

Note

1) If a current / voltage measuring module is in use, the transformer must be connected in the supply line.

It is also necessary to select "Line-to-line voltage" under "Device configuration → Voltage display".

5.2.8 "Star delta reversing starter" control function

Description

With this control function, a motor can be started in both directions of rotation in star-delta operation.

Control commands

- **Clockwise rotation:** Start with "ON >" first activates the QE1 contactor control (star contactor) and then immediately activates the QE3 contactor control
- **Counter-clockwise rotation**: Start with "ON <" first activates the QE1 contactor control (star contactor) and then immediately activates the QE4 contactor control
- **Stop** with "OFF" deactivates contactor controls QE1, QE2, QE3, and QE4.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

Every fault message causes the QE1, QE2, QE3 and QE4 contactor controls to be deactivated.

Switching from star to delta

For this purpose, SIMOCODE pro first deactivates the QE1 contactor control before connecting the QE2 contactor control (delta contactor).

SIMOCODE pro switches over from star to delta:

- Current-dependent, for decreasing current below the following thresholds:
  - Transformer installed in delta circuit: $I < 150\ \% I_s$
  - Transformer installed in supply line: $I < 90\ \% I_s$
- Time-dependent to the time set in the parameter "Max. star time" when the current in star operation does not sink below this threshold.

Switching the direction of rotation

The direction of rotation can be switched on condition that the signal "Status - ON >" or

"Status - ON <" has expired (motor has been shut down) **and** the interlocking time has elapsed:

- Via the OFF control command.
- Directly when "Save change-over command" is activated.

SIMOCODE pro prevents both contactors from switching on at the same time. Switching from one direction of rotation to the other can be delayed via the "interlocking time".

Start-up is always in star mode.

Safety information

Note

It is recommended that the QE1 and QE2 contactor controls are wired to the relay outputs of the basic unit. You need at least 1 digital module for this control function.

Note

False tripping can occur if you use internal ground-fault detection for star-delta circuits. During delta operation, the summation current is non-zero due to harmonics.

Note

If the current measuring module is switched to delta (normal case), a current which is $1/\sqrt{3}$ times smaller must be set for the star-delta starter control function.

Example: I_n = 100 A

$I_s = I_n \times 1/\sqrt{3}$

I_s = 100 A x $1/\sqrt{3}$ = 57.7 A

Current to be set I_s = 57.7 A

Change-over pause

The switching time from star to delta can be extended by the change-over pause. Reason: For motors with a high ratio between starting current and rated current, the line voltage plus motor EMF might lead to a very high delta starting current if the change-over pause is too short. The motor EMF decreases if the pause is longer.

Schematic

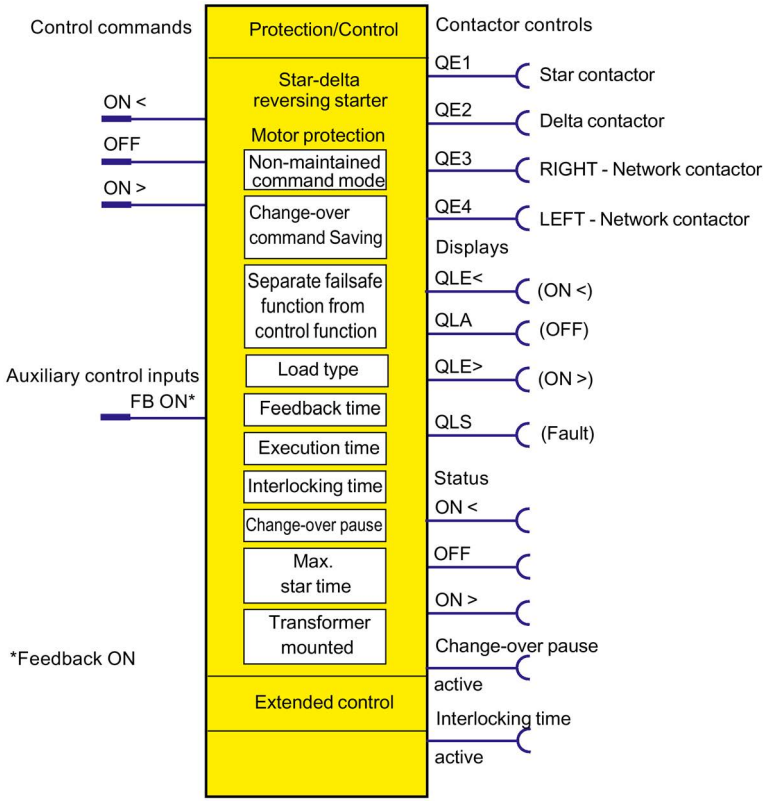


Figure 5-17 Schematic of the "Star-delta reversing starter" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 12 Star-delta reversing starter settings

Star-delta reversing starter	Description
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command - OFF"
ON >	Control command ON > Connection with any socket, usually with socket "Enabled control command - ON >"
ON <	Control command ON < Connection with any socket, usually with socket "Enabled control command - ON <"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated
Save change-over command	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional follow-on fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Range 0 to 6553.5 s (default setting: 1 s)
Change-over pause	Range 0 to 655.3 s (10 ms steps) (default setting: 0 s)
Interlocking time	Range 0 to 255 s (default setting: 0 s)
Max. star time	Time-dependent switching from star to delta. Range 0 to 255 s (default setting: 20 s)
Current measuring module installed [1)]	The set current and the switching levels for star-to-delta switching depend on the installation location of the current transformer/current measuring module: • in delta circuit (default): Set current I_s is reduced to I_{rated} x 1/√3 • In supply line: Set current $I_s = I_n$ (rated current of the motor)

Note

1) If a current / voltage supply module is in use, the transformer must be connected in the supply line.

5.2.9 "Dahlander" control function

Description

With this function, SIMOCODE pro can control motors with only one stator winding at two speeds (FAST and SLOW). SIMOCODE pro connects the stator winding via the contactors so that there is a high pole number at low speed and a low pole number at high speed.

Control commands

- **SLOW**: Start with "ON >" first activates the QE2 contactor control (SLOW).
- **FAST**: Start with "ON >>" first activates the QE3 contactor control (star contactor, FAST) and then immediately activates the QE1 contactor control (line contactor, FAST).
- **Stop** with "OFF" deactivates contactor controls QE1, QE2, and QE3.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

Every fault message causes the QE1, QE2 and QE3 contactor controls to be deactivated.

Switching the speed

The speed can be switched once the "Feedback ON" signal has expired (motor is switched off) **and** on changeover from "FAST" → "SLOW" after the change-over pause has elapsed:

- Via the "OFF" control command.
- Directly when "Save change-over command" is activated.

SIMOCODE pro prevents the contactors for the "FAST" speed from being switched on at the same time as the contactor for the "SLOW" speed.

Change-over pause

The "Change-over pause" parameter can be used to delay switching from "FAST" → "SLOW" to give the motor enough time to run down.

Note

Two set currents must be set for this control function:

- I_s1 for the SLOW speed
- I_s2 for the FAST speed.

Depending on the current range, the current can in many cases be directly measured at both speeds with a single current transformer. Otherwise you will need two external current transformers appropriate for the relevant speed (e.g. 3UF18 with a 1 A secondary transformer rated current), whose secondary cables must lead through the current measuring module within the range 0.3 to 3 A. The set current I_s1 or I_s2 must be converted according to the secondary currents of the external transformers. For more information, see Chapter Overload protection (Page 159).

Schematic

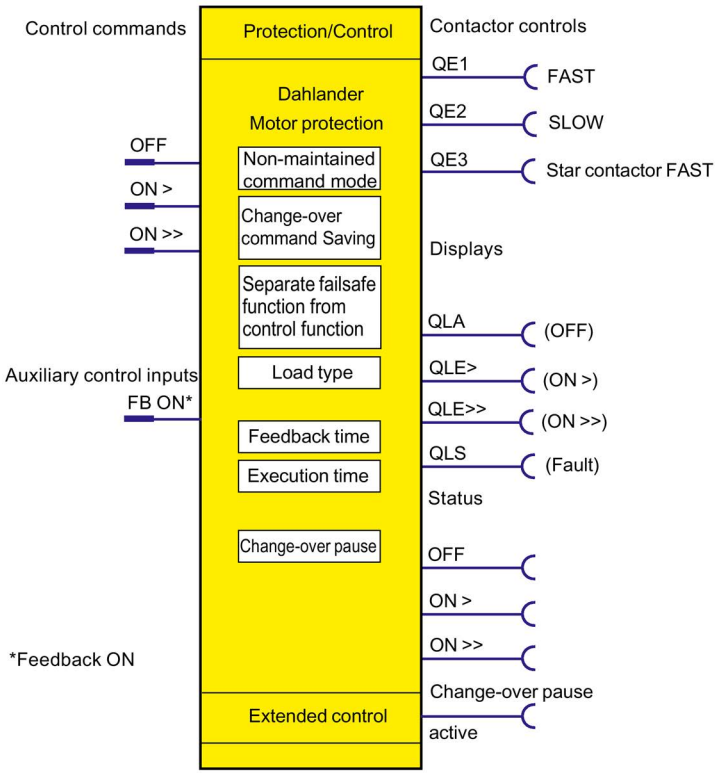


Figure 5-18 Schematic of the "Dahlander" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 13 Dahlander settings

Dahlander	Description
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command OFF"
ON >	Control command ON > (SLOW) Connection with any socket, usually with socket "Enabled control command - ON >"
ON >>	Control command ON >> (FAST) Connection with any socket, usually with socket "Enabled control command - ON >>"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Save change-over command	• Deactivated (default setting) • Activated
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Range 0 to 6553.5 s (default setting: 1.0 s)
Change-over pause	Range 0 to 655.3 s (10 ms steps) (default setting: 0.00 s)

5.2.10 "Dahlander reversing starter" control function

Description

This control function can be used to change the direction of rotation of a motor at both speeds.

Control commands

- **RIGHT-SLOW:** Start with "ON >" activates the QE2 contactor control (RIGHT-SLOW)
- **RIGHT-FAST:** Start with "ON >>" first activates the QE3 contactor control (star contactor FAST) and then immediately activates the QE1 contactor control (RIGHT-FAST)
- **LEFT-SLOW:** Start with "ON <" activates the QE4 contactor control (LEFT-SLOW)
- **LEFT-FAST:** Start with "ON <<" first activates the QE3 contactor control (star contactor FAST) and then immediately activates the QE5 contactor control (LEFT-FAST)
- **Stop** with "OFF" deactivates the contactor controls.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets. It does not matter in what order the control commands are given. Every fault message causes the contactor control to be deactivated.

Switching the direction of rotation

The direction of rotation can be switched once the "Status - ON >" or "Status - ON <" signal has expired (motor is switched off) and the interlocking time has elapsed:

- Via the OFF control command
- Directly when "Save change-over command" is activated.

SIMOCODE pro prevents both contactors from switching on at the same time. Switching from one direction of rotation to the other can be delayed via the "interlocking time".

Switching the speed

The speed can be switched once the "Feedback ON" signal has expired (motor is switched off) and on changeover from "FAST" → "SLOW" after the change-over pause has elapsed:

- Via the OFF control command
- Directly when "Save change-over command" is activated.

Change-over pause

The "Change-over pause" parameter can be used to delay switching from "FAST" → "SLOW" to give the motor enough time to run down.

Safety information

Note

You need at least one digital module for this control function. This control function cannot be implemented with bistable relay outputs.

Note

Two set currents must be set for this control function:

- I_s1 for the SLOW speed
- I_s2 for the FAST speed.

Depending on the current range, the current can in many cases be directly measured at both speeds with a single current transformer. Otherwise you will need two external current transformers appropriate for the relevant speed (e.g. 3UF18 with a 1 A secondary transformer rated current), whose secondary cables must lead through the current measuring module within the range 0.3 to 3 A. The set current I_s1 or I_s2 must be converted according to the secondary currents of the external transformers. For more information, see Chapter Overload protection (Page 159).

Schematic

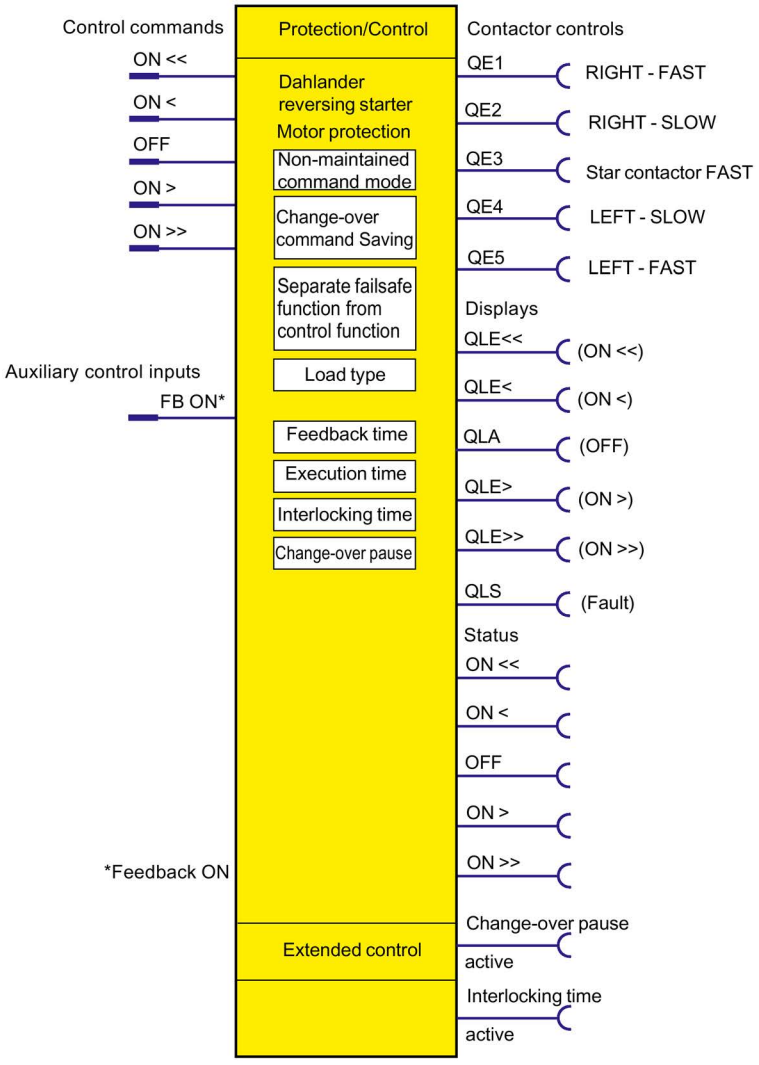


Figure 5-19 Schematic of the "Dahlander reversing starter" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 14 Control function settings for Dahlander reversing starter

Dahlander reversing starter	Description
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command OFF"
ON >	Control command ON > (RIGHT, SLOW) Connection with any socket, usually with socket "Enabled control command - ON >"
ON >>	Control command ON >> (RIGHT, FAST) Connection with any socket, usually with socket "Enabled control command - ON >>"
ON <	Control command ON < (LEFT, SLOW) Connection with any socket, usually with socket "Enabled control command - ON <"
ON <<	Control command ON << (LEFT, FAST) Connection with any socket, usually with socket "Enabled control command - ON <<"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated
Save change-over command	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Range 0 to 6553.5 s (default setting: 1.0 s)
Interlocking time	Range 0 to 255 s (default setting: 0 s)
Change-over pause	Range 0 to 655.3 s (10 ms steps) (default setting: 0.00 s)

5.2.11 "Pole-changing starter" control function

Description

With this control function, SIMOCODE pro can control motors with two stator windings at two speeds (FAST and SLOW).

Control commands

- **SLOW:** Start with "ON >" first activates the QE2 contactor control (SLOW).
- **FAST:** Start with "ON >>" activates the QE1 contactor control (FAST).
- **Stop** with "OFF" deactivates the contactor controls.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

It does not matter in what order the control commands are given.

Every fault message causes the contactor control to be deactivated.

Switching the speed

The speed can be switched once the "Feedback ON" signal has expired (motor is switched off) **and** on change-over from "FAST" → "SLOW" after the change-over pause has elapsed:

- Via the OFF control command.
- Directly when "Save change-over command" is activated.

Change-over pause

The "Change-over pause" parameter can be used to delay switching from "FAST" → "SLOW" to give the motor enough time to run down.

Note

Two set currents must be set for this control function:

- I_s1 for the SLOW speed
- I_S2 for the FAST speed

Depending on the current range, the current can in many cases be directly measured at both speeds with a single current transformer. Otherwise you will need two external current transformers appropriate for the relevant speed (e.g. 3UF18 with a 1 A secondary transformer rated current), whose secondary cables must lead through the current measuring module within the range 0.3 to 3 A. The set current I_s1 or I_s2 must be converted according to the secondary currents of the external transformers. For more information, see Chapter Overload protection (Page 159).

Schematic

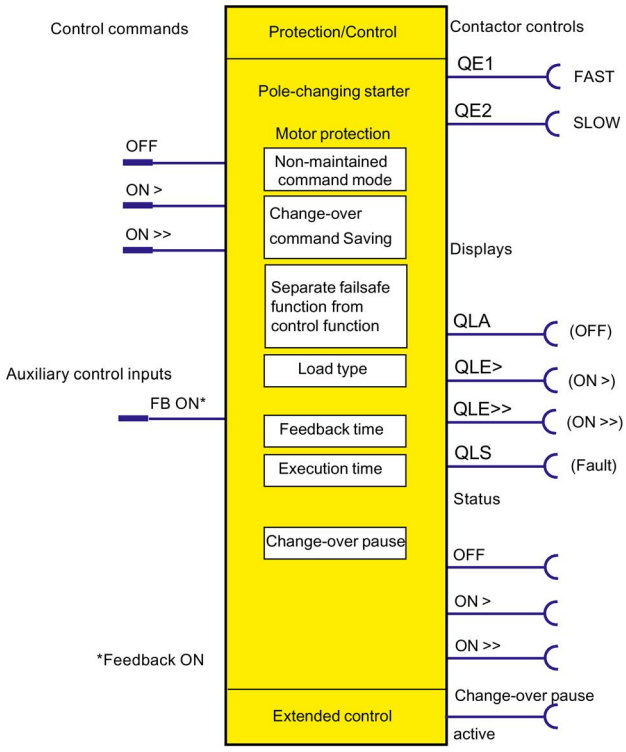


Figure 5-20 Schematic of the "Pole-changing starter" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 15 Pole-changing starter settings

Pole-changing starter	Description
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command - OFF"
ON >	Control command ON > (SLOW) Connection with any socket, usually with socket "Enabled control command - ON >"
ON >>	Control command ON >> (FAST) Connection with any socket, usually with socket "Enabled control command - ON >>"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated
Save change-over command	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional follow-on fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Range 0 to 6553.5 s seconds (default setting: 1.0 s)
Change-over pause	Range 0 to 655.3 s (10 ms steps) (default setting: 0.00 s)

5.2.12 "Pole-changing reversing starter" control function

Description

This control function can be used to change the direction of rotation of a motor at both speeds.

Control commands

- **RIGHT-SLOW:** Start with "ON >" first activates the QE2 contactor control (RIGHT-SLOW)
- **RIGHT-FAST:** Start with "ON >>" activates the QE1 contactor control (RIGHT-FAST).
- **LEFT-SLOW:** Start with "ON <" activates the QE4 contactor control (LEFT-SLOW).
- **LEFT-FAST:** Start with "ON <<" activates the QE5 contactor control (LEFT-FAST).
- **Stop** with "OFF" deactivates the contactor controls.

The control commands can be issued to SIMOCODE pro from any control stations. Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

It does not matter in what order the control commands are given. Every fault message causes the contactor control to be deactivated.

Switching the direction of rotation

The direction of rotation can be switched once the "Status - ON >" or "Status - ON <" signal has expired (motor is switched off) and the interlocking time has elapsed:

- Via the "OFF" control command.
- Directly when "Save change-over command" is activated.

SIMOCODE pro prevents both contactors from switching on at the same time. Switching from one direction of rotation to the other can be delayed via the "interlocking time".

Switching the speed

The speed can be switched once the "Feedback ON" signal has expired (motor is switched off) **and** on change-over from "FAST" → "SLOW" after the change-over pause has elapsed:

- Via the "OFF" control command.
- Directly when "Save change-over command" is activated.

Change-over pause

SIMOCODE pro prevents the contactors for "FAST" and "SLOW" from being switched on simultaneously. The "Change-over pause" can be used to delay switching from "FAST" → "SLOW" to give the motor enough time to run down.

Safety information

Note

At least one additional digital module is required for this control function.

Note

Two set currents must be set for the pole-changing starter:

- I_s1 for the SLOW speed
- I_s2 for the FAST speed.

Depending on the current range, the current can in many cases be directly measured at both speeds with a single current transformer. Otherwise you will need two external current transformers appropriate for the relevant speed (e.g. 3UF18 with a 1 A secondary transformer rated current), whose secondary cables must lead through the current measuring module within the range 0.3 to 3 A. The set current I_s1 or I_s2 must be converted according to the secondary currents of the external transformers. For more information, see Chapter Overload protection (Page 159).

Schematic

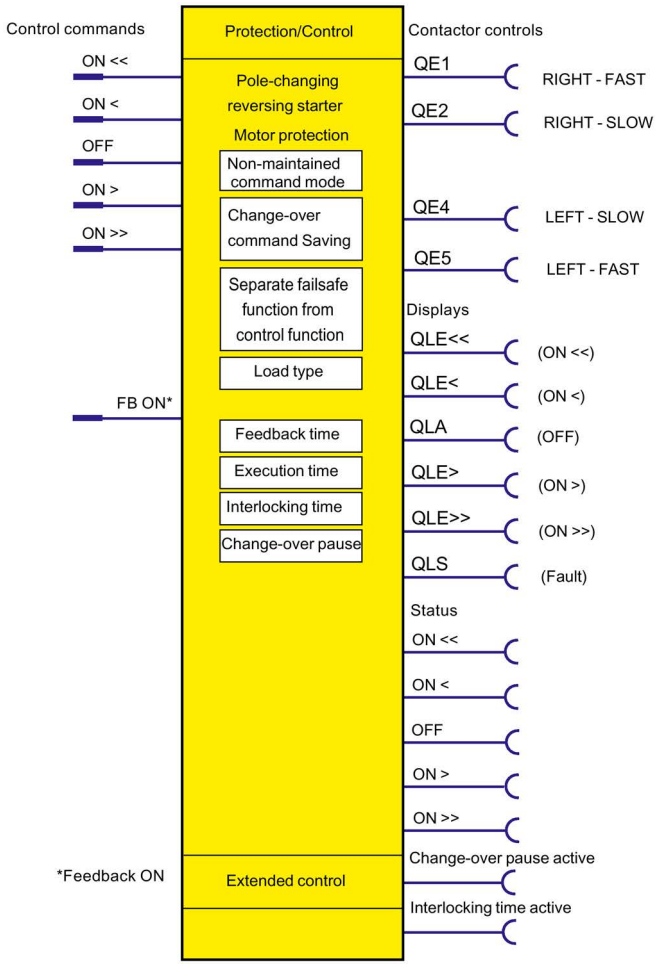


Figure 5-21 Schematic of the "Pole-changing reversing starter" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 16 Pole-changing reversing starter settings

Pole-changing reversing starter	Description
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command - OFF"
ON >	Control command ON > (RIGHT, SLOW) Connection with any socket, usually with socket "Enabled control command - ON >"
ON >>	Control command ON >> (RIGHT, FAST) Connection with any socket, usually with socket "Enabled control command - ON >>"
ON <	Control command ON < (LEFT, SLOW) Connection with any socket, usually with socket "Enabled control command - ON <"
ON <<	Control command ON << (LEFT, FAST) Connection with any socket, usually with socket "Enabled control command - ON <<"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated
Save change-over command	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional follow-on fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Range 0 to 6553.5 s (default setting: 1.0 s)
Interlocking time	Range 0 to 55 s (default setting: 0 s)
Change-over pause	Range 0 to 655.3 s (10 ms steps) (default setting: 0.00 s)

5.2.13 "Solenoid valve" control function

Description

SIMOCODE pro can use this function to control a solenoid valve. The solenoid valve is brought into the corresponding end position using the control commands "OPEN" and "CLOSED". SIMOCODE pro must be informed via corresponding limit switches (OPEN, CLOSED) when the end position has been reached.

Control commands

- **OPEN:** Start with "ON >" activates the QE1 internal contactor control.
- **CLOSE:** Start with "OFF" deactivates the QE1 internal contactor control.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

Every fault message causes the QE1 contactor control to be deactivated and puts the solenoid valve into the "CLOSED" position.

Safety information

Note

The motor protection functions are not active. A current measuring module is not necessary.

Note

If both limit switches respond at the same time (FO = 1 and FC = 1), the solenoid valve is immediately switched off via the fault message "Fault - Double 1" (= "CLOSED").

If the end position feedback does not correspond to the control command, the valve is switched off with the fault message "Fault - end position fault" (="CLOSED").

Schematic

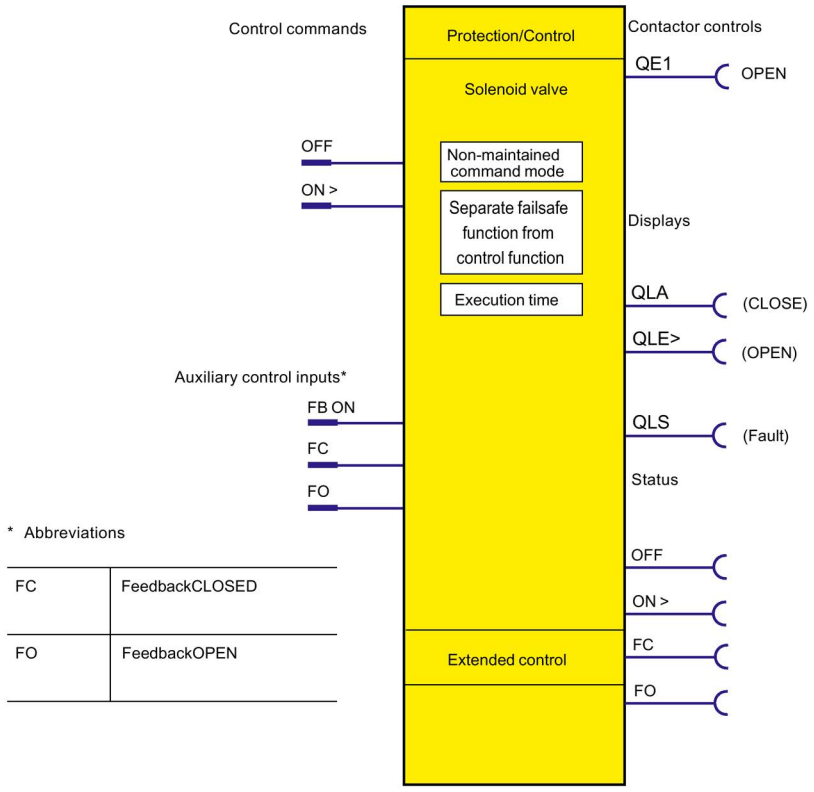


Figure 5-22 Schematic of the "Solenoid valve" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 17 Solenoid valve control function settings

Solenoid valve	Description
OFF	Control command OFF (CLOSED) Connection with any socket, usually with socket "Enabled control command - OFF"
ON >	Control command ON (OPEN) Connection with any socket, usually with socket "Enabled control command - ON >"
Non-maintained command mode	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional follow-on fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Execution time	Time until the end position is reached. Range 0 to 6553.5 s (default setting: 1.0 s)

5.2.14 "Positioner" control function

Description

SIMOCODE pro can control positioners / actuators with this function. The positioner is moved into the corresponding end position with the "OPEN" and "CLOSE" control commands and is deactivated via its limit switches (1-active) or torque switches (0-active). The response of the limit / torque switches must be passed to SIMOCODE pro via its inputs.

Control commands

- **OPEN:** Start with "ON >" activates the QE1 contactor control until "End position OPEN" is reached (Feedback OPEN).
- **CLOSED:** Start with "ON <" activates the QE2 contactor control until "End position CLOSED" is reached (Feedback CLOSED).
- **Stop** with "OFF" deactivates the contactor controls. The drive remains in the present position.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

Function schematic

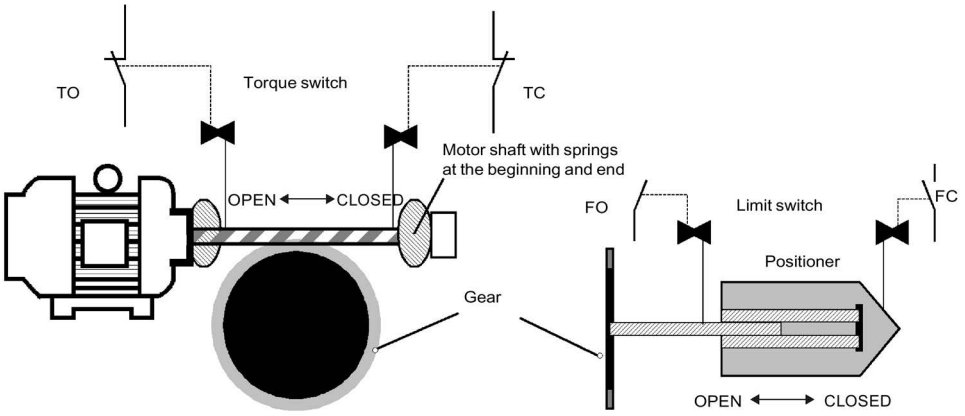


Figure 5-23 Function schematic of the torque and limit switches when controlling positioners

Switching the direction of travel

The direction of travel can be switched once the "Feedback ON" signal has expired (motor is switched off) **and** the interlocking time has elapsed:

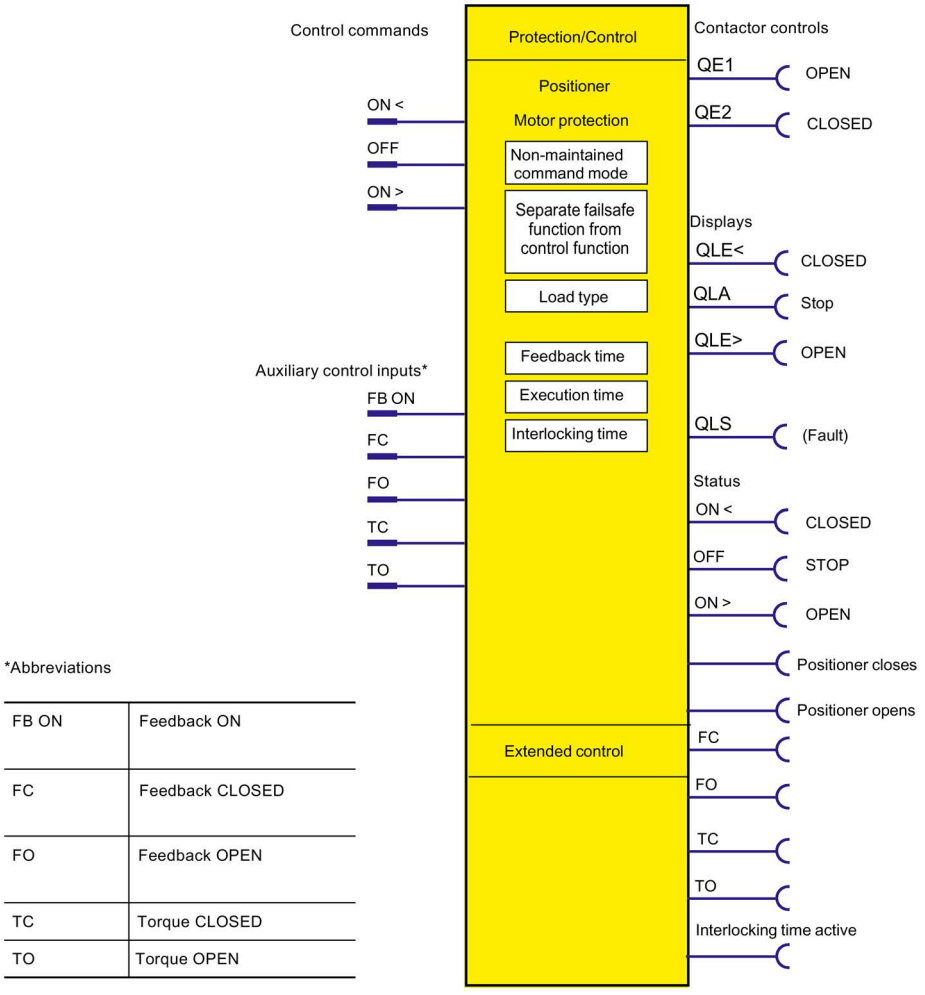
- Via the OFF control command

SIMOCODE pro prevents both contactors from switching on at the same time. Switching from one direction of travel to the other can be delayed via the "interlocking time".

Note

The corresponding torque switch must not respond before the associated limit switch when the torque switch TO (OPEN) and/or TC (CLOSED) is connected! In this case, the positioner is switched off immediately with the fault message "Fault - stalled positioner." If both limit switches respond at the same time (FO = 1 and FC = 1), the positioner is immediately switched off via the fault message "Fault - Double 1". If both torque switches respond at the same time (TO = 0 and TC = 0), the positioner is immediately switched off via the fault message "Fault - Double 0". If the end position feedback does not correspond to the control command, the positioner is switched off with the fault message "Fault - end position fault."

Schematic



*Abbreviations

FB ON	Feedback ON
FC	Feedback CLOSED
FO	Feedback OPEN
TC	Torque CLOSED
TO	Torque OPEN

Figure 5-24 Schematic of the "Positioner" control function, "Protection/Control" function block

Types of positioner control

The following table shows the five types of positioner control:

Table 5- 18 Variants of positioner control

Tripping variant	TC Torque closed	FC Limit closed	FO Limit open	TO Torque open
Positioner 1 After reaching the end position FO (OPEN) or FC (CLOSED)	—	X	X	—
Positioner 2 After reaching the end position FO (OPEN) or FC (CLOSED) **and** response of the associated torque switch TO (OPEN) or TC (CLOSED)	X	X	X	X
Positioner 3 After reaching the end position FO (OPEN). After reaching end position FO (CLOSED), the respective torque switch TC must also respond after the limit switch FC has responded.	X	X	X	—
Positioner 4 After reaching the end position FC (CLOSED). After reaching end position FO (OPEN), the respective torque switch FO must also respond after the limit switch TO has responded.	—	X	X	X
Positioner 5 After reaching the end position or the torque. The valve actuator is monitored either just with the limit switches or just with the torque switches. The switches are implemented as change-over contacts and are checked for antivalence. In the case of non-antivalent feedback (e.g. FC = 0 and TC = 0), SIMOCODE pro detects an open circuit and deactivates the positioner with the fault message "Fault - Antivalence".	Antivalent active		Antivalent active	

Note

The signals of the torque switches and the limit switches must be wired to the inputs of the basic unit. Torque switches must be 0-active, whereas the limit switches must be 1-active.

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 19 Positioner control function settings

Positioner	Description
ON <	Control command ON < (CLOSED) Connection with any socket, usually with socket "Enabled control command - ON <"
OFF	Control command STOP Connection with any socket, usually with socket "Enabled control command OFF"
ON >	Control command ON > (OPEN) Connection with any socket, usually with socket "Enabled control command - ON >"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
FC	"Feedback CLOSED" auxiliary control input Connection with any socket, usually with the socket of an input to which the limit switch is wired
FO	"Feedback OPEN" auxiliary control input Connection with any socket, usually with the socket of an input to which the limit switch is wired
TC	"Torque CLOSED" auxiliary control input Connection with any socket, usually with the socket of an input to which the torque switch is wired
TO	"Torque OPEN" auxiliary control input Connection with any socket, usually with the socket of an input to which the torque switch is wired)
Non-maintained command mode	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional follow-on fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Time until the end position is reached. Range 0 to 6553.5 s (default setting: 1.0 s)
Interlocking time	Range 0 to 255 s (default setting: 0 s)

5.2.15 "Soft starter" control function

Description

With this control function, SIMOCODE pro can activate the 3RW soft starter. Thus, the 3RW soft starters are connected via SIMOCODE pro to the PROFINET.

Control commands

- Start with "ON >" activates the QE1 and QE4 contactor controls.
- Stop with "OFF" first deactivates the QE4 contactor control. When the signal "Feedback ON" has expired, the QE1 contactor control is deactivated 3 s later in order to facilitate a smooth run down via the soft starter.
- With "Reset", the QE3 contactor control is activated for 20 ms and sends the soft starter an acknowledgement signal via a parameterizable relay output.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

Every fault message causes the contactor control to be deactivated.

Making internal assignments

You have to make the following assignments:

1. Assign the QE1 contactor control to the relay output which controls the coil of the line contactor.
2. Assign the QE4 contactor control to any relay output from which the "ON input" of the soft starter should be controlled.
3. Assign the QE3 contactor control to the relay output that supplies the 20 ms acknowledgment signal to the soft starter.
4. Assign the "ON >" and "OFF" control commands to the enabled control commands.
5. Assign the SIMOCODE pro input to which the "Fault" signal output of the soft starter is connected to the input (socket) of the standard function "External fault 1."
6. The "startup end" signal of the soft starter can also be wired to one of the inputs and processed by SIMOCODE pro.

Note

In order to avoid disconnections due to faults, the "Execution time" parameter in SIMOCODE pro must be set at least to the soft run-down time of the soft starter.

Schematic

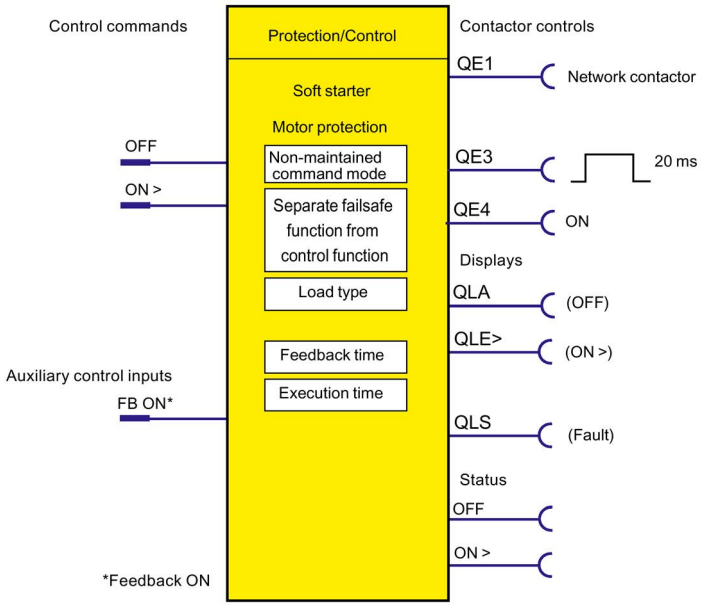


Figure 5-25 Schematic of "Soft starter" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 20 Soft starter settings

Soft starter	Description
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command OFF"
ON >	Control command ON Connection with any socket, usually with socket "Enabled control command - ON >"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional follow-on fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	At least ≥ soft run-down time Range 0 to 6553.5 s (default setting: 1.0 s)

5.2.16 "Soft starter with reversing contactor" control function

Description

With this control function, SIMOCODE pro can activate the 3RW soft starter including an additional reversing contactor. Thus, the 3RW soft starters are connected via SIMOCODE pro to the PROFINET. SIMOCODE pro can also control the direction of rotation of the motor (forwards and backwards).

Control commands

- Start with "ON >" activates the QE1 and QE4 contactor controls (clockwise, i.e. forwards)
- Start with "ON <" activates the QE2 and QE4 contactor controls (counter-clockwise, i.e. backwards).
- Stop with "OFF" first deactivates contactor control QE4. When the "Feedback ON" signal is no longer issued, the QE1 / QE2 contactor control is deactivated 3 s later in order to facilitate a soft run-down via the soft starter.
- With "Reset", the QE3 contactor control is activated for 20 ms and sends the soft starter an acknowledgement signal via a parameterizable relay output.

The control commands can be issued to SIMOCODE pro from any control stations (see also the description of "control stations"). Thus, the inputs (plugs) must be connected to the corresponding sockets, preferably to the "Enabled control command" sockets.

Every fault message causes the contactor control to be deactivated.

Switching the direction of rotation

The direction of rotation can be switched once the "Status - ON >" or "Status - ON <" signal has expired (motor is switched off) **and** the interlocking time has elapsed:

- Via the "OFF" control command.
- Directly when "Save change-over command" is activated.

SIMOCODE pro prevents both contactors from switching on at the same time. Switching from one direction of rotation to the other can be delayed via the interlocking time.

Making internal assignments

You have to make the following assignments:

1. Assign the QE1 contactor control to the relay output which controls the coil of the line contactor (right).
2. Assign the QE2 contactor control to the relay output which controls the coil of the line contactor (left).
3. Assign the QE4 contactor control to any relay output from which the "ON input" of the soft starter should be controlled.
4. Assign the QE3 contactor control to the relay output that supplies the 20 ms acknowledgment signal to the soft starter.
5. Assign the "ON >", "ON <" and "OFF" control commands to the enabled control commands.
6. Assign the SIMOCODE pro input to which the "Fault" signal output of the soft starter is connected to the input (socket) of the standard function "External fault 1."
7. The "startup end" signal of the soft starter can also be wired to one of the inputs and processed by SIMOCODE pro.

Note

An additional digital module may be necessary for this control function.

Schematic

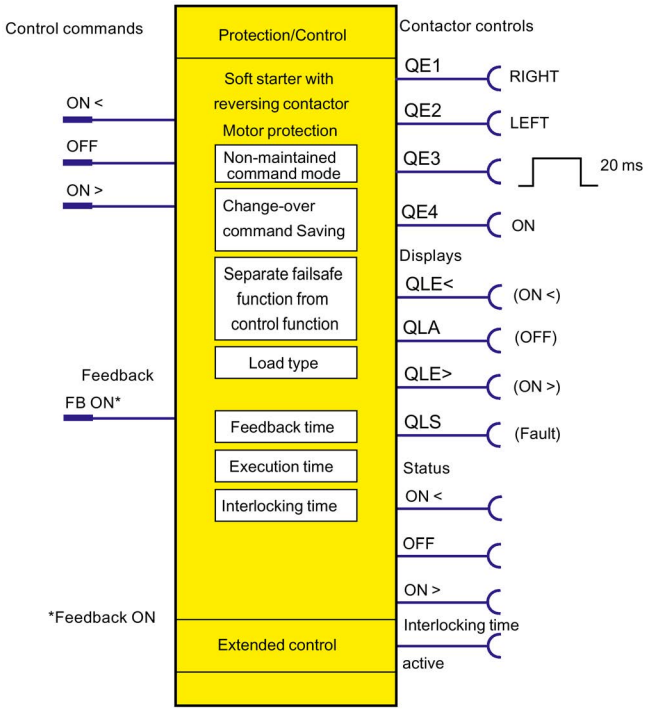


Figure 5-26 Schematic of the "Soft starter with reversing contactor" control function, "Protection/Control" function block

Settings

You will find detailed explanations of the settings in Chapter General settings and definitions (Page 189).

Table 5- 21 Soft starter with reversing contactor settings

Soft starter with reversing contactor	Description
ON >	Control command ON > (clockwise) Connection with any socket, usually with socket "Enabled control command - ON >"
OFF	Control command OFF Connection with any socket, usually with socket "Enabled control command - OFF"
ON <	Control command ON < (counter-clockwise) Connection with any socket, usually with socket "Enabled control command - ON <"
FB ON	"Feedback ON" auxiliary control input Connection with any socket, usually with socket "Status - current flowing"
Non-maintained command mode	• Deactivated (default setting) • Activated
Save change-over command	• Deactivated (default setting) • Activated
Separate fail-safe function from control function	• Deactivated (default setting): Safety-related tripping via the DM-F modules also affects the SIMOCODE pro control function, so that additional follow-on fault messages are avoided. This setting is selected for applications where safety-related tripping directly affects the motor controlled by SIMOCODE pro. • Activated: Safety-related tripping by the DM-F modules does not affect the SIMOCODE pro control function. This setting is selected for applications where safety-related tripping does not affect the motor controlled by SIMOCODE pro.
Type of consumer load	You can choose between • Motor (default) • Resistive load (see Chapter General settings and definitions (Page 189))
Feedback time	Range 0 to 25.5 s (default setting: 0.5 s)
Execution time	Execution time ≥ Soft run-down time Range 0 to 6553.5 s (default setting: 1.0 s)
Interlocking time	Range 0 to 255 s (default setting: 0 s)

5.2.17 Active control stations, contactor controls, lamp controls and status information for the control functions

Table 5- 22 Active control stations of control functions

Designation/control function	Control station				
	ON <<	ON <	OFF	ON >	ON >>
Overload	-	-	-	-	-
Direct starter	-	-	OFF	ON	-
Reversing starter	-	LEFT	OFF	RIGHT	-
Circuit breaker	-	-	OFF	ON	-
Star-delta starter	-	-	OFF	ON	-
Star-delta reversing starter	-	LEFT	OFF	RIGHT	-
Dahlander	-	-	OFF	SLOW	FAST
Dahlander reversing starter	LEFT-FAST	LEFT-SLOW	OFF	RIGHT-SLOW	RIGHT-FAST
Pole-changing starter	-	-	OFF	SLOW	FAST
Pole-changing reversing starter	LEFT-FAST	LEFT-SLOW	OFF	RIGHT-SLOW	RIGHT-FAST
Solenoid valve	-	-	CLOSED	OPEN	-
Positioner 1	-	CLOSED	STOP	OPEN	-
Positioner 2	-	CLOSED	STOP	OPEN	-
Positioner 3	-	CLOSED	STOP	OPEN	-
Positioner 4	-	CLOSED	STOP	OPEN	-
Positioner 5	-	CLOSED	STOP	OPEN	-
Soft starter	-	-	OFF	ON	-
Soft starter with reversing contactor	-	LEFT	OFF	RIGHT	-

Table 5- 23 Contactor control with control functions

Designation/control function	Contactor control				
	QE1	QE2	QE3	QE4	QE5
Overload	-	-	Active	-	-
Direct starter	ON	-	-	-	-
Reversing starter	RIGHT	LEFT	-	-	-
Circuit breaker	ON pulse	-	OFF pulse	-	-
Star-delta starter	Star contactor	Delta contactor	Line contactor	-	-
Star-delta reversing starter	Star contactor	Delta contactor	RIGHT line contactor	LEFT line contactor	-
Dahlander	FAST	SLOW	Star contactor FAST	-	-
Dahlander reversing starter	RIGHT-FAST	RIGHT-SLOW	Star contactor FAST	LEFT-SLOW	LEFT-FAST
Pole-changing starter	FAST	SLOW	-	-	-
Pole-changing reversing starter	RIGHT-FAST	RIGHT-SLOW	-	LEFT-SLOW	LEFT-FAST
Solenoid valve	OPEN	-	-	-	-
Positioner 1	OPEN	CLOSED	-	-	-
Positioner 2	OPEN	CLOSED	-	-	-
Positioner 3	OPEN	CLOSED	-	-	-
Positioner 4	OPEN	CLOSED	-	-	-
Positioner 5	OPEN	CLOSED	-	-	-
Soft starter	ON line contactor	-	Reset	ON command	-
Soft starter with reversing contactor	RIGHT line contactor	LEFT line contactor	Reset	ON command	-

Table 5- 24 Lamp control with control functions

Designation/control function	Lamp control				
	QLE << (ON <<)	QLE < (ON <)	QLA (OFF)	QLE < (ON >)	QLE >> (ON >>)
Overload	-	-	-	-	-
Direct starter	-	-	OFF	ON	-
Reversing starter	-	LEFT	OFF	RIGHT	-
Circuit breaker	-	-	OFF	ON	-
Star-delta starter	-	-	OFF	ON	-
Star-delta reversing starter	-	LEFT	OFF	RIGHT	-
Dahlander	-	-	OFF	SLOW	FAST
Dahlander reversing starter	LEFT-FAST	LEFT-SLOW	OFF	RIGHT-SLOW	RIGHT-FAST
Pole-changing starter	-	-	OFF	SLOW	FAST
Pole-changing reversing starter	LEFT-FAST	LEFT-SLOW	OFF	RIGHT-SLOW	RIGHT-FAST
Solenoid valve	-	-	CLOSED	OPEN	-
Positioner 1	-	CLOSED	STOP	OPEN	-
Positioner 2	-	CLOSED	STOP	OPEN	-
Positioner 3	-	CLOSED	STOP	OPEN	-
Positioner 4	-	CLOSED	STOP	OPEN	-
Positioner 5	-	CLOSED	STOP	OPEN	-
Soft starter	-	-	OFF	ON	-
Soft starter with reversing contactor	-	LEFT	OFF	RIGHT	-

Monitoring functions

6

In this chapter you will find information about monitoring functions.

- Ground-fault monitoring
- Current limit monitoring
- Voltage monitoring
- Cos phi monitoring
- Active power monitoring
- 0 / 4 mA to 20 mA monitoring
- Operation monitoring
- Temperature monitoring (analog)
- Monitoring interval for mandatory testing

As is the case with motor protection and motor control, the monitoring functions work "in the background". All monitoring function parameters are explained.

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- Programmers
- Commissioning engineers
- Service personnel

Required knowledge

You will require the following knowledge:

- SIMOCODE pro
- Motor protection, motor control
- The principle of connecting plugs to sockets
- Electrical drive engineering

Navigation in SIMOCODE ES

You will find the dialog boxes in SIMOCODE ES under Device Parameters → Monitoring functions.

6.1 Earth-fault monitoring

6.1.1 Description

Residual current monitoring relays are used in industry to:

- Protect systems from damage caused by residual currents
- Prevent production losses caused by unplanned downtime
- Perform maintenance to meet all demands.

In particular, ground-fault monitoring is used in conjunction with 3UL23 residual current transformers to monitor systems where environmental conditions increase the chance of fault currents.

Internal ground-fault monitoring

SIMOCODE pro acquires and monitors all three phase currents. By evaluating the summation current of the three current values, the motor feeder can be monitored for a possible fault current or ground fault.

Internal ground-fault monitoring via current measuring modules or current / voltage measuring modules is only possible for motors with a 3-phase connection in power systems that are either grounded solidly or with low impedance.

You can activate internal ground-fault monitoring by parameterization. It covers two different operating conditions.

- Normal operation up to 2 x I_s. The actual operating current must be smaller than twice the set current I_s. Residual currents of > 30 % of the set current I_s are detected.
- Start-up or overload operation to 2 x I_s. The actual operating current is greater than twice the set current I_s. Fault currents of > 15% of the actual motor current will be detected.

NOTICE
Star-delta connection False tripping can occur if you use internal ground-fault monitoring for star-delta circuits. During delta operation, the summation current is non-zero due to harmonics.

External ground-fault monitoring

The external ground-fault monitoring is normally used in the following cases:

- In cases in which power systems are grounded with high impedance
- Where precise measurement of the ground-fault current is necessary, e.g. for the purpose of condition monitoring

With ground-fault detection using the residual current transformer 3UL23, it is possible to determine the precise residual current as a measured value to define freely selectable warning and trip thresholds in a wide range 30 mA to 40 A.

Principle of operation:

The main conductors and, if present, the neutral conductor to which the load is connected, are routed through the opening of the 3UL23 residual current transformer. Its secondary winding is connected to the ground-fault module.

If an insulation fault occurs, for example, a residual current arises between the incoming and the outgoing currents that the ground-fault module evaluates via the residual current transformer.

For maximum plant availability, the ground-fault module 3UF7 510-1AA00-0 and the residual current transformer 3UL23 were developed with the following design goals:

- High measuring accuracy: The ground-fault module in conjunction with the residual current transformer 3UL23 achieves a measuring accuracy of ±7.5 %. This enables set limit values to be monitored very precisely. Spurious tripping caused by measuring errors is minimized. The combination of ground-fault module and 3UL23 residual current transformer is designed so that a warning or alarm is triggered at the latest when the set limit values are reached. To achieve this, slightly higher residual currents than those actually measured are displayed and compared with the set limit values. The measuring accuracy is -15 % to 0 % of the value displayed. This takes into account the measuring accuracy of monitoring relay and residual current transformer.
- Settable prewarning and trip levels: The threshold levels for the residual current are defined over a very wide range of 30 mA to 40 A. The response of SIMOCODE pro on reaching a prewarning level or trip level can be freely parameterized, including a delay.
- Permanent self-monitoring: The permanent self-monitoring of the ground-fault module 3UF7 510-1AA00-0 and the connected transformer ensures reliable monitoring of the function. The connected 3UL23 residual current transformer is also permanently monitored for open-circuit or short-circuit. This means cyclic manual tests to verify the function are obsolete.
- Settable active status and delay times of the residual current protection. Depending on the application, the monitoring function can be active permanently, only when the motor is running, or only after the motor has started. This permits the suppression of residual currents that are only measured during motor starting due to high starting currents. Short-term residual currents or radiated interference can be easily suppressed by means of the adjustable tripping delay time.

Use of the residual current transformers 3UL22 and 3UL23:

- Use the residual current transformer 3UL23 to detect residual currents with the ground-fault module 3UF7 510-1AA00-0. The residual current transformer 3UL23 is suitable for detecting pure AC residual currents and AC residual currents with a pulsating DC component.

Note

Precondition for using a 3UF7 510-1AA00-0 ground-fault module

The use of a ground-fault module requires a SIMOCODE pro V PN basic unit, version *E04* or later (from 09 / 2013).

- Use the 3UL22 residual current transformer to detect residual currents with the 3UF7 500-1AA00-0 ground-fault module.

Note

Only monitoring of the residual current trip level possible

With this combination, it is only possible to monitor a trip level of the residual current. Measured values are then not available for the residual current.

⚠ DANGER

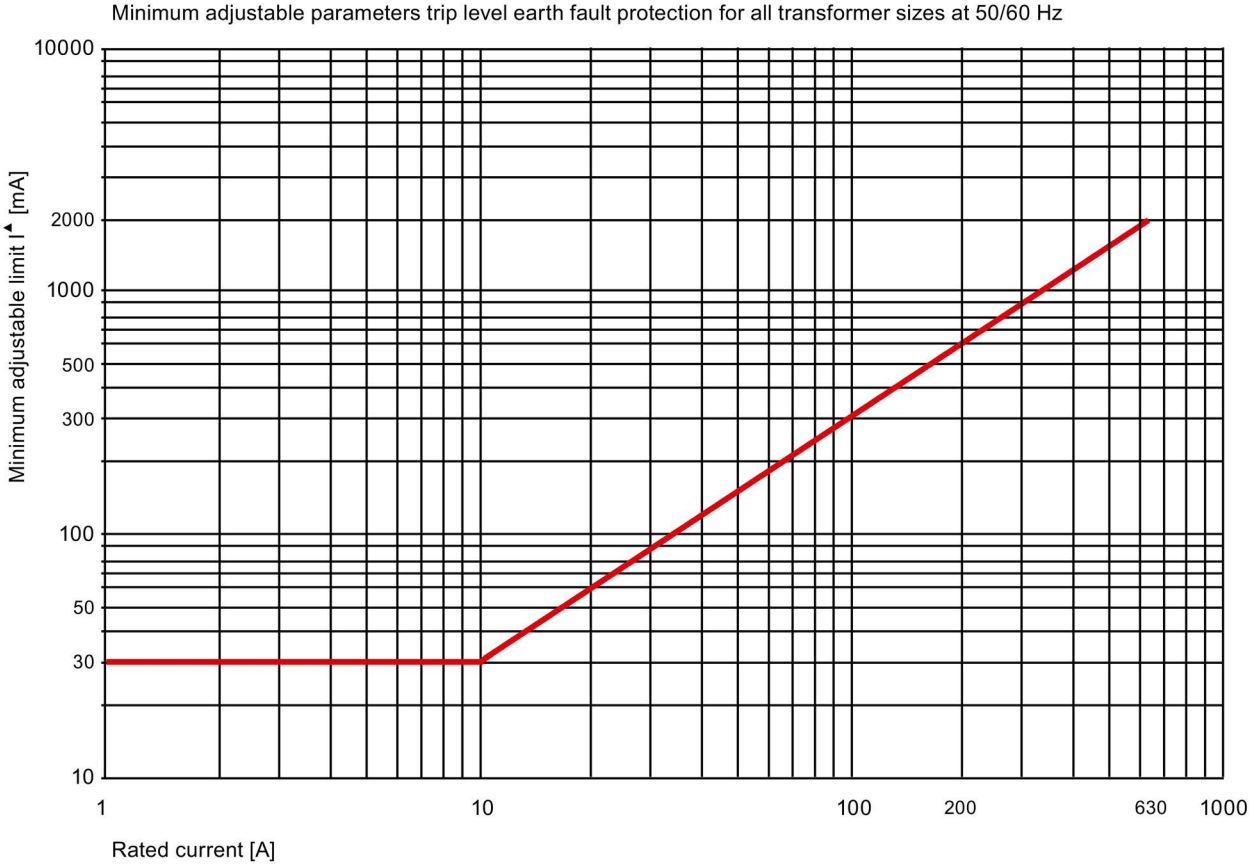
No personnel protection or fire protection!

The 3UF75* ground-fault modules monitor devices and systems for their correct function.

They are not suitable for personal protection or protection from fires.

6.1.2 Limits of fault current measurement

In the event of increasing primary currents, imbalances in the cable routing and current loads in individual cables increasingly cause what appear to be residual currents that are detected by the evaluation units. Spurious tripping may therefore occur if excessively low monitoring limit values have been set at high primary currents. Because of these tolerances in the configuration, the measuring accuracy no longer corresponds to the stated range of ±7.5 %. To avoid spurious tripping, we recommend setting the limit values to the minimum values listed in the following graphic, depending on the applicable primary current.



If monitoring is required within limit values that are lower than those recommended, we recommend the use of delay times, particularly if spurious tripping occurs exclusively during motor startup. If delay times do not lead to the desired result, the use of shield sleeves may considerably lower the minimum possible monitoring limit.

You will find more information in Chapters "14.2.5.2 Installation specifications" and "14.2.5.3 Optimization options" in the Manual 3UG4/3RR2 Monitoring Relay (http://support.automation.siemens.com/WW/view/en/50426183/133300).

The monitored current waveforms also have a strong influence on the measuring accuracy. In the case of loads with generalized phase control, deviations from the measuring accuracy can occur when monitoring for high residual current limits. The cause of this is the extreme difference between the monitored rms values and the peak values of the residual current. The more extreme the generalized phase control, the shorter the time during which current flows, and the lower the resulting rms value. To achieve and monitor a high rms value in such a case, an extremely high peak value of the residual current is necessary. In the case of high currents, current transformers tend towards saturation in which a further increase in current on the primary side does not result in an equivalent increase on the secondary side. In the case of extreme peak values of the residual current, the measuring accuracy suffers as a result of this principle. Due to the great difference between the peak value and the rms value, monitoring for lower limits is useful.

6.1.3 Internal earth-fault monitoring

Response

Here you can set how SIMOCODE pro will respond to an internal ground fault:

See also Section "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

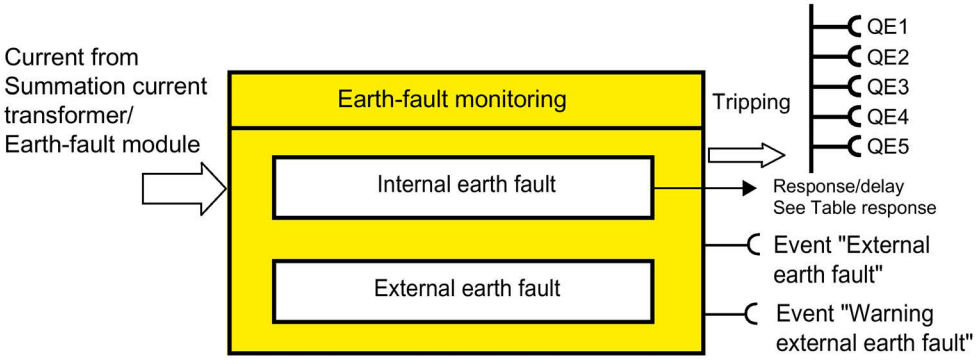


Figure 6-1 "Ground-fault Monitoring" function block

Table 6- 1 "Internal ground-fault monitoring" response

Response	Internal ground fault
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	X
Delay	0 to 25.5 s (default setting: 0.5 s)

Activity

Unless deactivated, this function is always active, independent of whether the motor is running or not (operating state "ON").

6.1.4 External ground-fault monitoring (with 3UL22 residual current transformer)

Response

Here you can set how SIMOCODE pro will respond to an external ground fault.

You will find more information in Section "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

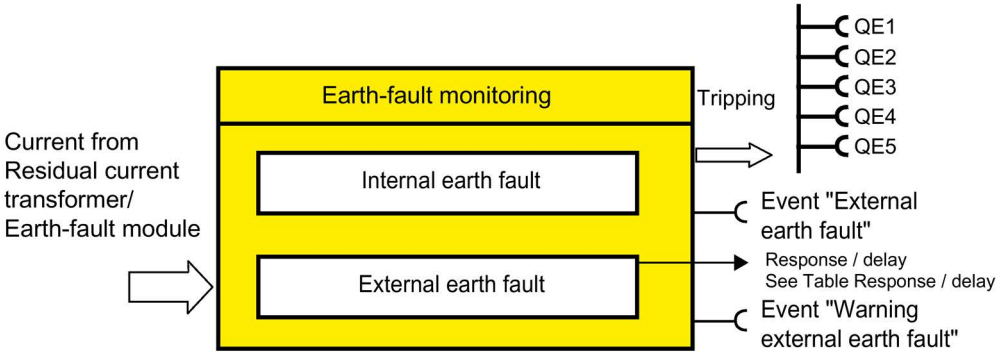


Figure 6-2 "Ground-fault Monitoring" function block

Table 6- 2 "External ground-fault monitoring" response

Response	External ground fault
Deactivated	-
Signaling	X (d)
Warning	X
Tripping	X
Delay	0 to 25.5 s (default setting: 0.5 s)[1)]
1) Extension of the residual current transformer delay	

If the response is set to "signal," a ground fault will trigger the "External ground fault" event.
If the response is set to "warn," a ground fault will trigger the "Warning external ground fault."

6.1.5 External ground-fault monitoring (with residual current transformer 3UL23)

Settings

You can parameterize two different response levels (trip level, warning level) for monitoring the ground-fault current.

If the ground-fault current exceeds the response level, the current limit monitoring will respond.

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

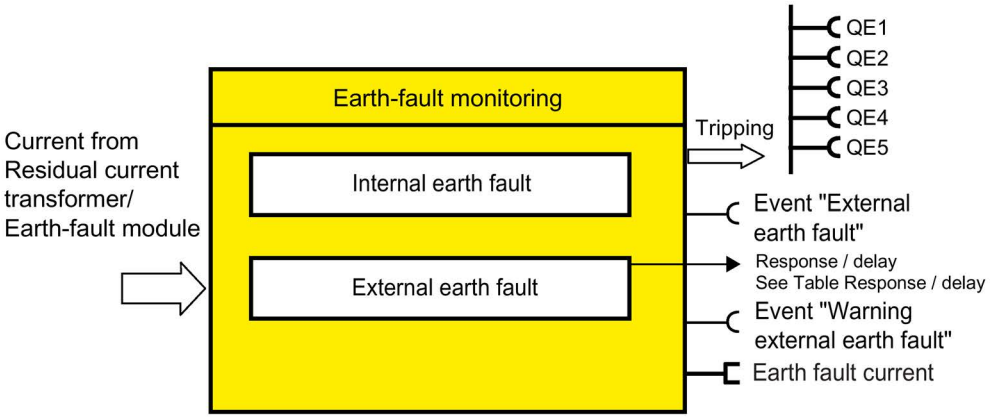


Figure 6-3 "Ground-fault Monitoring" function block

Trip level, warning level

You can parameterize two different response levels (trip level, warning level) for monitoring the ground-fault current.

If the ground-fault current exceeds the response level, the current limit monitoring will respond.

Trip level:	30 mA to 40 A in steps of 10 mA (default: 1000 mA)
Warning level:	20 mA to 40 A in steps of 10 mA (default: 500 mA)

Trip level/warning level activity

Unless deactivated, this function is always active, independent of whether the motor is running or not (operating state "ON").

Here you can specify in which motor operating states the trip level / warning level will be active:

• Always (on)	Trip level / warning level is always active, regardless of whether the motor is running or at a standstill
• If motor runs, except TPF (run)	Trip level / warning level is only active when the motor is running
• when the motor is on, except TPF, with startup override (run+)	Trip level / warning level is only active when the motor is running and starting has been completed

Response to trip level

Here you can set how SIMOCODE pro should respond if the trip level is overshot.

See also "Tables of responses of SIMOCODE pro" in chapter Important information (Page 15).

Table 6- 3 Response to "trip level" in ground-fault monitoring

Response	Trip level
Signaling	X (d)
Warning	—
Tripping	X
Delay	0 to 25.5 s (default setting: 0.5 s) 1)
1) Extension of the residual current transformer delay	

Response to warning level

Here you can set how SIMOCODE pro should respond if the warning level is overshot.

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 4 Response to "warning level" in ground-fault monitoring

Response	Warning level
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	—
Delay	0 to 25.5 s (default setting: 0.1 s) 1)
1) Extension of the residual current transformer delay	

Hysteresis

Here you can set the hysteresis for the ground-fault current:

Hysteresis	0 to 15% of the level value in steps of 1% Default setting: 5 %

Response to sensor fault

Here you can set how SIMOCODE pro should respond to a sensor fault. Open circuit and short-circuit to 3UL23 residual current transformer are recognized as sensor faults.

Response	Sensor fault
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	X

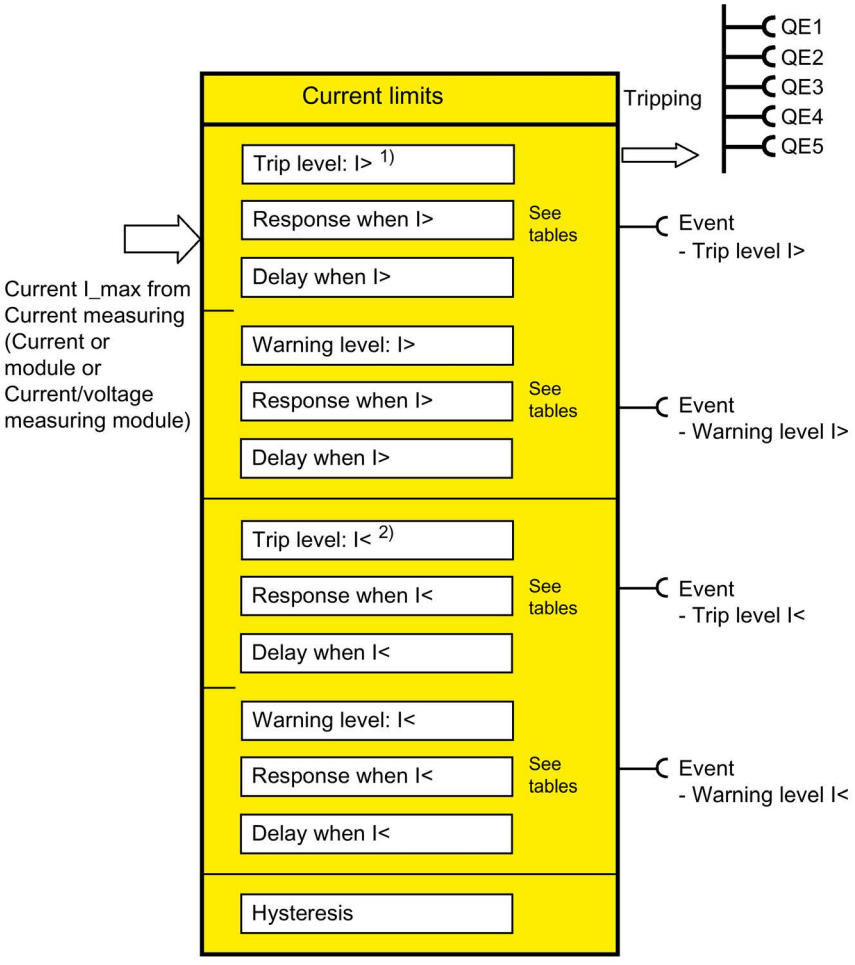
6.2 Current limit monitoring

6.2.1 Description

Monitoring of current limits is used for process monitoring independent of overload protection.

SIMOCODE pro supports two-level monitoring of the motor current for freely selectable upper and lower current limits. The response of SIMOCODE pro can be freely configured and delayed if it reaches a prewarning or trip level.

The motor current is measured using current measuring modules or current / voltage measuring modules.



1) Upper limit
2) Lower limit

Figure 6-4 "Current Limits" function block

6.2.2 I> (upper limit)

Trip level, warning level

When monitoring current limits I > (upper limit), two different I > response levels can be parameterized and monitored (upper limit - warning level and upper limit - trip level):

If the current of one or more phases exceeds the response level, current limit monitoring responds.

Trip level	0 to 1020 % of I_s in steps of 4% (default setting: 0)
Warning level	0 to 1020 % of I_s in steps of 4% (default setting: 0)

Trip level/warning level activity

The trip level / warning level is active only when the motor is running, the start-up procedure has been completed and there is no test position feedback (TPF) (run+).

Response to trip level

Here you can set how SIMOCODE pro should respond if the trip level is overshot.

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 5 "Trip level" response for monitoring current limits I >

Response	Trip level
Deactivated	X (d)
Signaling	X
Warning	-
Tripping	X
Delay	0 to 25.5 s (default setting: 0.5 s)

Response to warning level

Here you can define how SIMOCODE pro will respond if the warning level is overshot. See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 6 "Warning level" response for monitoring current limits I >

Response	Warning level
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	-
Delay	0 to 25.5 s (default setting: 0.5 s)

Hysteresis

Here you can set the hysteresis for the current limits I > (upper limit):

Hysteresis	0 to 15% of the level value in steps of 1%
	Default setting: 5 %

6.2.3 I< (lower limit)

Trip level / warning level

When monitoring current limits I < (lower limit), two different I< response levels can be parameterized and monitored (lower limit - trip level and lower limit - warning level):

If the current of the phases (I_{max}) drops below the response level, the current limit monitor responds.

Trip level	0 to 1020 % of I_s in steps of 4% (default setting: 0)
Warning level	0 to 1020 % of I_s in steps of 4% (default setting: 0)

Trip level/warning level activity

The trip level / warning level is active only when the motor is running, the start-up procedure has been completed and there is no test position feedback (TPF) (run+).

Response to trip level

Here you can set how SIMOCODE pro should respond if the trip level is undershot:

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 7 "Trip level" response for monitoring current limits I <

Response	Trip level
Deactivated	X (d)
Signaling	X
Warning	-
Tripping	X
Delay	0 to 25.5 s (default setting: 0.5 s)

Response to warning level

Here you can set how SIMOCODE pro should respond if the warning level is undershot:

You will find more information in Section "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 8 "Warning level" response for monitoring current limits I <

Response	**Warning level**
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	-
Delay	0 to 25.5 s (default setting: 0.5 s)

Hysteresis

Here you can set the hysteresis for current limits I< (lower limit):

Hysteresis	0 to 15% of the level value in steps of 1%
	Default setting: 5 %

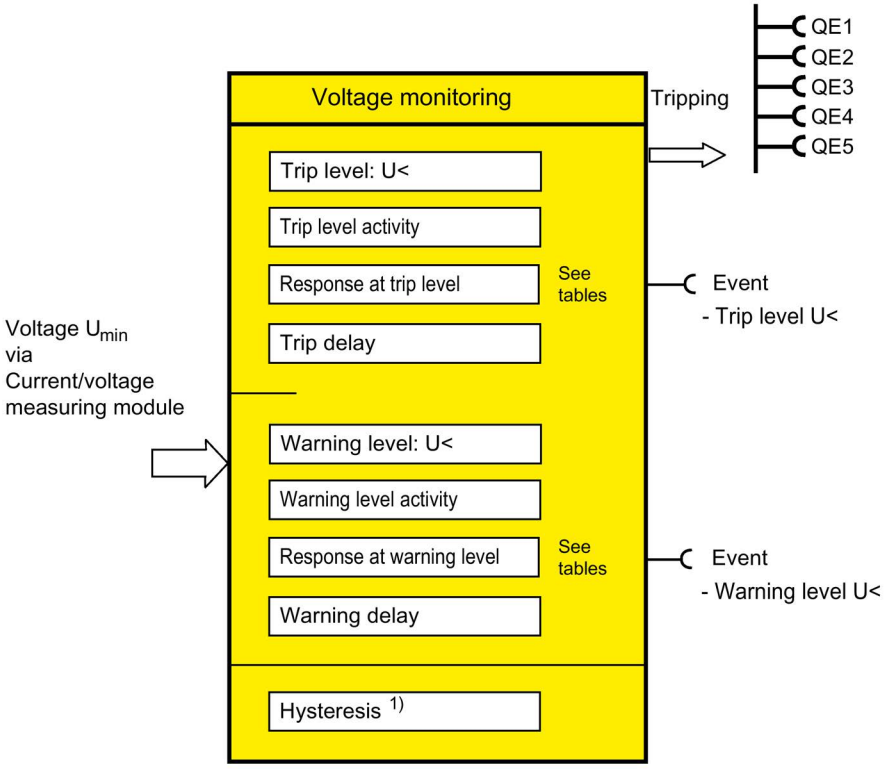
6.3 Voltage monitoring

6.3.1 Voltage monitoring

Description

SIMOCODE pro supports two-level undervoltage monitoring of either a three-phase network or a single-phase network for freely selectable limits. The response of SIMOCODE pro on reaching a prewarning level or trip level can be freely parameterized and delayed.

Voltage measuring is carried out using current / voltage measuring modules. This is based on the minimum voltage of all voltages U_{min}.



1) Hysteresis for voltage, cos phi, power

Figure 6-5 "Voltage Monitoring" function block

Furthermore, even when the motor is switched off, SIMOCODE pro can determine and signal the further availability of the feeder by measuring the voltage directly at the circuit breaker or at the fuses in the main circuit.

Trip level, warning level

You can parameterize two different response levels (trip level/warning level).

If the current of one or more phases undershoots the response level or the warning level, voltage monitoring responds.

Trip level:	0 to 2040 V in steps of 8 V (default setting: 0)
Warning level:	0 to 2040 V in steps of 8 V (default setting: 0)

Trip level/warning level activity

Here you can specify in which motor operating states the trip level/warning level will be active:

• Always (on)	Trip level/warning level is always active, regardless of whether the motor is running or at a standstill
• Always, except TPF (on+) (default)	Trip level/warning level always active, regardless of whether the motor is running or at a standstill; exception: "TPF", i.e. motor feeder is in "test position"
• If motor is running, except TPF (run)	Trip level/warning level only active if the motor is ON and not in the test position

Response to trip level

Here you can set how SIMOCODE pro should respond if the trip level is undershot.

See also Section "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 9 "Trip level" response for voltage monitoring

Response	Trip level
Deactivated	X (d)
Signaling	X
Warning	-
Tripping	X
Delay	0 to 25.5 s (default setting: 0.5 s)

Response to warning level

Here you can set how SIMOCODE pro should respond if the warning level is undershot.

See also Section "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 10 "Warning level" response for voltage monitoring

Response	Warning level
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	-
Delay	0 to 25.5 s (default setting: 0.5 s)

Hysteresis for voltage, cos phi, power

Here you can set the hysteresis for voltage, cos phi and power.

Hysteresis for voltage, cos phi, power	0 to 15% of the level value in steps of 1% (default setting: 5 %)

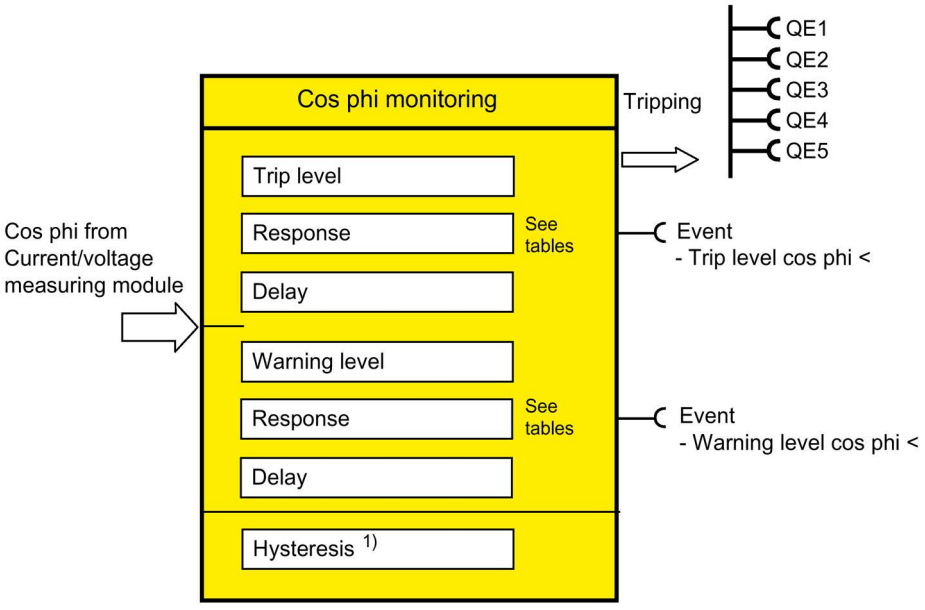
Voltage measurement - Load type for voltage, cos phi, power

Here you can specify whether 1-phase or 3-phase loads (default) are to be displayed.

6.4 Cos phi monitoring

Description

Cos phi monitoring monitors the load condition of inductive loads. The main field of application is for asynchronous motors in 1-phase or 3-phase networks with loads that fluctuate significantly. The power factor fluctuates more than either the motor current or the active power does, particularly in the low-end performance range of a motor. Therefore, power factor monitoring is particularly suitable for distinguishing between no-load operation and faults, e.g. a broken drive belt or drive shaft. If the set trip level or warning level is undershot, a signal is generated or the motor is switched off, depending upon the setting.



1) Hysteresis for voltage, cos phi, power (see "Voltage Monitoring" function block)

Figure 6-6 Cos Phi Monitoring function block

Trip level, warning level

You can parameterize two different response levels (trip level / warning level) for cos phi monitoring.

0 % = cos phi = 0.00

50 % = cos phi = 0.50

100 % = cos phi = 1.00

Trip level/warning level activity

The trip level / warning level is active only when the motor is running, the start-up procedure has been completed and there is no test position feedback (TPF) (run+).

Response to trip level

Here you can set how SIMOCODE pro should respond if the set trip level is undershot:

See also Section "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 11 "Trip level" response for cos phi monitoring

Response	Trip level
Deactivated	X (d)
Signaling	X
Warning	-
Tripping	X
Delay	0 to 25.5 s (default setting: 0.5 s)

Response to warning level

Here you can set how SIMOCODE pro should respond if the set warning level is undershot:

See also Section "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 12 "Warning level" response for cos phi monitoring

Response	Warning level
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	-
Delay	0 to 25.5 s (default setting: 0.5 s)

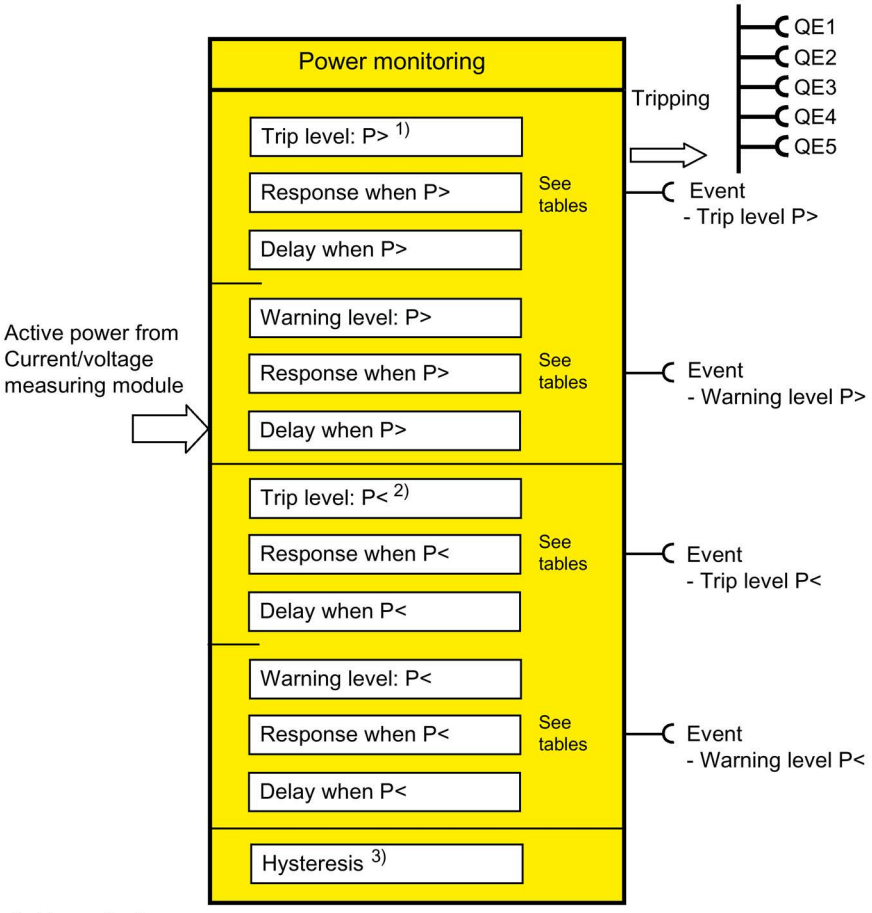
6.5 Active power monitoring

Description

SIMOCODE pro can indirectly monitor the state of a device or system via the active power. For example, by monitoring the active power of a pump motor, conclusions can be drawn from the active power level about the flow rate or fluid fill levels. The active power curve of a motor is a precise reflection of its actual load across the entire range. Excess load results in increased wear of the motor and, thus, may lead to premature motor failure. Excessively low active power can indicate no-load operation of the motor, for example.

SIMOCODE pro supports two-level monitoring of the active power for freely selectable upper and lower current limits. The response of SIMOCODE pro can be freely configured and delayed if it reaches a prewarning or trip level.

Active power measuring is carried out using current / voltage measuring modules.



1) Upper limit
2) Lower limit
3) Hysteresis for voltage, cos phi, power
(see "Voltage Monitoring" function block)

Figure 6-7 "Power Monitoring" function block

Trip level, warning level

With active power monitoring, you can parameterize two different response levels (trip level / warning level) for the upper and lower limits.

Trip level	
• P> (upper limit) • P < (lower limit)	0.000 to 4294967.295 kW (default: 0.000).
Warning level	
• P> (upper limit) • P < (lower limit)	0.000 to 4294967.295 kW (default: 0.000).

Trip level/warning level activity

The trip level / warning level is active only when the motor is running, the start-up procedure has been completed and there is no test position feedback (TPF) (run+).

Response to trip level P> (upper limit), P< (lower limit)

Here you can set how SIMOCODE pro should respond if the set trip level is overshot/undershot:

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 13 "Trip level" response for active power monitoring

Response	Trip level
Deactivated	X (d)
Signaling	X
Warning	-
Tripping	X
Delay	0 to 25.5 s (default setting: 0.5 s)

Response to warning level P> (upper limit), P< (lower limit)

Here you can set how SIMOCODE pro should respond if the set warning level is overshot/undershot:

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 14 "Warning level" response for active power monitoring

Response	Warning level
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	-
Delay	0 to 25.5 s (default setting: 0.5 s)

6.6 0 / 4 - 20 mA monitoring

Description

With the aid of an analog module, SIMOCODE pro is capable of measuring and monitoring further process variables as desired. For example, the fill level can be monitored to protect a pump against dry operation, or a differential pressure transducer can be used to monitor the degree of pollution in a filter. If the fill level undershoots a specified level, the pump can be switched off and, if a specific differential pressure value is exceeded, the filter must be cleaned.

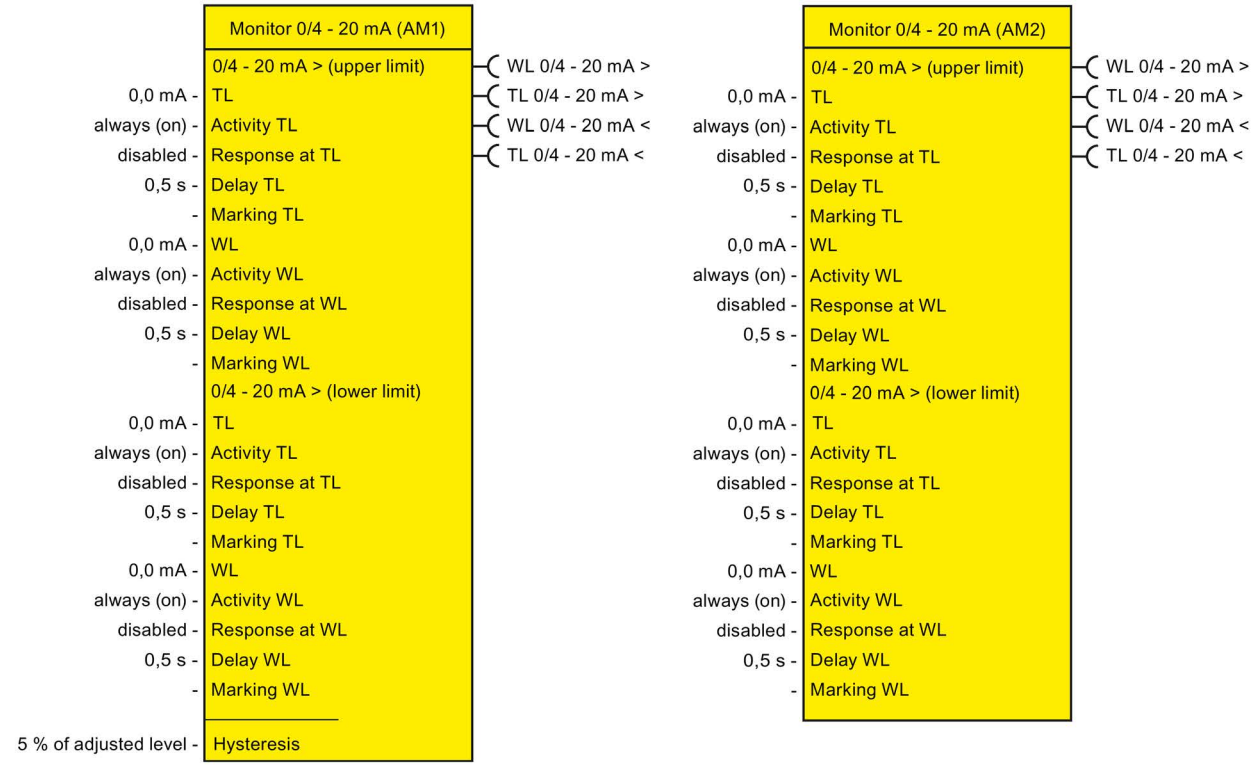


Figure 6-8 "0/4 - 20 mA (AM1) monitoring" and "0/4 - 20 mA (AM2) monitoring" function blocks

SIMOCODE pro supports two-level monitoring of the analog signals of a transducer (standardized 0/4 - 20 mA output signal). The analog signals are fed to the "0/4-20 mA (AM1) monitoring" and "0/4-20 mA (AM2) monitoring" function blocks via the analog module.

Trip level, warning level

With 0/4-20 mA monitoring, you can parameterize two different response levels (trip level / warning level) for the upper and lower limits.

Trip level	
• 0/4 to 20 > (upper limit) • 0/4 to 20 < (lower limit)	0.0 to 23.6 mA (default setting: 0.0 mA)
Warning level	
• 0/4 to 20 > (upper limit) • 0/4 to 20 < (lower limit)	0.0 to 23.6 mA (default setting: 0.0 mA)

Trip level/warning level activity

Here you can specify in which motor operating states the trip level/warning level will be active:

• Always (on) (default)	Trip level/warning level is always active, regardless of whether the motor is running or at a standstill
• Always, except TPF (on+)	Trip level / warning level is always active regardless of whether the motor is running or at a standstill, with the exception of "TPF," i.e. motor feeder is in the test position
• If motor is running, except TPF (run)	Trip level/warning level only active if the motor is ON and not in the test position
• If motor is running, except TPF, with startup override (run+)	Trip level / warning level is only active when the motor is running, the startup procedure has been completed, and no test position (TPF) is detected

Response to trip level 0/4 to 20 mA > (upper limit), 0/4 to 20 mA < (lower limit)

Here, you can define the response of SIMOCODE pro in the event that the monitored variable overshoots/undershoots the set trip level:
For further information, see also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 15 "Trip level" response for 0/4 to 20 mA monitoring

Response	Trip level
Deactivated	X (d)
Signaling	X
Warning	-
Tripping	X
Delay	0 to 25.5 s (default setting: 0.5 s)

Response to warning level 0/4 to 20 mA> (upper limit), 0/4 to 20 mA< (lower limit)

Here, you can define the response of SIMOCODE pro in the event that the monitored variable overshoots/undershoots the set warning level:
For further information, see also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 16 "Warning level" response for 0/4 to 20 mA monitoring

Response	Warning level
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	-
Delay	0 to 25.5 s (default setting: 0.5 s)

Marking

The marking is saved in the device and assigned and displayed in the "Faults/Warnings" online dialog box. Optional marking for identifying the message, e.g. "0/4 to 20 >"; range: maximum 10 characters. Each change to the marking requires that the communication interface be restarted when the web server is active. A new start interrupts all Ethernet and PROFINET links and reestablishes them afterward.

Hysteresis for 0/4-20 mA

Here you can set the fluctuation range (hysteresis) for the analog signal: 0 to 15 % in steps of 1% (default setting: 5%)

Note

Monitoring of a second process variable via input 2 of the analog module can be done, for example, by free limit monitors.

6.7 Operation monitoring

6.7.1 Description

Motor operation monitoring - use

SIMOCODE pro can monitor the operating hours and stop times of a motor and restrict the number of start-ups in a defined time frame in order to avoid plant downtimes due to failed motors caused by running or being stopped for too long.

When an adjustable limit is violated, a message or alarm can be generated which can indicate that the corresponding motor must be serviced or replaced.

After the motor has been replaced, the operating hours and stop times can be reset.

To avoid excessive thermal loads and premature wear of the motor, it is possible to limit the number of motor startups for a specifiable period. The number of still possible starts is available in the SIMOCODE pro for further processing. The limited number of possible starts can be indicated by prewarnings.

Note

Operating hours, motor stop times and the number of motor starts can be monitored completely in the device and/or transmitted to the automation system via PROFINET.

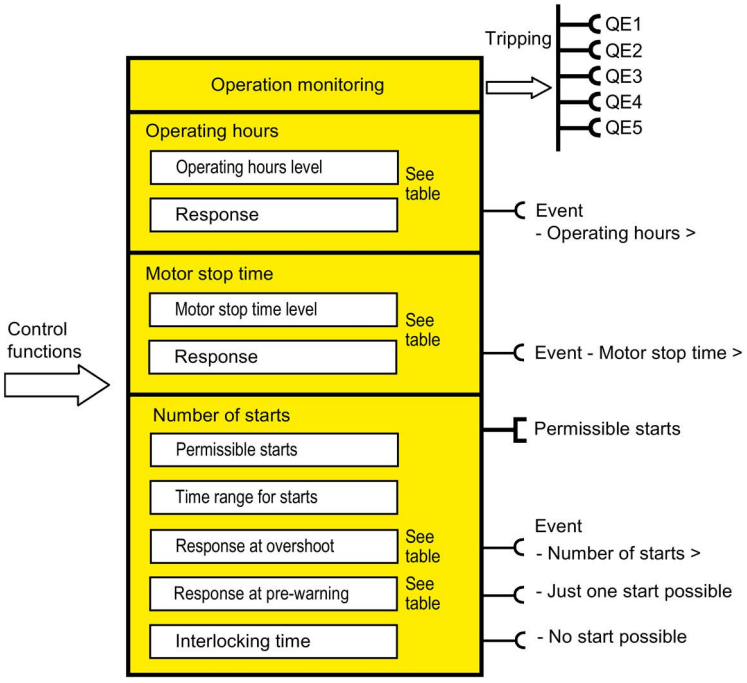


Figure 6-9 "Operation Monitoring" function block

Response

Table 6- 17 "Operation monitoring" response

Response	Monitoring of operating hours - Threshold	Stop time monitoring - level	Number of starts over-shoot	Number of starts pre-warning
Deactivated	X (d)	X (d)	X (d)	X (d)
Signaling	X	X	X	X
Warning	X	X	X	X
Tripping	-	-	X	-

6.7.2 Operating hours monitoring

Motor operating hours monitoring - use

The motor operating hours monitoring function enables the operating hours (service life) of a motor to be recorded so that motor maintenance prompts can be generated in good time as applicable.

Level

If the operating hours exceed the set response level, the monitoring function responds.
Response level: 0 to 1193046 hours (default setting: 0 h)

Activity

Unless deactivated, this function is always active, independent of whether the motor is running or not (operating state "ON").

Response

You can define the response to overshoot here.

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15) and Table "Response of operation monitoring".

6.7.3 Motor stop time monitoring

Motor stop time monitoring - use

System parts for important processes often have dual drives (A and B drives). Ensure that these are always operated alternately. This prevents long motor stop times and reduces the risk of non-availability. The motor stop time monitoring function can be used, for example, to generate an alarm, thus initiating connection of the motor.

Level

The length of the permissible motor stop time is stipulated here; if exceeded, the monitoring function responds. Level: 0 to 65535 hours (default: 0 h)

Activity

Unless deactivated, this function is always active, independent of whether the motor is running or not (operating state "ON").

Response

You can define the response to overshoot of the permissible stop time here:

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15) and Table "Response of operation monitoring".

6.7.4 Monitoring the number of starts

Number of starts monitoring - use

Monitoring the number of starts can protect system parts (motors and switching devices such as soft starters and converters) from too many start processes within a parameterizable time frame and thus prevent damage. This is particularly useful for commissioning or manual control.

The schematic below illustrates the principle of monitoring the number of starts:

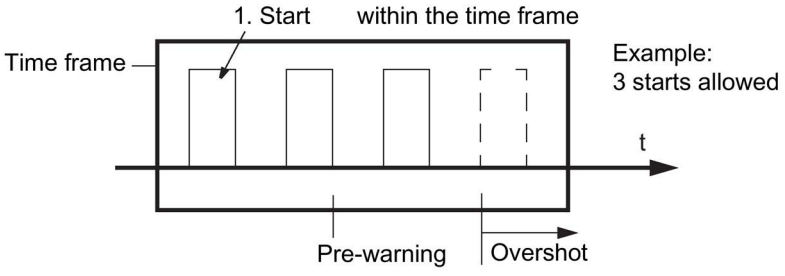


Figure 6-10 Number of starts monitoring

Permissible starts

The maximum permissible number of starts is set here. The time interval "Time range for starts" commences to run after the first start. After the second to last permissible start has been executed, the "Just one start possible" prewarning is generated.

Permissible starts: 1 to 255 (default setting: 1)

Time range for starts

The time range for permissible start processes is set here. The maximum number of starts is only available again after the parameterized time range for starts has elapsed. The number of available starts is shown by the analog value "Permissible starts - Actual value".

Time range for starts: 00:00:00 to 18:12:15 hh:mm:ss (default setting: 00:00:00 hh:mm:ss).

Activity

Unless deactivated, this function is always active, independent of whether the motor is running or not (operating state "ON").

Response to overshoot

You can define the response to overshoot of the number of starts within the time range for starts here:

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15) and Table "Response of operation monitoring".

Response to prewarning

You can define the response after the penultimate start here.

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15) and Table "Response of operation monitoring".

Interlocking time

If a new start command is issued within the time range for starts after the last permissible start, this new start command will no longer be executed if the setting "Response to overshoot - Tripping" has been set. "Trip - No. of starts >" will be displayed and the set interlocking time activated.

Interlocking time: 00:00:00 to 18:12:15 hh:mm:ss (default setting: 00:00:00 hh:mm:ss).

6.8 Temperature monitoring

6.8.1 Temperature monitoring (analog)

Schematic and characteristic curve

Temperature monitoring of, for example, motor windings, motor bearings, coolant and gearbox temperature, can be carried out via up to three analog temperature sensors such as NTC, KTY 83/84, PT100, PT1000.

SIMOCODE pro supports two-level monitoring for overtemperature: Separate levels for warning and tripping temperature can be set.

Temperature monitoring takes into account the highest temperature of all the sensor measuring circuits of the temperature module.

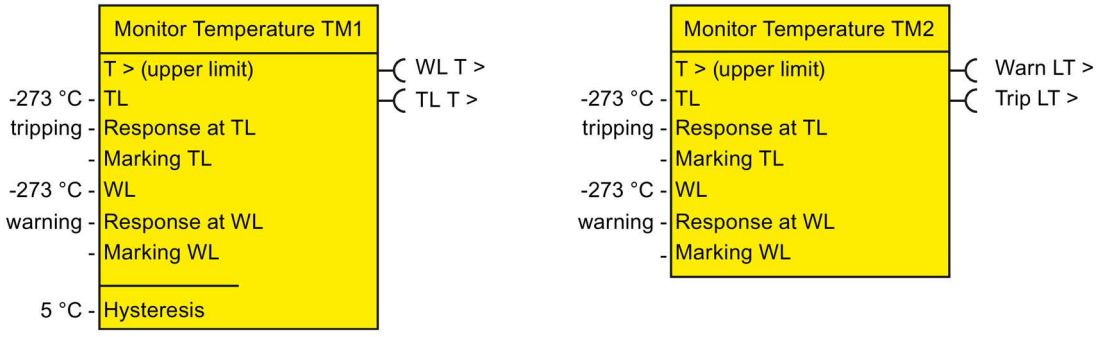


Figure 6-11 "Temperature TM1, TM2 monitoring" function blocks

Settings

Table 6- 18 "Temperature monitoring" settings

Temperature	Description
Trip level T >	- 273 to 65262 °C (default: - 273 °C)
Response to trip level T >	Setting of response when the temperature is overshot (see the following table and Chapter Important information (Page 15))
Marking for trip level T >	No parameter. Optional marking for identifying the message, e.g. "Temperature>"; range: maximal 10 characters
Warning level T >	- 273 to 65262 °C (default setting: - 273 °C)
Response to warning level T >	Setting of response when the temperature is overshot (see the following table and Chapter Important information (Page 15))
Marking warning level T >	No parameter. Optional marking for identifying the event, e.g. "Temperature>"; range: maximal 10 characters. Each change to the marking requires that the communication interface be restarted when the web server is active. A new start interrupts all Ethernet and PROFINET links and reestablishes them afterward.
Hysteresis	0 to 255 °C in steps of 1°C (default: 5 °C)

Trip level/warning level activity

The trip level / warning level is always active, independent of whether the motor is running or not (operating state "ON").

Response

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

- Overtemperature: Here you can select how SIMOCODE pro should respond when the temperature has overshot the warning level / trip level.

Note

With motors for EEx e applications, the response must be set to "Tripping"!

Note

The sensor type, the number of measuring circuits in use and the response to a sensor fault must be set in the "Temperature Module Inputs (TM Inputs)" function block if temperature monitoring is being used.

Note

To monitor several sensor measuring circuits individually and independently, a suitable number of free limit monitors can be linked to the "Temperature Module Inputs (TM Inputs)" function block and differing limits set for the individual temperature sensors, instead of the "Temperature Monitoring" function block.

6.9 Monitoring interval for mandatory testing

Description

Function for monitoring the interval between the connection and the tripping of the enabling circuit (actuator tripping). The monitoring time starts anew every time the enabling circuit closes. This function supports you in maintaining test intervals requiring verification.

In the enabling circuit of the DM-F Local and the DM-F PROFIsafe, relay contacts perform safety-related tripping. You can only determine whether or not the relay contacts of the enabling circuit actually open by changing the switching state of the contacts.

The function "Monitoring interval for mandatory testing" supports plant operators in monitoring the time that has elapsed since the enabling circuit was last switched in.

When the set limit is reached, the set response is triggered (deactivated, signaling, warning; see response). This is logged in the event memory.

This monitoring function is an organizational measure that supports the system operator in detecting faults by carrying out regular tests, see information in the operating instructions on regularly testing the function of a safety device. The monitoring function itself need not be safety-related.

Note

The function "Time until test" is not a safety-related function

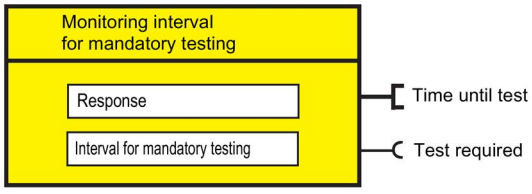


Figure 6-12 "Monitoring Interval for Mandatory Testing" function block

Response

You can define the response here.

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Table 6- 19 "Safe tripping" response

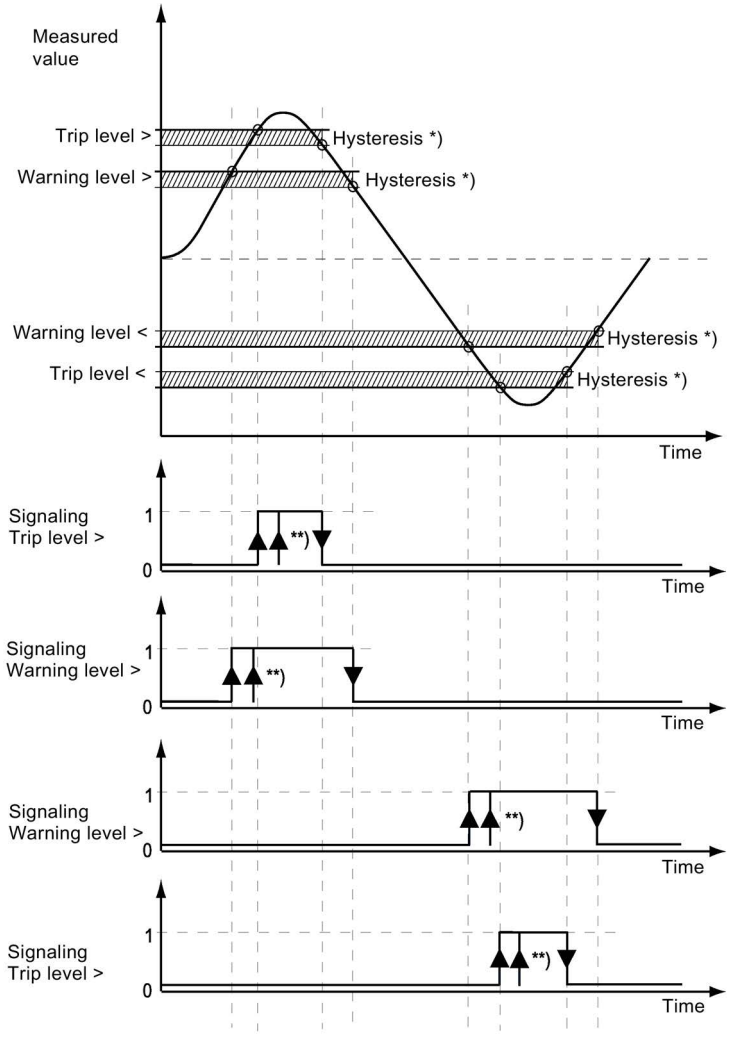
Response	
Deactivated	X (d)
Signaling	X
Warning	X
Tripping	-

Test interval

Adjustable limit value for the interval to mandatory testing: 0 to 255 weeks (default setting: 0).

6.10 Hysteresis for monitoring functions

The following diagram illustrates the function of the hysteresis for monitoring functions:



*) The hystereses are always based on the respectively set response level (exception: temperature monitoring)

**) The trip and warning level events can also be delayed individually

Figure 6-13 The hysteresis operating principle for monitoring functions

TL = Trip level (trip)

WL = Warning level (warn)

Outputs

7

In this chapter

In this chapter you will find information about the outputs of SIMOCODE pro:

- Relay outputs on the basic unit and the digital modules
- Analog module output
- Operator panel LEDs
- Send data via PROFINET

Target groups

This chapter addresses the following target groups:

- Planners and configuring engineers
- Programmers

Required knowledge

You will require the following knowledge:

- The principle of connecting plugs to sockets
- PROFINET

Navigation in SIMOCODE ES

You will find the dialog boxes in SIMOCODE ES under Further Function Blocks → Outputs.

7.1 Introduction

Description

SIMOCODE pro has various outputs. These are represented by different function blocks in SIMOCODE pro. They are the external SIMOCODE pro interfaces. Within SIMOCODE pro, the outputs are represented as plugs on the corresponding function blocks and can be assigned to any functions or events via connections.

Outputs include:

- Output terminals ⊘, located on the outside of basic units, digital modules, and on the analog module
- LEDs on the operator panel for visualizing the operating state or different statuses
- Outputs to the PROFINET.

Schematic

The following schematic shows the general representation of the various output types:

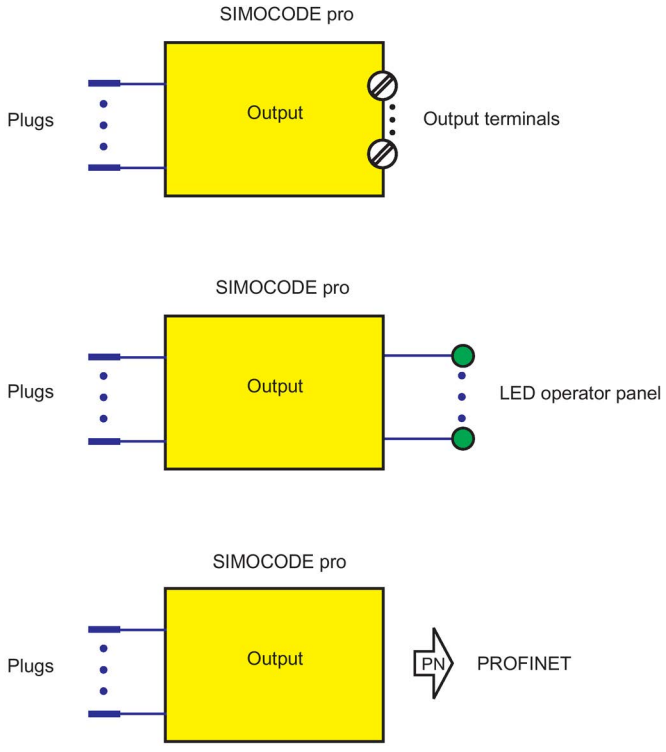


Figure 7-1 General representation of the various output types

Scope and application

Outputs are used, e.g. for controlling motor contactors, displaying states or signaling via PROFINET.

Table 7- 1 Outputs

Outputs	SIMOCODE pro V PN
Basic unit outputs (BU Outputs)	✓
Operator panel LEDs (OP LED)	✓
Digital module 1 outputs (DM1 Outputs)	✓
Digital module 2 outputs (DM2 Outputs)	✓
Analog module output (AM1 output/AM2 output)	✓
OPC-UA send	✓
Cyclic send data (Cyclic Send)	✓

7.2 Basic unit outputs

Description

SIMOCODE pro has a "BU Outputs" function block with two or three relay outputs. You can, for example, switch contactors or lamps via these relay outputs. For this, the inputs (plugs) of the function block must be connected to the respective sockets (usually the "QE..." contactor controls of the control function). The "BU Outputs" function block consists of:

- Three plugs corresponding to the relay outputs Out1 to Out3
- Three relays
- Output terminals.

Overall, there is one "BU Outputs" function block for the SIMOCODE pro V PN basic unit.

Schematic

The following schematic shows the "BU Outputs" function block:

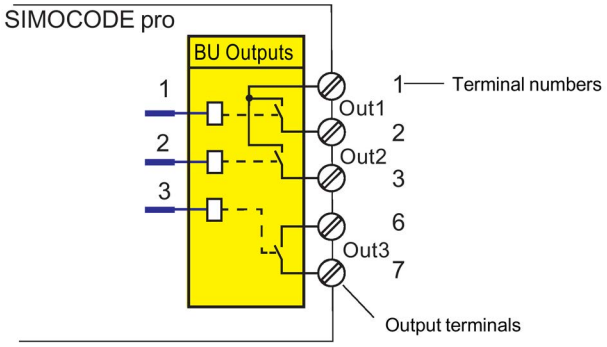


Figure 7-2 BU Outputs function block

Application examples

- Activation of the main contactor in the motor feeder: You can, for example, define which relay output is used for activating the motor contactor in the motor feeder. To do this, connect the desired relay output to the respective "QE..." contactor control of the control function.
- Activation of lamps for displaying operating states: You can define, for example, which relay outputs are to be used for controlling the lamps / LEDs that display the operating states of the motor (Fault, ON, OFF, FAST, SLOW, ...). To do this, connect the desired relay output to the respective "QE..." contactor control of the control function. These are provided specially for controlling lamps and LEDs. In addition to the status signals, the "QL..." lamp controls automatically signal the following using a 2-Hz flashing frequency:
  - Test mode (QLE.../QLA lamp outputs are flashing)
  - Unacknowledged fault (lamp output general fault QLS is flashing)
  - Transfer of any other information, status information, warnings, faults, etc. to the relay outputs.
  - Lamp test: All QL outputs are activated for approx. 2 s.

In most cases, the outputs of the basic unit will be connected to the QE or QL outputs. By referring to Table Active control stations, contactor controls, lamp controls and status information for the control functions (Page 236), you can determine which QE outputs are required for which control functions.

Settings

Table 7- 2 Basic unit output settings

BU Outputs	Description
Outputs 1 to 3	Control of the "BU Outputs" function block via any signal (any socket  , e.g. device inputs, PROFINET control bits, etc.), usually from the QE contactor controls.

Default settings depend on the selected application (template): See Chapter Example circuits (Page 657).

7.3 Operator panel LEDs (with OPD)

Description

SIMOCODE pro has an "OP LED" function block for controlling the seven freely assignable LEDs. The LEDs are located in the operator panel and can be used for any status displays. For this, the inputs (plugs) of the "OP LED" function block must be connected to the respective sockets (e.g. to the sockets for the status information of the control function).

Note

The "OP LED" function block can only be used if the operator panel (OP) is connected and configured in the device configuration.

The "OP LED" function block consists of:

- Four plugs, "OP LED Green 1" to "OP LED Green 4," corresponding to the green LEDs. The green LEDs are visually / mechanically allocated to the buttons on the operator panel. They normally display feedback concerning the motor operating state.
- Three plugs, "OP LED yellow 1" to "OP LED Yellow 3," corresponding to the yellow LEDs.
- Four green LEDs.
- Three yellow LEDs (not for the operator panel with display).

Overall, there is one "OP LED" function block for the SIMOCODE pro V PN basic unit.

LEDs of the operator panel

The following diagram shows the front view of the operator panel and the LEDs:

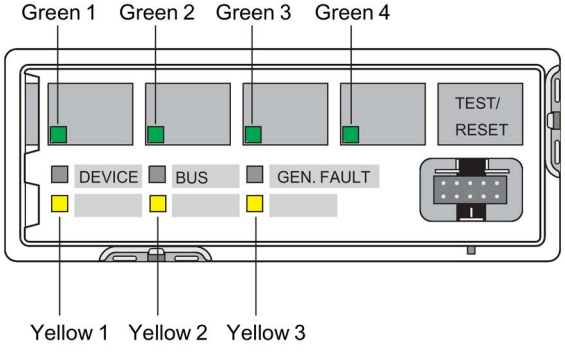


Figure 7-3 LEDs of the operator panel

LEDs of the operator panel with display

The following diagram shows the front view of the operator panel with display and the LEDs:

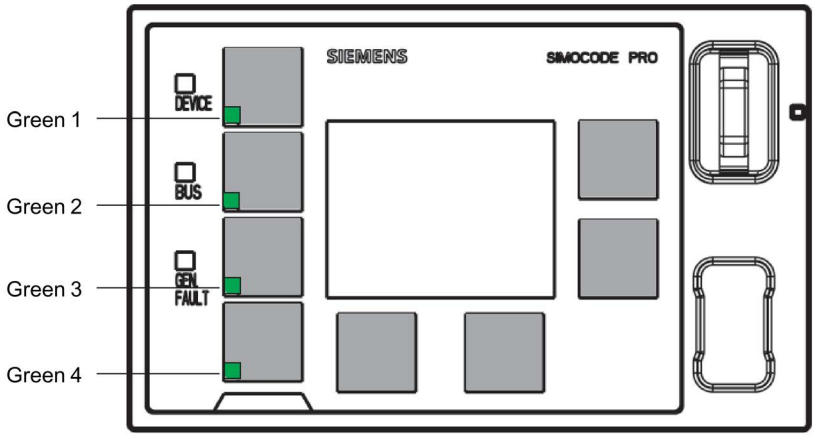


Figure 7-4 LEDs of the operator panel with display for SIMOCODE pro

Schematic

The following schematic shows the "OP LED" function block:

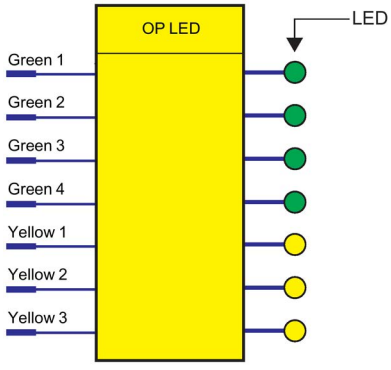


Figure 7-5 Schematic of the "OP LED" function block

Note

The three yellow LEDs mentioned in this section are not available for the operator panel with display. Status information can be read out here directly via the display. While it is still possible to connect the corresponding three plugs via the software, they remain non-functional.

Application examples

- Display of operating states: You can define which LEDs are to be used for displaying the operating states (Fault, ON, OFF, FAST, SLOW,...). To do this, connect the desired LED to the respective "QL." lamp control of the control function. In many cases, the LEDs are connected to the QL outputs. By referring to Table Active control stations, contactor controls, lamp controls and status information for the control functions (Page 236), you can determine which QL outputs are required for which control functions.
- Transfer of any other information, status information, warnings, faults, etc. to the yellow LEDs.

Settings

Table 7- 3 Operator panel LED settings

OP LED	Description
Green 1 to Green 4	The "OP LED" function block can be activated by any signal (any sockets —C, e.g. "motor" operating state feedback).
Yellow 1 to Yellow 3 [1)]	The "OP LED" function block can be activated by any signal (any sockets —C, e.g. displays for status, events, faults).
1) No function when using the operator panel with display.	

Default settings depend on the selected application (template): See Chapter Example circuits (Page 657).

7.4 Digital module outputs

Description

SIMOCODE pro has two "DM1 Outputs" and "DM2 Outputs" function blocks, which are each equipped with two relay outputs. You can, for example, switch contactors or lamps via these relay outputs. For this, the inputs (plugs of the "DM Outputs" function blocks) must be connected to the respective sockets (e.g. of the control function).

Note

"DM Outputs" function blocks can only be used if the corresponding digital modules (DM) are connected and configured in the device configuration.

Each function block has:

- Two plugs, corresponding to relay outputs Out1, Out2
- Two relays
- Output terminals.

Overall, there is one "DM1 Outputs" function block and one "DM2 Outputs" function block for the SIMOCODE pro V PN basic unit.

Note

In addition to the two jointly-switched fail-safe enabling circuits, the fail-safe DM-F Local and DM-F PROFIsafe digital modules are equipped with two standard relay outputs, the common potential of which is switched off for safety reasons via an enabling circuit.

From a logical connection point of view, the standard relay outputs are always switched. The state of the fail-safe enabling circuits is not affected by the logical wiring.

Schematic

The following schematic shows the "DM Outputs" function blocks:

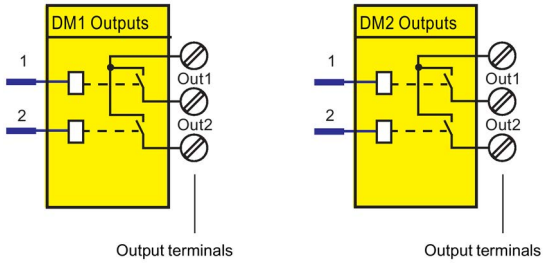


Figure 7-6 Schematic of the "DM1 Outputs" / "DM2 Outputs" function blocks

Application examples

- Activation of the motor contactor in the motor feeder: You can, for example, define which relay output is used for activating the main contactor in the motor feeder. To do this, connect the desired relay output to the respective "QE" contactor control of the control function.
- Activation of lamps for displaying operating states: You can define, for example, which relay outputs are to be used for controlling the lamps / LEDs that display the operating states of the motor (Fault, ON, OFF, FAST, SLOW, ...). To do this, connect the desired relay output to the respective "QL..." lamp control of the control function.
- Transfer of any other information, status information, warnings, faults, etc. to the relay outputs.

In many cases, the outputs of the digital module will be connected to the QE outputs. By referring to Table Active control stations, contactor controls, lamp controls and status information for the control functions (Page 236), you can determine which QE outputs are required for which control functions.

Settings

Table 7- 4 "DM1 / DM2 Outputs" settings

"DM1 / DM2 Outputs"	Description
Outputs 1 to 2	Control of the "DM1 Outputs" and "DM2 Outputs" function blocks via any signal (any socket , e.g. device inputs, PROFINET control bits, etc., usually from the QE contactor controls.)

Default settings depend on the selected application (template): See Chapter Example circuits (Page 657).

7.5 Analog module output

Description

The analog module allows you to expand the SIMOCODE pro V PN basic unit by two analog outputs. The corresponding function blocks allow every analog value (2 bytes / 1 word) in SIMOCODE pro to be output as a 0/4 to 20 mA signal to a connected pointer instrument, for example. By activating the function blocks via the "Assigned analog output value" plug with any integer value between 0 and 65535, an equivalent analog signal of 0 to 20 mA or 4 to 20 mA will be sent to the output terminals of the analog module.

Note

The "AM1 Output" and "AM2 Output" function blocks can only be used if the analog module (AM) is connected and configured in the device configuration.

Schematic

The following schematic shows the "AM1 Output" and "AM2 Output" function blocks:

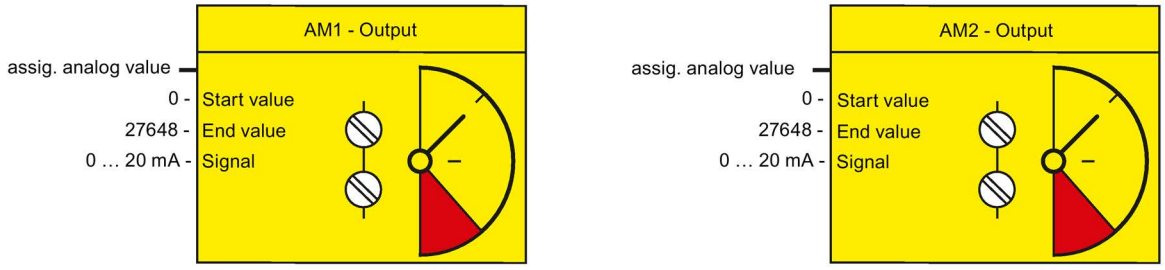


Figure 7-7 Schematic of the "AM1/2 Output" function blocks

Settings

Table 7- 5 "Analog module output" settings

Signal/value	Range
Assigned analog output value	Any value (1 word / 2 bytes) in SIMOCODE pro
Output signal	0 to 20 mA (default setting) or 4 to 20 mA
Start value of value range	0 to 65535 (default setting: 0)
End value of value range	0 to 65535 (default setting: 0)

Application examples

1) Output of the actual motor current - across the entire motor current range

The motor current of a motor is within the range 0 to 8 A.

The rated current I_{rated} of the motor at rated load is 2 A.

The set current in SIMOCODE ES I_s corresponds to the rated current I_N (2 A). In SIMOCODE pro, the present phase currents or the maximum current (current IL_1, IL_2, IL_3, max. current I_max) are represented as a percentage of the parameterized set current I_s in accordance with the selected range:

- 0 A motor current corresponds to 0 % of I_s
- 8 A motor current corresponds to 400% of I_s
- The smallest unit for the effective motor current in SIMOCODE pro is 1% (see measured values data record 94).

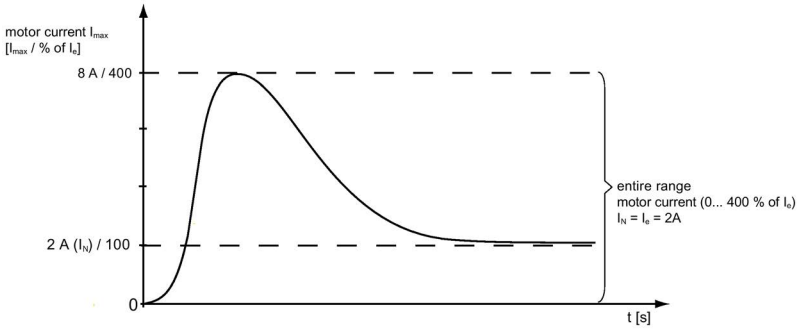


Figure 7-8 Application example: Motor current output - entire range

As a result,

- The "Start value of value range" to be selected is: 0
- The "End value of value range" to be selected is: 400.

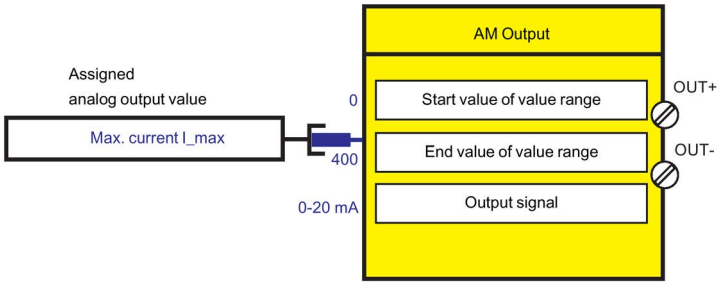


Figure 7-9 Application example: Motor current output - output values to function block

When the parameterized "Output signal" = 0 - 20 mA:

- 0.0 % motor current: 0 mA at the analog module output
- 400 % motor current: 20 mA at the analog module output.

When the parameterized "Output signal" = 4 - 20 mA:

- 0.0 % motor current: 4 mA at the analog module output
- 400 % motor current: 20 mA at the analog module output.

2) Output of the actual motor current - only part of the motor current range (overload range)

The motor current of a motor is within the range 0 to 8 A.

The rated current I_{rated} of the motor at rated load is 2 A.

The set current in SIMOCODE ES I_s corresponds to the rated current I_N (2 A). However, only the overload range (2 to 8 A) is to be displayed on an instrument via the analog module output. In SIMOCODE pro, the present phase currents or the maximum current (current IL_1, IL_2, IL_3, max. current I_max) are represented as a percentage of the parameterized set current I_s in accordance with the selected range:

- 2 A motor current corresponds to 100 % of I_s
- 8 A motor current corresponds to 400% of I_s
- The smallest unit for the effective motor current in SIMOCODE pro is 1% (see measured values data record 94).

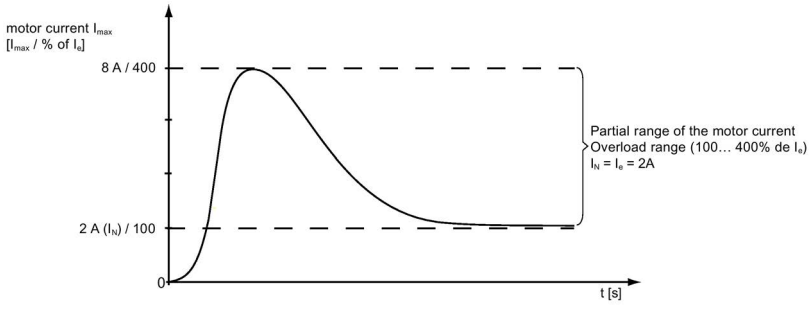


Figure 7-10 Application example: Motor current output - Overload range

As a result,

- The "Start value of value range" to be selected is: 100
- The "End value of value range" to be selected is: 400

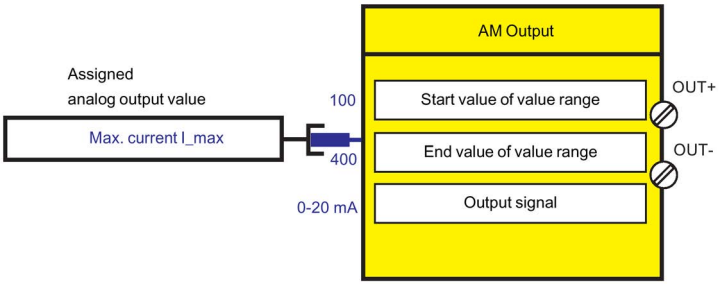


Figure 7-11 Application example: Motor current output - output value to function block at output

When the parameterized "Output signal" = 0 - 20 mA:

- 100 % motor current: 0 mA at the analog module output
- 400 % motor current: 20 mA at the analog module output.

When the parameterized "Output signal" = 4 - 20 mA:

- 100 % motor current: 4 mA at the analog module output
- 400 % motor current: 20 mA at the analog module output.

Note

(relating to examples 1 and 2):

In SIMOCODE pro, phase currents are available as a percentage of the set current I_s. When using the analog module output to display the present motor current on a connected pointer instrument, the present motor current is always indicated as a percentage of the set current. If the selected control function is for a motor with only one speed, the pointer instrument can display a percentage (% of I_s) and an absolute value (e.g. in A).

In the case of motors / control functions with two speeds and, thus, two set currents (e.g. pole-changing starters or Dahlanders), the motor current is only shown on the pointer instrument as a percentage of the present set current I_s1 or I_s2, depending upon which of the two speeds (slow or fast) currently applies.

3) Output of any analog value from the automation system via PROFINET

Two words (2 x 2 bytes) can be transmitted from the automation system to SIMOCODE pro via PROFINET, depending on the basic type. Any value can be output as a 0/4 to 20 mA signal by directly connecting this cyclic control word to the analog module output. If the transmitted value is in S7 Format (0 to 27648) this must be taken into consideration when parameterizing:

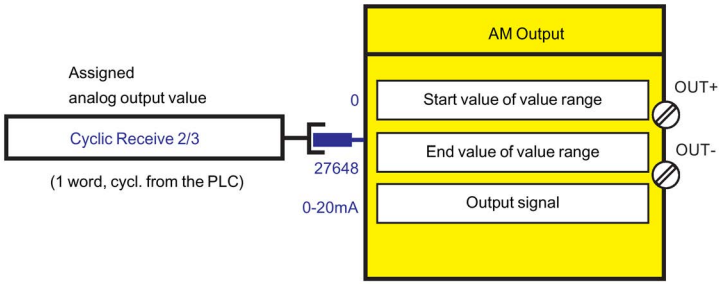


Figure 7-12 Output of an analog value from the automation system

As a result,

- The "Start value of value range" to be selected is: 0
- The "End value of value range" to be selected is: 27648.

When the parameterized "Output signal" = 0 - 20 mA:

- 0: 0 mA at the analog module output
- 27648: 20 mA at the analog module output.

When the parameterized "Output signal" = 4 - 20 mA:

- 0: 4 mA at the analog module output
- 27648: 20 mA at the analog module output.

7.6 Cyclic Send

Description

The "Cyclic Send" function blocks allow you to specify the information to be transferred cyclically to the automation system via PROFINET.

"Cyclic Send" function blocks consist of:

- Eight bits each (two bytes, byte 0 and byte 1 for binary information)
- Nine words (= 18 bytes, bytes 2 to 19 for nine analog values, freely parameterizable).

A total of five "Cyclic Send" function blocks (0, 1, 2/3, 4/9, 10/19) are available.

Schematic

The following schematic shows the "Cyclic Send" function blocks:

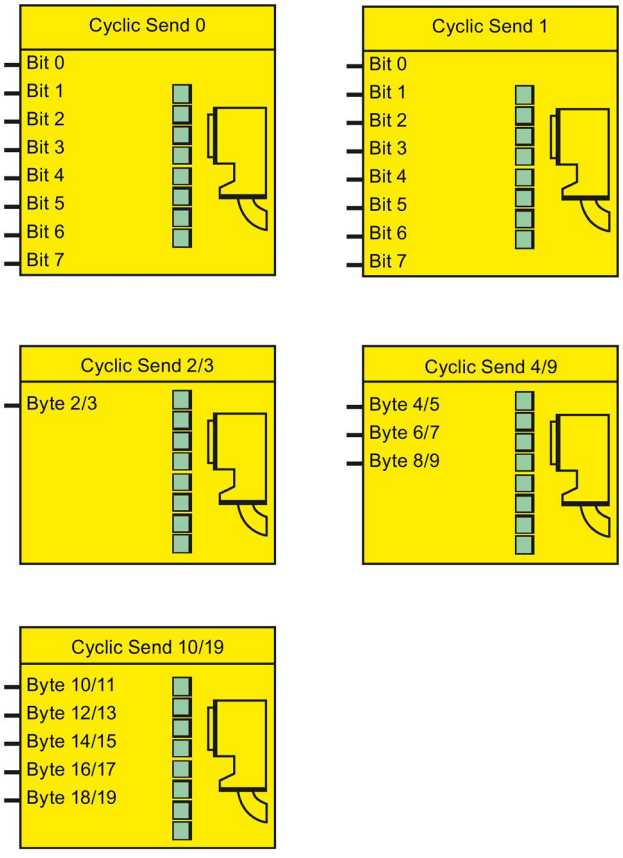


Figure 7-13 Schematic of the "Cyclic Send" function blocks

Cyclic services

The Cyclic Send data are exchanged between the IO Device (SIMOCODE pro) and the IO Controller (automation system). The IO Controller sends the Cyclic Receive data to SIMOCODE pro in each case. In response, SIMOCODE pro returns the Cyclic Send data.

Settings

Table 7- 6 Cyclic send data settings

Cyclic send data	Description
Bytes 0 to 1, bits 0 to 7, basic types 1, 2, 3	Setting and resetting of bits by means of any signal (any sockets —C , e.g. device inputs, send data, etc.)
Bytes 2 / 3, basic types 1, 2, 3	Control of one word (two bytes) by means of any analog value (any socket —C , e.g. maximum current I_{max}, remaining cooling down period, timer actual value, etc.)
Bytes 4 / 5, 6 / 7, 8 / 9, basic type 1	Control of three words (six bytes) by means of any analog value (any sockets —C)
Bytes 10/11, 12/13, 14/15, 16/17, 18/19, basic type 3	Control of five words (ten bytes) by means of any analog value (any sockets —C)

Byte 0 of the send data is already preset; byte 2/3 is preset with the max. current I_max.

7.7 OPC-UA send

Description

In addition to "Cyclic Send," it is possible to transfer a further 16 bits of binary information via OPC UA.

With the "OPC UA Send" function block, you can specify which information is to be transferred. The inputs (plugs) of the function blocks must be connected to the respective sockets.

The OPC-UA Send function blocks consist of

- Eight bits each (= two bytes, byte 0 and byte 1 for binary information)

A total of two "OPC-UA Send" function blocks are available.

Schematic

The following schematic shows the "OPC-UA Send" function blocks:

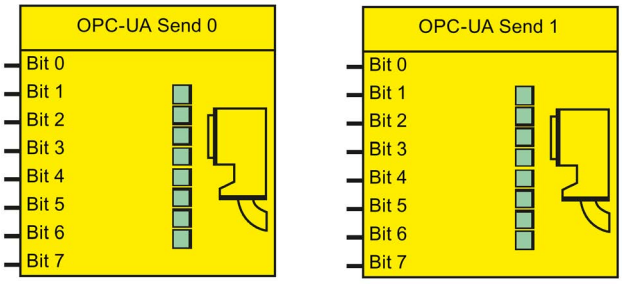


Figure 7-14 "OPC-UA send" function blocks

Settings

Table 7- 7 OPC-UA Send Data settings

OPC-UA Send Data	Description
Bytes 0 to 1, bits 0 to 7	Control of bits by means of any signal (any socket , e.g. device inputs, send data, status information, events, etc.)

Inputs

8

In this chapter

In this chapter you will find information about SIMOCODE pro inputs.

The inputs are:

- Binary inputs on the basic units and digital modules (Basic unit inputs (Page 297) Digital module inputs (Page 302))
- Operator panel buttons (Operator panel buttons (Page 299))
- Temperature module inputs (Temperature module inputs (Page 306))
- Analog module inputs (Analog module inputs (Page 308))
- Receive data from PROFINET (Cyclic Receive (Page 310) OPC UA Receive (Page 311))

Target groups

This chapter addresses the following target groups:

- Planners
- Configuring engineers

Required knowledge

You will need to understand the principle of connecting plugs to sockets.

Navigation in SIMOCODE ES

You will find the dialog boxes in SIMOCODE ES under Device Parameters → Inputs.

8.1 Introduction

Description

SIMOCODE pro has various inputs. These are represented by different function blocks in SIMOCODE pro. These function blocks are the ingoing SIMOCODE pro interfaces. Within SIMOCODE pro, these inputs are represented as sockets on the corresponding function blocks and can be assigned via connections to any functions. Inputs can be:

- Input terminals⊘, located on the outside of the basic unit and digital modules
- Buttons on operator panels (one Test / Reset button, four freely parameterizable buttons), and basic units (one Test / Reset button)
- Temperature module inputs
- Analog module inputs
- Inputs from PROFINET (cyclic and acyclic).

Schematic

The following schematic shows the general representation of input types:

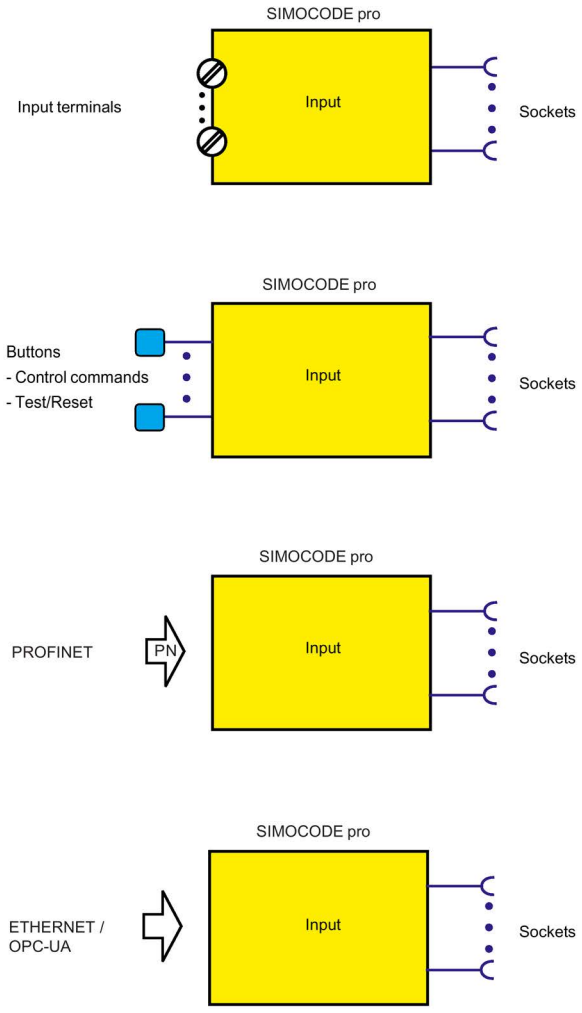


Figure 8-1 General representation of the input types

Scope and application

Inputs are used, for example, to input external signals e.g. via pushbuttons, key-operated switches, etc. These external signals are processed further internally via appropriate connections. The system has different inputs depending upon the device series:

Table 8- 1 Inputs

Inputs	SIMOCODE pro V PN
Basic unit inputs (BU Inputs)	✓
Operator panel buttons (OP Buttons)	✓
Digital module 1 inputs (DM1 Inputs)	✓
Digital module 2 inputs (DM2 Inputs)	✓
Temperature module inputs (TM Inputs)	✓
Analog module inputs (AM Inputs)	✓
Ethernet / OPC-UA Receive	✓
PROFINET (Cycl. receive)	✓

8.2 Basic unit inputs

Description

SIMOCODE pro has a "BU Inputs" function block with four binary inputs connected to common potential. You can connect, for example, the buttons for a local control station to the inputs. These signals can be further processed in SIMOCODE pro by internally connecting the sockets of the "BU Inputs" function block.

The "BU inputs" function block consists of:

- Input terminals ⊘ located on the outside of the basic unit, corresponding to the sockets "BU Input 1" to "BU Input 4"
- Sockets in SIMOCODE pro that can be connected to any plugs, e.g. to the "Control Stations" function block
- Socket for "TEST/RESET" button: The function of the "TEST/RESET" button is generally dependent upon the operating state of the device:
  - Reset function for the acknowledgement of pending faults
  - Test function for carrying out device tests

In addition, other functions can be assigned to the "TEST/RESET" button (e.g. operation of the memory module).

See also Chapter Test / Reset (Page 319).

A total of 1 "BU Inputs" function block is available in each case.

Schematic

The following schematic shows the "BU Inputs" function block:

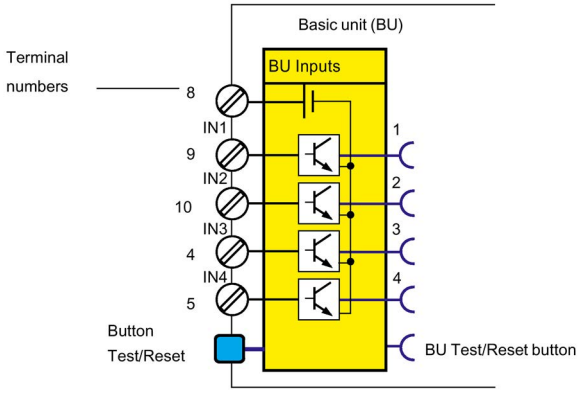


Figure 8-2 Schematic of the "BU Inputs" function block

Application examples

You can wire the start and stop buttons of the local control station, for example, to the inputs. These can then be assigned to the "Local control stations" function block.

If assigned accordingly, the input signals can also be used to activate function blocks such as "Reset" or "External Fault".

Supply of the inputs

See Chapter Mounting basic units, expansion modules, and decoupling module (Page 442).

Settings

Table 8- 2 "Basic unit inputs" settings

Inputs	Description
Delays	You can set delays for the inputs, if required. Range: 6, 16, 26, 36 ms (default setting: 16 ms)

8.3 Operator panel buttons

Description

The operator panel contains buttons 1 to 4 as well as the "TEST/RESET" button. Correspondingly, the "OP Buttons" function block is available in SIMOCODE pro with five sockets.

Note

The "OP Buttons" function block can only be used if the operator panel (OP) is connected and configured in the device configuration.

Note

The operator panel with display does not have a TEST/RESET button. The allocated functions can be carried out via the operator panel menu or via softkeys. Similarly, the corresponding status signal will then be available at the "OP TEST/RESET Button" socket.

- Operator panel, buttons 1 to 4: Buttons 1 to 4 are usually used to input control commands for the motor feeder. Control commands can be, for example:
  - Motor ON (ON >), Motor OFF (OFF) for a direct starter
  - Motor LEFT (ON <), Motor OFF (OFF), Motor RIGHT (ON >) for a reversing starter
  - Motor SLOW (ON>), Motor FAST (ON>>), Motor OFF (OFF) for a Dahlander circuit.

However, buttons 1 to 4 are not rigidly assigned to the above mentioned control commands, and can be assigned to other functions via different internal connection of the respective function block socket in SIMOCODE pro.

- "TEST/RESET" button, operator panel: The function of the "TEST/RESET" button is generally assigned to fixed functions:
  - Reset function for the acknowledgement of pending faults
  - Test function for carrying out device tests.
  - Operation of the memory module.

Nevertheless, the status of the "TEST/RESET" button can be picked off at the corresponding socket of the function block and assigned to further functions in SIMOCODE pro.

See also Chapters Test / Reset (Page 319) , Setting IP parameters and PROFINET device name (Page 487) and Backing up and saving parameters (Page 492).

Operator panel buttons

The following figure shows the front view of the operator panel and the buttons:

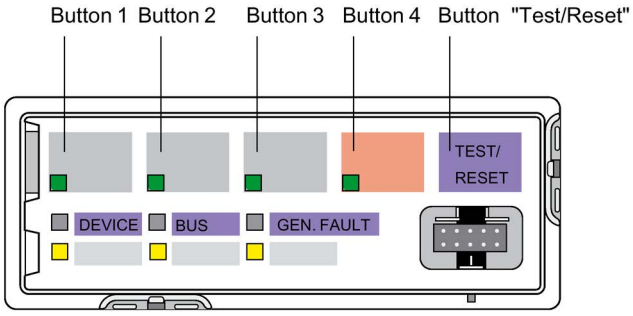


Figure 8-3 Operator panel buttons

Buttons on the operator panel with display

The following diagram shows the front view of the operator panel with display and the buttons:

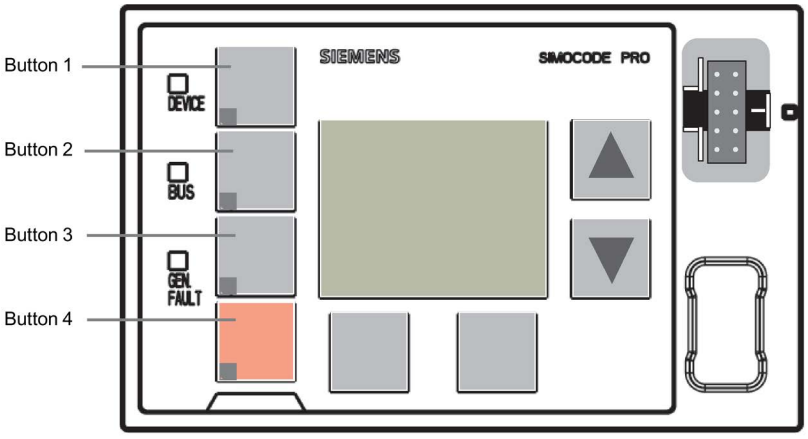


Figure 8-4 Buttons on the operator panel with display for SIMOCODE pro V

Schematic

The following schematic shows the "OP buttons" function block:

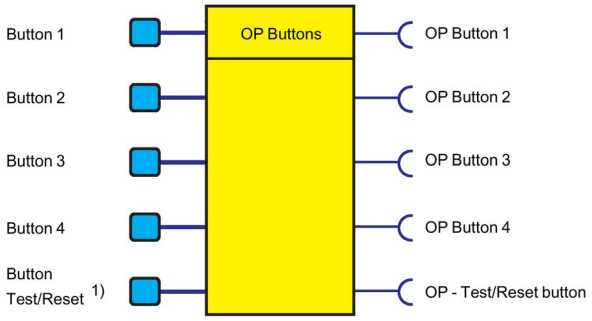


Figure 8-5 Schematic of the "OP Buttons" function block

1) For menu-assisted operation on the operator panel with display

8.4 Digital module inputs

Description

SIMOCODE pro has two "DM Inputs" function blocks, each with four binary inputs connected to common potential. You can connect, for example, the buttons for a local control station to the inputs. These signals can be further processed in SIMOCODE pro by internally connecting the sockets of the "DM Inputs" function blocks.

Note

"DM Inputs" function blocks can only be used if the corresponding digital modules (DM) are connected and configured in the device configuration!

Each "DM Inputs" function block consists of:

- Input terminals ⊘ located on the outside of the digital module, corresponding to the sockets "DM Input 1" to "DM Input 4"
- Sockets in SIMOCODE pro that can be connected to any plugs, e.g. to the "Control Stations" function block

One function block "DM1 Inputs" and "DM2 Inputs" is provided in each case.

Schematic

The following schematic shows the "DM1/DM2 Inputs" function blocks:

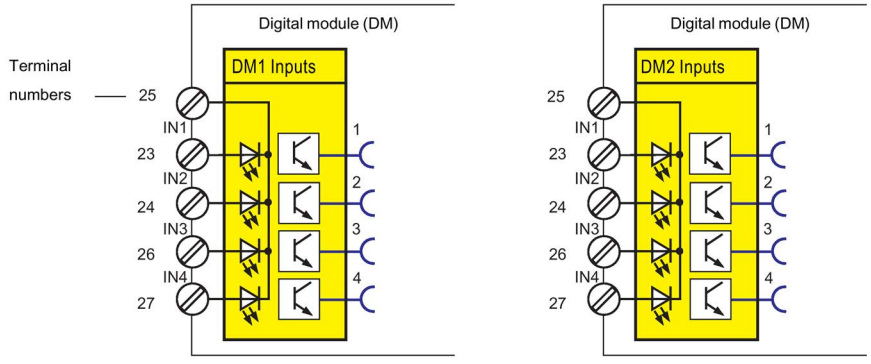


Figure 8-6 Schematic of the "DM1 / DM2 Inputs" function blocks

The following schematic shows the "DM1 Inputs" function block as a DM-F Local fail-safe digital module:

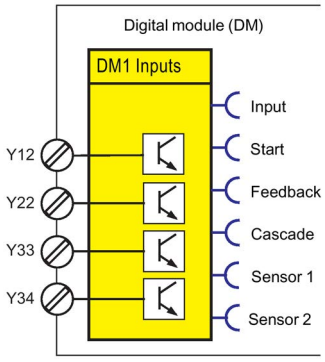


Figure 8-7 The following schematic shows the "DM1 Inputs" function block as DM-F Local fail-safe digital module:

Table 8- 3 Inputs, "DM1 Inputs" function block as DM-F Local fail-safe digital module

Input	Description
Input	1 - "tripped" state (connection of states sensor circuit 1 and sensor circuit 2)
Start	Start input state (Y33)
Feedback	Feedback circuit state (Y34): 1 - closed, 0 - open
Cascade	Cascade input state (1)
Sensor 1	Sensor circuit 1 state (Y12)
Sensor 2	Sensor circuit 2 state (Y22)

The following schematic shows the "DM1 Inputs" function block as DM-F PROFIsafe fail-safe digital module:

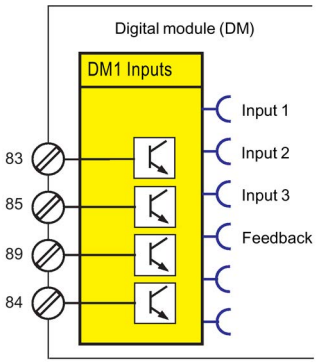


Figure 8-8 The following schematic shows the "DM1 Inputs" function block as DM-F PROFIsafe fail-safe digital module:

Table 8- 4 The following schematic shows the "DM1 Inputs" function block as DM-F PROFIsafe fail-safe digital module

Input	Description
input 1	IN1 (83) state
input 2	IN2 (85) state
input 3	IN3 (89) state
Feedback	Feedback circuit state FBC (91): 1 - closed, 0 - open
Sensor 1	-
Sensor 2	-

Application examples

Digital modules allow the number of binary inputs and binary outputs on basic unit to be increased in increments. In this way, SIMOCODE pro V PN can be expanded to a maximum of twelve binary inputs and seven binary outputs. If assigned accordingly, the input signals can be also used to activate, for example, function blocks such as "Reset" or "External Fault". An external fault can be, for example, the binary signal of an external speed monitor, signaling that the nominal speed of a motor has been undershot.

Supply of the inputs

See Chapter Expansion modules (Page 108).

Settings

Table 8- 5 "DM1 / DM2 Inputs" settings

Basic unit	Description
Delay for inputs	You can set delays for the inputs, if required. Range: 6, 16, 26, 36 ms (default setting: 16 s). These values apply to digital modules with a 24 V DC input supply. The values are approximately 40 ms higher for digital modules with AC/DC input supplies of 110 to 240 V AC/DC.

Note

Delays for the digital module inputs can only be set, or are only relevant, if "monostable" or "bistable" is set for digital module 1.

If digital module 1 is a DM-F PROFIsafe, the delay cannot be set.

If digital module 1 is a DM-F Local, the delays are set using the DIP switches at the front of the DM-F Local.

Non-safety functions (fail-safe digital modules)

- If digital module 1 is a DM-F Local, the DM-F Local is a digital module with non-safety inputs, relay outputs and diagnostics in a SIMOCODE pro system.
- If digital module 1 is a DM-F PROFIsafe, the DM-F PROFIsafe is a digital module with non-safety inputs, relay outputs and diagnostics in a SIMOCODE pro system.

Detailed information on fail-safe digital modules: See Chapter Expansion modules (Page 108).

8.5 Temperature module inputs

Description

SIMOCODE pro has two function blocks, "TM1 Inputs" and "TM2 Inputs," with three analog sockets corresponding to the three sensor measuring circuits of the temperature modules. The temperature (in K) of the three measuring circuits can be read from these sockets and processed internally. An additional analog socket always supplies the maximum temperature of all three measured temperatures. Furthermore, the two binary sockets of the function blocks reflect the status of the sensor measuring circuits. The analog values can be processed internally and/or transmitted cyclically to the automation system via the "Cyclic Send" function blocks.

Note

The "TM1/TM2 Inputs" function blocks can only be used if the corresponding temperature modules (TM1 and/or TM2) have been connected and configured in the device configuration!

Schematic

The following schematic shows the "TM1/2 Inputs" function blocks:

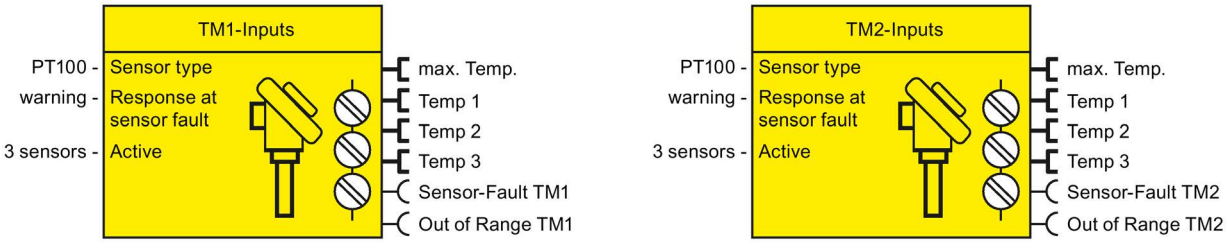


Figure 8-9 Schematic of the "TM1/2 Inputs" function blocks

Notes on wiring

You can connect up to three 2-wire or 3-wire temperature sensors to a temperature module. For more information, see Chapter Wiring (Page 449).

Application examples

Among other things, you can monitor the following motor components:

- Motor windings
- Motor bearings
- Motor coolant temperature
- Motor gearbox oil temperature.

The individual temperatures of the three sensor measuring circuits can be monitored independently of each other by connecting free limit monitors.

Settings

Table 8- 6 Temperature module input settings

Temperature module	Description
Sensor type	PT100 (default), PT1000, KTY83, KTY84, NTC
Response 1) to sensor fault/out of range	Deactivated, signaling, warning (default),, tripping
Number of active sensors	1 sensor, 2 sensors, 3 sensors (default)
1) see Table "Sensor fault / Out of range response"	

Table 8- 7 "Sensor fault / Out of range" response

Response	Sensor fault/Out of range
Deactivated	X
Signaling	X
Warning	X (d)
Tripping	X
Delay	-

See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

8.6 Analog module inputs

Description

SIMOCODE pro has two function blocks, "AM1 Inputs" and "AM2 Inputs," with two analog sockets each, corresponding to the two analog inputs of the analog module. The effective analog value of each input can be read from these sockets and processed internally. An additional binary socket of the function block represents the status of the analog measuring circuits. The analog values can be processed internally and/or transmitted cyclically to the automation system via the "Cyclic Send" function blocks.

Note

The "AM1/AM2 Inputs" function blocks can only be used if the corresponding analog modules (AM1 and/or AM2) have been connected and configured in the device configuration!

Schematic

The following schematic shows the "AM1/AM2 Inputs" function blocks:

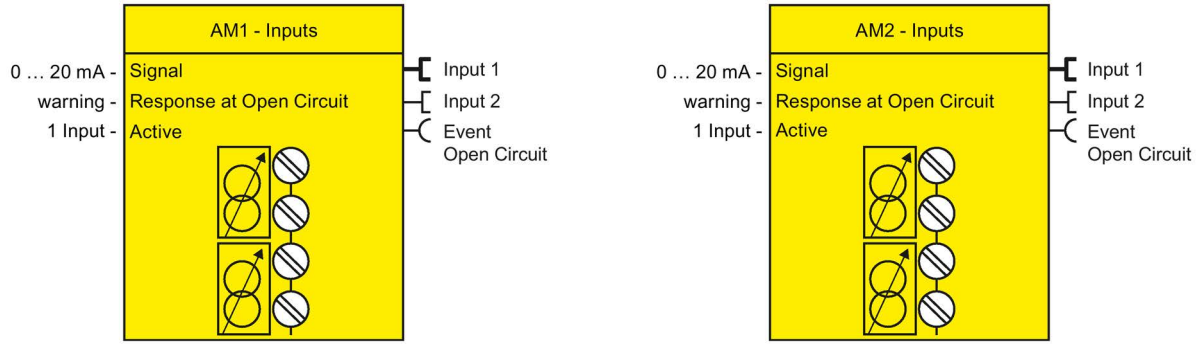


Figure 8-10 Schematic of the "AM1/2 Inputs" function blocks

Application examples

Typical applications are:

- Fill-level monitoring for implementing dry running protection for pumps
- Monitoring of pollution in a filter using a differential pressure transducer.

Settings

Table 8- 8 Analog module input settings

Analog module	Description
Input signal	0 to 20mA (default), 4 to 20 mA
Response to open circuit	Signaling, warning (default), tripping
Active inputs	1 input (default), 2 inputs

Notes

Note

The value of the analog module inputs is in S7 format.

Note

The inputs of the analog module are passive inputs, i.e. to configure an analog input circuit, each input will require an additional, isolated external current source connected in series. If the output of the analog module is not being used by another application, it can also be used as a current source for an analog module input circuit. The "Start value of value range" and the "End value of value range" of the analog module output have to be set to 65535 for this. Thus, the maximum possible current will always be available via the analog module output.

8.7 Cyclic Receive

Description

With the "Cyclic Receive" function block, you can specify which cyclic data from the automation system will be further processed via PROFINET in SIMOCODE pro. These will normally be PLC/PCS binary control commands. Connection with the "Control Stations" function block in SIMOCODE pro will allow the motor to be controlled via PROFINET. Direct connection of the analog value with the "AM Output" function block will result in, for example, the cyclic output of the value sent via PROFINET at the output of the analog module.
The "Cyclic Receive" function blocks consist of:

- Eight bits each (= two bytes, byte 0 and byte 1 for binary information)
- Two words (= two bytes, bytes 2 and 3 and bytes 4 and 5 for one analog value each, freely programmable).

Overall there are four "Cyclic Receive" function blocks (0, 1, 2/3, 4/5).

Schematic

The following schematic shows the "Cyclic Receive" function blocks:

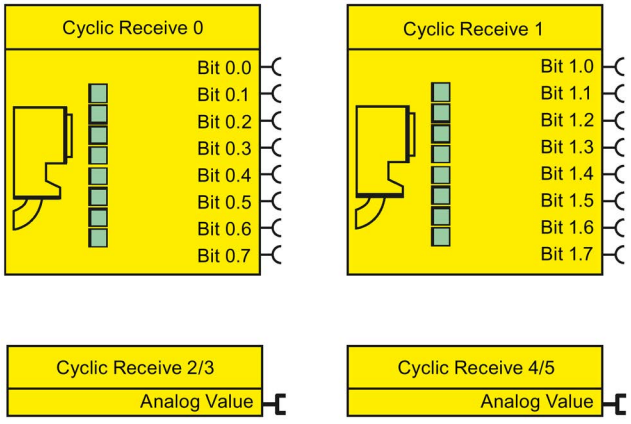


Figure 8-11 Schematic of the "Cyclic Receive" function blocks

Cyclic services

The Cyclic Send data are exchanged between the IO Device (SIMOCODE pro) and the IO Controller (automation system). The IO Controller sends the Cyclic Receive data to SIMOCODE pro in each case. In response, SIMOCODE pro returns the Cyclic Send data.

8.8 OPC UA Receive

Description

In addition to "Cyclic Receive," it is possible to transfer further data to SIMOCODE pro via OPC-UA. With the "OPC UA Receive" function block, you can specify which information will be further processed in SIMOCODE pro. For this, you only have to link the sockets of the "OPC-UA Receive" function blocks to any other function blocks in SIMOCODE pro.

The "OPC-UA Receive" function blocks consist of:

- Eight bits each (= two bytes, byte 0 and byte 1 for binary information)
- One word (= two bytes, byte 2 to 3 for an analog value, freely parameterizable).

A total of three "OPC-UA Receive" function blocks (0, 1, 2/3) are provided.

Schematic

The following schematic shows the "OPC-UA Receive" function blocks:

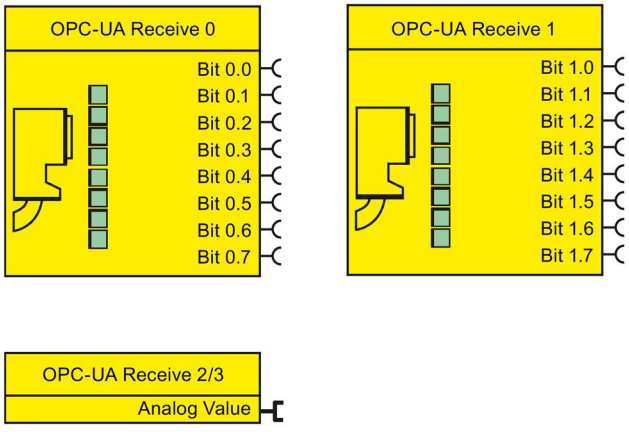


Figure 8-12 Schematic of the "OPC-UA Receive" function blocks

Analog value recording

9

In this chapter

This chapter describes the tools provided by SIMOCODE pro V PN which allow you to record the measured curves of different measured values, e.g. the motor current during motor startup.

As the wear on the motor and the equipment driven by the motor increases, the motor current curve will change. By recording the motor current at different points in time and making direct comparisons, conclusions can be drawn regarding the condition of the motor and the equipment.

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- Programmers
- Commissioning engineers
- Service personnel

Required knowledge

You will require the following knowledge:

- SIMOCODE pro
- Motor protection, motor control
- The principle of connecting plugs to sockets
- Electrical drive engineering

Navigation in SIMOCODE ES

You will find the dialog boxes in SIMOCODE ES under Device Parameters → Analog Value Recording.

9.1 Description

The "Analog Value Recording" function block can be used to record any analog values (2 bytes/1 word) in SIMOCODE pro over a set period of time. For example, you can use this function block to record the characteristic curve of the motor current during motor startup.

The recording is made directly in SIMOCODE pro, related to the motor feeder, and independently of PROFINET or the automation system. Every analog value present at the "Allocated analog value" analog socket is recorded and saved. Recording starts on the basis of the edge (positive / negative) via any binary signal at the trigger input of the function block. Up to 60 values can be saved internally in the device. The time frame of the recording is indirectly determined by the selected sampling rate:

Sampling time = sampling rate [s] * 60 values

The pre-trigger can be used to specify how far in advance the recording should commence before the trigger signal is issued. The pre-trigger is set as a percentage of the entire sampling time. In addition, with SIMOCODE ES you can also export the measured curve into a *.csv file for further processing, for example, in MS Excel.

9.2 Functional principle

Measured curve

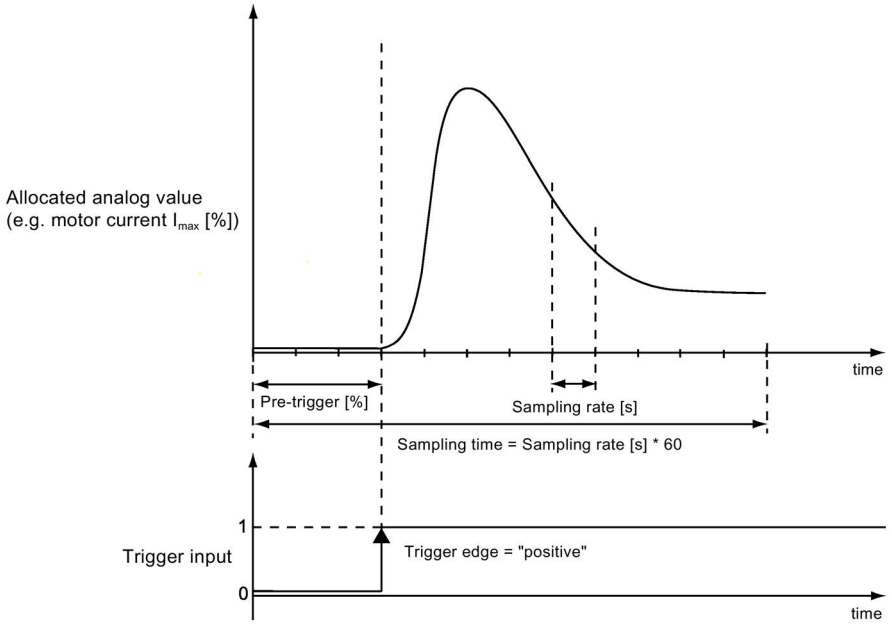


Figure 9-1 Functional principle of analog value recording

The old measured curve will be overwritten in SIMOCODE pro each time a new trigger signal is sent to the trigger input.

Schematic

The following schematic shows the "Analog Value Recording" function block:

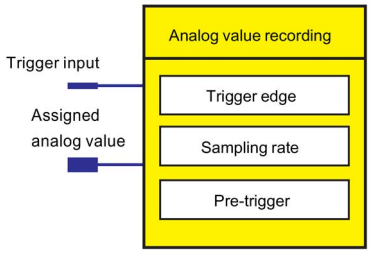


Figure 9-2 Schematic of the "Analog Value Recording" function block

Settings

Table 9- 1 "Analog value recording" settings

Signal/value	Range
Trigger input	Activate analog value recording with any signal (any sockets, e.g. device inputs, current flowing)
Allocated analog value	Any value (1 word / 2 bytes) in SIMOCODE pro
Trigger edge	positive (default) / negative
Sampling rate	0.1 to 50 s, in steps of 0.1 s (default setting: 0.1 s)
Pre-trigger	0 to 100 % in steps of 5 % (default setting: 0 %)

Application example

Record the motor current when the motor starts / sampling time = 12 s / pre-trigger = 25 % (3 s):

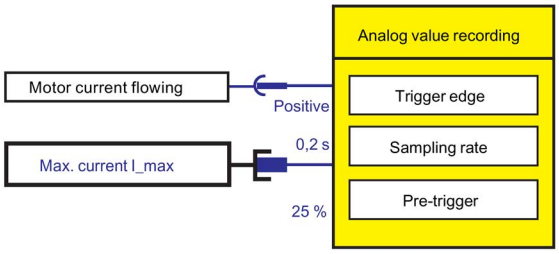


Figure 9-3 Application example of the analog value recording

Standard functions

10

In this chapter

In this chapter you will find information about the standard functions stored as function blocks in SIMOCODE pro. Standard functions are typical motor functions that can be activated according to need and, as applicable, individually set for each motor feeder.

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- Programmers of application programs for reference purposes

Required knowledge

You will require the following knowledge:

- The principle of connecting plugs to sockets
- Motor protection
- Control functions, control stations

Navigation in SIMOCODE ES

You will find the dialog boxes in SIMOCODE ES under "Standard Functions."

10.1 Introduction

Description

So-called "Standard functions" in the form of function blocks are also stored in SIMOCODE pro, and can be used as required. These function blocks may contain:

- Plugs (▬—)
- Sockets (—C) in the form of status information
- Setting values, e.g. the response when an external fault occurs ("Signaling", "Warning," or "Tripping").

Schematic

The following schematic shows the general representation of the function block of a standard function:

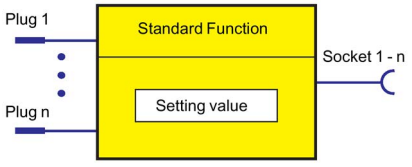


Figure 10-1 General representation of the function block of a standard function

Scope and application

These function blocks work independently of the selected control function and can be used as optional supplements. They are ready to use and only require activating by connecting the plug(s) of the respective function block. Depending on the device series, the system offers several different function blocks for such standard functions.

Standard function block	SIMOCODE pro V PN
Test	2
Reset	3
Test position feedback (TPF)	1
External fault	6
Operational Protection OFF (OPO)	1
Power failure monitoring (UVO)	1
Emergency start	1
Watchdog (PLC / PCS monitoring)	1
Safe tripping	1

10.2 Test / Reset

TEST/RESET description

The function of the "TEST/RESET" button on the basic unit or operator panel is generally dependent upon the operating state of the device:

- Reset function: If a fault occurs
- Test function: In other operating states

In addition to the TEST/RESET buttons, SIMOCODE pro allows internal TEST/RESET tripping via the "Test" function blocks. The "Test" function block consists of one plug.

A total of two function blocks, "Test 1" and "Test 2," are provided, each function block having a slightly different function:

- Test 1: Tests / trips the output relays
- Test 2: Does not trip the output relays (normally for testing via the bus).

Schematic

The following schematic shows a general representation of the "Test / Reset" function blocks:

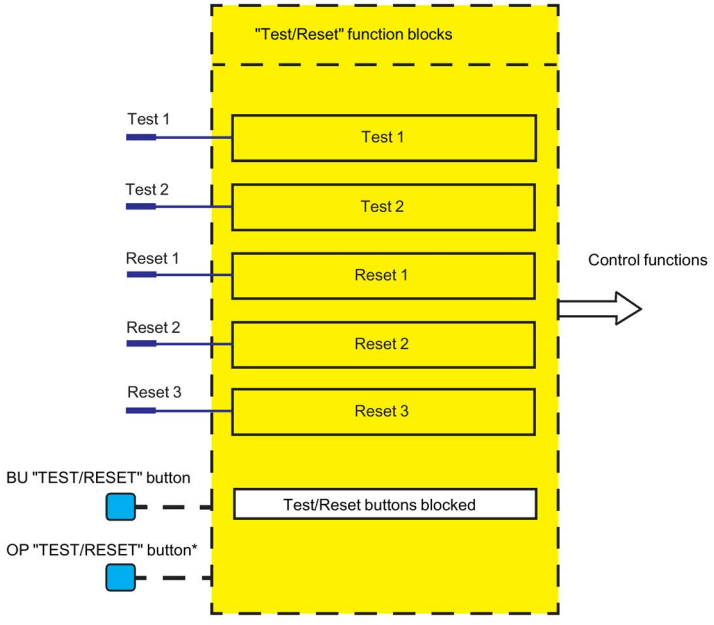


Figure 10-2 "Test / Reset" function blocks

1) The operator panel with display does not have a "TEST/RESET" button. The respective functions can be carried out via the operator panel menu or via softkeys.

Testing

Testing can be carried out as follows:

- Via the "TEST/RESET" button on the basic unit and on the operator panel (can be deactivated), as well as via PC with SIMOCODE ES software.
- Via the plugs of the internal "Test 1" or "Test 2" function blocks
- Via the menu of the operator panel with display (e.g. the "Commands" menu item).

Testing can be terminated at any time - it does not influence the thermal motor model of the overload function, i.e. after tripping via test, the system can be reset immediately. Tripping only occurs for the "Test 1" function block when the operating mode is set to "Remote".

Reset function

Resetting can be carried out as follows:

- Via the "TEST/RESET" button on the basic unit and on the operator panel (can be deactivated), as well as via PC with SIMOCODE ES software.
- Using the "Reset input" plug of the internal function blocks via the plugs of the internal function blocks "Reset 1", "Reset 2" and "Reset 3".
- Via the menu of the operator panel with display (e.g. the "Commands" menu item).

The "Reset" function block consists of one plug.

There are three function blocks "Reset 1" to "Reset 3."

All reset inputs (sockets) are equal (OR function).

Test function

A SIMOCODE pro function test can also be initialized via the test function. The test function comprises the following steps:

- Lamp / LED test (test function activated for < 2 s)
- Test of the device functionality (test function activated for 2 to 5s)
- For "Test 1" function block only: Switching off the QE (test function activated for > 5 s).

Test phases

The following table shows the test phases performed when the "TEST/RESET" button is pressed for the required length of time:

Table 10- 1 States of the status LEDs / contactor controls during testing

Test phase	State	Without main current		With main current	
		OK	Fault[1)]	OK	Fault
Hardware test / lamp test					
< 2 s	"DEVICE" LED	● orange	● green	● orange	● green
	"GEN. FAULT" LED	●	●	●	●
	Contactor control	Unchanged	Unchanged	Unchanged	Unchanged
	Show QL	●	●	●	●
Results of the hardware test / lamp test					
2 - 5 s	"DEVICE" LED	● green	● red	● green	● red
	"GEN. FAULT" LED	◑	●	⊗	●
	Contactor control	Unchanged	Deactivated	Unchanged	Deactivated
Relay test					
> 5 s	"DEVICE" LED	● green	● red	● green	● red
	"GEN. FAULT" LED	●	●	●	●
	Contactor control	Deactivated	Deactivated	Deactivated	Deactivated
● LED lit/switched on		◑ LED flashing	⊗ LED flickering	○ LED off	
1) "Fault" only displayed after 2 s					

Test settings

Table 10- 2 Test settings

Test 1 to 2	Description
Input	Activation of the "Test" function block by any signal (any sockets —C, e.g. device inputs, PROFINET control bits, etc.).
TEST/RESET keys disabled	The blue TEST/RESET buttons on the basic unit and the operator panel are usually intended for acknowledging faults and for performing a device test. The buttons can be disabled with "TEST/RESET keys disabled". These can then be used for other purposes. On the operator panel with display, blocking is carried out via the corresponding menu function. (Default: Unblocked)

Acknowledgment of faults

Generally, the following applies to the acknowledgement of faults:

- Faults can only be acknowledged
  - if the cause of the fault has been eliminated
  - if there is no "ON" control command pending.
- A reset will not be possible if the cause of the fault has not been eliminated and/or if an "ON" control command is pending. The reset will be saved depending on the type of fault. Saving a reset is indicated by the "GEN. FAULT" LED on the basic unit and on the control panel. The LED changes from flashing to continuous signal.

Automatic acknowledgement of faults

Faults are automatically acknowledged in the following cases:

- A reset has been saved and the cause of the fault is no longer present (user has previously acknowledged the fault)
- Auto reset of an overload trip or thermistor trip if motor protection reset = Auto (an automatic acknowledgment is issued here after expiry of the cooling down period). The motor cannot start immediately since reset cannot be performed when an ON command is pending.
- If a configured module fails, all related faults will be acknowledged automatically. However, a configuration fault will be generated (exception: operator panel, if parameterized accordingly). This ensures that a module fault does not cause the general fault to be acknowledged automatically.
- If a function or module is deactivated in the device configuration (via parameterization), all related faults are acknowledged automatically. The motor cannot start immediately since parameters cannot be entered if an ON command is pending.
- If a parameter of a function is changed from "Tripping" to "Warning", or to "Signaling" or "Deactivated", all related faults will be acknowledged automatically.
- For an external fault: With its own parameter: "Auto-Reset."

Reset settings

Table 10- 3 Reset settings

Reset 1 to 3	Description
Input	Activation of the "Reset" function block by any signal (any sockets —C, e.g. device inputs, PROFINET control bits, etc.).
Test / Reset keys disabled	The blue TEST/RESET buttons on the basic unit and the operator panel are usually intended for acknowledging faults and for performing a device test. The buttons can be disabled with "TEST/RESET keys disabled." These can then be used for other purposes. On the operator panel with display, the keys are disabled via the corresponding menu function (default setting: not disabled).

10.3 Test position feedback (TPF)

Description

You can carry out the "Cold run" function test using the "Test Position Feedback (TPF)" function block. For this purpose, the function block input (plug) must be connected to the respective socket. The activated test position will be indicated by the flashing QL of the control function.

The "Test Position Feedback (TPF)" function block consists of

- 1 plug
- 1 "Status - test position" socket. It is set if a signal is pending at the input.
- 1 "Fault - test position feedback error" socket. It is set if
  - "TPF" is activated although current is flowing in the main circuit
  - "TPF" is activated and current is flowing in the main circuit.

In total, 1 "Feedback test position" function block is available.

Note

When the test position is enabled, the QLE / QLA sockets of the control function are activated, to indicate test operation of the motor feeder via a flashing button LED, for example.

Schematic

The following schematic shows the "Test Position Feedback" function block:

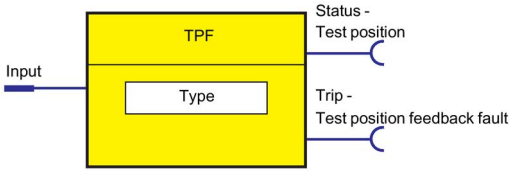


Figure 10-3 "Test Position Feedback" function block

Cold run

If the motor feeder is in the test position, its main circuit is isolated from the network. However, the control voltage is connected.

The "cold run" function test is performed with the feeder in this state. This means the motor feeder is tested without a current in the main circuit.

To enable this function to be differentiated from normal operation, it must be activated via the socket on the function block.

The feedback that the motor feeder is disconnected from the line voltage on the primary current side can be made, for example, via an auxiliary contact of the main switch in the motor feeder, wired to any device input (terminal). This is then internally connected to the "Test position feedback (TPF) - Input" plug of the function block. When using current / voltage measuring modules, this type of auxiliary contact is entirely unnecessary. The "TPF" function block can be activated by monitoring for undervoltage ("Voltage Monitoring" function block).

Thereafter, the contactor outputs can be set via the control stations (see Chapter Control stations (Page 174)), enabling the current-free status to be tested.

If current flows erroneously during test operation, the contactor outputs are switched off by "Trip - Test position feedback".

"Fault - Test Position Feedback (TPF)" fault message and acknowledgement

Note

"Trip - Test position feedback (TPF)" will be generated if:

- "TPF" is activated, although current is flowing in the motor feeder
- "TPF" is activated and current is flowing in the motor feeder.

Acknowledge with "Reset."

Settings

Table 10- 4 Test position feedback (TPF) settings

Test position feedback (TPF)	Description
Input	Activation of the "Test position feedback (TPF)" function block by any signal (any sockets, e.g. device input)
Type	Specification of the input logic: • NO contact (1-active) (default) • NC contact (0-active)

10.4 External fault

Description

The "External Fault 1 to 6" function blocks can be used to monitor any statuses and/or external devices, to generate fault messages and, if necessary, to switch off the motor. To do this, the inputs (plugs) of the "External Fault" function blocks must be connected to any sockets (e.g. device inputs, PROFINET control bits, etc.). External faults can also be "marked" in SIMOCODE pro. This facilitates their allocation to the actual malfunction. Example: monitoring the rotational speed of the motor using an external speed monitor.

The "External Fault" function block consists of:

- 2 plugs (1 plug for setting, 1 plug for resetting)
- 1 "Event - External fault" socket. It is set if a signal is pending at the input.

The following are available:

- 6 "External Faults 1 to 6" function blocks on the SIMOCODE pro V basic unit.

Schematic

The following schematic shows the "External Fault" function blocks:

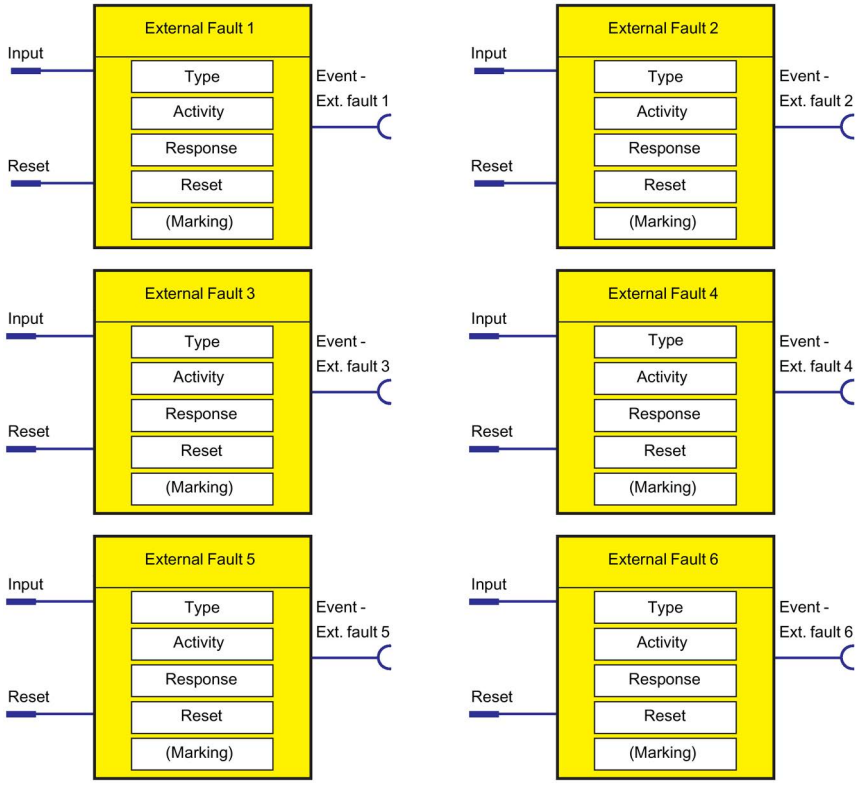


Figure 10-4 "External Fault" function blocks

Special reset options:

A specific reset input is also available in addition to the other reset options (remote reset, TEST/RESET buttons, OFF command reset). Furthermore, Auto-Reset can also be activated. See table below.

Settings

Table 10- 5 Settings for "External fault"

External fault 1 to 6	Description
Input	Activation of the "External Fault" function block by the monitored signal (any sockets, e.g. device inputs, PROFINET control bits, etc.)
Type	Specification of the input logic: • NO contact (1-active) (default) • NC contact (0-active)
Activity	Specify in which motor operating state the external fault is to be evaluated: • Always (default): Always evaluate, regardless of whether the motor is running or at a standstill • Only if motor is ON: Evaluation only if motor is switched ON.
Response	Specify the response to an external fault when activated via the input (see the following table and Chapter Important information (Page 15)).
Reset	Acknowledge the "External fault" fault via any signal (any sockets, e.g. device inputs, PROFINET control bits, etc.)
Reset also by	Specification of further (common) acknowledgement options using additional reset types: • Test/Reset buttons on the basic unit and the operator panel or, in the case of the operator panel with display, via the menu (panel reset) (default) • Remote reset: Acknowledgment via reset 1 to 3, DPV1, "Reset" command (default) • Auto reset: The fault resets itself after the cause has been eliminated (after removal of the activation signal). • OFF command reset: "OFF" control command, resets the fault
Marking [1)]	No parameter. Optional marking for designating the event, e.g. "Rotational speed ", e.g. with SIMOCODE ES. Range: maximum 10 characters.

1)

Note

Changing the marking

Each change to the marking requires that the communication interface be restarted when the web server is active. A new start interrupts all Ethernet and PROFINET links and reestablishes them afterward.

"External fault" response

Table 10- 6 "External fault" response

Response	External fault
Tripping	X
Warning	X
Signaling	X (d)
Deactivated	-

10.5 Operational protection off (OPO)

10.5.1 Response to positioner control function

Description

The "Operational Protection Off (OPO)" function block returns the positioner to a safe position. To do this, the input (plug) must be connected to an appropriate socket (e.g. device inputs, PROFINET control bits, etc.).

The "Operational Protection OFF" function block consists of

- one plug
- one "Status - OPO" socket. It is set if a signal is pending at the input.
- one "Fault - OPO Fault" socket. It is set when the respective, safe end position has been reached.

There is 1 "Operational Protection OFF (OPO)" function block for the SIMOCODE pro V PN basic unit.

The following table shows the basic operating principle:

Table 10- 7 Basic operating principle of Operational Protection OFF(OPO) for the "Positioner" control function

OPO	Initial position when OPO is pending				
	Positioner is open	**Positioner opens**	**Positioner stop / OFF**	**Positioner closes**	**Positioner is closed**
Reaction to OPO					
Parameterized response "Positioner closes"	Fault reset: With Close command	Fault reset: With Close command	Fault reset: With Close command	—	—
	→ Positioner closes	→ Positioner closes	→ Positioner closes	→ Positioner closes	
Parameterized "Positioner opens" response	—	—	Fault Reset: With open command	Fault Reset: With open command	Fault Reset: With open command
		← Positioner opens	← Positioner opens	← Positioner opens	← Positioner opens

Schematic

The following schematic shows the "Operational Protection OFF (OPO)" function block:

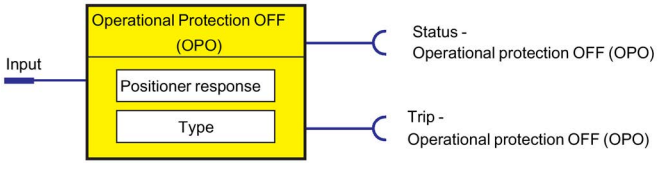


Figure 10-5 "Operational Protection OFF (OPO)" function block

Settings

Table 10- 8 Operational Protection OFF settings

Operational Protection OFF (OPO)	Description
Input	Activation of the "Operational Protection OFF" function block by the monitored signal (any sockets, e.g. device inputs, etc.)
Positioner response	Specification of the response for the "Positioner" control function when activated via the input: • CLOSED: Positioner runs to the end position in the "closed" direction (default). • OPEN: Positioner moves to the "Open" end position.
Type	Specification of the input logic: • NO contact (1-active) (default) • NC contact (0-active)

Safety information

Note

A "Fault - Operational Protection OFF (OPO)" fault message is not generated if the "OPO" command attempts to run the positioner to the end position if it is approaching or has already reached this end position.

Note

No other control command (counter command or stop command) is performed while "Operational Protection OFF (OPO)" is active.

Note

The "Fault - Operational Protection OFF (OPO)" fault message must be acknowledged by the OPEN or CLOSED control command, depending on the present "OPO" end position.

Note

Acknowledgment is performed even if the desired end position has not yet been reached.

Note

The fault message is available as diagnosis via PROFINET.

10.5.2 Response to other control functions

Description

For other control functions, the following scenarios can be differentiated between for OPO:

- Motor in operation: The motor is switched off with a "Trip - Operational Protection OFF (OPO)" fault.
- The motor is off. Initially no fault. "Fault - Operational protection OFF (OPO)" only occurs when an "ON command" is issued.

10.6 Power failure monitoring (UVO)

Description

The "Power Failure Monitoring (UVO)" function block is activated via the plug. This is carried out via an external voltage relay that is connected to the function block via the binary inputs of SIMOCODE pro.

Sequence (see timing charts below):

1. All contactors (QE) are disconnected immediately after the monitoring relay has been operated/the input has been activated (UVO).
2. If the voltage is restored within the "power failure time", the motor will be reset to its previous state. This can either take place immediately or with a time delay (restart time delay).
3. If the "power failure time" elapses before the voltage returns, the device signals a fault (UVO fault).

Prerequisite: The SIMOCODE pro control voltage is buffered and not interrupted.

Schematic

The following schematic shows the "Power Failure Monitoring (UVO)" function block:

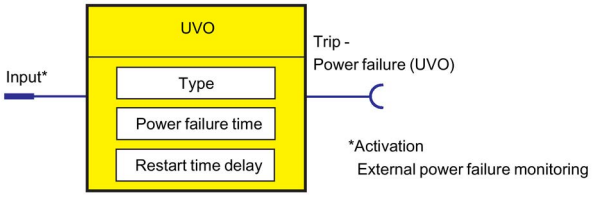


Figure 10-6 "Power Failure Monitoring (UVO)" function block

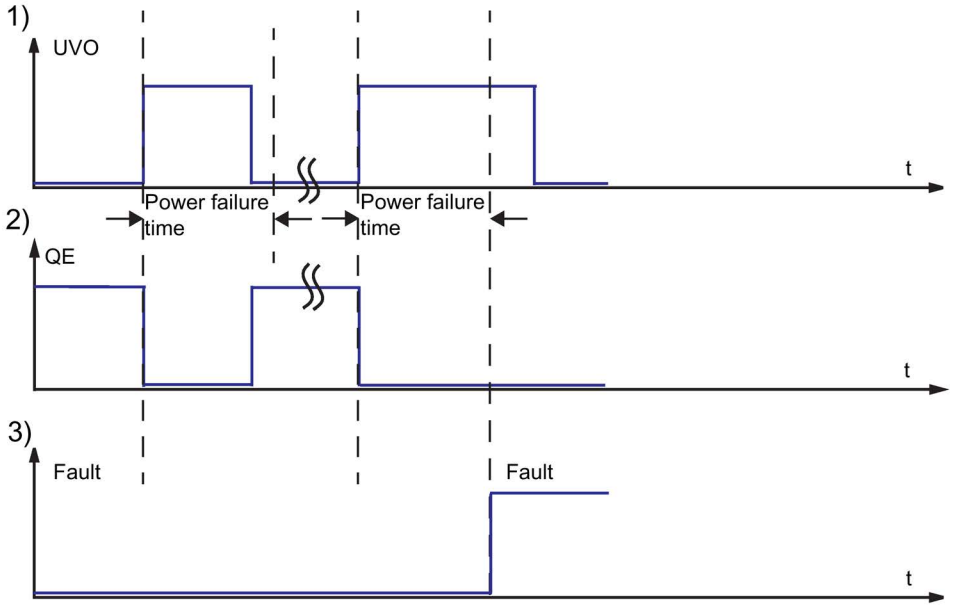


Figure 10-7 Power failure monitoring (UVO) sequence charts

Settings

Table 10- 9 Power failure monitoring settings

Power failure monitoring (UVO)	Description
Input	Activation of the "Power Failure Monitoring (UVO)" function block by the monitored signal (any sockets —C, e.g. device inputs, PROFINET control bits, etc.)
Type	Specification of the type of power failure monitoring: • Deactivated (default setting) • No interruption of device power supply. The SIMOCODE pro control supply voltage is maintained. The failure of the line voltage must be detected, for example, by a separate voltage relay.
Power failure time	Time that starts when the power fails. If the line voltage is restored within the power failure time, all drives which were running prior to the power failure are reconnected automatically. If the line voltage is not restored within the power failure time, the drives remain disconnected and the "Fault - Power failure (UVO)" message is generated. Once the line voltage has been restored, this fault message can be acknowledged using "Reset". Range: • 0 to 25.5 s, in steps of 0.1 s • 26 to 255 s, in steps of 1 s • 256 to 2550 s, in steps of 10 s.
Restart time delay	The restart time delay can be set so that not all motors restart simultaneously. (The line voltage would otherwise dip again). Range: 0 to 255 s (default setting: 0).

10.7 Emergency start

Description

Emergency start deletes the thermal memory from SIMOCODE pro each time it is activated. This allows the motor to be immediately restarted after an overload trip. This function can be used to:

- Enable an immediate reset and restart after an overload trip
- Delete the thermal memory (motor model) during operation, if required.

NOTICE
Do not perform an emergency start more often than absolutely necessary! If emergency starts are performed too frequently this may result in thermal overloading of the motor!

Since the emergency start is "edge-triggered", this function cannot permanently affect the thermal motor model. An emergency start is carried out as follows:

- Using the plug of the function block. To do this, the input (plug) of the function block must be connected to any socket (e.g. device inputs, PROFINET control bits, etc.).

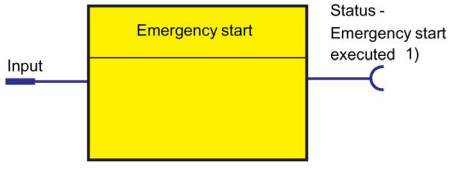
The "Emergency Start" function block consists of:

- one plug
- one "Status - emergency start executed" socket. It is set when an emergency start has been executed.

There is 1 "Emergency Start" function block.

Schematic

The following schematic shows the "Emergency start" function block:



1) The "Emergency start executed" signal is triggered by the edge (input) and reset when the current flows.

Figure 10-8 Emergency Start function block

Settings

Table 10- 10 Emergency start settings

Emergency start	Description
Input	Activation of the "Emergency Start" function block by any signal (any sockets, e.g. device inputs, PROFINET control bits, etc.).

10.8 Safety-oriented tripping

Description

Note

Please note that the information made available for further processing is in the form of non-safety-related signals.

Note

Please note that the "Safe Tripping" function block does not itself represent a safety-related function.

The safety function of the DM-F Local is determined exclusively by the setting of the DIP switches on the module.

The safety function of the DM-F PROFIsafe is determined by the fail-safe program in the F-CPU.

Further information: See Manual Fail-safe Digital Modules SIMOCODE pro Safety (http://support.automation.siemens.com/WW/view/en/50564852).

The "DM-F Local Safe Tripping" function block consists of 3 sockets:

- Event - DM-F LOCAL ok: The DM-F LOCAL is ON.
- Event - Safe tripping: A safety-related tripping has been carried out.
- Status - Enabling circuit closed: The enabling circuit is closed.

The "DM-F PROFIsafe Safe Tripping" function block consists of 3 sockets:

- Event - PROFIsafe active: Fail-safe communication between the F-CPU and the DM-F PROFIsafe is active.
- Event - Safe tripping: A safety-related tripping has been carried out.
- Status - Enabling circuit closed: The enabling circuit is closed.

1 "Safe Tripping" function block is available in each case for SAFETY (Local) and PROFIsafe.

Schematic

The following schematic shows the "Safe Tripping" function block:

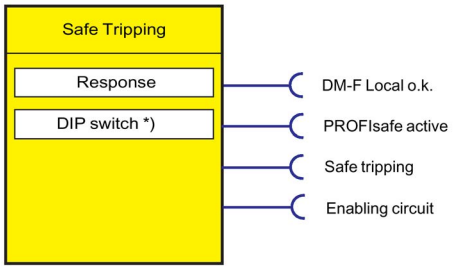


Figure 10-9 "Safe Tripping" function block

SET / RESET button on DM-F Local

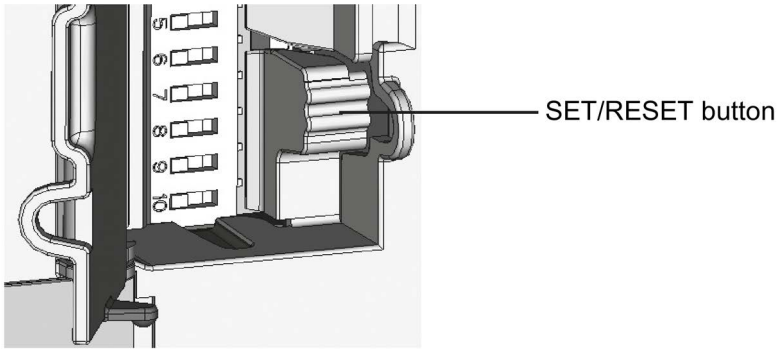


Figure 10-10 SET / RESET button

See Manual Fail-safe Digital Modules SIMOCODE pro Safety (http://support.automation.siemens.com/WW/view/en/50564852).

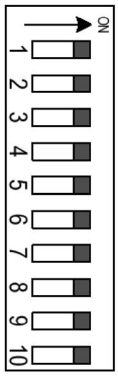
⚠ DANGER

Automatic starting after power failure. Risk of death or serious injury.

In the case of automatic starting after a power failure, the enabling circuits are connected without pressing the Start button.

Settings of the DIP switches (DM-F Local)

Table 10- 11 Settings of the DIP switches (DM-F Local)

Switch position		OFF / ON
1		With /without cross-circuit detection
2		1 NC + 1 NO evaluation / 2 NC evaluation
3		2x 1-channel / 1x 2-channel
4		Delay for sensor inputs 50 ms / 10 ms
5		Sensor input automatic start / monitored start
6		Cascading input automatic start / monitored start
7		With / without startup testing
8		With automatic starting / without automatic starting after power failure

Note

The target setting of the DIP switches in the SIMOCODE ES user interface (can be made using the mouse pointer) is transferred to the basic unit on download but does not affect the function of the DM-F Local digital module. The desired function is thus saved as soon as the parameterization has been created.

You must set the effective parameterization via the DIP switches on the front of the DM-F Local (see tables below and / or the manual "Fail-safe digital modules SIMOCODE pro Safety"). The basic unit compares the target setting (from the download) with the actual setting on the DM-F Local. If these differ "Configuration deviation" is output!

Settings of the DIP switches (DM-F Local)

Table 10- 12 Description of the settings of the DIP switches on the DM-F Local

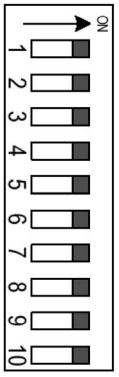
DIP switches (DM-F Local)	Description
With/without cross-circuit detection	Cross-circuit detection is only possible with floating sensors. The sensors must be connected between T1 - Y12, Y33 and T2 - Y22, Y34. The device anticipates the T1 terminal test signal at the terminals Y12 and Y33, and the T2 terminal test signal at the terminals Y22 and Y34. The device detects a sensor fault if the signal at the Y12, Y33 or the Y22, Y34 terminals is not identical to the test signals T1, T2. Cross-circuit detection must be deactivated if electronic sensors such as light arrays or laser scanners are connected. In this case, the DM-F LOCAL no longer monitors the sensor inputs for cross-circuits. Usually, the outputs of safety sensors (OSSD) are already monitored for cross-circuits in the sensor. If "Without cross-circuit detection" is set on the device, the test outputs T1, T2 are deactivated and may no longer be connected. At the Y12, Y22, Y33, and Y34 inputs, the DM-F LOCAL expects a +24 V DC signal from the same current source as the one from which the device receives its power supply (possible only in the case of DM-F LOCAL-1AB00) or from T3 (static +24 V DC). In the case of the DM-F LOCAL-1AU00 device version, it is imperative to connect the T3 terminal to the floating sensor contacts due to the electrical isolation between the input circuit and the sensor power supply.
1 NC + 1 NO evaluation / 2 NC evaluation	In addition to 2-channel connection of the same types of sensor contacts (NC / NC), sensors with opposite types of contacts (NC / NO), as are frequently used for magnetically-operated switches, can also be evaluated. Make sure that the NC contact is connected to Y12 and the NO contact to Y22.
2x 1-channel / 1x 2-channel	• 2 sensors with one contact each (2x 1-channel) (NC / NC). It is expected that both sensors are AND-connected. Simultaneity is not monitored. • 1 sensor with two contacts each (1x 2-channel) (NC / NC). The system expects both contacts to be simultaneously open.
Delay for sensor inputs 50 ms / 10 ms	Any change in the sensor signal during the delay is not evaluated. • Delay 50 ms: Changes in the switch position of strongly bouncing contacts are suppressed (e.g. position switches on heavy protective doors). • Delay 10 ms: The shorter delay permits faster tripping in the case of bounce-free sensors (e.g. light arrays).
Sensor input automatic start / monitored start	• Autostart: The enabling circuits are switched to the operative position as soon as the starting condition at sensor inputs Y12, Y22, Y34 and terminal 1 has been fulfilled. The start button connection terminal Y33 is not queried. • Monitored start: The enabling circuits are switched to the operative position, as soon as the starting condition at sensor inputs Y12, Y22, Y34 and terminal 1 has been fulfilled and the start button at terminal Y33 has subsequently been actuated (start with the falling edge).
Cascading input automatic start / monitored start	Autostart: The enabling circuits are switched to the active position as soon as the starting condition at cascading input 1 has been fulfilled, i.e. as soon as a static +24 V DC signal is present (e.g. from T3). Monitored start: The enabling circuits are switched to the operative position as soon as the starting condition at cascading input 1 has been fulfilled, i.e. as soon as a static +24 V DC signal is present (e.g. from T3), and the start button at terminal Y33 has subsequently been actuated (start with the falling edge).

DIP switches (DM-F Local)	Description
With / without startup testing	After a power failure, start-up testing requires that the sensors at Y12 and Y22 are actuated once by the system operator.
With automatic starting / without automatic starting after power failure	The DM-F Local can be parameterized in such a way that the enabling circuits automatically switch to the operative position after a power failure, i.e. without actuation of the start button Y33. Requirements: • Y12, Y22 or the cascade input 1 are set to "monitored start". • The starting condition at the sensor inputs and at the cascade input has been fulfilled. • Valid actuation of the start button prior to the power failure, i.e. the enabling circuits were in the operative position.

Settings of the DIP switches, DM-F PROFIsafe

Before commissioning the DM-F PROFIsafe, set the PROFIsafe address as follows:

Table 10- 13 DIP switch settings (DM-F PROFIsafe)

Switch position		Value
1 = 2^0		1
2 = 2^1		2
3 = 2^2		4
4 = 2^3		8
5 = 2^4		16
6 = 2^5		32
7 = 2^6		64
8 = 2^7		128
9 = 2^8		256
10 = 2^9		512

If 1 DIP switch is at ON, the respective value is active.

If more than 1 DIP switch is at ON, the respective values must be added.

- Briefly press the "SET/RESET" button. LEDs 1 to 10 indicate the current PROFIsafe address.
- Setting the PROFIsafe address:
  - Switch off the supply voltage
  - Set the DIP switch configuration
  - Switch on the supply voltage again.

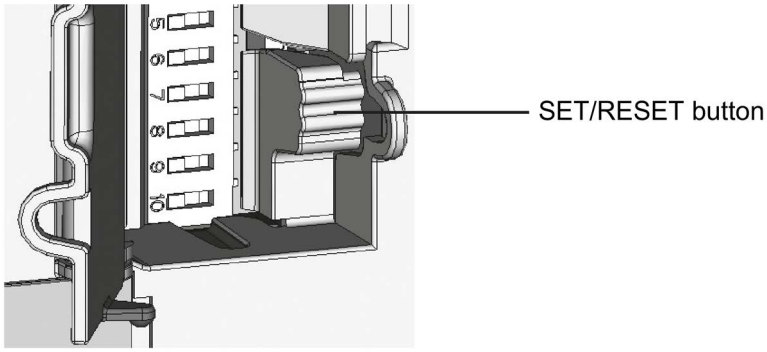


Figure 10-11 "SET/RESET" button

"Safe tripping" response

Here, you set the SIMOCODE pro response to safety-related tripping via DM-F Local or DM-F PROFIsafe.

Note

The response of the modules is not influenced by this setting.

If the conditions for safety-related tripping are met, the enable circuits are always disabled.

Table 10- 14 "Safe tripping" response

Response	Safe tripping
Tripping	X
Deactivated	X (d)
Signaling	X
Warning	X

Note

In the event that the option "DM-F LOCAL / Separate PROFIsafe function from control function" has been activated under "Motor control > Control function > Operating mode," only "Deactivated," "Signaling" or "Warning" can be set as the response, not "Tripping."

"Safe tripping" reset

Here, you can select manual or automatic acknowledgment of SIMOCODE pro faults caused by safety-related tripping: Manual (default), Auto.

10.9 Watchdog (Bus monitoring, PLC/PCS monitoring)

Description

The "Watchdog" function block monitors communication with the PLC via PROFINET, as well as the operating state of the PLC in the "Remote" operating mode.

Schematic

Bus monitoring: With this type of monitoring, the "Fault - bus" fault is generated if

- "Bus monitoring" is active.
- The cyclic data transfer between the PLC and SIMOCODE pro is interrupted in the "Remote" operating mode (mode selector S1 = 1 and S2 = 1), , e.g. by the PROFINET connection being interrupted.

"Status - Bus o.k." can always be evaluated. If SIMOCODE pro is cyclically exchanging data with the PLC, "Status - Bus o.k." is set to "1."

PLC / PCS monitoring: With this type of monitoring, the "Fault - PLC/PCS" message is generated if

- "PLC / PCS monitoring" is active.
- The PROFINET switches to the "Hold/Stop" status when in the "Remote" operating mode (mode selector S1=1 and S2=1).

The "Status - PLC / PCS in Run" can always be evaluated. If the PROFINET is in the "Hold/Stop" state, the "Status - PLC / PCS in Run" is set to"0."

If the "PLC / PCS monitoring - Input" is connected primarily to the "Cyclic Receive - Bit 0.7" bit, the status of the PLC is deduced from this bit only.

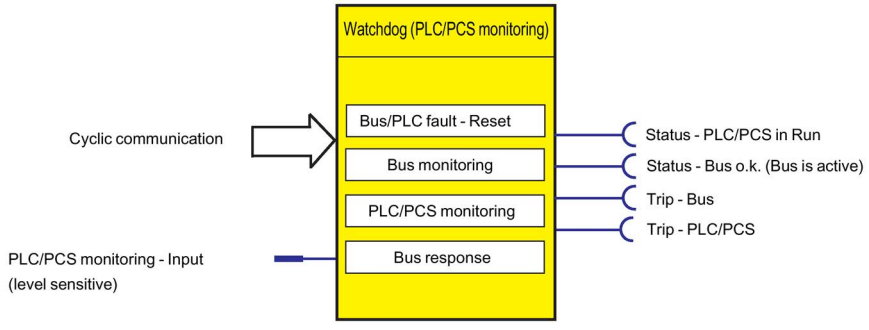


Figure 10-12 "Watchdog (PLC/PCS Monitoring)" function block

Settings

Table 10- 15 Watchdog settings

Watchdog -	Description
PLC / PCS monitoring - Input	Activates the "Watchdog" function block using the monitored signal (any sockets, e.g. PROFINET control bits, etc.)
Bus monitoring	• Deactivated (default setting). If a bus fault occurs, the "Fault - Bus" fault message is generated and must be acknowledged. • Deactivated: No fault message; however, the "Status - Bus ok" information can be evaluated at any time.
PLC / PCS monitoring	• Deactivated (default setting). If a bus fault occurs, the "Fault - PLC / PCS" fault message is generated and must be acknowledged. • Deactivated: No fault message
Bus / PLC fault - Reset	You can select whether faults are to be acknowledged automatically or manually. Range: Manual / Auto

"Bus fault" / "PLC / PCS fault" response

Table 10- 16 "Bus fault" / "PLC / PCS fault" response

Response	Bus fault	PLC / PCS fault
Fault	X (d)	X (d)
Warning	-	-
Event	-	-
Deactivated	X	X

Logic modules

11

In this chapter

In this chapter you will find information about SIMOCODE pro logic modules. Logic modules are function blocks which are modeled not only on standard logic functions, e.g. truth tables (AND, OR,...), but also on counters and timers. In addition to the predefined control functions, you can use this, for example, to implement logical functions, time relay functions and counter functions without depending on external components (relays).

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- Programmers

Required knowledge

You will require the following knowledge:

- The principle of connecting plugs to sockets
- The basic principles of digital signal processing, e.g. timers, counters, etc.

Navigation in SIMOCODE ES

You will find the dialog boxes in SIMOCODE ES under "Further Function Blocks → Logic Modules".

11.1 Introduction

Description

Freely programmable logic modules are function blocks that process input signals and supply binary or analog output signals according to their internal logic components. Logic modules can contain:

- Plugs
- An internal logic component
- Sockets
- Settings, e.g. the time for a timer.

Schematic

The following schematic shows a general representation of a logic module:

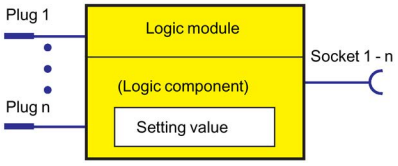


Figure 11-1 General representation of a logic module

Scope and application

You can use the logic modules to carry out additional functions for your application. These can be used, for example, to implement logical operations, time relay functions and counter functions. Depending on the device series, the system provides several logic modules:

Table 11- 1 Freely programmable logic modules

Logic module	SIMOCODE pro V PN
	Number
Truth tables 3 inputs /1 output	8
Truth table 2 inputs /1 output	2
Truth tables 5 inputs / 2 outputs	1
Timer	6
Counter	6
Signal conditioners	6
Non-volatile elements	4
Flashing	3
Flicker	3
Limit monitor	6
Calculation modules (calculators)	4
Analog multiplexer	1
Pulse width modulator	1

11.2 Truth table for 3I / 1O

Description

The truth table 3I / 1O consists of

- Three plugs
- One logic component
- One socket.

You can choose which of the eight possible input conditions an output signal should be generated for.

There are 8 truth tables 1 through 11 on the SIMOCODE pro V PN basic unit.

Schematic

The following schematic shows the "Truth Table for 3I / 1O" logic modules:

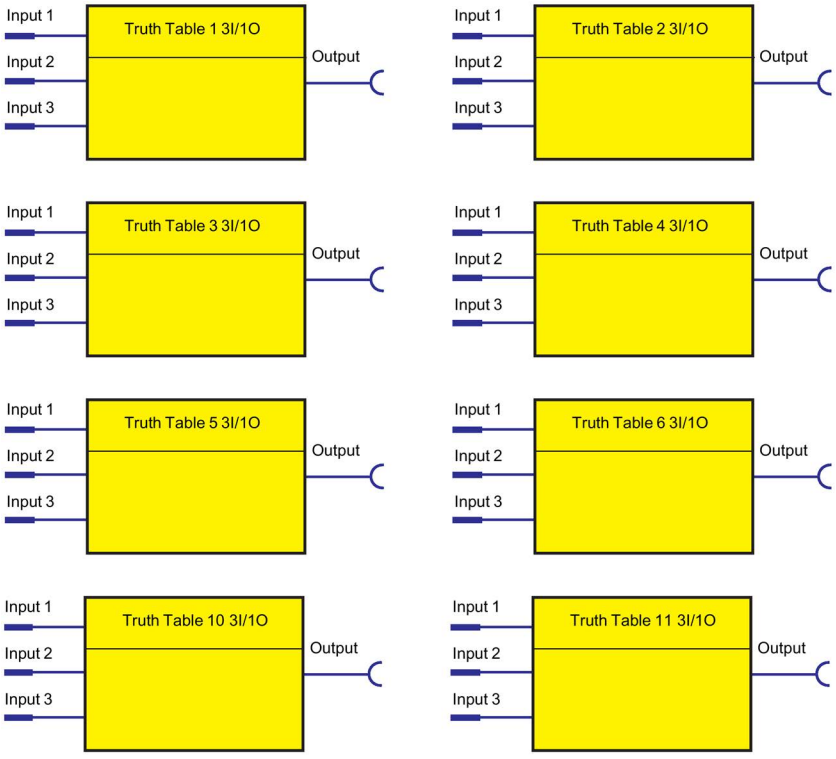
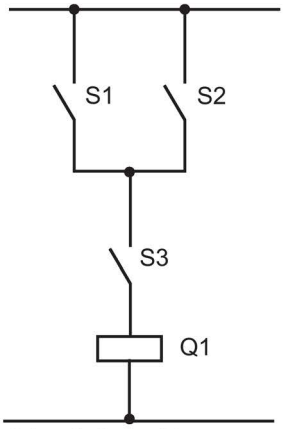


Figure 11-2 "Truth Table for 3I / 1O" logic modules

Example

You want to implement the following circuit:

Circuit:



Q1 switches with:
(S1 or S2) and S3
or
S1 and S2 and S3

Truth table, input conditions colored in gray:

S1= Input 1	S2= Input 2	S3= Input 3	Q1= Output
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

Figure 11-3 Example of a truth table

Circuit and parameterization

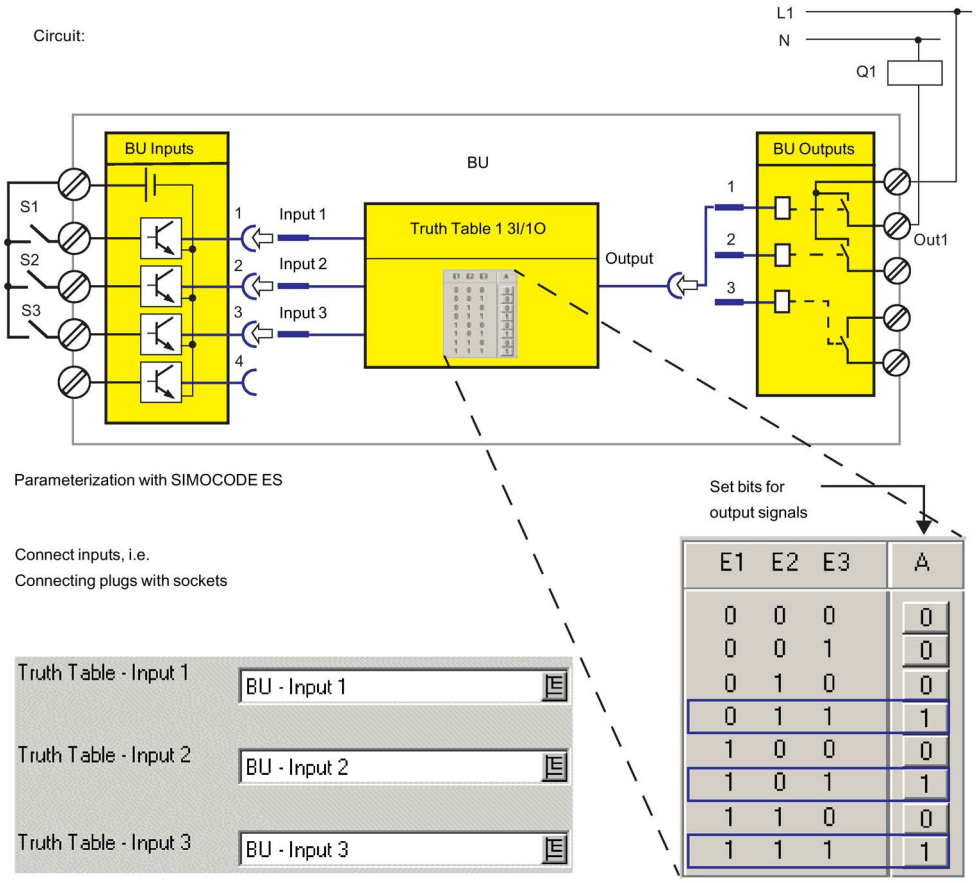


Figure 11-4 Example circuit and parameterization for "truth table 3I / 1O"

Settings

Table 11- 2 Settings for "truth table 3I / 1O"

Truth table 1 to 11 (3I / 1O)	Description
Inputs 1 to 3	Activation of the truth table by any signal (any sockets —C, e.g. device inputs, PROFINET control bits, etc.).

11.3 Truth table for 2I / 1O

Description

The truth table for 2I / 1O consists of:

- Two plugs
- One logic component
- One socket.

You can choose which of the four possible input conditions an output signal should be generated for.
There are a total of 2 truth tables (7 and 8) on the SIMOCODE pro V PN basic unit.

Schematic

The following schematic shows the "Truth Table for 2I / 1O" logic modules:

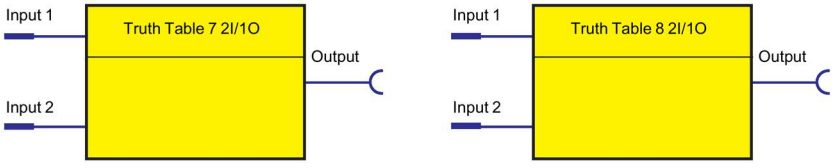
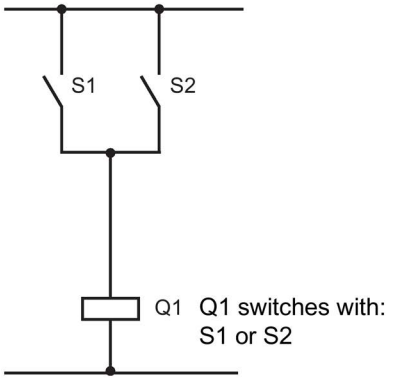


Figure 11-5 "Truth Table for 2I / 1O" logic modules

Example

You want to implement the following circuit:

Circuit:



Truth table, input conditions colored in gray:

S1= Input 1	S2= Input 2	Q1= Output
0	0	0
0	1	1
1	0	1
1	1	1

Figure 11-6 Example of "truth table 2I / 1O"

11.4 Truth table for 5I / 2O

Description

The truth table for 5I / 2O consists of:

- Five plugs
- One logic component
- Two sockets.

You can choose for which of the 32 possible input conditions a maximum of two output signals should be generated.
There is 1 truth table (No. 9) on the SIMOCODE pro V PN basic unit.

Schematic

The following schematic shows the "Truth Table for 5I / 2O" logic modules:

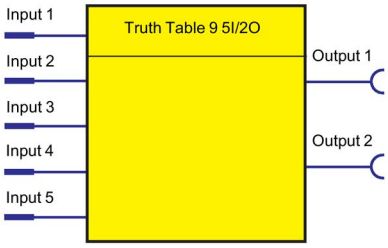


Figure 11-7 "Truth Table for 5I / 2O" logic modules

Settings

Table 11- 3 "Truth Table for 5I / 2O" settings

Truth table 9 (5I / 2O)	Description
Input 1 to 5	Activation by any signal (any sockets, e.g., device inputs, control bits from PROFINET, etc.).

11.5 Counter

Description

Counters are integrated in the SIMOCODE pro system. These are activated via the plugs "+" or "-". The counter output switches to "1" when the preset limit is reached. The counter is reset with "Reset". The current actual value is available as a socket for further internal processing and can also be transmitted to the automation system.

- Plug +: Increases the actual value by 1 (maximum: limit).
- Plug –: Reduces the actual value by 1 (minimum: 0).
- Reset: Resets the actual value to 0.

The counter consists of

- Three plugs (input +, input - and reset)
- One logic component
- One socket
- One "actual value" analog socket with the current value in the range between 0 and the limit.
  It is buffered through power failures.

There are 6 counters 1 through 6 on the SIMOCODE pro V PN basic unit.

Schematic

The following schematic shows the "Counter" logic modules:

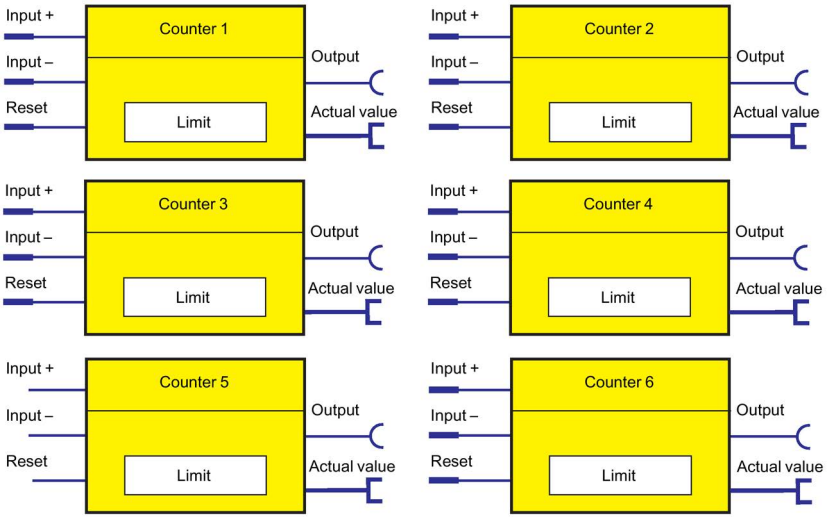


Figure 11-8 "Counter 1-6" logic modules

Note

The time between the events to be counted depends on:

- The input delay
- The device cycle time.

Note

The actual value remains the same:

- During parameterization or failure of the supply voltage
- If there are simultaneous input signals at input + and input –

Note

The output is always 0 if a reset is pending.

Settings

Table 11- 4 Counter settings

Counters 1 to 4 -	Description
Input +	Increments actual value by 1 Activation by any signal (any sockets, e.g., device inputs, control bits from PROFINET, etc.).
Input -	Decrements the actual value by 1. Activation by any signal (any sockets, e.g., device inputs, control bits from PROFINET, etc.).
Reset	Reset the actual value to 0 (count value and output). Activation by any signal (any sockets, e.g., device inputs, control bits from PROFINET, etc.).
Limit	Maximum value that can be reached when counting and at which the counter issues an output signal. Range: 0 to 65535 (default setting: 0)

11.6 Timer

Description

The timer consists of:

- Two plugs (input and reset)
- One socket
- One "Actual value" analog socket with the actual value.

The current actual value is available as a socket for further internal processing and can also be transmitted to the automation system. If an input signal is pending, the timer issues an output signal according to the chosen timer type:

- With closing delay
- With closing delay with memory
- With opening delay
- With fleeting closing.

There are 6 timers 1 through 6 on the SIMOCODE pro V PN basic unit.

Schematic

The following schematic shows the "Timer" logic modules:

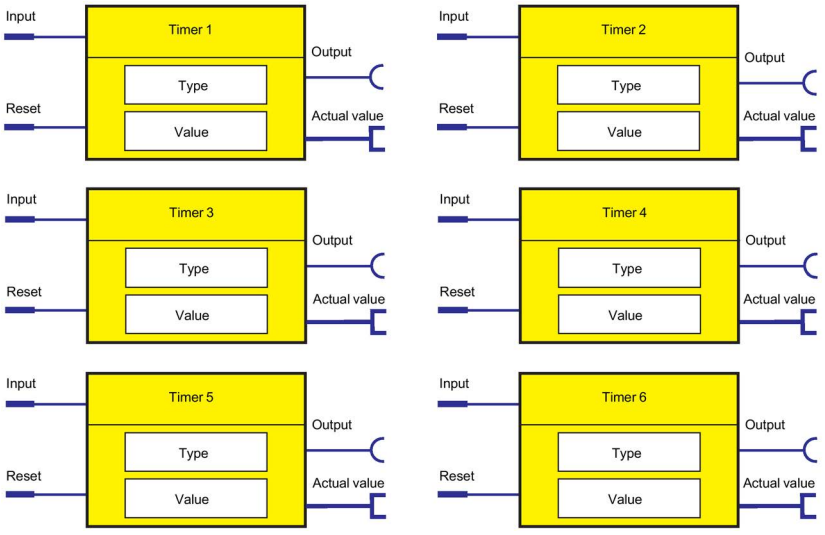


Figure 11-9 "Timer 1-6" logic modules

Note

Reset

The output is always 0 if a reset is pending.

Output response of the timer

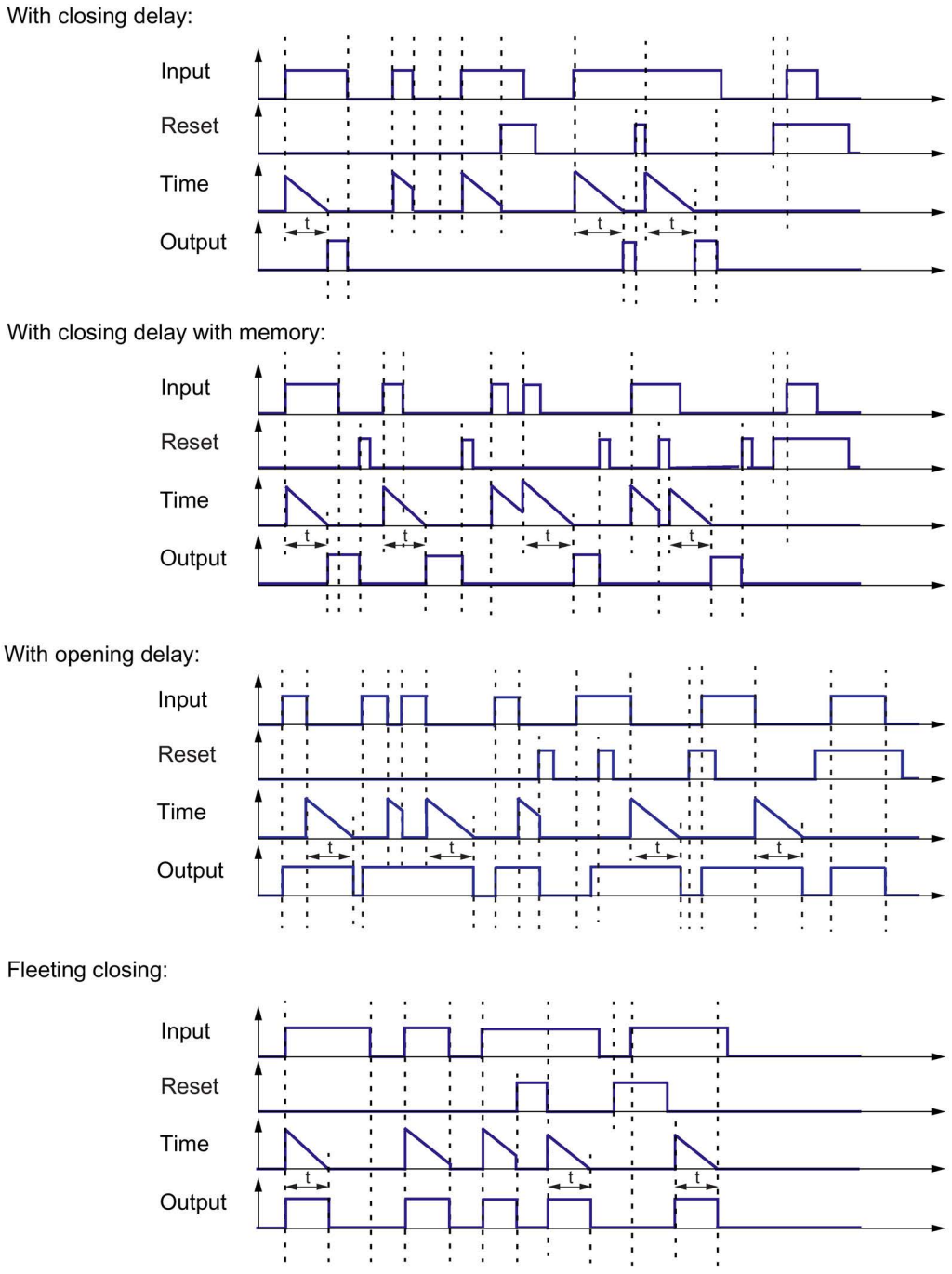


Figure 11-10 Output response of the timer

Settings of timer output response

Table 11- 5 Settings of timer output response

Timers 1 to 4 -	Description
Input	Activation by any signal (any sockets —C, e.g., device inputs, control bits from PROFINET, etc.).
Reset	Resetting the actual value to 0. Activation by any signal (any sockets —C, e.g., device inputs, control bits from PROFINET, etc.).
Type	Different output responses Range: With closing delay (default), closing delay with memory, with opening delay, with fleeting closing
Value	Time during which the timer provides an output signal when activated, depending on the output response (type). Range: 0 … 6553.5 s, unit: 100 ms (default setting: 0)

11.7 Signal conditioner

Description

If an input signal is pending, the signal conditioning issues an output signal according to the selected signal conditioning type:

- Non-inverting
- Inverting
- Edge rising with memory
- Edge falling with memory

You can set the output response.

The signal conditioning consists of:

- 2 plugs (input and reset)
- One logic component
- One socket.

There are 6 signal conditioners 1 through 6 on the SIMOCODE pro V PN basic unit.

Schematic

The following schematic shows the "Signal conditioning" logic modules:

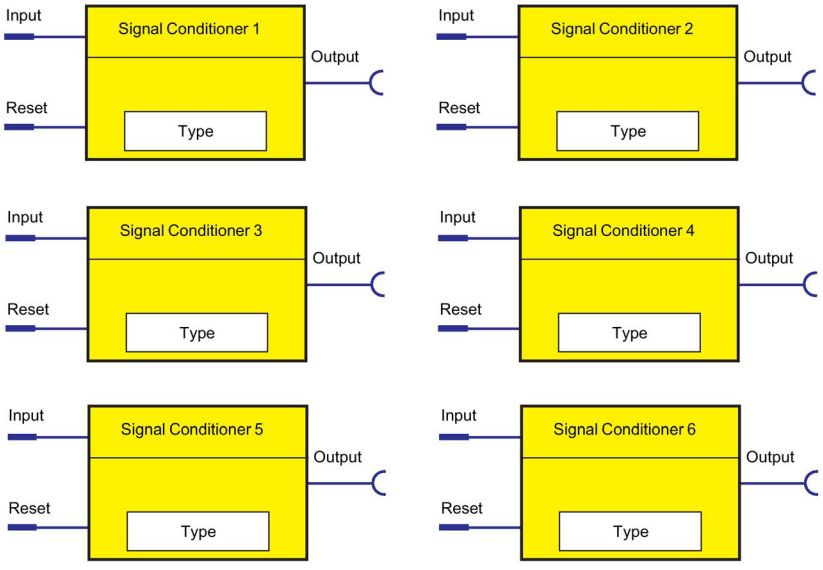


Figure 11-11 "Signal conditioner 1-6" logic modules

Note

The output is always 0 if a reset is pending.

Types of signals/output responses

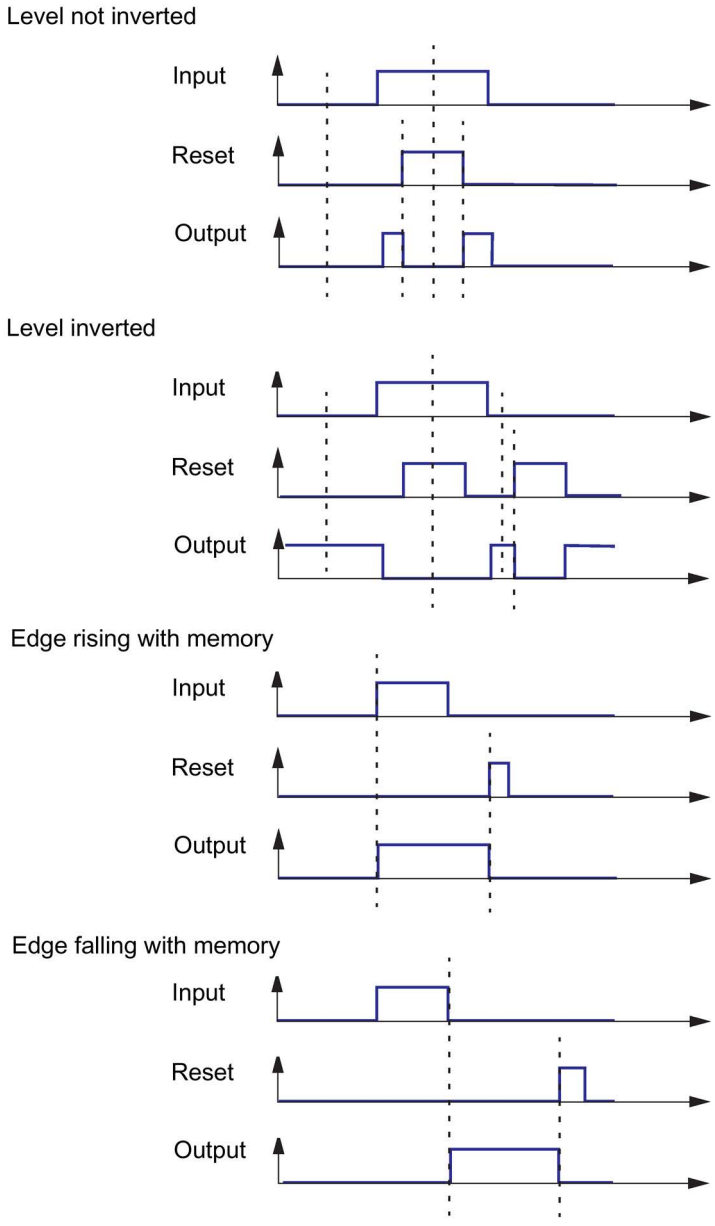
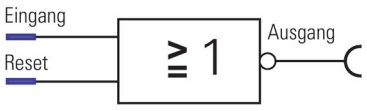


Figure 11-12 Types of signals/output responses of the signal conditioners

NOR function

You can implement a NOR function with the "Level inverted" type of signal:

Table 11- 6 NOR function

Input	Reset	Output	Schematic
0	0	1	
1	0	0	
0	1	0	
1	1	0	

Settings

Table 11- 7 Settings

Signal conditioner 1 to 4 -	Description
Input	Activation by any signal (any sockets —C, e.g., device inputs, control bits from PROFINET, etc.).
Reset	Resetting the signal conditioning to 0. Activation by any signal (any sockets —C, e.g., device inputs, control bits from PROFINET, etc.).
Type	Different output responses. Range: Non-inverting (default), inverting, edge rising with memory, edge falling with memory

11.8 Non-volatile elements

Description

Non-volatile elements behave like signal conditioners. However, these output signals are retained after a power supply failure.

If an input signal is pending, the signal conditioner issues an output signal according to the selected signal conditioner type:

- Non-inverting
- Inverting
- Edge rising with memory
- Edge falling with memory

You can set the output response.

The non-volatile element consists of

- Two plugs (input and reset)
- One logic component
- One socket.

There are 4 non-volatile elements 1 through 4 on the SIMOCODE pro V PN basic unit.

Schematic

The following schematic shows the "Non-volatile elements" logic modules:

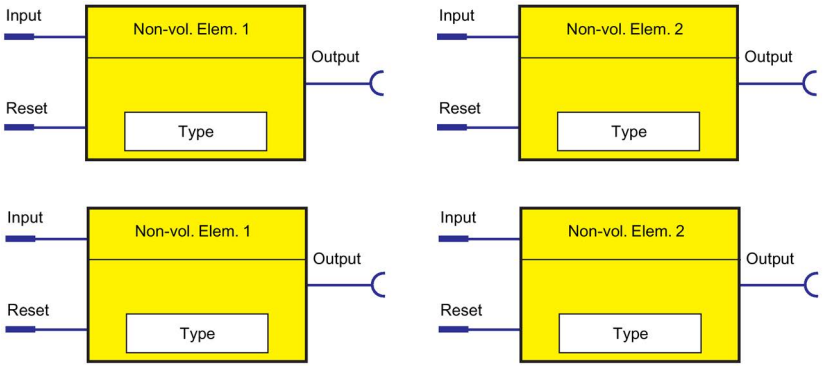


Figure 11-13 "Non-volatile Element" logic modules

Note

The output is always 0 if a reset is pending.

Types of signals/output responses

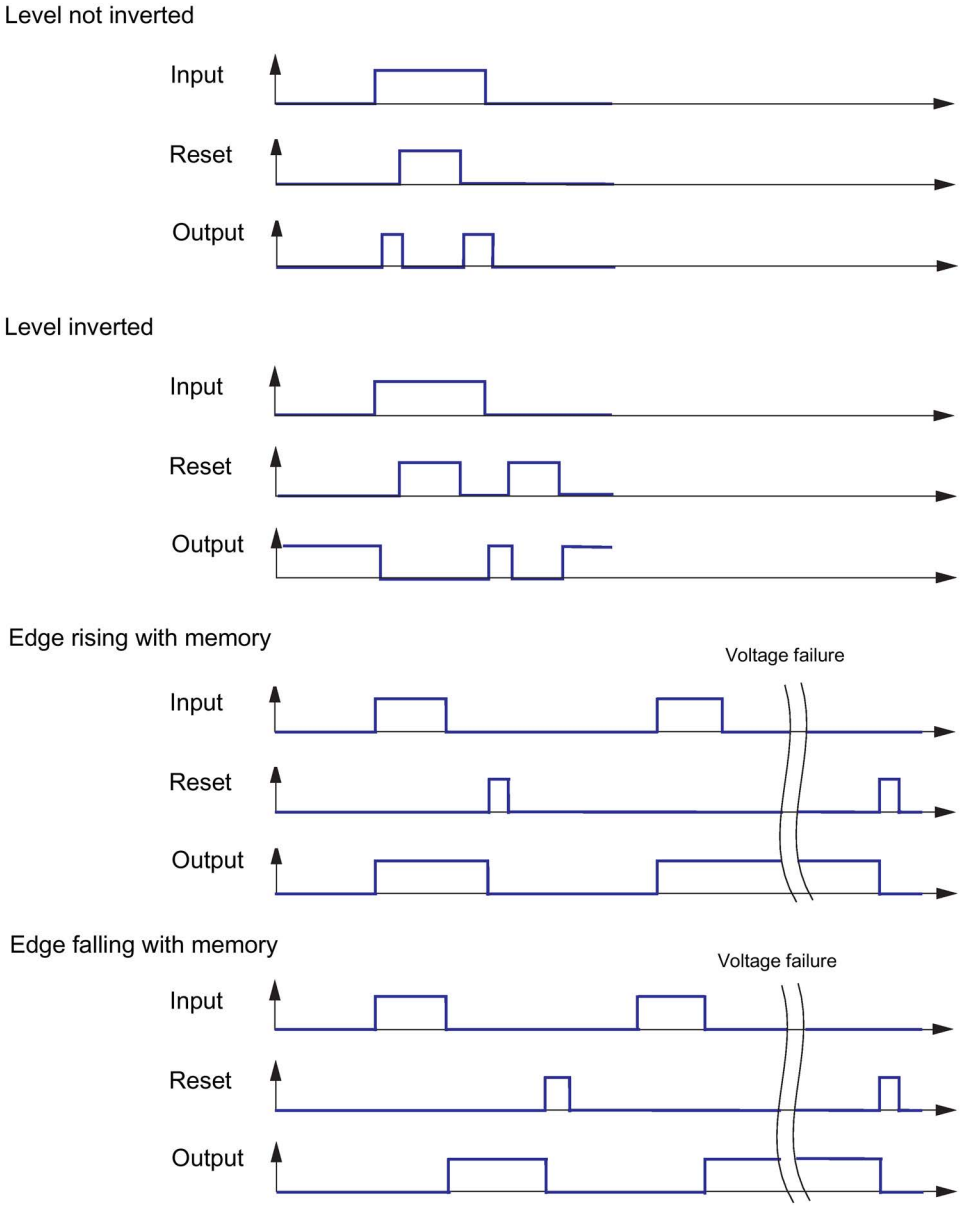
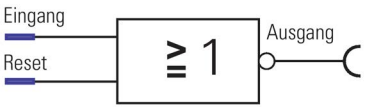


Figure 11-14 Types of signals/output responses of non-volatile elements

NOR function

You can implement a NOR function with the "Level inverted" type of signal:

Table 11- 8 NOR function

Input	Reset	Output	Schematic
0	0	1	
1	0	0	
0	1	0	
1	1	0	

Non-volatile element settings

Table 11- 9 Non-volatile element settings

Non-volatile elements 1 to 4	Description
Input	Activation by any signal (any sockets, e.g., device inputs, control bits from PROFINET, etc.).
Reset	Resets the signal conditioning to 0. Activation by any signal (any sockets, e.g. device inputs, PROFINET control bits, etc.).
Type	Different output responses Range: Non-inverting (default), inverting, edge rising with memory, edge falling with memory

11.9 Flashing

Description

If an input signal is pending at its plug, the "Flashing" logic module issues a signal to its socket, which alternates between binary 0 and 1 at a fixed frequency of 1 Hz. You can use this to make the LEDs on the operator panel flash, for example. The logic module consists of:

- One plug
- One logic component
- One socket.

There are 3 logic modules "Flashing 1" through "Flashing 3."

Schematic

The following schematic shows the "Flashing" logic modules:

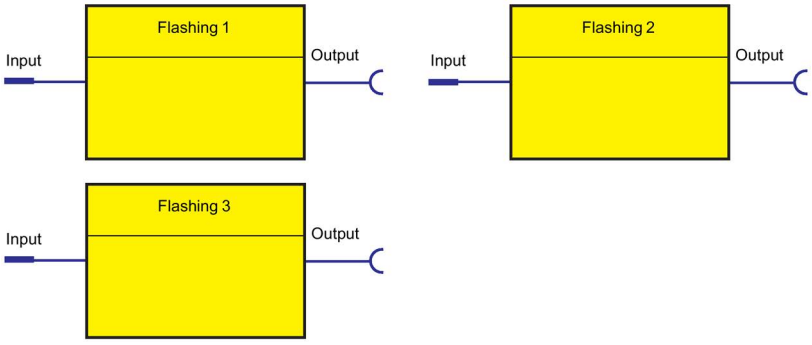


Figure 11-15 "Flashing" logic modules

Settings

Table 11- 10 Flashing settings

Flashing 1 to 3	Description
Input	Activation by any signal (any sockets —C, e.g. device inputs, status information, status, etc.)

11.10 Flickering

Description

You can use the "Flicker" logic modules to assign the "Flicker" function to the operator panel LEDs, for example.

The "Flicker" function block provides an output signal with a frequency of 4 Hz when an input signal is present.

The function block consists of:

- One plug
- One logic component
- One socket.

There are 3 logic modules "Flicker 1" through "Flicker 3."

Schematic

The following schematic shows the "Flicker" logic modules:

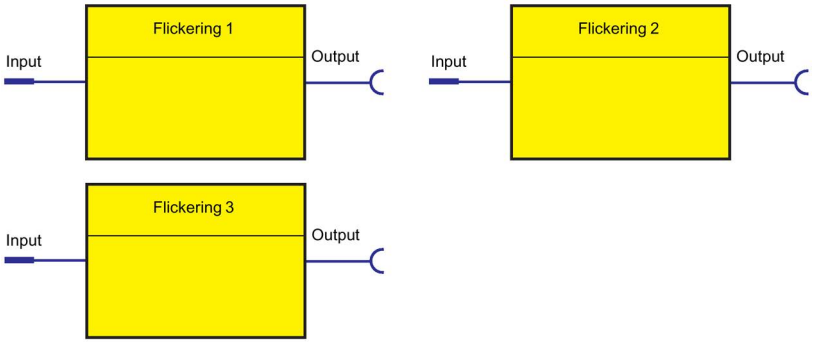


Figure 11-16 "Flicker" function blocks

Flicker settings

Table 11- 11 Flicker settings

Flicker 1 to 3	Description
Input	Activation by any signal (any sockets, e.g. status information, etc.)

11.11 Limit monitor

Description

With the limit monitor, any analog values (2 bytes / 1 word) can be monitored for limit overshooting or limit undershooting The limit monitor issues the "Limit" signal at its socket. In addition, limit monitors can be "marked" according to their function. Example: Monitoring the individual sensor measuring circuits of the temperature module (Temperature 1 to 3) for overtemperature.

The limit monitor consists of:

- One analog plug
- One logic component
- One socket.

There are 6 limit monitors 1 through 6 on the SIMOCODE pro V PN basic unit.

Schematic

The following schematic shows the "Limit Monitor" logic modules:

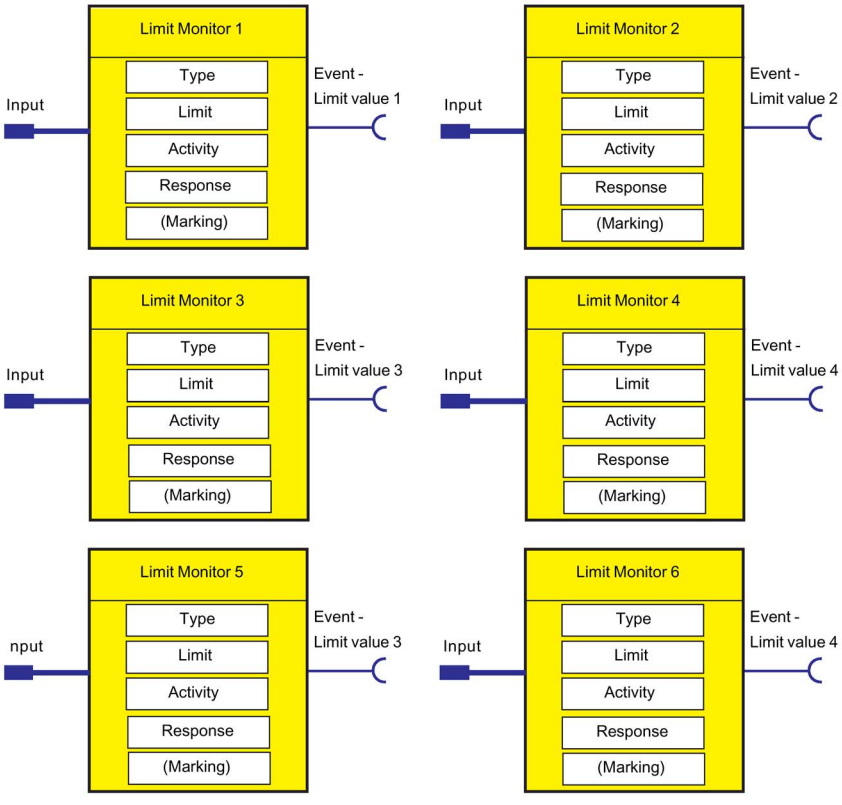


Figure 11-17 "Limit monitor 1-6" logic modules

Limit monitor response

Table 11- 12 Limit monitor response

Response	Limit 1 to 4
Tripping	-
Warning	-
Signaling	X (d)
Deactivated	-
Delay	0 - 25.5 s (default setting: 0.5 s)

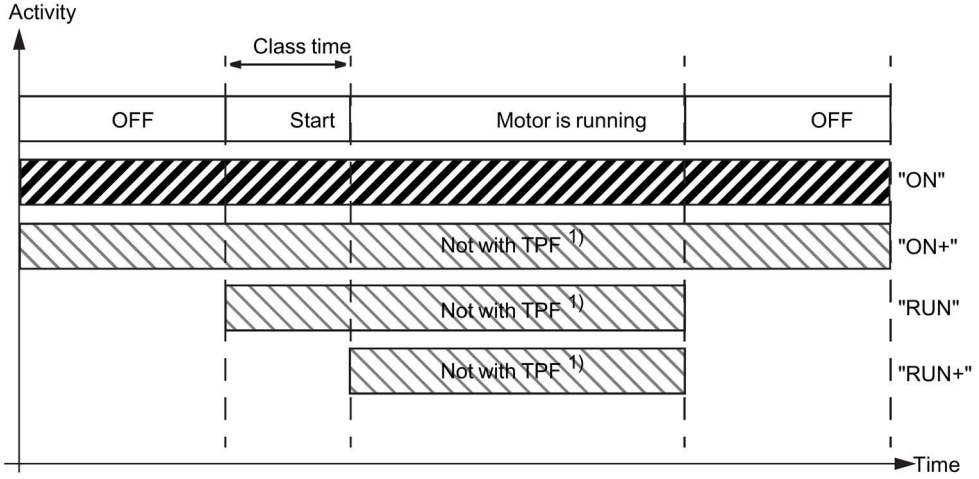
See also "Tables of responses of SIMOCODE pro" in Chapter Important information (Page 15).

Functional principle

The limit signal issued depends on:

- The operating state of the motor
- The TPF function
- The parameterized "activity":
  - ON
  - ON+
  - RUN
  - RUN+.

The following diagram shows a flow chart with the different "activities" parameters.



1) TPF: There is test position feedback, the motor feeder is in the test position, i.e. its main circuit is isolated from the network. However, the control voltage is connected.

Figure 11-18 Active status of limit monitor

Limit monitor settings

Table 11- 13 Limit monitor settings

Limit monitor	Description
Input	Analog plug of the limit monitor for linking to the analog value to be monitored (2 bytes), e.g. maximum current I_{max}, remaining cooling down period, actual value of timers, etc.)
Type	Specifies if the limit has to be monitored for overshooting (default) or undershooting.
Activity	Determines in which motor operating state the limit monitor is to be evaluated: • ON, i.e. always (default) evaluate, regardless of whether or not the motor is running • ON+, i.e. always evaluate, regardless of whether or not the motor is running Exception: "TPF", i.e. motor feeder is in test position • RUN, i.e. evaluate only if the motor is in the ON state and not in the test position (TPF). • run+, i.e. evaluate only if the motor is running and the start-up procedure is finished (i.e. the "Start active" message is no longer active) and there is no test position feedback (TPF); example: Cos phi monitoring
Limit	Monitor response value. The return value is always determined by the "Limit monitor - Delay" parameter. Range: 0 to 65535 (default setting: 0)
Delay	Specifies the time period for which the limit must be constantly overshot before the "Event - Limit" output is set. Range: 0 to 25.5 s (default setting: 0.5 s)
Marking [1)]	No parameter. Optional marking for identifying the message, e.g. "Limit>"; range: max. 10 characters.

1)

NOTICE

Changing the marking

Each change to the marking requires that the communication interface be restarted when the web server is active. A new start interrupts all Ethernet and PROFINET links and reestablishes them afterward.

Note

When using limit monitors, always ensure that the correct range and unit are used for the analog values connected to the limit input. These always have a direct influence on the unit of the limit value to be set. You will find the units and ranges of all relevant analog values in Chapter Data record 94 - measured values (Page 553) and in Chapter Data record 95 - Service data/statistical data (Page 555).

Table 11- 14 Examples of typical units and ranges in SIMOCODE pro

	Unit	Range
Temperatures (e.g. max. temperature)	1 K	0 - 65535
Operating hours	1 s	0 - 1193046
Motor stop time	1 h	0 - 65535
Active power	1 W	0 - 4294967295
Apparent power	1 VA	0 - 4294967295
Timer actual value	100 ms	0 - 65535
Currents (e.g. max. current I_{max})	1 % of I_e	0 - 65535
Analog module inputs	-	0 to 27648 (S7 format)

Thus, for example, a limit of 473 (K) must be parameterized for a limit monitor to monitor a maximum temperature of 200°C.

11.12 Calculators (calculation modules) 1, 2

Description

The two logic modules "Calculator 1" and "Calculator 2" integrated in the SIMOCODE pro V PN basic unit are capable of the standard calculation modes and enable all analog values featured in SIMOCODE pro to be adapted, calculated, and converted, for example:

- Conversion of the measured temperatures from K (Kelvin) to °F or °C
- Conversion of the motor current from [%] to [A]
- Conversion of the 0/4 to 20mA signals of the analog module directly into fill levels, pressures and flow rates.

The analog value (2 bytes / 1 word) present at the analog sockets is calculated using a defined formula and using freely-selectable parameters (numerators, denominators, operators, offsets). The result of the calculation is output as an analog value (2 bytes/1 word) at the analog socket of the logic module for further processing.

Each calculator consists of:

- One analog plug (Calculator 1) or two analog plugs (Calculator 2)
- One logic component
- One analog socket.

Schematic

The following schematic shows the "Calculators" logic modules:

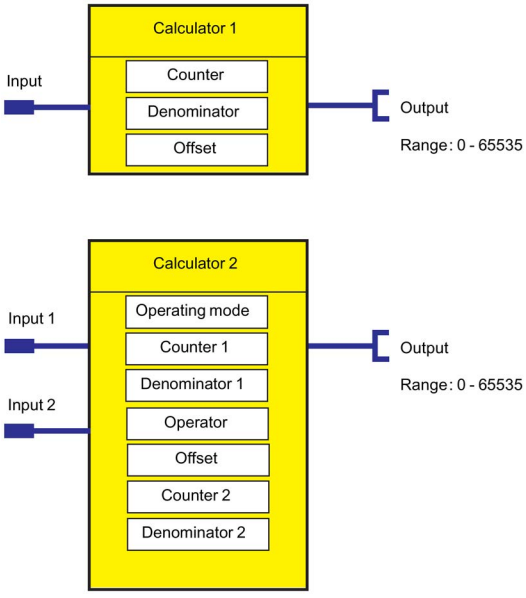


Figure 11-19 "Calculators" logic modules

Operating modes for calculator 2

The mode of the "Calculator 2" logic module can be changed via the "Operating mode" parameter:

- Operating mode 1: The analog value at input 1 is combined with the analog value at input 2 using a predefined formula and taking into account the specified parameters (numerators, denominators, offsets, operators). The result is available as an analog value (1 word / 2 bytes) at the output of the function block for further processing.
- Operating mode 2: The analog values at inputs 1 and 2 are processed together as a double word. Input 1 represents the high word and input 2 the low word. The result is calculated by means of the formula defined for this operating mode using the specified parameters (numerators, denominators, offsets) and is output by the function block as 1 word /2 bytes. In operating mode 2, it is also possible to process double words (e.g. active power, apparent power) and to display them (2 bytes / 1 word).

Settings Calculators 1, 2

Table 11- 15 Calculator settings

Calculator	Description
Calculator 1 - Input	Any value (2 bytes / 1 word); Range: 0 - 65535
Calculator 1 - Output	Calculated value / (2 bytes / 1 word); Range: 0 - 65535
Calculator 1 - Numerator	Range: -32766 to +32767, increment 1
Calculator 1 - Denominator	Range: 0 to 255, in steps of 1
Calculator 1 - Offset	Range: -32766 to +32767, in steps of 1
Calculator 2 - Input 1	Any value (2 bytes / 1 word); Range: 0 - 65535
Calculator 2 - Input 2	Any value (2 bytes / 1 word); Range: 0 - 65535
Calculator 2 - Output	Calculated value (2 bytes / 1 word); Range: 0 - 65535
Calculator 2 - Numerator 1	Range: -128 to +127, in steps of 1
Calculator 2 - Denominator 1	Range: 0 to 255, in steps of 1
Calculator 2 - Numerator 2 [1)]	Range: 0 to 255, in steps of 1
Calculator 2 - Denominator 2 [1)]	Range: -128 to +127, in steps of 1
Calculator 2 - Offset	Range: -2147483648 to +2147483647, increment 1
Calculator 2 - Operating mode	1 or 2
Calculator 2 - Operator [1)]	+, -, *, /
1) Only relevant for operating mode = 1	

Formulas calculators 1, 2

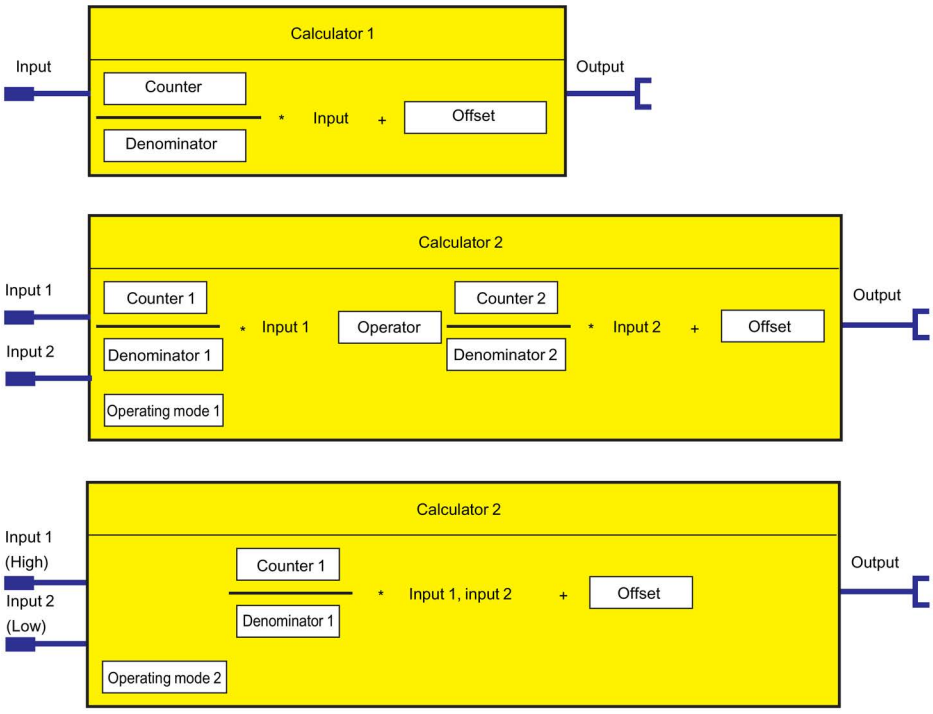


Figure 11-20 Calculator formulas

Calculator examples

Example 1 - Calculator

- Conversion of the maximum temperature of the temperature module from K to °C

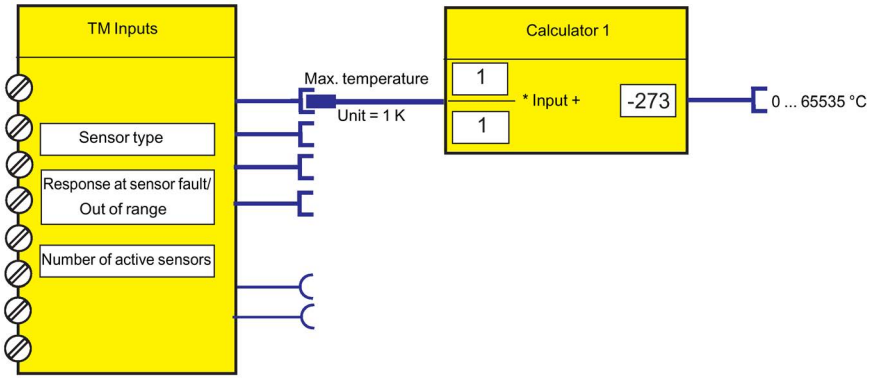


Figure 11-21 Example 1 - Calculator

Example 2 - Calculator

- Conversion of the maximum temperature of the temperature module from K to °F

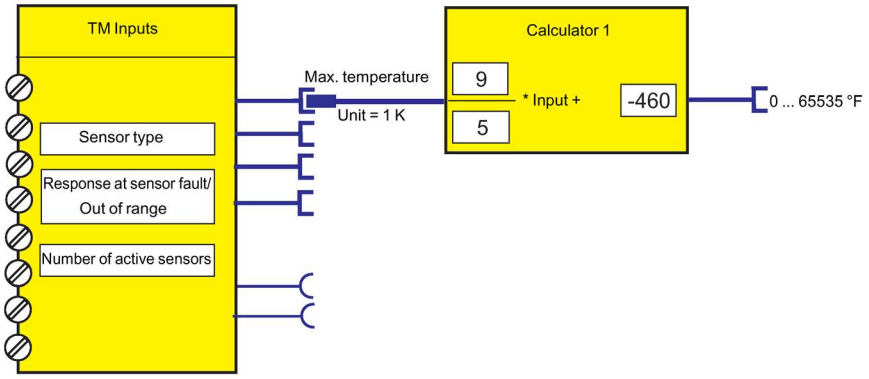


Figure 11-22 Example 2 - Calculator

Example 3 - Calculator

- Conversion of motor current I_max from % to A (e.g. set current I_s = 3.36 A) (only possible for motors with one rotational speed)

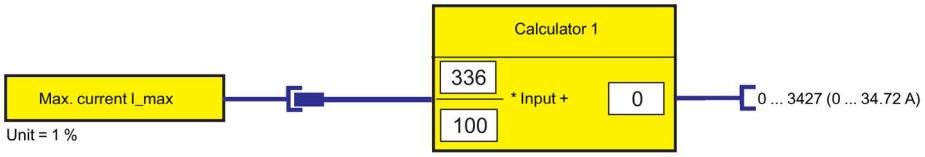


Figure 11-23 Example 3 - Calculator

11.13 Calculators (calculation modules) 3, 4

Description

Using the "Calculator 3" and "Calculator 4" function blocks (for SIMOCODE pro V PN basic unit only), analog values can be processed according to the following arithmetic:

Output = Input 1 [Operator 1] Input 2 [Operator 2] Input 3 [Operator 3] Input 4.

You can connect the corresponding analog signals to the 4 inputs "Calculator 3/4 - Inputs 1 to 4". As operators "Calculator 3/4 - Operator 1 to 3," you can choose one of the four standard operators ("+", "-", "*," or "/").

With "Calculator 3/4 - Priority 1 to 3," you can specify the processing sequence (high, medium, low). You must clearly define a priority for each operator. The priority determines the processing sequence comparable to the placement of a term inside parentheses.

Example:

Output = I1 OP1 I2 OP2 I3 OP3 I4, where

- OP1 = "*"; Medium,
- OP2 = "+"; High,
- OP3 = "-"; Low

Associated equation: Output = (I1 * I2 + I3)) - I4.

If you interconnect the input to the device-internal analog output data element "Output 1 - Fixed level", the input is assigned the constant "Const x" (x = 1 - 4). In this case, the respective edit field for the constant is activated. You can enter a value between 0 and 65535.

The "Calculator 3" and "Calculator 4" function blocks each consist of:

- Four analog plugs
- One analog socket
- Logic.

Schematic

The following schematic shows the "Calculator 3" and "Calculator 4" logic modules:

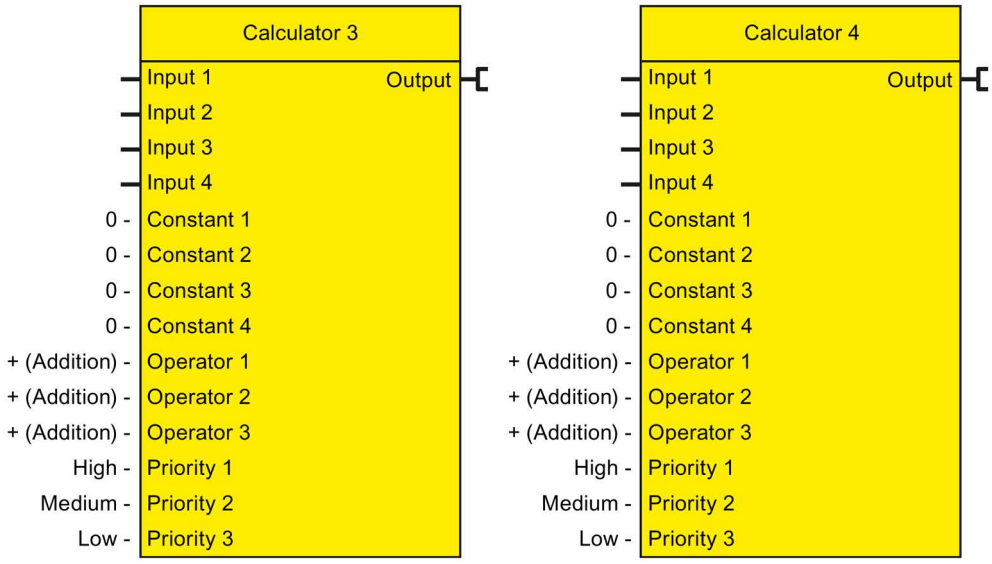


Figure 11-24 "Calculator 3" and "Calculator 4" function blocks

Settings Calculator 3, 4

Table 11- 16 Settings Calculator 3, 4

Calculators 3, 4	Description
Input	Any analog value
Output	Calculated analog value
Constant 1 to 4	Any analog value; range: 0 to 65535 (default setting: 0)
Operator 1 to 3	• "+": Addition • "-": Subtraction • "*": Multiplication • "/": Subtraction
Priority 1 to 3	• OP1 = "*"; Medium • OP2 = "+"; High • OP3 = "-"; Low

Formula Calculators 3, 4

Output = Input 1 [Operator 1] Input 2 [Operator 2] Input 3 [Operator 3] Input 4

11.14 Analog multiplexer

Description

The analog multiplexer (for SIMOCODE pro V PN basic unit only) outputs one of 4 possible analog values Input 1 to Input 4 at the output, depending on control signals S1 and S2.

If you interconnect the input to "Fixed level," the input is assigned the constant "Const x" (x = 1 - 4). In this case, the respective edit field for the constant is activated. You can enter a value between 0 and 65535.

The "Analog Multiplexer" function block consists of:

- two digital plugs (control signal 1 and 2)
- Four analog plugs (Input 1 to 4)
- One analog socket
- Logic.

Schematic

The following schematic shows the Analog Multiplexer logic module:

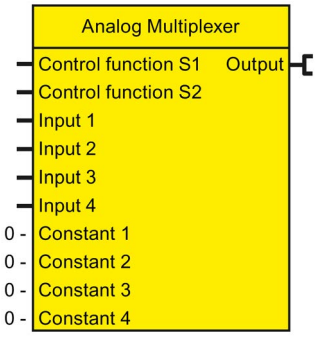


Figure 11-25 Analog multiplexer function block

Settings Analog Multiplexer

Table 11- 17 Settings Analog Multiplexer

Analog multiplexer	Description
Control signal S1 to S4	Activation by any signal (any sockets , e.g., device inputs, control bits from PROFINET, etc.).
Input 1 to 4	Any analog value or "Fixed level"
Output	Output value according to panel (see below)
Constant 1 to 4	Any analog value; range: 0 … 65535

Analog multiplexer example

Pressing an operator panel button multiple times will output the maximum motor current and the three phase currents one after the other (e.g., via the output of the analog module):

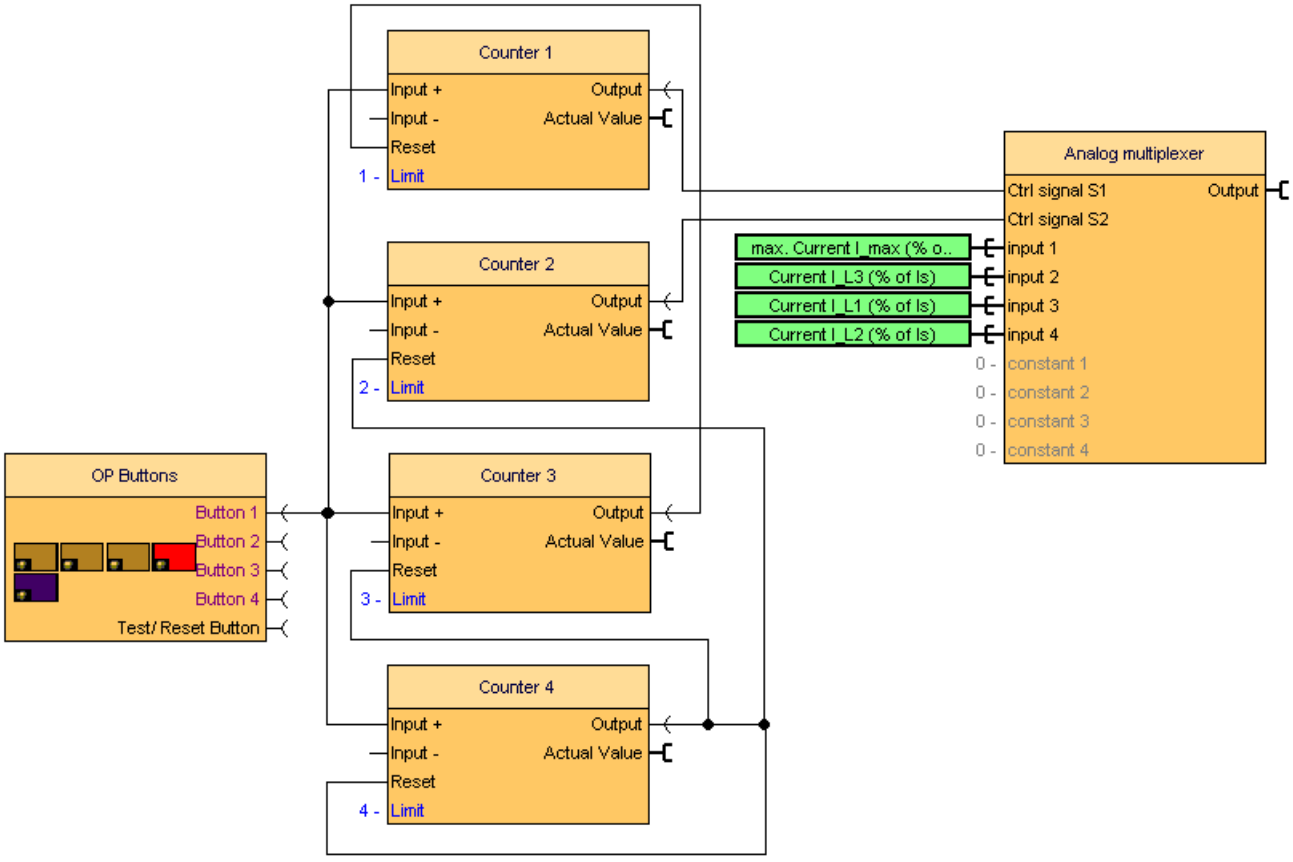


Figure 11-26 Analog multiplexer example

- Pressing the OP button 1x: Phase current IL1
- Pressing the OP button 2x: Phase current IL2
- Pressing the OP button 3x: Phase current IL3
- Pressing the OP button 4x: Maximum motor current I_max.

11.15 Pulse width modulator

Description

The pulse width modulator (PWM) (for SIMOCODE pro V PN basic unit only) modulates the analog input value into a digital output signal "PWM Output" with a variable duty factor that is proportional to the analog input value.

If you interconnect the input to "Fixed value," the input is assigned the parameterized constant "Input (const)." In this case, the edit field for the constant is activated. You can enter a value between 0 and 65535.

The "Pulse Width Modulator" function block consists of:

- One analog plug (input)
- One digital socket (PWM output)
- Logic.

Schematic

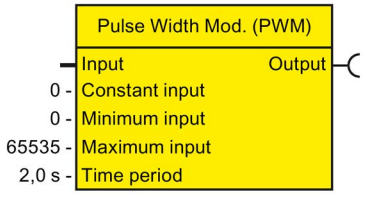


Figure 11-27 "Pulse width modulator" function block

Settings Pulse Width Modulator

Table 11- 18 Settings Pulse Width Modulator

Pulse width modulator	Description
Input	Activation by any analog signal or "Fixed value"
Constant input	Any constant; range: 0 to 65535 (default setting: 0)
Input Minimum	Any constant; range 0 to 65535 (default setting: 0)
Input Maximum	Any constant; range 0 to 65535 (default setting: 0)
PWM duration	0.2 to 6553.5 s (default setting: 2)

Pulse width modulator formulas

- Length of 1-signal = PWM period * (PWM Input - PWM Input Minimum) / (PWM Input Maximum - PWM Input Minimum)
- Length of 0-signal = PWM period - Length of 1-signal.

Note

Signal duration

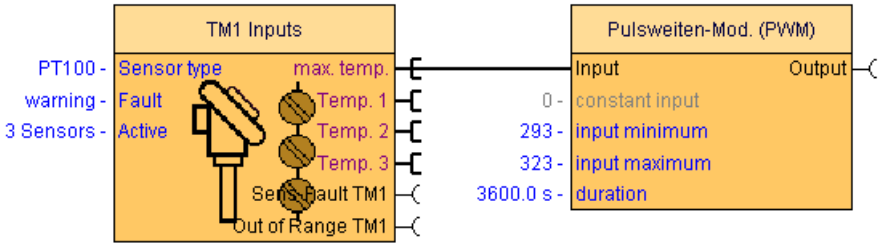
The shortest signal duration for 0 and 1 is 0.1 s in each case.

If a duration for the 1 signal that is shorter than 0.1 s results from calculation, the output will remain permanently 0, while for a duration for the 0 signal shorter than 0.1 s the output remains permanently 1.

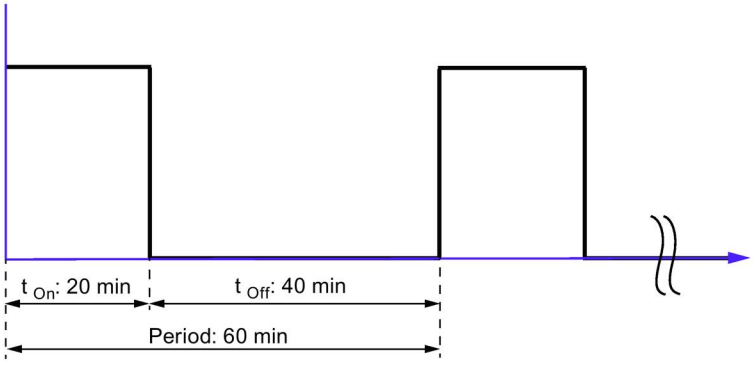
Example - Pulse width modulator

A load will be switched on and off with a duration of 60 minutes, dependent on a measured value (e.g., temperature).

- If the measured value exceeds a maximum value of 50°°C (323 K), the load will be switched on permanently, and if it falls below 20°°C (293 K), it will be switched off permanently.
- If the measured value falls within the range between the minimum and maximum value, the On duration will be proportional to the measured value.



- Duration: 60 min (3600 s)
- Lower limit: 20°C (293 K)
- Hi limit: 50°C (323 K).



- At 20°C (293 K): OFF
- At 30℃ (303 K): 20 min ON and 40 min OFF
- At 40°C (313 K): 40 min ON and 20 min OFF
- At 50°C (323 K): ON.

Communication

12

In this chapter

This chapter provides information about options for communication of SIMOCODE pro V PN with a PLC via PROFINET IO and via further communication functions with PC and HMI systems via Ethernet.

You are given an overview of the integration of SIMOCODE pro via PROFINET into the automation system and about the options for parameterization using the SIMOCODE ES 2007 software.

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- PLC programmers

Required knowledge

You will require the following knowledge:

- PROFINET/Ethernet
- Communication via OPC UA
- Integration of PROFINET IO devices into an automation system
- STEP 7

12.1 Definitions

GSD file

The properties of a PROFINET devices are described in a GSD (General Station Description) file that contains all the necessary information for the configuration. Just like for PROFIBUS, you can link a PROFINET device into an automation system using a GSD file: PROFINET GSD (http://www.siemens.com/profinet-gsd)

In the case of PROFINET IO, the GSD file is in XML format. The structure of the GSD file conforms to ISO 15734, the worldwide standard for device descriptions.

Device name

Before an IO device can be addressed by an IO controller, it must have a device name because the IP address is permanently assigned to the device name. In the case of PROFINET, this method was chosen because names are easier to handle than complex IP addresses.

Assignment of a device name for a specific IO device is comparable to setting the PROFIBUS address on a DP slave.

An IO device does not have a device name when it is delivered. It can only be addressed by an IO controller once a device name has been assigned to it, e.g. for transmission of the configuration data (including the IP address) during startup or for exchanging useful data in cyclic operation.

IO Device

Distributed field device assigned to one of the IO controllers.

As a field device, the SIMOCODE pro V PN basic unit functions as a PROFINET-IO device.

IP address

To enable a PROFINET device to be addressed as a node on Industrial Ethernet, this device also requires an IP address that is unique within the network. The IP address is made up of 4 decimal numbers with a range of values from 0 through 255. The decimal numbers are separated by a period.

The IP address is made up of

- The address of the (sub)net and
- The address of the node (generally called the host or network node)

MAC address

Each PROFINET device is assigned a globally unique device identifier at the factory. This 6-byte long device identifier is the MAC address.

The MAC address is divided up as follows:

- 3 bytes manufacturer's ID and
- 3 bytes device identifier (consecutive number).

The MAC address can generally be read from the front on the device, e.g.: 08-00-06-6B-80-C0

OPC Unified Architecture (UA)

OPC Unified Architecture (UA) is the next generation technology of the OPC Foundation for safe and reliable data transfer and defines access to industrial communication networks.

OPC UA client

An OPC UA client is a user program that accesses process data via the OPC UA interface. Access to the process data is made possible by the OPC UA server.

OPC UA server

The OPC server provides the OPC client with a wide range of functions with which it can communicate via industrial networks. SIMOCODE pro V PN provides extensive process data via OPC UA.

PROFINET

Within the context of Totally Integrated Automation (TIA), PROFINET is the systematic development of the following systems:

- PROFIBUS DP, the established fieldbus
- Industrial Ethernet, the communications bus for the cell level.

Experiences from both systems have been and are being integrated in PROFINET. PROFINET was defined as an Ethernet-based automation standard of PROFIBUS International (PROFIBUS Nutzerorganisation e. V.).

PROFINET IO controller

Device via which the connected IO devices are addressed. That means the IO controller exchanges input and output signals with assigned field devices. The IO controller is often the controller on which the automation program runs.

PROFINET IO Supervisor

PG/PC for commissioning and diagnostics.

12.2 Data security in automation

Introduction

The topic of data security and access protection (security) is becoming more and more important in industrial environments. Increased networking of entire industrial plants, vertical integration and networking of the levels within a company, and new technologies, such as remote maintenance, are resulting in more increased requirements for protection of the industrial plant. Security is the generic term for all protection measures

- Loss of confidentiality due to unauthorized accessing of data
- Loss of integrity due to data manipulation
- Loss of availability due to destruction of data

To provide protection from manipulation in sensitive plant and production networks, it is not enough to apply data security solutions for offices to industrial applications without any adaptation.

Requirements

The special requirements of communication in an industrial environment (e.g. communication in real time) result in additional requirements for security in industrial use:

- Protection against interaction between automated cells
- Protection of network segments
- Protection from unauthorized access
- Scalability of the security functionality
- No influence on the network structure.

Threats

Threats can arise from external and internal manipulation. Loss of data security is not always caused by deliberate actions.

Internal threats arise due to:

- Technical faults
- Operating errors
- Errors in programs.

This internal hazards are compounded by external threats. The external hazards do not differ from the known threats in the office environment:

- Computer viruses and computer worms
- Trojan horses
- Unauthorized access
- Password phishing.

Password phishing means attempting to get a user to divulge access data and passwords by masquerading as a different identity in an e-mail.

Precautions

The most important precautions against manipulation and loss of data security in an industrial environment are:

- Filtering and verification of data traffic through virtual private networks (VPN). A virtual private network is used to exchange private data in a public network (e.g. the Internet). The most common VPN technology is IPsec. IPsec is a collection of protocols based on the IP protocol at the network layer.
- Segmentation into protected automation cells. The aim of this concept is to protect devices in the network through security modules. A group of protected devices forms a protected automation cell. Only security modules in the same group or the device protected by you can be interchanged.
- Authentication (identification) of the networked devices. The security modules identify themselves to each other via a secure (encrypted) channel using authentication procedures. This prevents access to a protected segment by unauthorized persons from outside.
- Encryption of the data traffic. The confidentiality of the data is ensured by encrypting the data traffic. For this purpose, every security module is given a VPN certificate which includes the encryption key.

Guidelines on information security in industrial automation

VDI guideline

The VDI/VDE Association of German Engineers "Measurement and Automation" has published with the VDI guideline "VDI/VDE 2182 Sheet 1, IT Security for Industrial Automation - General Model" a guideline in implementation of a security architecture in the industrial environment. The guideline is found under "VDI guidelines" on the VDI homepage: VDI guidelines (http://www.vdi.eu/engineering/vdi-standards).

PROFINET Security Guideline

The PROFIBUS & PROFINET user organization supports you with building up safety standards in your company with the PROFINET Security Guideline. These guidelines are found under downloads on the homepage of the PROFIBUS & PROFINET user organization: PI - PROFIBUS & PROFINET International Home (http://www.profibus.com).

12.3 Data transfer

Options for data transfer

The following figure shows an overview of the communication functions supported by SIMOCODE, which are described in the following sections:

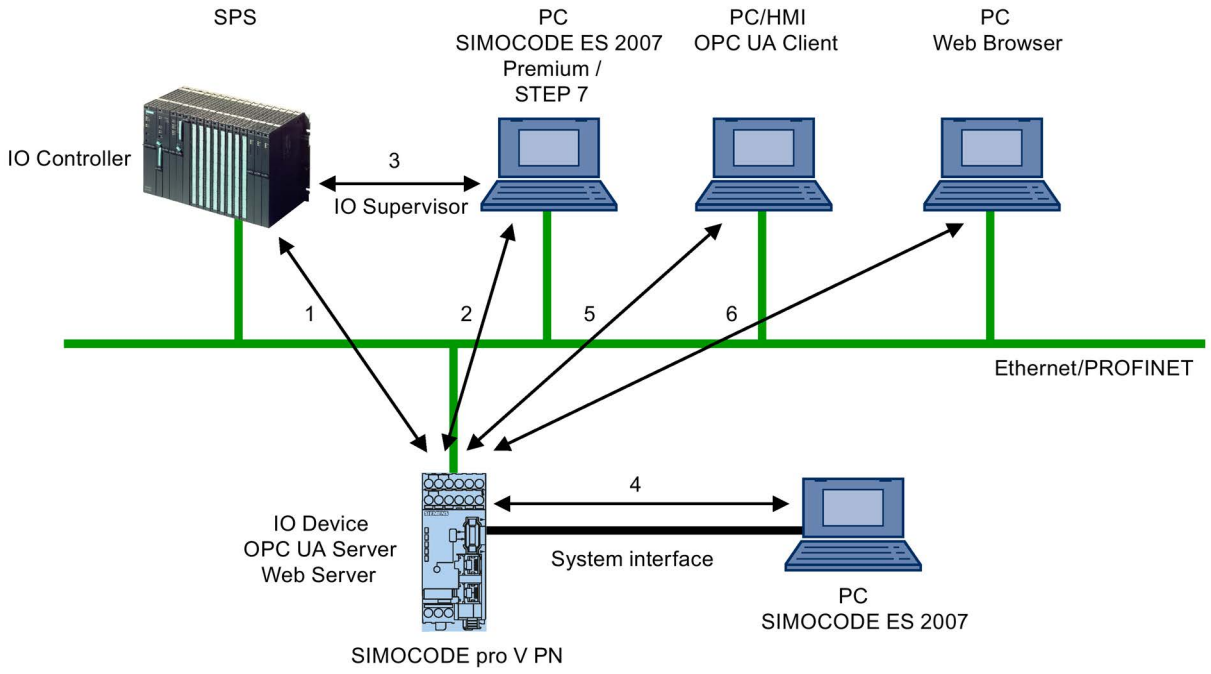


Figure 12-1 SIMOCODE pro V PN communication functions

1 Communication between PLC (IO controller) and SIMOCODE pro (IO device) via PROFINET / Ethernet

2 Communication between PC with parameterization software SIMOCODE ES 2007 Premium (IO Supervisor) and SIMOCODE pro via PROFINET

3 Communication between PC with parameterization software SIMOCODE ES 2007 Premium and SIMOCODE pro via SIMATIC S7 (SIMOCODE pro integrated into STEP 7)

4 Communication between PC parameterization software SIMOCODE ES 2007 Premium and SIMOCODE pro via the SIMOCODE pro system interface (point-to-point via RS 232 or USB)

5 Communication between PC or HMI with OPC UA Client and SIMOCODE pro via Ethernet/OPC UA

6 Communication between PC with a web browser and SIMOCODE pro via TCP/IP and HTTP

12.4 Communication via PROFINET IO

SIMOCODE pro V PN provides communication functions via PROFINET IO with the following properties:

- Integrated switch with 2 ports

With the integrated 2-port switch, it is possible to build PROFINET bus and ring topologies without additional switches.

The integrated 2-port switch supports functions for port diagnostics if this functions are used by the automation system.

- Device replacement without removable medium/programming device

This is a function that permits replacement of a device (e.g. in case of a device defect) by a new device with factory settings without the help of PCs or programming devices without a memory module.

- Shared device

Shared device is the function with which an IO device is used simultaneously by two or more IO controllers.

This function can be used in conjunction with the fail-safe DM-F PROFIsafe digital module. An automation system communicates with SIMOCODE pro via PROFINET IO and performs the standard control tasks while a second fail-safe automation system via PROFINET IO can be used for safety-related tripping using the PROFIsafe profile.

Use of this function depends on whether the automation system supports the function. It is configured using the configuration tool of the automation system, e.g. with STEP 7 HW Config.

- Media redundancy

SIMOCODE pro V PN supports media redundancy according to the Media Redundancy Protocol (MRP). This function is configured using the configuration tool of the automation system, e.g., HW Config with STEP 7.

- System redundancy

Product version *E05* and higher of SIMOCODE pro V PN supports a redundant-system connection with two S7-400H CPUs. This provides for a communication link (Application Relation) between each IO device and each of the two H CPUs. The communication link can be set up by means of a freely selectable topological connection.

This function is configured using the configuration tool of the automation system, e.g., HW Config with STEP 7.

- RT communication

As a motor management system, SIMOCODE pro V PN does not have any time-critical communication functions itself but it does support PROFINET hardware RT used. The integrated 2-port switch can therefore be used to forward RT data.

- Support for PROFIenergy

PROFIenergy, a protocol defined by the PROFINET User Organization, lays the foundations for a vendor-neutral, universal system for flexible, short-term, and intelligent shutdown of individual loads or whole production units.

SIMOCODE pro V PN supports the functions defined in the protocol in the form of a switchgear with switching and measuring functions

You will find more information in the system manual "SIMATIC PROFINET System Description" (see System manual "SIMATIC PROFINET System Description" (http://support.automation.siemens.com/WW/view/en/19292127)).

12.5 Integration of SIMOCODE pro into the automation system (PLC)

I/O configurations

SIMOCODE pro V PN supports a number of I/O configurations which define the structure and length of the I/O data that are cyclically transferred between the IO controller (PLC) and the IO device (SIMOCODE pro). In the case of SIMOCODE pro, these configurations are termed **Basic types**.

Cyclic data to SIMOCODE pro V (PN)

The following basic types are available:

- Basic type 1, 4 bytes:

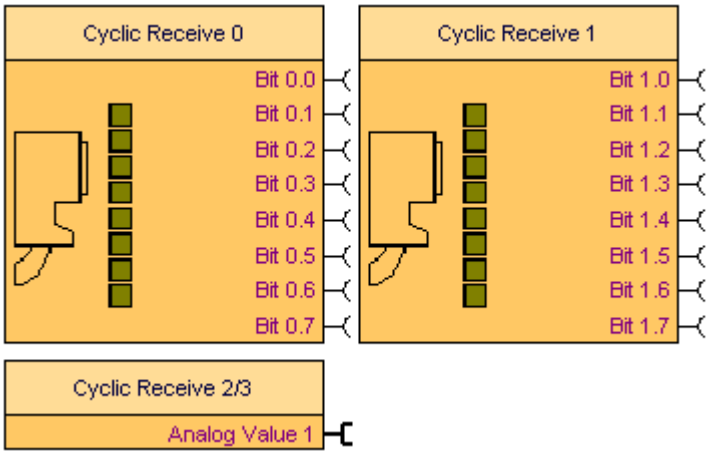


Figure 12-2 Cyclic data to SIMOCODE pro, basic type 1, 4 bytes

- Basic type 2, 2 bytes:

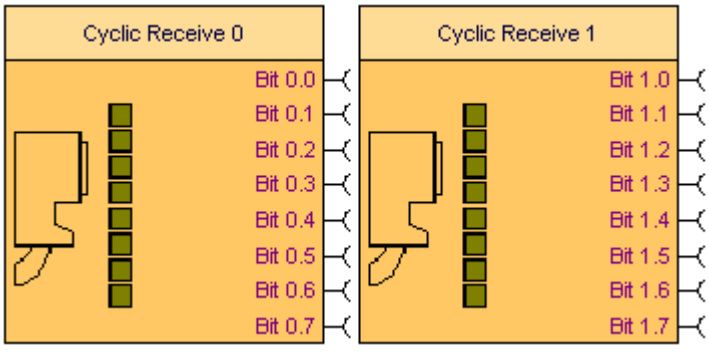


Figure 12-3 Cyclic data to SIMOCODE pro, basic type 2, 2 bytes

- Basic type 3, 6 bytes

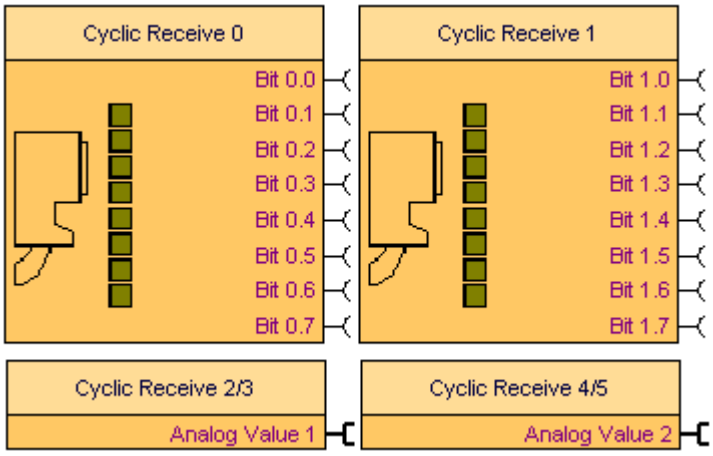


Figure 12-4 Cyclic data to SIMOCODE pro, basic type 3, 6 bytes

- PROFIsafe, 1 F-DO

Permanently assigned to the fail-safe relay enable circuits of the DM-F PROFIsafe, length 5 bytes.

Cyclic data from SIMOCODE pro V (PN)

- Basic type 1, 10 bytes

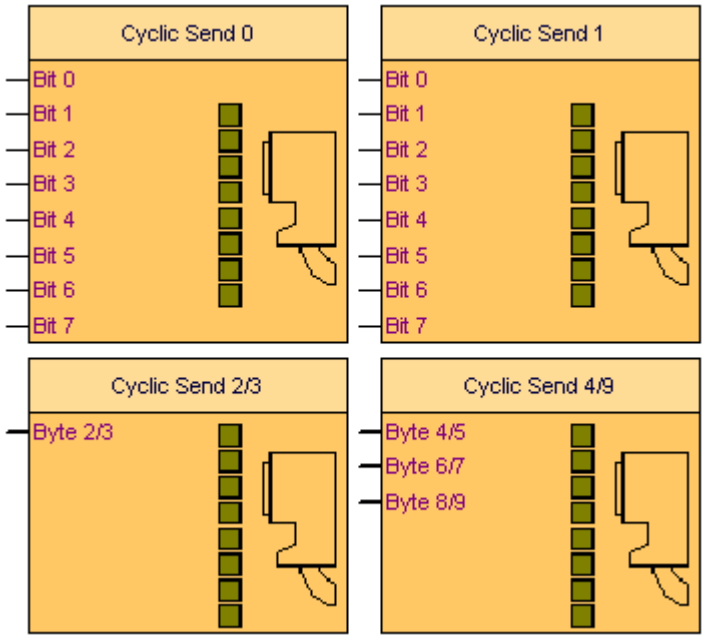


Figure 12-5 Cyclic data from SIMOCODE pro, basic type 1, 10 bytes

- Basic type 2, 4 bytes

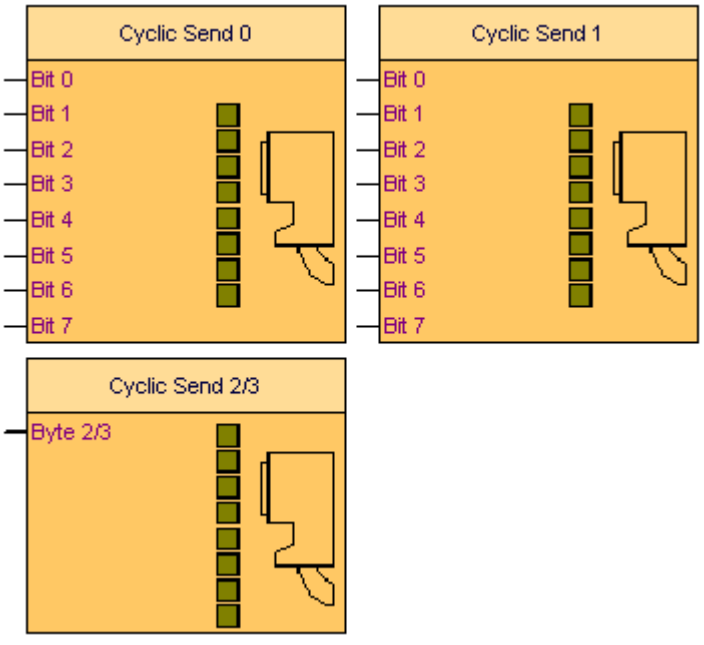


Figure 12-6 Cyclic data from SIMOCODE pro, basic type 2, 4 bytes

- Basic type 3, 20 bytes

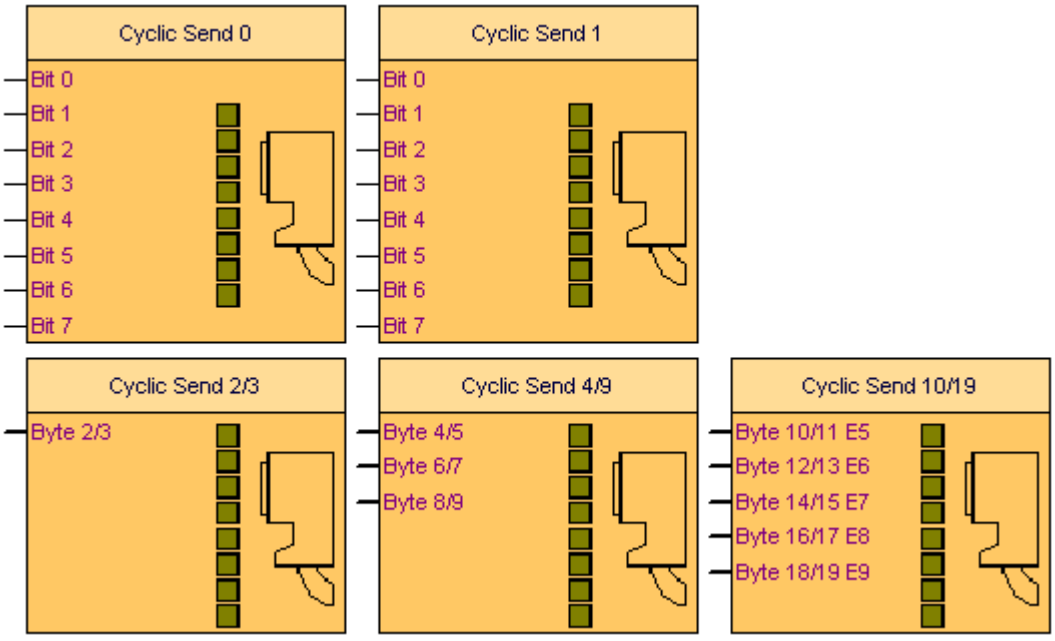


Figure 12-7 Cyclic data from SIMOCODE pro, basic type 3, 20 bytes

- PROFIsafe

No useful data, length 4 bytes.

12.6 Integration of SIMOCODE pro V PN via GSD

Using the GSD, integration into the PROFINET-IO system and device diagnostics are possible. For parameterization of the device function of SIMOCODE pro, use the SIMOCODE ES 2007 software SP4 and later.

Integrate the GSD for SIMOCODE pro V PN into the configuration tool of your automation system (e.g. STEP 7 HW Config). The GSD is available for downloading at the following link: PROFINET GSD (http://www.siemens.com/profinet-gsd)

After installation of the GSD, you will find SIMOCODE pro V PN in the hardware catalog of STEP7 V5 under "Hardware Catalog → Additional Field Devices → PROFINET IO → Switching Devices → Siemens AG → Motor Management System." Insert the SIMOCODE pro V (PN) into the PROFINET IO system.

After insertion of SIMOCODE pro V (PN), configure one of the three possible basic types in Slot 1 of the IO device inserted in this way (see figures about "Cyclic data to SIMOCODE pro" and "Cyclic data of SIMOCODE pro").

If SIMOCODE pro V PN is used in conjunction with the fail-safe DM-F PROFIsafe digital module, additionally configure the I/O configuration for PROFIsafe in Slot 2.

12.7 Integration of SIMOCODE pro V PN in SIMATIC STEP 7 V5 via OM SIMOCODE pro

Integration of SIMOCODE pro V PN in SIMATIC STEP 7 V5 via OM SIMOCODE pro

In addition to integration via GSD, with SIMATIC S7 controllers from Siemens it is possible to integrate SIMOCODE pro V PN in STEP 7 V5 using the "Object Manager (OM) SIMOCODE pro V PN" software as part of Totally Integrated Automation (TIA).

The advantage is that the "SIMOCODE ES 2007 Premium" parameterization software can be called directly from STEP 7 HW Config and can be used for developing SIMOCODE pro V PN device parameters.

The SIMOCODE pro device parameters are stored in the STEP 7 project. After transmission of the hardware configuration, the device parameters are available in the form of start-up parameter data records in the CPU and are automatically transmitted during start-up.

The necessary OM SIMOCODE pro V PN software is part of SIMOCODE ES 2007 Premium. During installation of SIMOCODE ES, select the "Integration in STEP 7" installation option to use the described function.

When the hardware is being configured, SIMOCODE pro V PN is integrated by selecting SIMOCODE pro in the hardware catalog from STEP 7 HW Config under "PROFINET IO → Switching Devices → Motor Management System".

Insert the SIMOCODE pro V PN into the PROFINET IO system.

Select one of the three possible basic types (see figure "Cyclic data to SIMOCODE pro" and figure "Cyclic data from SIMOCODE pro").

Note

Changing the slot

It is only possible to change the slot by selecting another SIMOCODE type!

When using SIMOCODE pro V PN in conjunction with the fail-safe DM-F PROFIsafe digital module, select the relevant configuration with PROFIsafe.

Module replacement without exchangeable medium/PC

Note

Precondition for module replacement without exchangeable medium/PC

The use of this function depends whether the IO controller and the neighboring IO devices support this function.

Assuming SIMOCODE pro in STEP 7 V5 has been integrated and parameterized using OM SIMOCODE pro, the IO controller can automatically restore the device name, the IP configuration, and then the complete device parameterization performed with SIMOCODE ES 2007 Premium of the replaced device.

Note

Do not use a memory module or initialization module!

To use this function, you do not have to and indeed must not use of a memory module or an initialization module!

See Chapter Restoring factory settings (Page 497).

12.8 Configuring SIMOCODE pro V PN ports

Configuring the ports

SIMOCODE pro V PN has two RJ45 ports labeled 1 and 2 on the front. In the configuration tool of the automation system (e.g. STEP 7 HW Config), the settings for topology, diagnostics and other options of the two ports X1P1 and X1P2 are defined.

12.9 Configuration of further properties of SIMOCODE pro V PN as an IO device

Device name and IP parameters

The precondition for PROFINET IO communications is setting and configuring the IO device name and IP parameters.

The device name and the IP parameters can be assigned in different ways:

- Assigning device names using the configuration tool of the automation system
- Configure device names with SIMOCODE ES 2007 parameterization software and transfer into the device.

Assigning device names using the configuration tool of the automation system

The device name is assigned during the commissioning phase by the configuration tool of the automation system (e.g. STEP 7) or with the "SIMOCODE ES Premium" configuration software and transmitted into the IO device via Ethernet. For transmission, the basic unit must be connected and accessible via the Ethernet interface. Using the MAC address (e.g. 00-0E-8C-BD-1F-27) printed on the front of the basic unit, the device can be accessible via LAN. In this case, the "Overwrite device name in device" parameter set with the SIMOCODE ES 2007 parameterization software under "PROFINET Parameters → Station" must not be active.

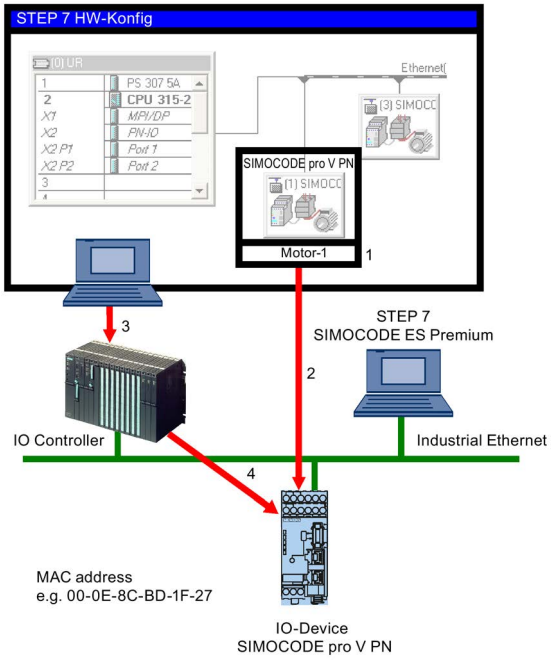


Figure 12-8 Assigning device names using the configuration tool of the automation system

1. Device is given a technological name as part of configuration by the user (device name here: Motor-1). STEP 7 automatically assigns an IP parameter
2. The user assigns the the device name to the IO device using the MAC address and transmit this, for example, with the "Edit Ethernet station" function
3. The user loads the configuration into the IO controller
4. IO controller assigns the IP parameters during start-up based on the device name

Configuring device names with SIMOCODE ES 2007 parameterization software and transfer into the device

In this case, the device name must be configured under "PROFINET Parameters → Station" and the "Overwrite device name in device" parameter must be active.

Note

Transferring the device parameters

It is always possible to transfer the device parameters via the system interface.

If the PROFINET IO device name has already been configured in a different way, the device parameters can be transferred via PROFINET, too.

Note

Assignment of the device name

The device name can be assigned with the "SIMOCODE ES 2007 Premium" parameterization software using the "Target System → Edit Ethernet Station" function. This function is not identical with parameterization with the "PROFINET parameter" dialog box. Unlike in this dialog box, under "PROFINET Parameters → Station," the "Overwrite device name in device" parameter must **not** be active.

Note

Changing the device name

Every change to the device name with SIMOCODE ES in the "PROFINET Parameters" dialog box requires a restart of the communication interface. A new start interrupts all Ethernet and PROFINET links and reestablishes them afterward.

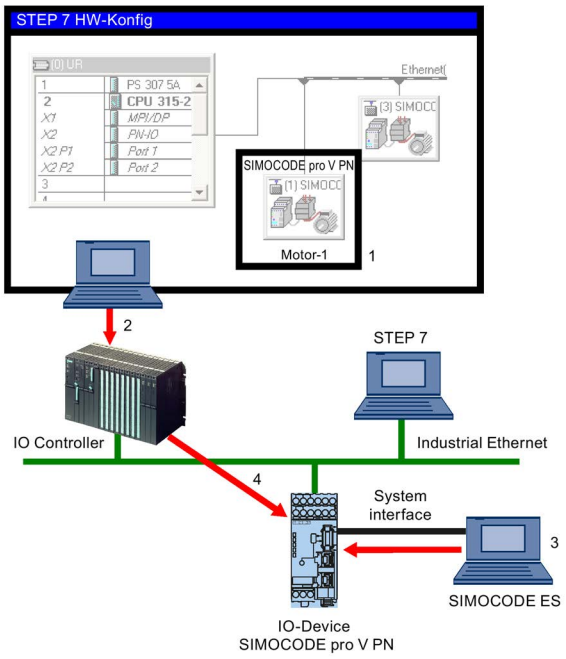


Figure 12-9 Assigning device names with SIMOCODE ES 2007

1. Device is given a technological name (device name here: Motor-1)
2. Configuration is loaded into the IO controller
3. Configuration of device names and IP parameters with SIMOCODE ES:
   a) Device name "Motor-1" is configured with SIMOCODE ES and is transferred into the device via the system interface / PROFINET
   b) Device name and IP parameter are configured with SIMOCODE ES and are transferred into the device via the system interface / PROFINET

Transferring IP parameters

The IP parameters, consisting of IP address, subnet mask, and router can also be assigned in various ways and transferred to the IO Device.

Possibilities for this are:

- The IO Controller assigns the IP parameters to the IO Device. In this case, the "Overwrite IP parameters in device" parameter set with the SIMOCODE ES 2007 parameterization software under "PROFINET Parameters → IP Parameters" must **not** be active.

  Note
  Deleting IP parameters

  IP parameters assigned by the IO controller are stored non-retentively in the device, i.e. they are deleted again when the supply voltage is switched off.

- The IP parameters are configured with "SIMOCODE ES 2007" parameterization software and transferred to the device. In this case, the "Overwrite IP parameters in device" parameter under "PROFINET Parameters → IP Parameters" must be active.

  Note
  Transferring the device parameters

  It is always possible to transfer the device parameters via the system interface.

  If the PROFINET IO device name has already been configured in a different way, the device parameters can be transferred via PROFINET, too.

  Note
  Assigning the IP parameters

  The IP parameters can be assigned with the "SIMOCODE ES 2007 Premium" parameterization software using the "Target System → Edit Ethernet Station" function. This function is not identical with the parameterization of the IP parameters with the "PROFINET Parameters" dialog box. Unlike in this dialog box, under "PROFINET Parameters → IP Parameters," the "Overwrite IP parameters in device" parameter must **not** be active.

  Note
  Restarting the communication interface

  Every change to the IP parameter with SIMOCODE ES in the "PROFINET Parameters" dialog box requires a restart of the communication interface.

  A new start of the communication interface interrupts all Ethernet and PROFINET links and reestablishes them afterward.

12.10 Identification data for PROFINET IO

Brief description of the identification data

Identification data are information that is stored in the PROFINET IO device and supports the user with the following activities:

- Checking the system configuration
- Locating modified system hardware
- Troubleshooting a system.

With the identification data, SIMOCODE pro V PN can be uniquely identified online.

The identification data can be edited with the configuration tool of the automation system (e.g. STEP 7) and with SIMOCODE ES and transferred to the device or read out of the device.

In STEP 7, the identification data are displayed on the "Module status" and "Properties ..." tab cards and loaded into the modules with "Load module identification data ..." with menu item "Target System." It is possible to transfer data already in the device into the configuration with "Load module identification data into the programming device" when configuring via GSD file (see STEP 7 Online Help on this function).

You can also assign the identification data with SIMOCODE ES. You will find this under "Identification." Only I&M 1 to I&M 3 can be changed.

The following identification data records are supported:

- I&M 0: Identification (device identification); read only
- I&M 1: Tag (plant identifier, location designation)
- I&M 2: Installation Date
- I&M 3: Descriptor (comment).

12.11 Shared device

Shared device provision

PROFINET IO provides the shared device function. Shared device enables access by two IO controllers to one IO device. Input and output data can be flexibly assigned to different IO controllers.

This function can be used in conjunction with the fail-safe DM-F PROFIsafe expansion module. While one controller accesses the standard I/O data via an IO controller and performs the routine control, the fail-safe program is processed in a separate, fail-safe controller that is responsible for safety-related tripping via PROFIsafe.

Shared device configuration

The I/O data is assigned to the IO controllers in the configuration tool of the automation system (e.g. STEP 7 HW Config).

Note

Shared device function

The system redundancy function is not available when the "Shared Device Function" is used.

12.12 Media redundancy

Media redundancy support

The media redundancy protocol manages a redundant network. The data that are exchanged between IO controller and IO device are transmitted via two different paths.

If both Ethernet ports are used, the function enables communication to be maintained even if one of the two transmission channels fails.

Settings for media redundancy

In the configuration tool of the automation system (e.g. STEP 7 HW Config), the settings for media redundancy in the properties of Slot X1 of the relevant PN-IO devices. In particular, the MRP domain is assigned and the role is defined that will be taken over in the MRP by the device. SIMOCODE pro V PN supports ring redundancy in the role as a client.

Information material for media redundancy

You will also find useful information about "Ring redundancy with the Media Redundancy Protocol (MRP)" under: Ring redundancy with the Media Redundancy Protocol (MRP) (http://support.automation.siemens.com/WW/view/en/33696406)

12.13 System redundancy

System redundancy with H CPUs

The redundant-system connection via PROFINET provides a communication link (Application Relation) between each SIMOCODE pro V PN IO device and each of the two H CPUs. The communication link can be set up by means of a freely selectable topological connection, i.e. the topology of a plant does not indicate whether or not SIMOCODE pro V PN is interfaced via a redundant-system connection. In addition to operation as a redundant system, the SIMOCODE pro V PN can also be operated on H CPUs as a so-called "non-redundant IO device". In this mode, only one of the two CPUs establishes a communication link to the IO device. The disadvantage of operating an IO device as a non-redundant device is that it will fail in the event of failure of the CPU to which it is linked.

Note

Firmware version of the H CPU

System redundancy is supported with H CPU firmware version V6.0.3 and higher.

SIMOCODE pro V PN with system redundancy

The diagram below illustrates a configuration with two redundant-system SIMOCODE pro V PN basic units. This topology offers particular advantages. The entire system can remain in operation if a line break occurs anywhere in the configuration. One of the two SIMOCODE pro V PN communication links always remains operational. The SIMOCODE pro V PN units then function like non-redundant devices.

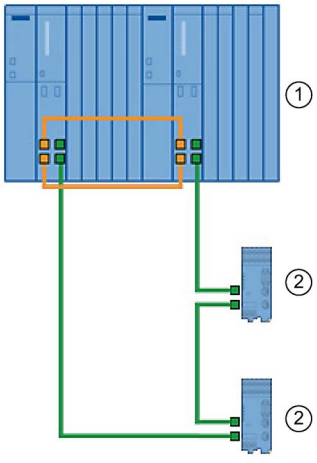


Figure 12-10 S7-400 H system with redundant I/Os

① S7-400H system

② SIMOCODE pro V PN as a redundant IO device

PN/IO with non-redundant I/Os

The following diagram illustrates an example of a topographical configuration with one switch. Two IO devices are connected as non-redundant units and the other three IO devices as redundant-system units.

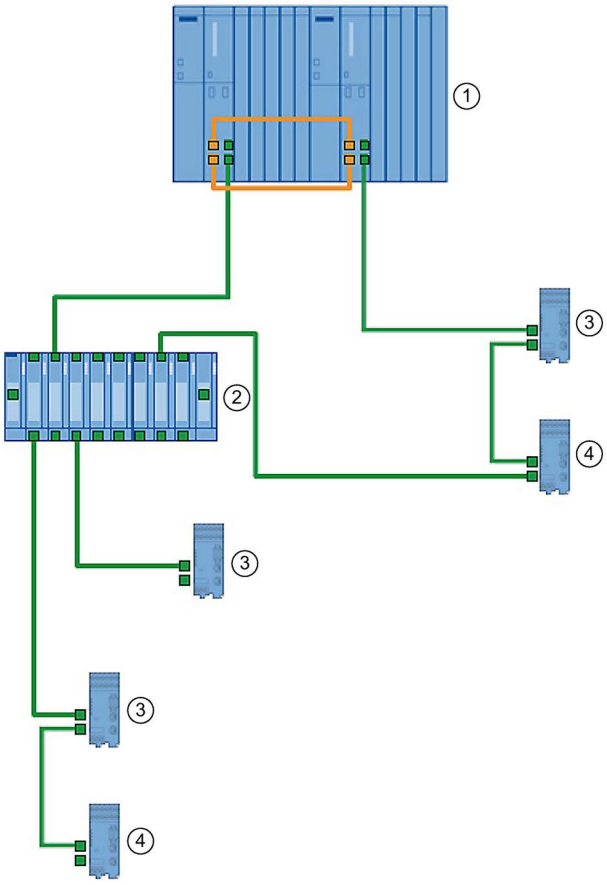


Figure 12-11 S7-400 H system with redundant and non-redundant I/Os

① S7-400H system

② SCALANCE (e.g. X400)

③ SIMOCODE pro as a redundant IO device

③ SIMOCODE pro as a non-redundant IO device

Maximum number of IO devices

You can connect a maximum number of 256 IO devices to the two integrated PN/IO interfaces. The station numbers range from 1 to 256 and must be unique at both the PN/IO interfaces, i.e. they must not be assigned to a station more than once.

Configuring system redundancy with PROFINET IO

Requirements

In the example below, you will configure a redundant-system PROFINET configuration with redundant I/Os as discussed in diagram "S7-400 H system with redundant I/Os" in the previous chapter.

The PROFIBUS elements have been excluded from this example. Please refer to manual Fault-tolerant S7-400H systems (http://support.automation.siemens.com/WW/view/en/1186523) for basic instructions on configuring H systems.

Procedure

Set up a new H station in the SIMATIC Manager and open "HW Config" for the station.

1. Insert a rack 400 (e.g. UR2-H) for redundant controllers.
2. Insert a CPU 400-H PN/DP (e.g. CPU 4174-5H PN/DP).
3. Network the Ethernet interface in the normal way and set the IP parameters.
4. Configure a power supply module and the H-Sync modules.
5. Copy the station that you have set up: To do this, select the station and then select command Edit → Copy followed by command Edit → Paste.
6. Configure SIMOCODE pro V PN as a redundant IO device by dragging the IO devices in the normal way to one of the two IO systems. The modules will be connected as redundant units (to both PROFINET lines) as standard.

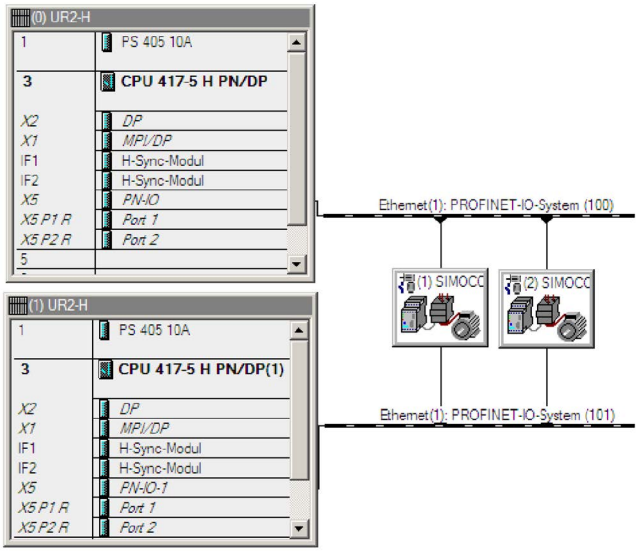


Figure 12-12 SIMOCODE pro V PN as a redundant I/O unit in HW Config

There are two methods by which you can connect SIMOCODE pro V PN as a non-redundant IO device:

- Configure a SIMOCODE pro V PN as a redundant IO device as described above and then navigate to the tab card labeled "Redundancy" in the module properties dialog. By activating the checkbox, you can assign the IO device to a single IO system and thus to a single CPU.

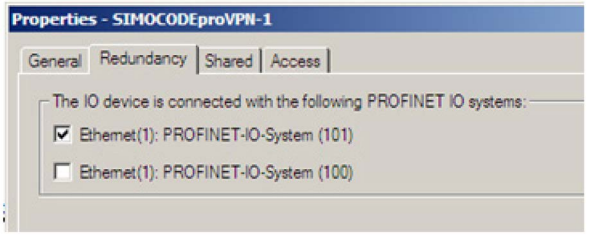


Figure 12-13 "Redundancy" tab card in module properties screen

Configure the SIMOCODE pro V PN specifically as a non-redundant IO at the relevant IO system.

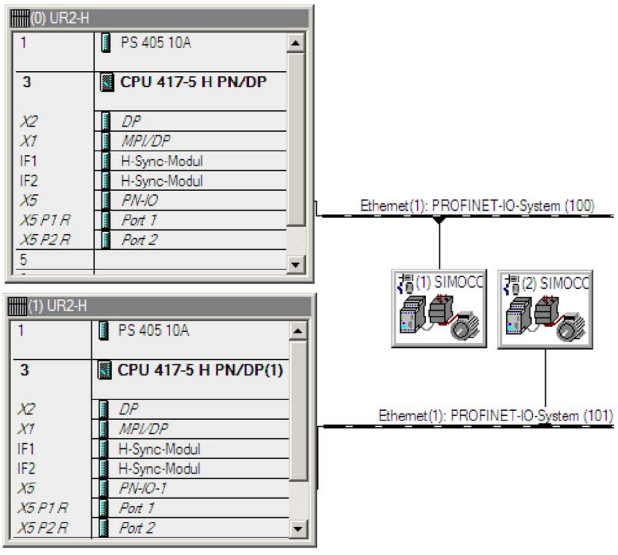


Figure 12-14 SIMOCODE pro V PN connected as a non-redundant device

Note

H systems and separate subnets

IO devices are connected as redundant units only if the two PROFINET I/O systems of the H system are in the same subnet. As an alternative, each CPU can be networked with a different subnet. In this case, the IO devices will always be connected as non-redundant units.

Note

Shared device function

The system redundancy function is not available when the "Shared Device Function" is used.

Note

Product version of SIMOCODE pro V PN basic unit

System redundancy is supported by product version *E05* and higher of SIMOCOCE pro V PN with firmware version V1.2.

Possible topologies

You can also combine PROFINET-based system redundancy with other PROFINET functions.

System redundancy with media redundancy:

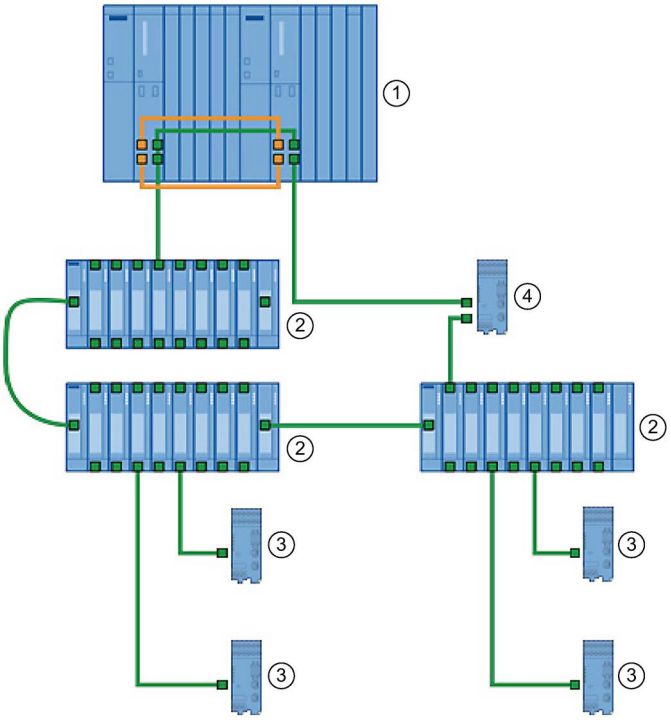


Figure 12-15 Sample configuration for system redundancy with MRP

① S7-400H system

② SCALANCE X400 (non-redundant IO device)

③ SIMOCODE pro V PN (non-redundant/redundant-system IO device)

③ SIMOCODE pro V PN (MRP, non-redundant/redundant-system IO device)

Note

Response monitoring time of IO devices

RT communication is interrupted (station failure) if the reconfiguration time setting of the ring is higher than the response monitoring time setting of the IO devices.

For this reason, make sure that the response monitoring time of the IO devices is set to a high enough value. This also applies to IO devices configured with MRP outside the ring.

12.14 Diagnostics

Diagnosis - Overview

When an error occurs, the defective IO device generates a diagnostics alarm and sends it to the IO controller. To respond to errors with a defined (programmed) response, this alarm calls a corresponding part in the user program (e.g. in the case of SIMATIC S7: organization block OB 82 for the diagnostics alarm).

SIMOCODE pro V PN provides the diagnostics as channel diagnostics data records. Channel diagnostics data records are generated as an alarm for

- Selected signals (see Chapter Data record 92 - Device diagnostics (Page 545), PNIO diagnostics column, marked with "1")
- Warnings
- Faults
- Device faults.

Diagnostic status

The channel diagnostics is transmitted with different diagnostics states:

- Maintenance required:
- Maintenance demand (maintenance requested):

All SIMOCODE pro monitoring functions with "warn" configured as their response are transmitted with this diagnostics status.

- Failure:

All SIMOCODE pro monitoring functions with "trip" configured as their response are transmitted with this diagnostics status.

Configuring the diagnostics response

The diagnostics response is configured with the SIMOCODE ES 2007 configuration software. The global enable of the diagnostics can be set for the following events under "PROFINET Parameters → Diagnostics":

Diagnostics for process events

Selected diagnostics events are transmitted with the "maintenance required" diagnostics status.

See also Chapter Data record 92 - Device diagnostics (Page 545), diagnostics events marked "1" in the "PNIO diagnostics" column.

Diagnostics for process warnings

All SIMOCODE pro monitoring functions in which the response has been configured with "warn" are transmitted with the "maintenance demand" diagnostics status.

Diagnostics for process faults

All SIMOCODE pro monitoring functions with "trip" configured as their response are transmitted with the "fault" diagnostics status.

Diagnostics for device faults

Diagnostics events that can occur in connection with defective hardware or incorrect parameterization are also transmitted with the "fault" diagnostics status.

The response of the different monitoring functions can be configured individually. Depending on the function, the following can be selected by configuration:

- Deactivated: There is no response. No diagnostics are produced.
- Signaling: The diagnostics event is entered in data record 92 and is displayed in the "Faults/Warnings/Events" online dialog box of SIMOCODE ES. No diagnostics alarm is triggered.
- Warning: A diagnostics alarm is generated with the "maintenance demand" diagnostics status.
- Tripping: A diagnostics alarm is generated with the "fault" diagnostics status.

Evaluating diagnostics with SIMATIC S7 300/400 and STEP 7 V5

Diagnostics with STEP 7 HW Config

In the online display of STEP 7 HW Config, after selection of the corresponding module (in this case: SIMOCODE pro V PN), the status of the module is determined with the "module status" function.

The following statuses are represented in the overview:

Table 12- 1 Module statuses in diagnostics with STEP 7 HW Config

Symbol representation in HW Config Online	Status in HW Config Online	Possible cause with SIMOCODE
	Module does not exist	SIMOCODE shut down or not accessible on the bus
	Module defective	Fault is pending
	Maintenance required	Warning is pending
	Maintenance required	Event it pending
OK	OK	None

The detailed diagnostics is displayed as follows on the "IO device diagnostics" tab card under "Channel-specific diagnostics":

Table 12- 2 Detailed diagnostics with STEP 7 HW Config

Slot	Channel No.	Error
1: I/O address	0	Error text, e.g. "Execution of ON command"

Diagnostics in the STEP 7 user program

With PROFINET IO, you can perform diagnostics in the user program via system function modules.

Possibilities of diagnostics evaluation in the S7 user program:

PROFINET IO uses a non-manufacturer-specific structure for data records with diagnostics information. Diagnostics information are only formed for defective components. Two ways in which you can evaluate the diagnostics of SIMOCODE pro V PN via PROFINET are shown below.

You will find more information and detailed examples in the programming manual "PROFINET IO - from PROFIBUS DP to PROFINET IO" (http://support.automation.siemens.com/WW/view/en/19289930), Chapter 8 "Diagnostics in the STEP 7 User Program."

Evaluating diagnostics alarms with SFB 54 "RALRM" in OB 82

SIMOCODE pro V PN as a diagnostics-capable IO device detects both internal faults (e.g. of hardware components) and events relating to the motor feeder and generates a diagnostics alarm to which you can respond using an alarm OB.

Initial information on the cause and class of the error is already available, based on the OB number and start information for the fault event.

You can then obtain detailed information on the error event in this error OB with the SFB 54 "RALRM" (read supplementary alarm information).

Note

STEP 7 online help

You will find a detailed explanation of SFB 54 "RALRM" in the STEP 7 Online Help.

Alarm processing

On process warnings, process faults, and device faults, SIMOCODE pro V PN makes diagnostic interrupt requests to the CPU (on both the raised and the cleared event). The precondition is that the diagnostics response has been enabled for these events in the device parameterization (see Section "Configuring the diagnostics response" above).

The operating system calls the OB 82 based on the diagnostics request. The local variables of OB 82 contain the logical base address and four bytes of diagnostics data about the SIMOCODE pro V PN device in question.

If you have not programmed OB 82, the CPU will switch to the "STOP" status.

Reading diagnostics data records with SFB 52 "RDREC" in OB 1

With SFB 52 "RDREC," you read the data record with number INDEX from the SIMOCODE pro V PN IO Device addressed by means of ID. ID contains the logical address with which SIMOCODE pro V PN was configured in STEP 7 HW Config.

Example:

If you want to obtain diagnostic information with the 0xE00A diagnostics data record for the pending faults from SIMOCODE pro V PN at the device level, INDEX = W#16#E00A.

With the MLEN variable, you specify the maximum number of bytes to be read. For this reason, you select the target area RECORD to be at least the same size as MLEN.

The "true" value of the VALID output parameter indicates that the data record has been successfully transferred to the target area RECORD. In this case, the output parameter LEN has the length of the read data in bytes.

If an error occurs during data record transmission, this will be displayed in the "ERROR" output parameter. In case of an error, "ERROR = true" is set and the error data will be contained in the "STATUS" output parameter.

Note

STEP 7 online help

You will find a detailed explanation of SFB 52 "RDREC" in the STEP 7 Online Help.

Note

Complete diagnostics information from SIMOCODE pro V PN

Note that reading the diagnostics data records 0xCXXX only ever provides the pending diagnostics.

You can evaluate the complete diagnostics information of SIMOCODE pro V PN by reading data record 92 (0x005C).

You will find more information and detailed examples in Chapter 8 of the programming manual "PROFINET IO - from PROFIBUS DP to PROFINET IO" (http://support.automation.siemens.com/WW/view/en/19289930).

Addressing levels

PROFINET IO defines different addressing levels via which diagnostics information of the IO devices can be accessed. You will find more information in Chapter 5 of the programming manual "PROFINET IO - from PROFIBUS DP to PROFINET IO" (http://support.automation.siemens.com/WW/view/en/19289930).

Diagnostics information from SIMOCODE pro V PN is evaluated at the addressing level for the slot.

Overview of the diagnostics data records

Table 12- 3 Diagnostics data records at slot level

Diagnostics data record No.	Diagnostic status
0xC010	Maintenance required
0xC011	Maintenance demand
0xC00A	Fault
0xC00C	All (maintenance required, maintenance demand, fault)

Example:

- Reading the diagnostics data record 0xC00C provides all pending diagnostics information (maintenance required, maintenance demand, fault).
- Reading the diagnostics data record 0xC011 provides all pending diagnostics information with the "maintenance demand" diagnostics status at slot level.

Structure of the diagnostics data records

Data blocks, diagnostics data records

In the following description, the main structure of the diagnostics data records at slot level (0xC010, 0xC011, 0xC00A) is described with the individual data blocks:

Table 12- 4 Data blocks, diagnostics data records

BlockType	2 bytes
BlockLength	2 bytes
BlockVersion	2 bytes
API (Application Process Identifier)	4 bytes
SlotNumber	2 bytes
SubslotNumber	2 bytes
ChannelNumber	2 bytes
ChannelProperties	2 bytes
USI (User Structure Identifier)	2 bytes
Number of repeats = number of entries	
ChannelNumber	2 bytes
ChannelProperties	2 bytes
ChannelErrorType	2 bytes

Data block "BlockType"

Table 12- 5 Data block "BlockType"

BlockType	Meaning
0x0010	Diagnostics data record
0x0001	Alarm transport channel 1
0x0002	Alarm transport channel 2

Data block "BlockLength"

In the "BlockLength" data field, the number of the following bytes of the diagnostics data record is coded. This is the length of the diagnostics data record without the number of bytes for the data fields "BlockType" and "BlockLength," which each have a length of 2 bytes.

Data block "BlockVersion"

Table 12- 6 Data block "BlockVersion"

BlockVersion	Value	Meaning
BlockVersionHigh	0x01	First value of the version number, 0x01
BlockVersionLow	0x01	Version number, always 0x01 in the case of SIMOCODE pro

Data block "API"

API (Application Process Identifier): SIMOCODE pro uses the standard API 0.

Data blocks "SlotNumber," "SubslotNumber"

As a compact PROFINET IO Device, SIMOCODE pro V PN has the following structure:

Table 12- 7 Data blocks "SlotNumber," "SubslotNumber"

Designation	SlotNumber	SubslotNumber
Head module	0x0000	0x0001
- Interface		0x8000
- Port 1		0x8001
- Port 2		0x8002
I/O module	0x0001	0x0001
PROFIsafe [1)]	0x0002	0x0001

1) Only in conjunction with fail-safe DM-F PROFIsafe expansion module

Data block "ChannelNumber"

Table 12- 8 ChannelNumber

ChannelNumber	Meaning
0x0000 - 0x7FFF	Manufacturer-specific
0x8000	Submodule

Data block "ChannelProperties"

Table 12- 9 ChannelProperties

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
.Direction			.Specifier		.Qualifier		.Acc.	.Type							

Data block "ChannelProperties.Type (Bit 0 -7)"

Table 12- 10 ChannelProperties.Type (Bit 0 - 7)

Value	Meaning
0	If ChannelNumber has the value 0x8000
1	1 bit
2	2 bits
3	4 bits
4	8 bits
5	16 bits
6	32 bits
7	64 bits

Data block "ChannelProperties.Accumulative (bit 8)"

Table 12- 11 ChannelProperties.Accumulative (bit 8)

Value	Meaning
0	No channel error group signal
1	Channel error group signal (more than one channel affected)

Combination of ChannelProperties.Qualifier (bit 9/10) and ChannelProperties.Specifier (bit 11/12)

Maintenance Required Bit 9	Maintenance Demanded Bit 10	Specifier Bit 12/11	Meaning	Diagnostics in user programs SIMATIC S7 300 and SIMATIC S7 400
0	0	00	All lower-level diagnostics are no longer pending	Evaluation of diagnostic interrupts with SFB54 in the OB82
		01	Diagnostics active	Evaluation of diagnostic interrupts with SFB54 in the OB82 read data records with SFB52
		10	Diagnostics no longer active	Evaluation of diagnostic interrupts with SFB54 in the OB82
		11	Status signal - only possible for manufacturer-specific errors	Evaluation of diagnostic interrupts with SFB54 in the OB82
0	1	00	Reserved	-
		01	Maintenance required is active	Evaluation of diagnostic interrupts with SFB54 in the OB82 read data records with SFB52
		10	Maintenance required no longer active	Evaluation of diagnostic interrupts with SFB54 in the OB82
		11	Maintenance required no longer active - all others still active	

Combination of ChannelProperties.Qualifier (bit 9/10) and ChannelProperties.Specifier (bit 11/12) (continued)

Maintenance Required Bit 9	Maintenance Demanded Bit 10	Specifier Bit 12/11	Meaning	Diagnostics in user programs SIMATIC S7 300 and SIMATIC S7 400
1	0	00	Reserved	-
		01	Maintenance demand is active	Evaluation of diagnostic interrupts with SFB54 in the OB82 read data records with SFB52
		10	Maintenance demand no longer active	Evaluation of diagnostic interrupts with SFB54 in the OB82
		11	Maintenance demand no longer active - all others still active	
1	1	00	Reserved	-
		01	Graded diagnostics is active	Evaluation of diagnostic interrupts with SFB54 in the OB82 read data records with SFB52
		10	Graded diagnostics no longer active	Evaluation of diagnostic interrupts with SFB54 in the OB82
		11	Graded diagnostics no longer active - all others still active	

Data block "ChannelProperties.Specifier (Bit 11/12)"

Table 12- 12 ChannelProperties.Specifier (bit 11/12)

Value	Meaning	Diagnostics in user programs SIMATIC S7 300 and SIMATIC S7 400
00	Reserved	-
01	Pending diagnostics	Evaluation of diagnostic interrupts with SFB54 in the OB82 read data records with SFB52
10	Cleared event and no further events	Evaluation of diagnostic interrupts with SFB54 in the OB82
11	Cleared events, but other events remain	

Data block "ChannelProperties.Direction (bits 13 - 15)"

Table 12- 13 ChannelProperties.Direction (bit 13 - 15)

Value	Meaning
000	Manufacturer-specific
001	Input
010	Output
011	Input/Output
100 - 111	Reserved

Data block "ChannelErrorType"

The ChannelErrorType does not indicate the "Fault" status. For this purpose, there is the PNIO diagnostics status for the raised alarm: Maintenance Required, Maintenance Demanded, Failure.

Table 12- 14 ChannelErrorType

ChannelErrorType	Meaning
0x0009	Error [1)]
0x0010	Parameterization error [1)]
Error of the PROFINET interface	
0x8000	Data transmission not possible
0x8001	Incorrect neighborhood
0x8002	Loss of redundancy
0x8003	Loss of synchronization (bus end)
0x8004	Loss of clock synchronization (device end)
0x8005	Slave-to-slave traffic connection error
0x8008	Error in network component
0x8009	Timebase error
Device diagnostics	
0x1000	Execution ON command
0x1001	Execution stop command
0x1002	Feedback (FB) ON
0x1003	Feedback (FB) OFF
0x1004	Stalled positioner
0x1005	Double 0
0x1006	Double 1
0x1007	End position
0x1008	Antivalence
0x100A	Cold start (TPF)
0x100B	Power failure (UVO)
0x100C	Operational protection OFF (OPO)
0x1021	Unbalance
0x1022	Overload
0x1023	Overload + Loss of phase
0x1024	Thermistor overload
0x1025	Thermistor short circuit
0x1026	Thermistor open circuit
0x1027	Internal ground fault
0x1028	EM/EM+ External ground fault
0x1029	EM+ open circuit
0x1030	TM2 out of range
0x102A	EM+ short circuit
0x102B	TM1 trip level T>

ChannelErrorType	Meaning
0x102C	TM1 sensor error
0x102D	TM1 out of range
0x102E	TM2 trip level T>
0x102F	TM2 sensor error
0x1040	Trip level I>
0x1041	Trip level I<
0x1042	Trip level P>
0x1043	Trip level P<
0x1045	Trip level cos phi<
0x1047	Trip level U<
0x1048	AM1 trip level 0/4-20mA>
0x1049	AM1 trip level 0/4-20mA<
0x104A	AM2 trip level 0/4-20mA>
0x104B	AM2 trip level 0/4-20mA<
0x104C	Stalled rotor
0x1055	Test trip
0x1057	Number of starts>
0x105B	AM1 open circuit
0x105C	AM2 open circuit
0x105D	DM-F safety-related tripping
0x1061	DM-F wiring
0x1062	DM-F cross circuit
0x1070	External fault 1
0x1071	External fault 2
0x1072	External fault 3
0x1073	External fault 4
0x1074	External fault 5
0x1075	External fault 6

1) Further details of the cause of error can be obtained by reading data record 92 "Device diagnostics."

Data block "User Structure Identifier (USI)"

Table 12- 15 User Structure Identifier (USI)

USI	Meaning
0x0000 - 0x7FFF	Manufacturer-specific diagnostics
0x8000	Channel diagnostics
0x8002	Extended channel diagnostics
0x9000 - 0x9FFF	Profile-specific

Example of the diagnostics data records

The following example shows the content of the data record 0xC010 with the pending fault "execution of ON command":

Table 12- 16 Content of data record 0xC010 for the pending fault "execution ON command"

BlockType	0x0010: Diagnostics data record
BlockLength	0x0016: Block length 22 bytes
BlockVersion	0x0101: always 0x0101 in the case of SIMOCODE
API	0x00000000: always 0 in the case of SIMOCODE
SlotNumber	0x0001: Slot 1 - I/O address
SubslotNumber	0x0001: Sub-slot 1
ChannelNumber	0x8000: Submodule
ChannelProperties	0x0800: Pending diagnostics
USI (User Structure Identifier)	0x8000: Channel diagnostics
ChannelNumber	0x0000: always 0 in the case of SIMOCODE
ChannelProperties	0x6804: Pending diagnostics
ChannelErrorType	0x1000: Execution ON command

12.15 Data records

Reading and writing data records in the STEP7 user program

With SFB 52 "RDREC," you read the data record with number INDEX from the SIMOCODE pro V PN IO Device addressed by means of ID.

ID contains the logical address with which SIMOCODE pro V PN was configured in STEP 7 HW Config.

Example:

SIMOCODE pro V PN was configured in STEP 7 HW Config with basic type 2 (I address 0 / O address 0).

You want to read data record 94 - measured values.

SFB "RDREC"

INDEX:	W#16#005E	Data record 94 - measured values (0x005E)
ID:	DW#16#0	Logical address 0
LEN:	W#16#00AC	Data record length 172 bytes (0x00AC)

With SFB 53 "WRREC," you read the data record with number INDEX into the SIMOCODE pro V PN IO device addressed by means of ID.

ID contains the logical address with which SIMOCODE pro V PN was configured in STEP 7 HW Config.

Example:

SIMOCODE pro V PN was configured in STEP 7 HW Config with basic type 2 (I address 16 / O address 16).

You want to write data record 95 - service data/statistical data (data record length 148 bytes (0x0094)).

SFB "WRREC"

INDEX:	W#16#005F	Data record 95 - service data/statistical data (0x005F)
ID:	DW#16#F	Logical address 16
LEN:	W#16#0094	Data record length 148 bytes (0x0094C)

Note

STEP 7 online help

You will find a detailed explanation of SFB 52 "RDREC" in the STEP 7 Online Help.

An overview of the data records is provided in Chapter Data formats and data records (Page 537).

12.16 PROFIenergy

PROFIenergy - definition

PROFIenergy, a protocol defined by the PROFINET User Organization, lays the foundations for a vendor-neutral, universal system for flexible, short-term, and intelligent shutdown of individual loads or whole production units.

PROFIenergy - functions supported

With the PROFIenergy data record index 0x80A0, SIMOCODE pro V PN supports the following PROFIenergy functions of device class type 3 "Switching and measuring devices without their own energy-saving level":

Table 12- 17 PROFIenergy - functions supported

Service	Service-ID	Meaning
Start_Pause	0x01	Switching off the motor in "remote" mode
End_Pause	0x02	Possible to switch on the motor again
Query_Modes - list of modes - get mode	0x03	Energy-saving modes - Query the supported energy-saving modes - Read out the energy-saving mode
PEM_Status	0x04	Read out of the PROFIenergy status
PE_Identify	0x05	Read out of the supported PROFIenergy services
Query_Measurement - get measurement list - get measurement values	0x10	Measured values - Query the list of supported measured values - Read out the supported measured values

Start_Pause

The "Start_Pause" command result in direct shutdown of the motor and activation of the OFF command. This command only affects the control station PLC/PCS [PN] on the precondition that the commands of this control station are enabled in the relevant mode. It therefore only has an effect if the control commands of this control station are also active. The "PE command Start_Pause pending" status is output.

If the motor is already switched off, the "PE energy-saving mode active" status is output. In this status, the LED "device" flashes green on the basic unit.

Note

Command "Start_Pause"

Use of this function is not meaningful in conjunction with the "overload" control function because this does not have any control station for routine switch-off and switch-on.

Minimum pause time

A pause time is transferred with the "Start_Pause" command. SIMOCODE pro V PN executes this command if the pause time is greater than the minimum pause time configured in the device. The minimum pause time of the motor is configured with the "SIMOCODE ES" software under "PROFIenergy." The minimum pause time is preset to the smallest possible value 0.1 s. You can increase the minimum pause time if executing the command in longer pauses is convenient for technological reasons.

End_Pause

The "End_Pause" command results in the stop command being canceled at the PLC/PCS control station and the motor being switched on again via enabled control stations.

Note

Command "End_Pause"

The command to switch on has to be output again because subsequent automatic switch-on is not performed.

Note

Switching on the motor in the paused condition

If the PLC/PCS control station is disabled, the motor can also be switched on in the paused condition.

Query_Measurement

Depending on the use of the current measuring or the current-voltage measuring module, the following measured values are supported:

Table 12- 18 Query_Measurement

Measurement-ID	PROFIenergy identifier	SIMOCODE pro identifier	Unit
4	Voltage (a-b)	Voltage U_L12 V	V
5	Voltage (b-c)	Voltage U_L31 V	V
6	Voltage (c-a)	Voltage U_L31 V	V
7	Current (a)	Phase current I_L1 A	A
8	Current (b)	Phase current I_L2 A	A
9	Current (c)	Phase current I_L3 A	A
33	Current average (abc)	Average phase current I_L A	A
34	Active power (total)	Active power P	W
36	Apparent power (total)	Apparent power S	VA
37	Power factor (total)	Cos phi	-
200	Active energy import (total)	Energy W	Wh

Function blocks for SIMATIC S7

The application description "Saving Energy with SIMATIC S7 and ET200 S" (http://support.automation.siemens.com/WW/view/en/41986454), which also contains an example program for using PROFIenergy functions, is available on the Internet service portal of Siemens AG, Industry Automation and Drives Technologies. You can also make use of the blocks from the example to implement PROFIenergy functions in conjunction with SIMOCODE pro V PN.

In the application description in Chapter 4.2 "FB 815 PE_START_END functionality," you will find the description of the block with which the "PE_START_Pause" or "PE_END_Pause" commands can be directly transferred to an IO device.

With the FB 815 "PE_START_END" function block, you can transfer the "START_Pause" or "END_Pause" commands directly to SIMOCODE pro V PN.

For use of further functions, in Chapter 4.3 "FB 816 PE_CMD functionality" you will find a universal function block with which you can transfer further commands of the PROFIenergy profile (e.g. Query_Modes, PEM_Status, PE_Identify, Query_Measurement).

You will also find the structure of the command and response data of the FB 816 in Chapter 4.4 "Response Data" of the application description "Saving Energy with SIMATIC S7 and ET200 S."

12.17 Further communication functions via Ethernet

OPC basics

The OPC Foundation (an interest group of renowned manufacturers for definition of standard interfaces) has defined numerous software interfaces over the past years to standardize the flow of information from the process level to the management level. In the past, the various OPC specifications have been drawn up in line with the different requirements within an industrial application.

Based on the experience of these classic OPC interfaces, the OPC Foundation has defined a new platform with the name OPC Unified Architecture (UA). The aim of this new standard is generic description and standardized access to all information that has to be exchanged between systems and/or applications.

What is OPC?

In the past, OPC was a collection of software interfaces for data exchange between PC applications and process devices. These software interfaces were defined according to the rules of Microsoft COM (component object model) and can therefore be easily integrated on Microsoft operating systems. COM or DCOM (Distributed COM) provides the functionality of interprocess communication and organizes information exchange between applications, including across computer boundaries (DCOM).

An OPC client (COM client) can therefore exchange information with an OPC server (COM server) using mechanisms of the Microsoft operating system.

The OPC server provides process information of a device at its interface. The OPC client connect to the server and can access the data offered.

The consequence of using COM or DCOM is that the OPC server and clients can only run on a Windows PC or in the local area network and usually have to implement communication with the corresponding automation system via proprietary protocols. This practice, in particular, results in additional communication and software layers that increase the configuration effort and complexity.

To resolve the above restrictions in practice and to meet the additional requirements, the OPC Foundation has defined a new platform with the name OPC Unified Architecture, which provides a standardized basis for exchanging information between components and systems. OPC-UA will also be available as an IEC 62541 standard and will thus form the basis for other international standards.

To summarize, OPC-UA offers the following features:

- Use of open and non-platform-specific protocols for network communication.
- Internet access and communication through firewalls.
- Integrated access control and security mechanisms at the protocol and application level.

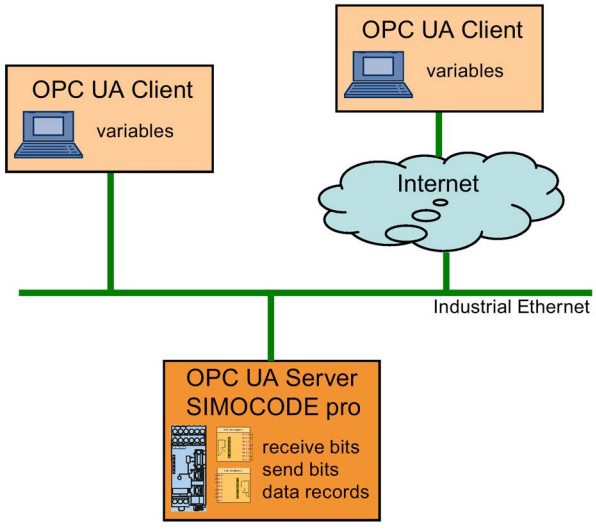


Figure 12-16 Block diagram of OPC-UA

Configuring the SIMOCODE pro V PN OPC-UA server - Requirements

Activating the OPC-UA server

The default setting the OPC-UA server is "**not** active." For activation, the parameter "PROFINET Parameters → OPC-UA Server Activated" must be set.

Note

Restarting the communication interface

Each change to the "Activate OPC-UA server" parameter requires that the communication interface be restarted.

A new start of the communication interface interrupts all Ethernet and PROFINET links and reestablishes them afterward.

Note

Firmware version of SIMOCODE pro V PN basic unit

OPC UA is supported by SIMOCOCE pro V PN from firmware version V1.2.2.

Setting the IP parameters

To enable a link to be established via OPC-UA, SIMOCODE pro V PN must have valid IP parameters.

Example of the URL of the SIMOCODE pro V PN-OPC-UA server:

opc.tcp://192.168.0.2:4840, where 192.168.0.2 is the IP address of SIMOCODE pro V PN.

The IP parameters, consisting of IP address, subnet mask, and router can be configured with SIMOCODE ES 2007 and transferred to the device.

If SIMOCODE pro V PN does not obtain these parameters in another way (e.g. from the controller via PROFINET IO), the "Overwrite IP parameters in device" parameter must be activated under "PROFINET Parameters → IP Parameters."

Note

If the IP parameters are modified using the SIMOCODE ES 2007 function “Target system → Edit Ethernet participants” while the OPC-UA connection is active, the device has to be restarted using “Target system → Command" to accept the parameters.

Connecting to the SIMOCODE pro OPC-UA server

Introduction

An OPC-UA client can access process values in the hierarchical namespace of the SIMOCODE pro V PN-OPC-UA server.

To enable this, the OPC-UA server and the OPC-UA client authorize each other by exchanging certificates. You can additionally encrypt the data traffic.

The SIMOCODE pro V PN-OPC-UA server classes every certificate of an OPC-UA clients as "trustworthy" by default.

Note

Configuring the connection on the client side

You can obtain information directly from the manufacturer of the software that is to access the data of the SIMOCODE pro V PN-OPC-UA server via OPC-UA.

Supported OPC-UA services of the SIMOCODE pro V PN OPC-UA server

SIMOCODE pro V PN supports the following OPC-UA services:

- SecurityPolicy:
  - None
  - Basic128Rsa15
- MessageSecurityMode:
  - None
  - Sign&Encrypt.

Explanation of security settings:

The following table shows the security functions supported by the SIMOCODE pro V PN-OPC-UA server, which have to be set in the connection configuration of the OPC-UA clients:

Table 12- 19 Security functions that have to be set in the connection configuration of the OPC-UA client

Security Policy	MessageSecurityMode
None 1)	None
Basic128Rsa152	SignAndEncrypt 2)

1) Exchange of certificates is deactivated

2) The data packets are signed and encrypted with the certificates.

Note

When using the MessageSecurityMode “SignAndEncrypt”, the connection timeout effective in the OPC UA Client must be set to at least 15 s.

⚠ DANGER

Unsecured connection between the client and the server possible!

Use the setting "none" for test purposes only.

During productive operation, use the following settings for secure communication between the client and server:

- Security Policy: Basic128Rsa15
- Message Security Mode: SignAndEncrypt.

Note

Requirement for certificate exchange in SIMOCODE pro V PN

The precondition for certificate exchange in SIMOCODE pro V PN is the presence of a valid time (see Section "Time-of-day synchronization by the NTP procedure" below).

Access to SIMOCODE pro V PN-OPC-UA variables

The OPC-UA server integrated into SIMOCODE pro V PN provides the following structured objects in its address space to which the client can have read access and, in some case, write access. The precondition for write access is a secure connection with Security Policy "Basic128Rsa15" and Message Security Mode "SignAndEncrypt."

Table 12- 20 Access to SIMOCODE pro V PN-OPC-UA variables

Tag	Designation	Read / write
Diagnostics	Device diagnostics	Read
Diagnostic events		
Diagnostic status		
Diagnostic trips		
Diagnostic warnings		
Measured values	Measured values	Read
Statistics	Display and statistical data	Read
Acyclic receive	Receive data (OPC-UA Receive)	Read / write
Analog value	Analog value	
Bit 0.0 - 1.7	Digital receive data	
Acyclic send	Send data (OPC-UA Send)	Read
Bit 0.0 - 1.7 1)	Digital send data	

1) The current assignment of the OPC-UA send data is displayed as it was configured in SIMOCODE pro V PN.

You will find a detailed description of each variable in Chapter OPC UA variables (Page 516).

Write access is only possible via a secure connection.

Table 12- 21 Quantities and update interval

Maximum number of clients	Max. 2
Maximum number of monitored terms	160
Maximum number of subscriptions	2
Shortest update interval for subscriptions	100 ms

Configuration of the OPC-UA receive and send data with SIMOCODE ES 2007

OPC-UA Receive

The bit information that is to be transferred via OPC-UA Receive to SIMOCODE is also assigned by configuring with SIMOCODE ES 2007.

OPC-UA variables (write):

- Receive data byte 0, bits 0-7
- Receive data byte 1, bits 0-7
- Receive data byte 2/3

Data to SIMOCODE pro V PN:

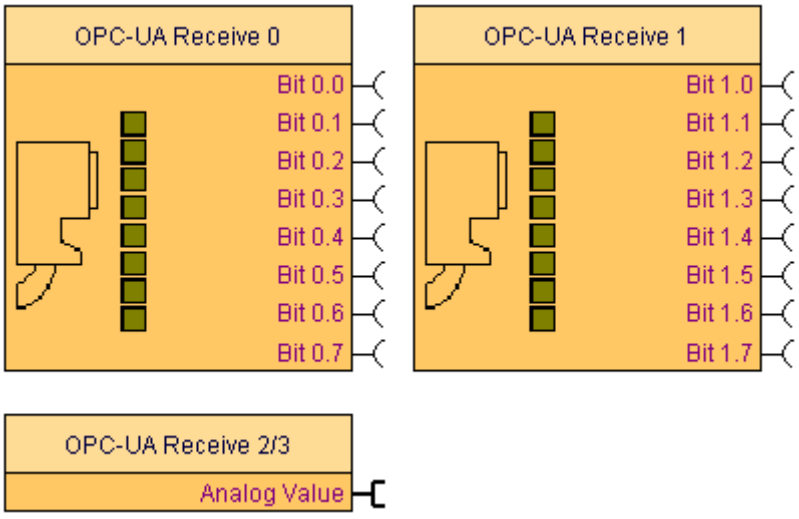


Figure 12-17 OPC-UA receive 0, 1, 2/3 function blocks

Example:

The motor is to be switched on and off via the control station "PC/OPC-UA."

OPC-UA - Acyclic receive - Bit 0.0 → Motor ON<

OPC-UA - Acyclic receive - Bit 0.1 → Motor OFF

OPC-UA - Acyclic receive - Bit 0.2 → Motor ON>

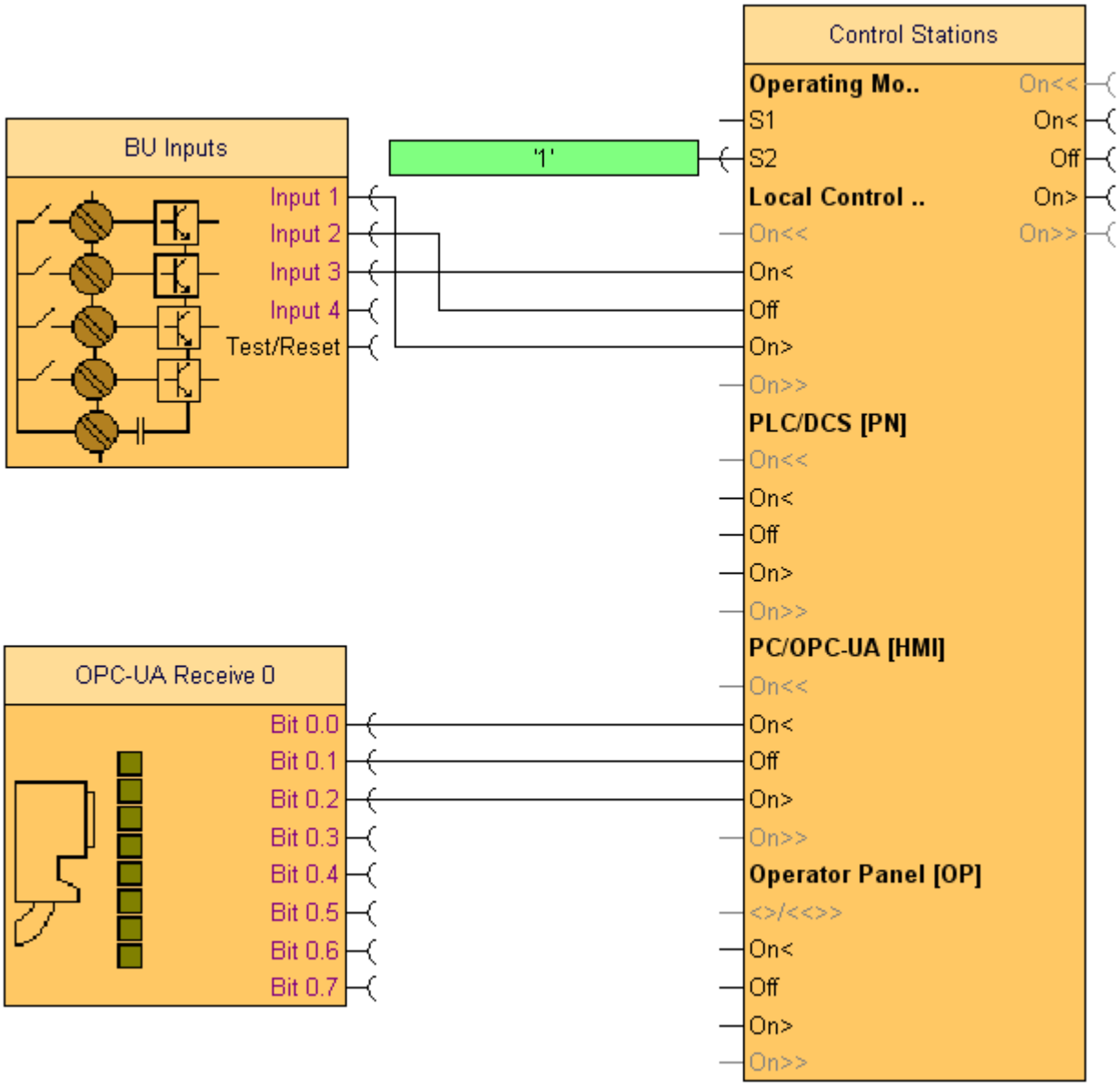


Figure 12-18 Example of motor control OPC-UA

Note

Write access

Write access is only possible if a secure connection is used with Security policy "Basic128Rsa15" and with Message security mode "SignAndEncrypt."

Note

Non-maintained command mode

Do **not** use the "non-maintained command mode" for motor control with OPC-UA!

Connection monitoring

The OPC-UA connection is monitored over time. The monitoring time is set by the OPC-UA client and is in the range of 10 s to 100 s. If the OPC-UA connection is terminated, the OPC-UA control variables will be deleted in SIMOCODE pro only after this time has expired. In SIMOCODE pro, no fault is triggered.

If you want to monitor for failure of the OPC-UA connection of SIMOCODE pro, you can achieve that as follows:

⚠ WARNING

The drive cannot be controlled.

Can result in death, serious injury, or property damage.

If the connection is interrupted, the drive cannot be controlled while the OPC-UA connection monitoring time is active.

Take suitable safety measures to avoid personal injury or property damage.

Example:

Makes sure that Bit 0.7 is set statically at the client end. If the connection is interrupted, this will activate the "PLC/PCS" fault in "remote" mode (mode selector S1=1, S2=1).

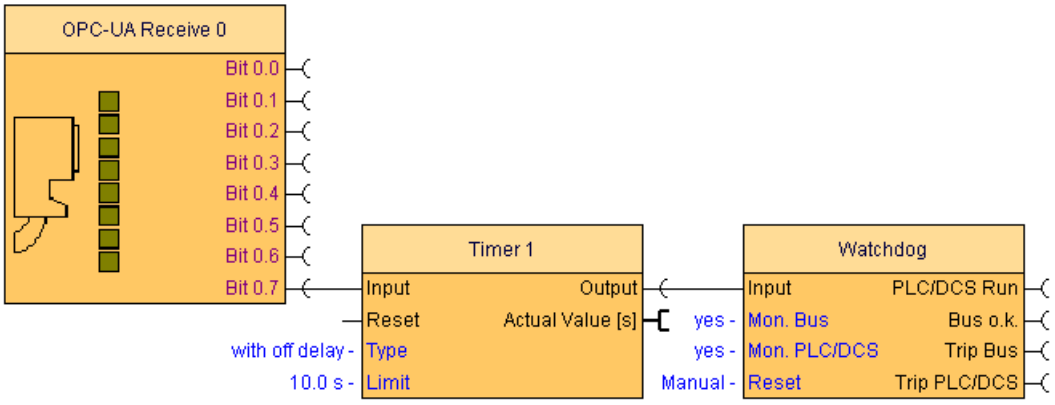


Figure 12-19 Example of connection monitoring

OPC-UA send

The bit information that is to be transferred to the client via OPC-UA Send is also defined by configuring with SIMOCODE ES 2007.

OPC-UA variables (read):

- Send data byte 0, bits 0-7
- Send data byte 1, bits 0-7

Data from SIMOCODE PRO V PN:

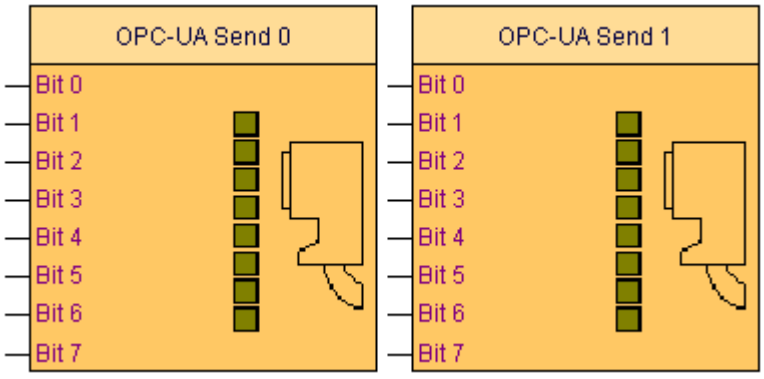


Figure 12-20 OPC-UA send 0, 1 function blocks

Example:

The feedback of the switching state of the motor is transferred to the client via OPC-UA. When selecting the variables in the OPC-UA client, the assigned status signals are then as follows:

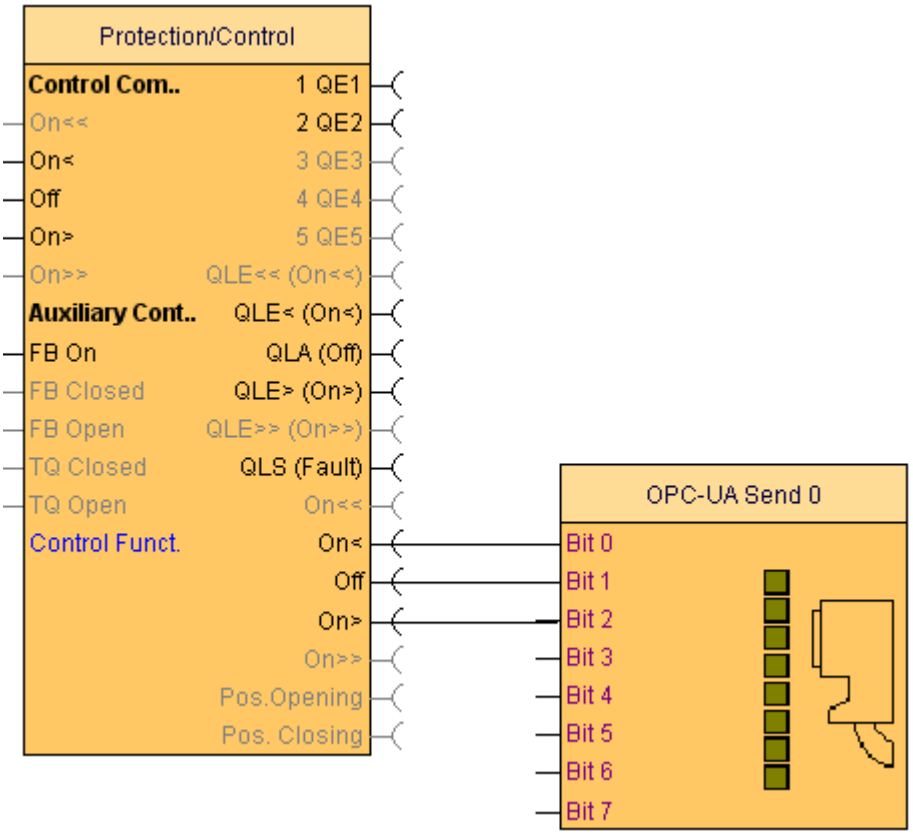


Figure 12-21 Configuration of OPC-UA send in SIMOCODE ES (see also table below)

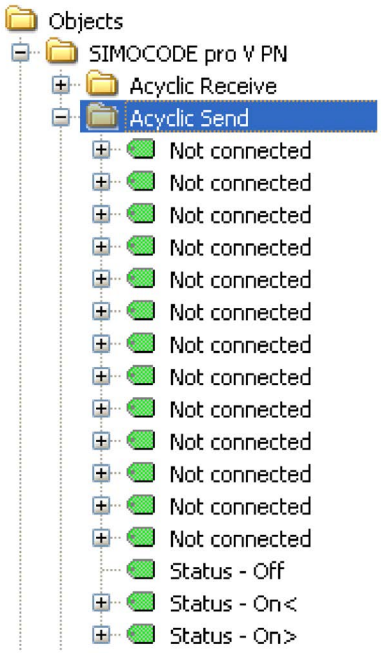


Figure 12-22 Representation in the object directory of the SIMOCODE pro V PN-OPC-UA server (see also table below)

Configuration of OPC-UA send in SIMOCODE ES	Representation in the object directory of the SIMOCODE pro V PN-OPC-UA server
OPC-UA send - Bit 0.0: "Status ON<"	Acyclic Send → Status - On <
OPC-UA send - Bit 0.1: "Status Off"	Acyclic Send → Status - Off
OPC-UA send - Bit 0.2: "Status ON>"	Acyclic Send → Status - On >
...	...
OPC-UA send - Bit 0.3: "Not connected"	Acyclic Send → Not connected
OPC-UA send - Bit 1.7: "Not connected"	Acyclic Send → Status - On <

Note

Restarting the communication interface

Each change to the configuration of the OPC-UA send data requires that the communication interface be restarted.

A new start of the communication interface interrupts all Ethernet and PROFINET links and reestablishes them afterward.

Web diagnostics (web server)

SIMOCODE pro V PN offers you with the web diagnosis the possibility of calling the following information of the motor feeder from a PG/PC using an HTTP client:

- Status information
- Faults, warnings, events
- Measured values
- Service and statistical data
- Error buffer, error protocol.

The following functions for controlling the motor feeder is available for authorized users after log-on with user name and password:

- Receive (switching the motor on and off, not available in non-maintained command mode)
- Acknowledging faults
- Execution of the test function.

Number of web server connections: One connection is supported.

Web diagnostics are available in Chinese, Russian, English and German.

Activating the web server:

The default setting of the web server is "not active." To activate it, the "PROFINET Parameters →Web Server Activated" parameter must be active.

Note

Restarting the communication interface

Each change to the configuration of the web server requires that the communication interface be restarted.

A new start of the communication interface interrupts all Ethernet and PROFINET links and reestablishes them afterward.

Setting the IP parameters:

To enable a link to be established via the web, SIMOCODE pro V PN must have valid IP parameters. You can find out how to makes these settings in Chapter Configuration of further properties of SIMOCODE pro V PN as an IO device (Page 395).

Configuration of the user name and password:

If the functions are to be used to control the motor feeder, a user must additionally be configured with the user name and password. User name and password must not contain any blanks. Configuration is performed under "PROFINET Parameters → OPC UA server / web server"

Note

Control station PC/OPC-UA

The control via the web uses the SIMOCODE pro control station PC/OPC-UA [HMI, for which the configured enabled commands are then active.

Web browser

For access to the HTML pages in the SIMOCODE pro V PN, you need a web browser.

The following web browsers are suitable for communication with SIMOCODE pro etc.:

- Internet Explorer (recommended version: Version 10)
- Firefox (recommended version: Version 29).

Note

Connection to a web client

Connection to a web client is supported.

Settings of the web browser for access to the information

Check the following settings, which are a precondition for access to the information made available via the web:

- To load the diagnostics data, Javascript must be activated in the Internet browser.
- The browser must support frames.
- Cookies must be permitted.
- The browser should be set in such a way that whenever it accesses a page, it automatically loads the current data from the server.

In the Internet Explorer 8, you will find these settings with menu "Tools" → "Internet Options" → "General" tab card → "Temporary Internet Files" group box → "Settings" button.

To use a firewall in your PG/PC, the following port must be enabled for use of the web diagnostics: "http Port 80/TCP" or, in the case of secure connections, "https Port 443/TCP".

Logging on to the web server

You can only use functions for controlling the motor feeder after you have logged on to the web server with user name and password. Only then are the buttons with a controlling function active.

The log-on dialog box is only available via a secure https connection.

Certificates:

To enable the web browser to access the web server via an https connection, certificates are mutually exchanged. On each change of the SIMOCODE pro V PN IP address, a unique certificate with a validity of five years is created for this purpose.

You can also install a CA certificate with a validity up to 2037 via the integrated web server as follows: Click the "Download certificate" link in the header of the home page and open or install the CA certificate.

Note

Installing the SIMOCODE pro CA certificate

You only have to install the SIMOCODE pro CA certificate once for the web client inquestion and it then applies to all SIMOCODE pro V PN devices.

If you do not install the CA certificate, the web browser will signal a certificate error when the connection is established to SIMOCODE pro V PN.

Time-of-day synchronization by the NTP procedure

SIMOCODE pro V PN has a non-battery-backed realtime clock that can be synchronized via the NTP procedure.

Network Time Protocol (NTP) is the implementation of a TCP/IP protocol for time synchronization in network. The NTP procedure uses hierarchical time synchronization, that is, an external clock (e.g. SICLOCK TM or a PC in the network) is used for synchronization.

The device transmits time-of-day queries to the configured NTP server at configured time intervals. Using the responses of the server, the time of day of the non-battery-backed clock is synchronized in SIMOCODE pro. This ensures that a synchronized time of day is available shortly before the supply voltage is switched on.

The NTP synchronization is configured with the "SIMOCODE ES 2007" configuration software under "PROFINET Parameters → NTP procedure/synchronization."

The following settings are also made:

- NTP server address: Enter the NTP server address when the "Activate NTP synchronization" checkbox is selected.

  Note

  Adoption of the NTP server address

  The NTP server address is not adopted until the device has been restarted or after the supply voltage has been switched off and on again.

- Cyclic update interval: Time interval in seconds at which synchronization of the time of day with the NTP server is performed
- Time shift: Time difference in minutes between UTC time (UTC = Universal Time Coordinated) and the time in the device.

Examples:

- Time shift for CET (Central European Time): +60 min
- Time shift for CST (Central Standard Time, North America): -360 min.

If an NTP server address has not been configured or a server was not found on the network, you can also set the time of day using SIMOCODE ES. To do this, proceed as follows:

Select the "Set time (= PC time)" command in the "Target system → Command" dialog box in SIMOCODE ES.

Note

Command execution

Commands are executed immediately.

If a valid time of day is available (either synchronized by NTP or set via SIMOCODE ES), the entries in the error buffer/error protocol (i.e. log) will be additionally displayed with the time of day. In addition, the "Clock set (NTP)" and "Clock synchronized (NTP)" messages are displayed.

Note

Access via OPC-UA

A valid time of day is necessary to be able to use the "Sign" and "SignAndEncrypt" OPC-UA Security Modes.

Simple Network Management Protocol (SNMP)

SNMP is a network protocol for monitoring and controlling network elements (e.g. switches).

SIMOCODE pro V PN supports the Ethernet service SNMP. MIB-2 (RFC1213) is supported. R/W objects change be changed with SNMP tools and are stored in the basic unit.

After replacement with a new basic unit from the factory or a basic unit that has undergone a general reset, the R/W objects will be in the factory settings.

Mounting, wiring, interfaces

13

In this chapter

This chapter contains information about installation and wiring of individual SIMOCODE pro components.

Target groups

This chapter addresses the following target groups:

- Technicians
- Electricians
- Service and maintenance personnel

Required knowledge

You require basic general knowledge about SIMOCODE pro.

13.1 General information about mounting and wiring

Safety information

⚠ WARNING

Hazardous voltage!

Can cause electric shock and burns.

Ensure the system and devices are disconnected from the power supply before starting work.

Note

Please also observe the SIMOCODE pro operating instructions (enclosed with the devices), which are listed in the table below:
You can also view or download the operating instructions for SIMOCODE pro at Manuals/operating instructions (http://www.siemens.com/sirius/manuals)

Table 13- 1 SIMOCODE pro operating instructions

Device	Order No.
Basic unit	3ZX1012-0UF70-3AA1
Operator panel	3ZX1012-0UF72-1AA1
Operator panel adapter	3ZX1012-0UF78-2BA1
Operator panel with display	3ZX3012-0UF72-2AA1
Digital module	3ZX1012-0UF73-1AA1
DM-F Local fail-safe digital module	3ZX1012-0UF73-1BA1
DM-F PROFIsafe fail-safe digital module	3ZX1012-0UF73-3BA1
Expansion modules	3ZX1012-0UF75-1BA1
Current measuring module	3ZX1012-0UF71-1AA1
Current / voltage measuring module	3ZX1012-0UF77-1BA1
Door adapter	3ZX1012-0UF78-1AA1
Decoupling module	3ZX1012-0UF71-5BA1
Initialization module	3ZX1012-0UF70-2AA1

Mounting lugs for screw attachment

Note

Two different fixing lugs are provided for screw mounting for technical reasons:

- For basic unit, expansion modules, decoupling module: Order No. 3RP1903
- For current measuring modules and current / voltage measuring modules, 45 mm and 55 mm wide: Order No. 3RV2928-0B

Removable terminals

Note

The removable terminals are mechanically coded and will only fit in a certain position!

13.2 Mounting

13.2.1 Mounting basic units, expansion modules, and decoupling module

You can attach these system components as follows:

- Snap-on mounting onto a 35 mm standard mounting rail, without tools
- Snap-on mounting of basic units (no tools required) onto current measuring modules of 45 mm and 55 mm in width (up to 100 A) with integrated standard mounting rail
- Screw mounting with mounting lugs (order No: 3RP1903) and screws for mounting on a level surface. These fixing lugs are only suitable for basic units, expansion modules and the decoupling module!

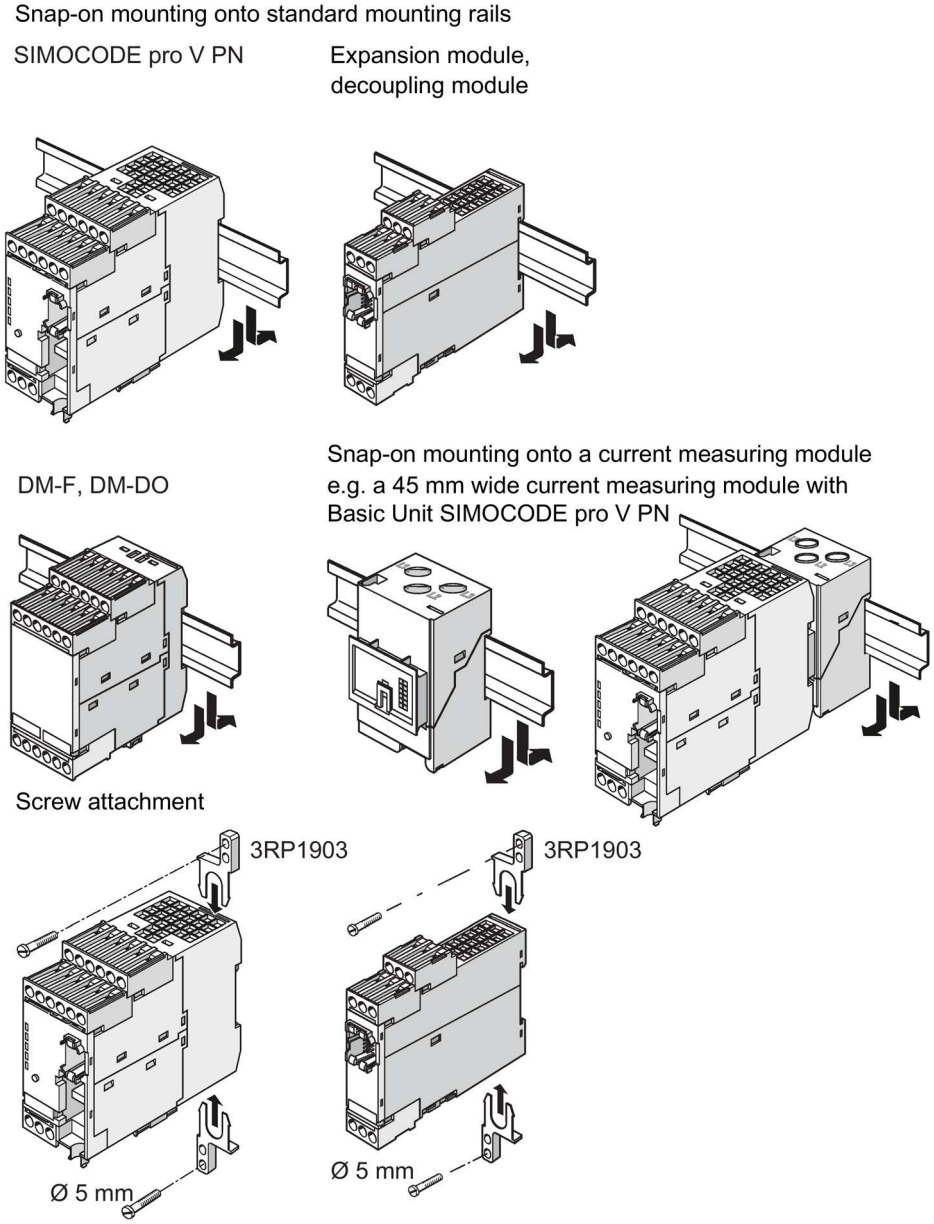


Figure 13-1 Mounting of basic units, expansion modules and the decoupling module

13.2.2 Digital modules DM-F Local and DM-F PROFIsafe

See "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852), Chapter "Mounting and connection."

13.2.3 Mounting of current measuring modules

You can attach these system components as follows:

- Current measuring modules up to 100 A: On a standard mounting rail or by screw mounting with mounting lugs (order No: 3RV2928-0B) and screws for mounting on a level surface. These mounting lugs are suitable only for current measuring modules and current / voltage measuring modules! For current measuring modules up to 25 A you will require an additional 25 mm spacer.
- Current measuring modules up to 200 A: Rail-mounting or screw attachment
- Current measuring modules up to 630 A: Screw attachment.

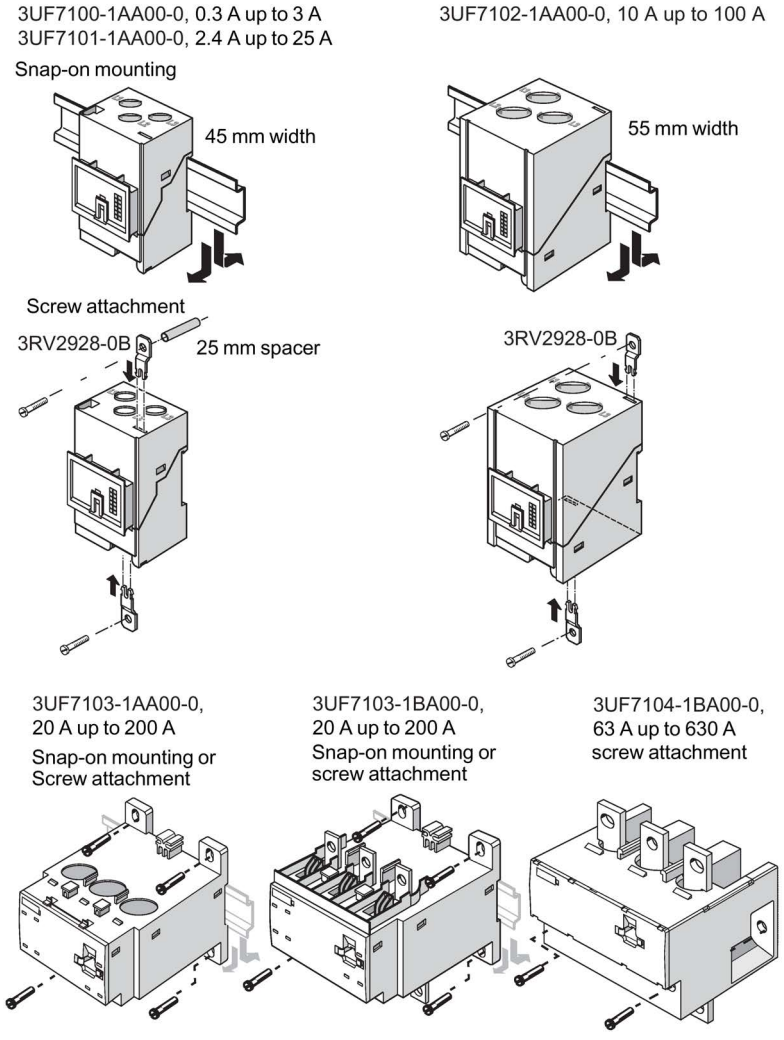


Figure 13-2 Mounting the current measuring modules

13.2.4 Mounting the current / voltage measuring modules

You can attach these system components as follows:

- Current / voltage measuring modules up to 100 A: On a standard mounting rail or by screw mounting with mounting lugs (order No: 3RV2928-0B) and screws for mounting on a level surface. These mounting lugs are suitable only for current / voltage measuring modules (and current measuring modules)! For current / voltage measuring modules up to 25 A you will require an additional spacer, 25 mm in length.
- Current / voltage measuring modules up to 200 A: Standard mounting rail or screw attachment.
- Current / voltage measuring modules up to 630 A: Screw attachment.

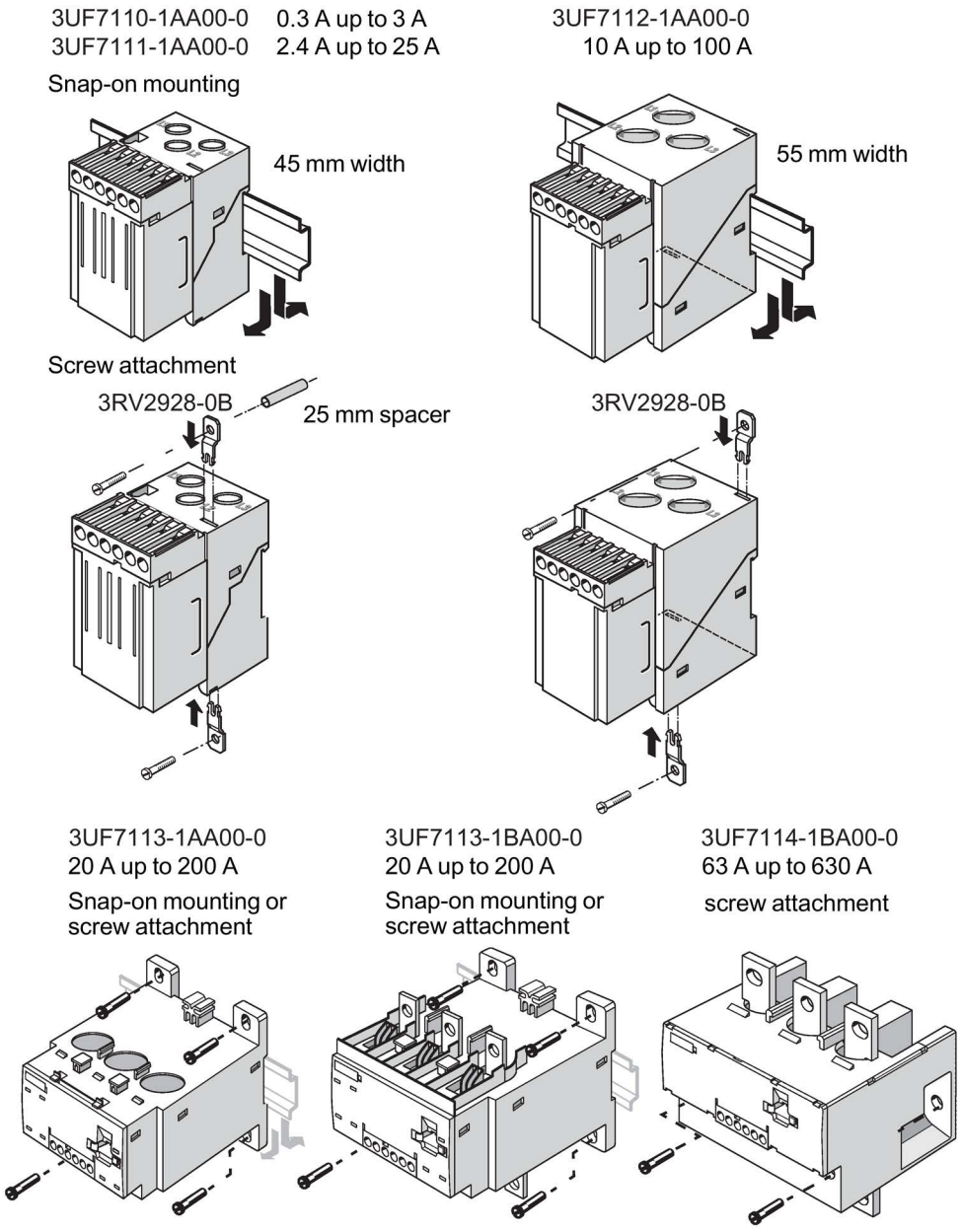


Figure 13-3 Mounting the current / voltage measuring modules

13.2.5 Operator panel and operator panel with display

The operator panels are designed for installation in the front panels of motor control centers, for example, or in control cabinet doors.

Note

Product version of the operator panel with display

For use with the SIMOCODE pro V PN basic unit, an operator panel with display version *E07* is required.

To install, proceed as follows:

Table 13- 2 Sequence for installing the operator panel / operator panel with display

Step	Description
1	Make a cutout, e.g. in the front panel or control cabinet door. Dimensions: See figures below.
2	Position the operator panel or the operator panel with display in the cutout.
3	Snap the four mounting brackets onto the operator panel.
4	Lock the operator panel in position by tightening the four screws on the securing brackets.

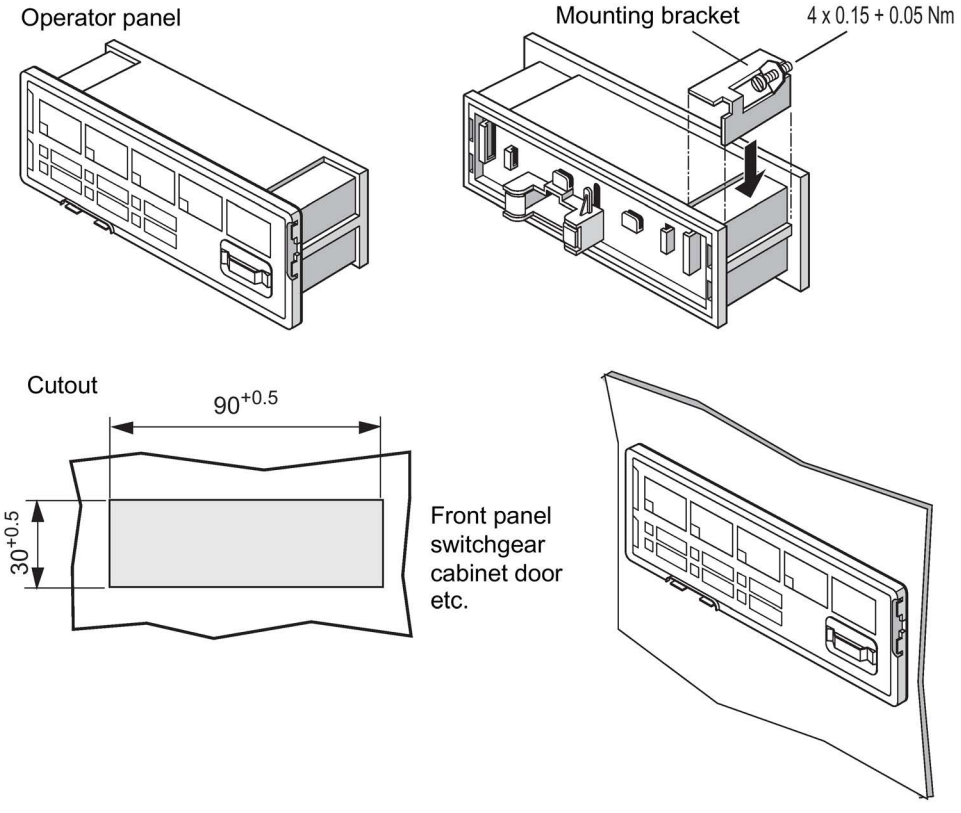


Figure 13-4 Mounting the operator panel

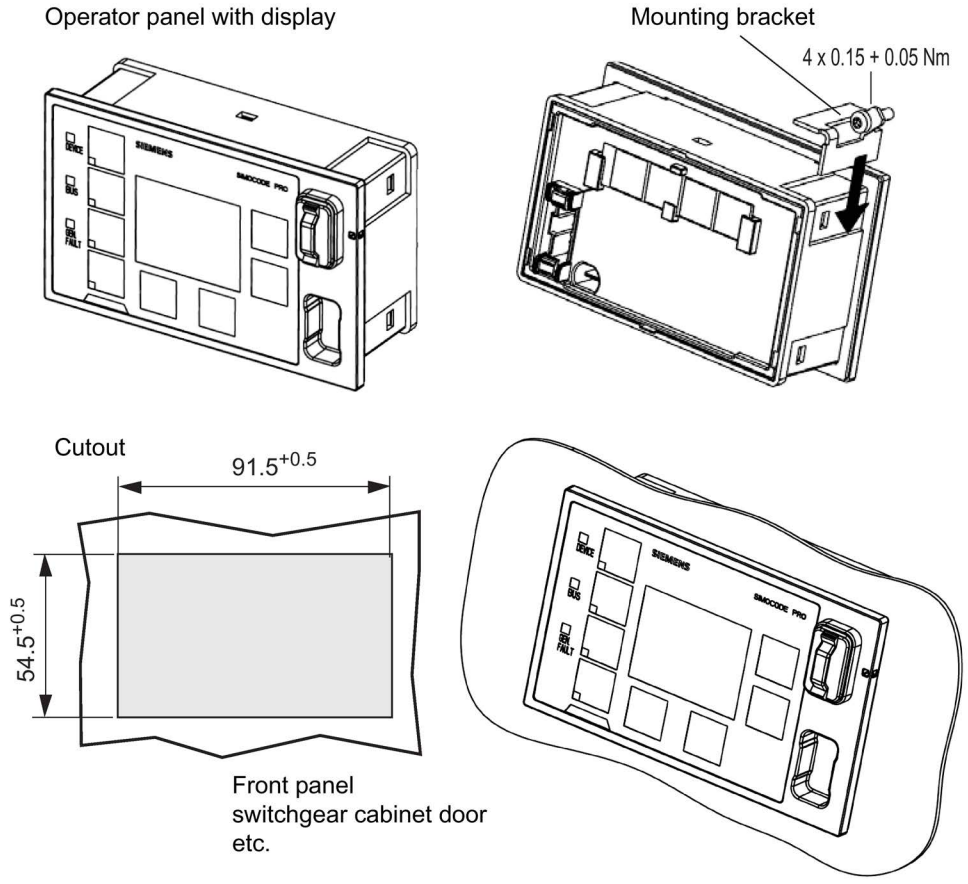


Figure 13-5 Mounting the operator panel with display

WARNING

Tightening torque of the screws

To ensure that the panel will function correctly and is sealed to comply with IP54, the tightening torque of the screws provided must not be set too high when mounting and the seal must be properly fitted.

Note

Only a connecting cable is required for connecting the operator panel with display to SIMOCODE pro (see Chapter An overview of system components (Page 49)). Additional wiring for the power supply or ground is not required.

13.2.6 Exchanging a 3UF52 operator panel for a 3UF720 operator panel

To exchange a 3UF52 operator panel for the smaller 3UF720 operator panel, proceed as follows:

Table 13- 3 Exchanging a 3UF52 operator panel for a 3UF720 operator panel

Step	Description
1	Unscrew the four mounting bracket screws and remove the 3UF52 operator panel from the front panel or control cabinet door.
2	Ensure that the dimensions of the cutout in the front panel or control cabinet door measure 91.5 + 0.5 mm (width) and 54.5 + 0.5 mm (height) (see figure).
3	Slide the seal provided onto the operator panel adapter (see figure below).
4	Position the operator panel adapter in the cutout.
5	Position the operator panel in the adapter.
6	Snap the four mounting brackets onto the operator panel.
7	Lock the operator panel in position by tightening the four mounting bracket screws (see figure and safety information!).

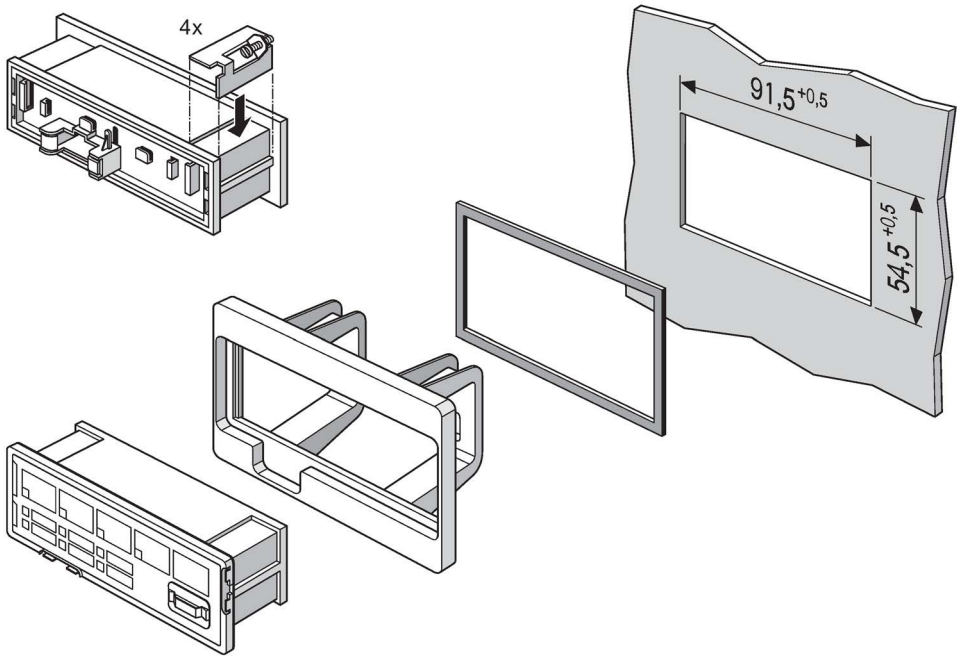


Figure 13-6 Mounting the operator panel adapter (1)

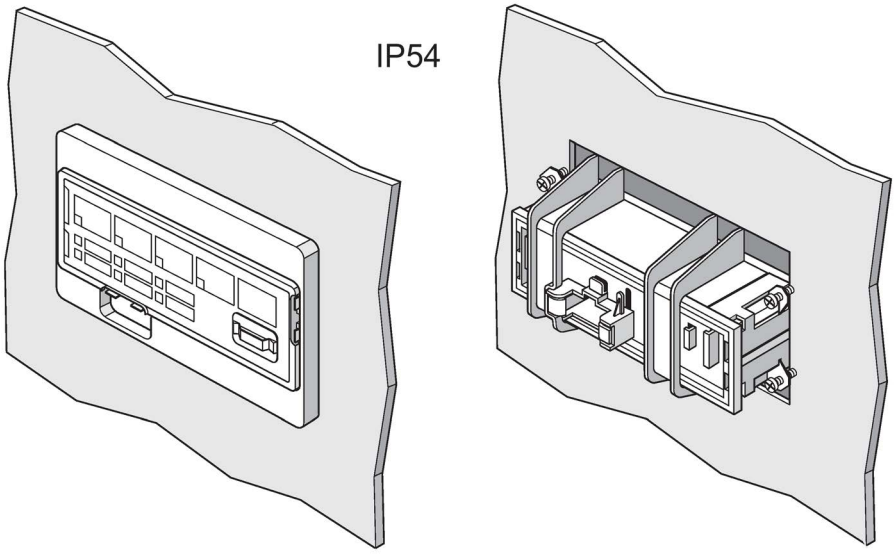


Figure 13-7 Mounting the operator panel adapter (2)

⚠ WARNING

Tightening torque of the screws

To ensure that the panel will function correctly and is sealed to comply with IP54, the tightening torque of the screws provided must not be set too high when mounting and the seal must be properly fitted

Note

A SIMOCODE pro 3UF7 system operator panel is not compatible with SIMOCODE DP 3UF5, and vice versa.

13.3 Wiring

13.3.1 Basic units, expansion modules and the decoupling module

Basic units, expansion modules and the decoupling module have removable terminals. You do not have to detach the wiring to exchange these devices!

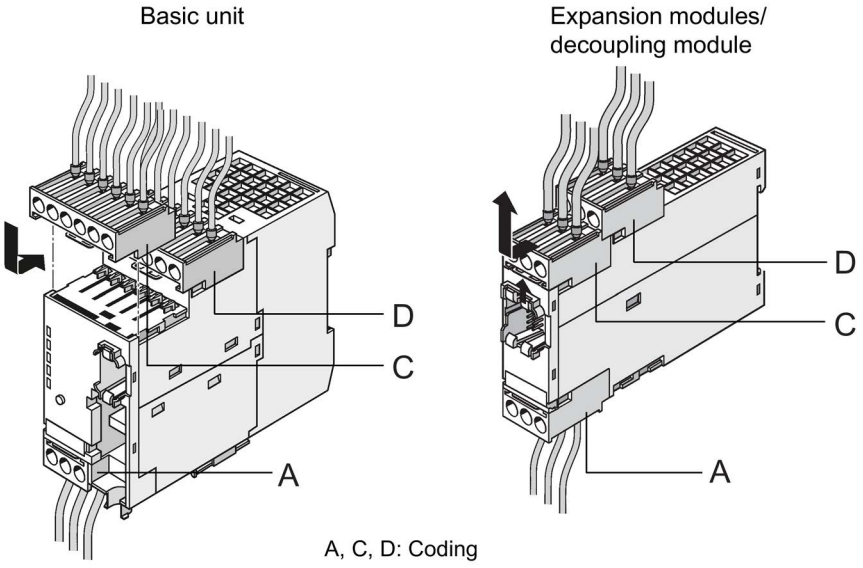


Figure 13-8 Removable terminals on basic units, expansion modules and the decoupling module

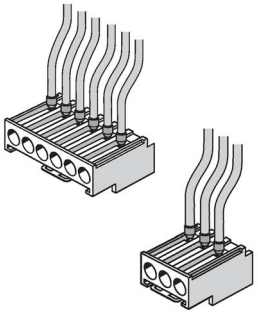
Note

The removable terminals are mechanically coded and will only fit in a certain position!

Cables

The cable cross sections are the same for all devices. The following table shows conductor cross sections, stripped lengths, and tightening torques of the cables for the removable terminals:

Table 13- 4 Cable cross sections, stripped lengths and tightening torques of the cables

Removable terminals	Screwdriver		Tightening torque
		PZ2 / Ø 5 to 6 mm	TORQUE: 7 to 10.3 LB.IN 0.8 to 1.2 Nm
	Stripped length		**Conductor cross section**
		Solid	2x 0.5 to 2.5 mm² / 1x 0.5 to 4 mm² 2x AWG 20 to 14 / 1x AWG 20 to 12
		Finely stranded with / without end sleeve	2x 0.5 to 1.5 mm² / 1x 0.5 - 2.5 mm² 2x AWG 20 to 16 / 1x AWG 20 to 14

Supplying the inputs of the basic unit

There are three possibilities for supplying the inputs:

- **a)**: 24 V DC internal
- **b)**: 24 V DC external. Input 3 is the reference potential, i.e. three inputs are available.
- **c)**: 24 V DC external. **Only possible for a basic unit with 24 V DC supply voltage!**

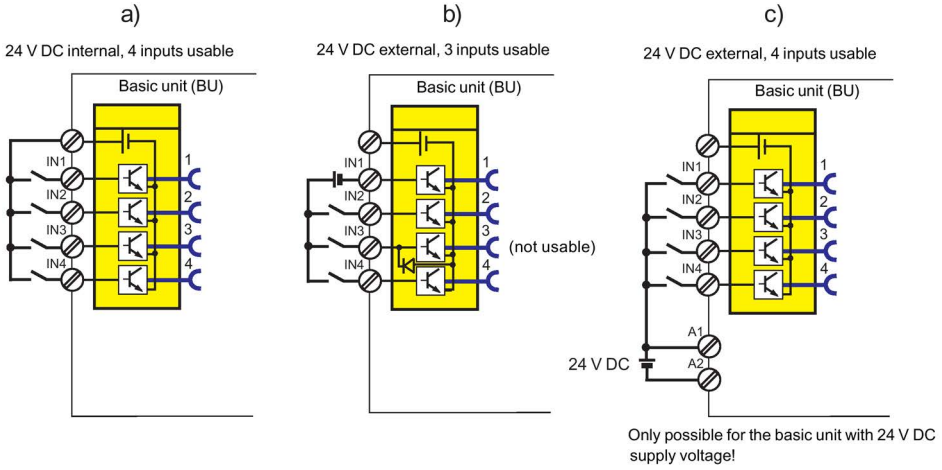


Figure 13-9 24 V DC for powering the inputs

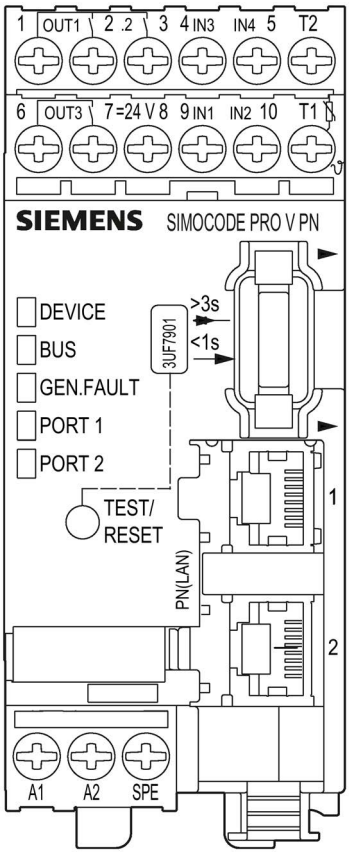
All inputs work reaction-free, i.e. the signal statuses on neighboring inputs do not influence each other.

Pin assignment of basic unit

The following table shows the pin assignments of the removable terminals:

Table 13- 5 Pin assignments of the removable terminals of the basic unit

Connection	Assignment
Upper terminals	
1	Common potential for relay outputs 1 and 2
2	Relay output OUT1
3	Relay output OUT2
4	Digital input IN3
5	Digital input IN4
T2	Thermistor connection (binary PTC)
6	Relay output OUT3
7	Relay output OUT3
8	24 V DC only for IN1 to IN4
9	Digital input IN1
10	Digital input IN2
T1	Thermistor connection (binary PTC)
Lower terminals	
A1	Supply voltage terminal 1
A2	Supply voltage terminal 2
PORT 1	PROFINET connection 1
PORT 2	PROFINET connection 2
SPE	System shielding



Pin assignment for the removable terminals of the basic unit

Proceed as follows:

Table 13- 6 Wiring the removable terminals of the basic unit

Step	Description
1	Connect the cables to the upper and lower terminals.
2	Connect the equipment shield to the SPE terminal.

Basic unit connection example

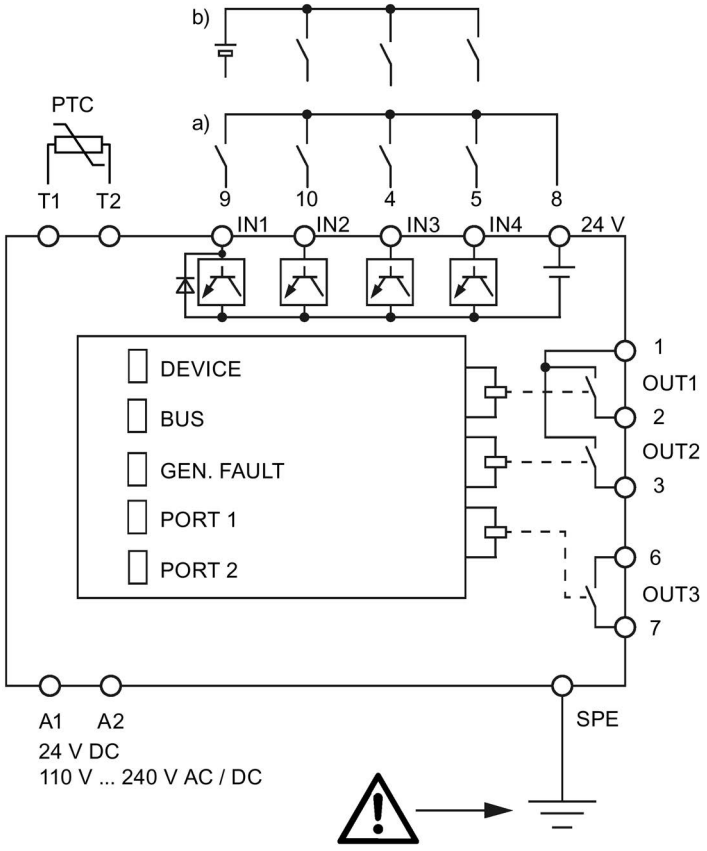


Figure 13-10 Basic unit connection example

Supplying the inputs of the digital module

- Digital module with 24 V DC input supply
- Digital module with 110 to 240 V AC / DC input supply

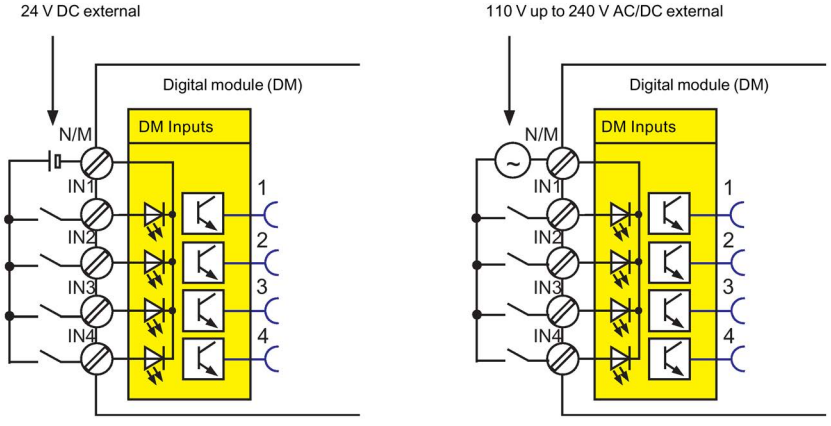
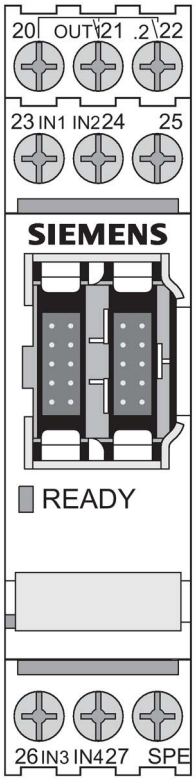


Figure 13-11 Supplying the inputs of the digital module

Digital module pin assignment

The following table shows the pin assignments of the removable terminals:

Table 13- 7 Pin assignments of the removable terminals of the digital module

Connection	Assignment	
Upper terminals		
20	Common potential for relay outputs 1 and 2	
21	Relay output OUT1	
22	Relay output OUT2	
23	Digital input IN1	
24	Digital input IN2	
25	N / M for IN1 to IN4	
Lower terminals		
26	Digital input IN3	
27	Digital input IN4	
SPE	System shielding	

Digital module connection example

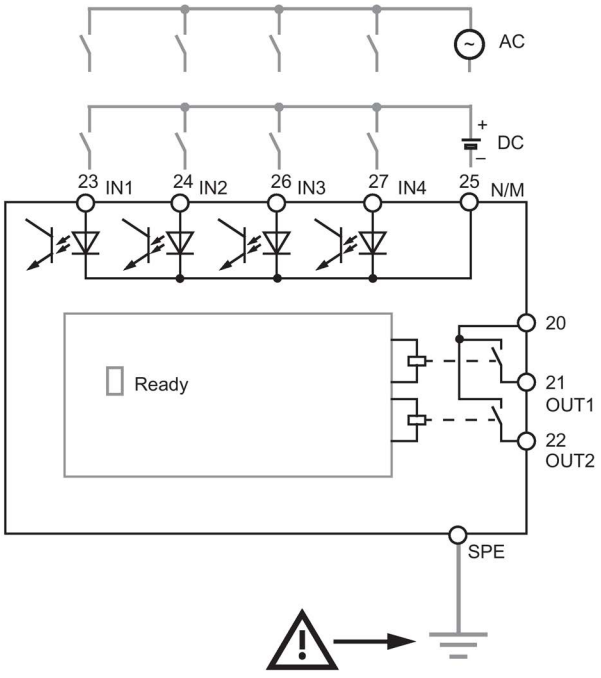
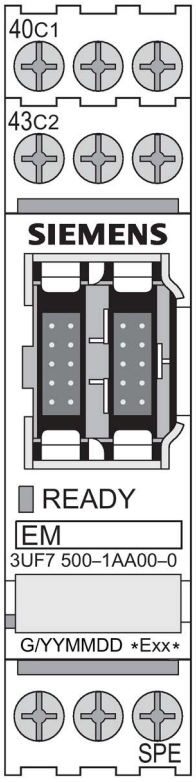


Figure 13-12 Digital module connection example

Ground-fault module pin assignment

The following table shows the pin assignments of the removable terminals:

Table 13- 8 Pin assignments of the removable terminals of the ground-fault module

Connection	Assignment	
Upper terminals		
40	Input C1 residual current transformer	
43	Input C2 residual current transformer	
Lower terminals		
SPE	System shielding	

NOTICE

Types of ground-fault module

The 3UF7 500-1AA00-0 ground-fault module requires the 3UL22 residual current transformer.

The 3UF7 510-1AA00-0 ground-fault module requires the 3UL23 residual current transformer.

Ground-fault module connection example

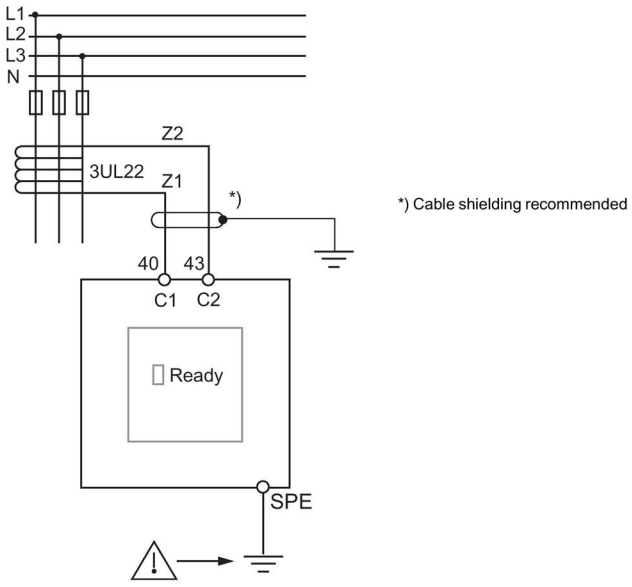


Figure 13-13 Ground-fault module connection example

The output signal of the 3UL22/3UL23 transformers is connected to terminals C1 and C2 of the corresponding ground-fault module.

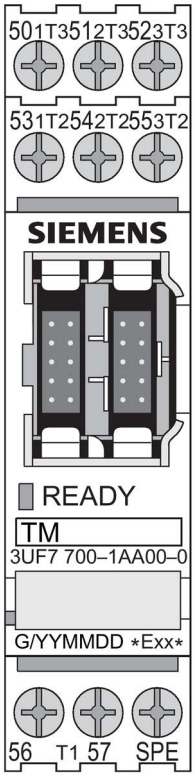
Information on installing the 3UL23 residual current transformer: See Manual "3UG4/3RR2 Monitoring Relay" (http://support.automation.siemens.com/WW/view/en/50426183/133300), Chapter 14.2.5.

NOTICE
Routing the connecting cables / using shielded cables To avoid interference injection, which could result in incorrect measurements, route these connecting cables parallel and twisted, if possible, or use shielded cables.

Temperature module pin assignment

The following table shows the pin assignments of the removable terminals:

Table 13- 9 Pin assignments of the removable terminals of the temperature module

Connection	Assignment	
Upper terminals		
50	Input T3, temperature sensor 1	
51	Input T3, temperature sensor 2	
52	Input T3, temperature sensor 3	
53	Input T2, temperature sensor 1	
54	Input T2, temperature sensor 2	
55	Input T2, temperature sensor 3	
Lower terminals		
56	Input T1, temperature sensor 1 to 3	
57	Input T1, temperature sensor 1 to 3	
SPE	System shielding	

You can connect up to three 2-wire or three 3-wire temperature sensors.

- 2-wire temperature sensors: Connect a jumper between the T2 terminals and T3 terminals.
- 3-wire temperature sensors: Assign terminals 56 and 57 twice when three sensors are used.

Temperature module connection example

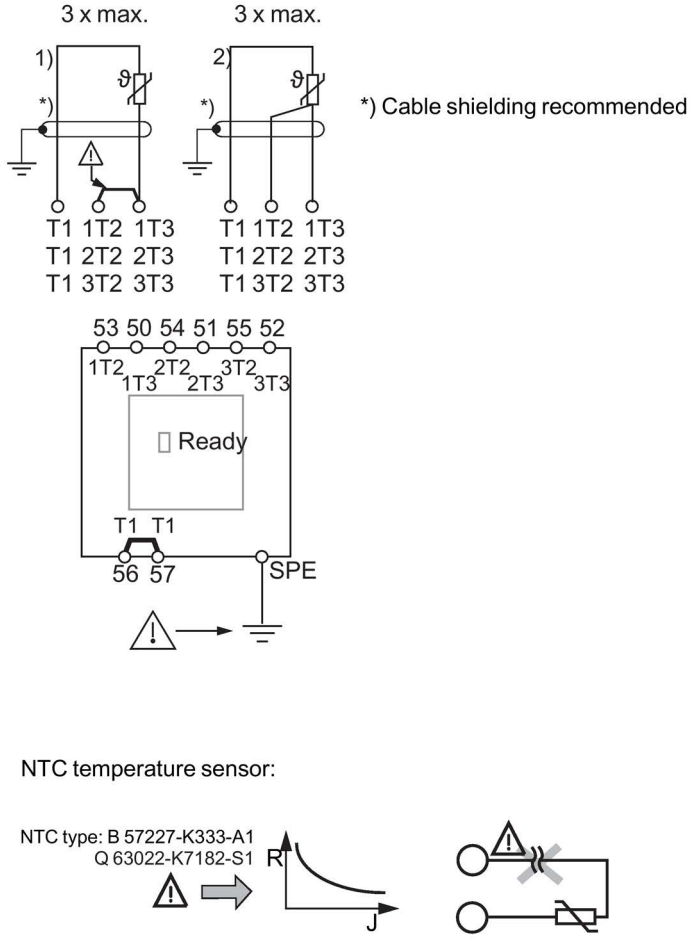
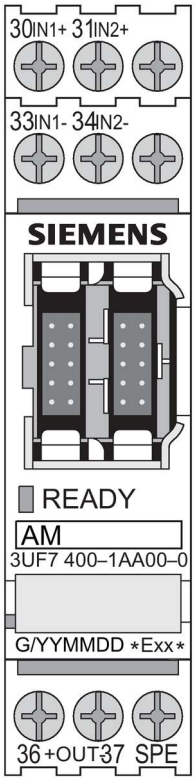


Figure 13-14 Temperature module connection example

Analog module pin assignment

The following table shows the pin assignments of the removable terminals:

Table 13- 10 Pin assignments of the removable terminals of the analog module

Connection	Assignment	
Upper terminals		
30	Analog input IN1+	
31	Analog input IN2+	
33	Analog input IN1+	
34	Analog input IN2+	
Lower terminals		
36	Analog output OUT+	
37	Analog output OUT+	
SPE	System shielding	

Analog module connection example

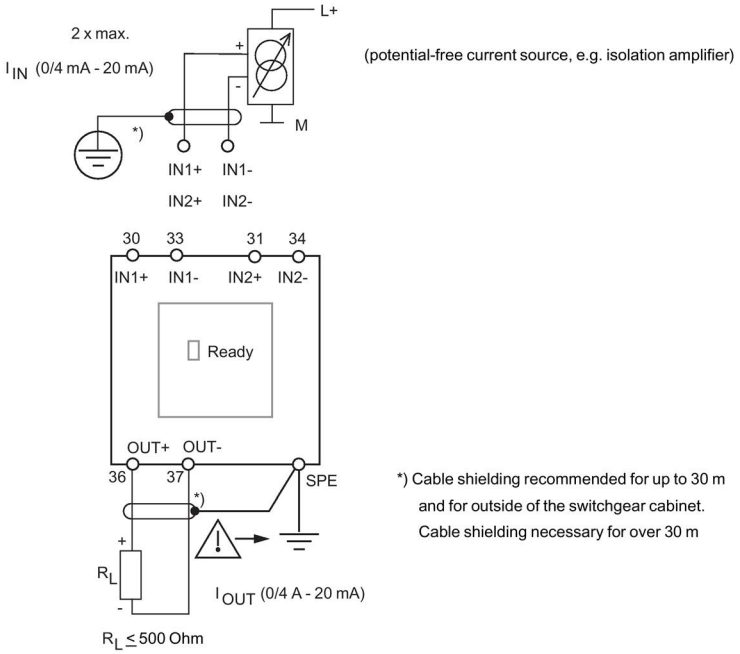
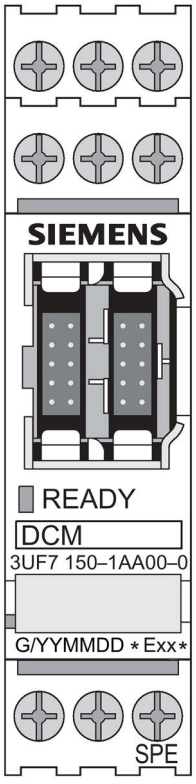


Figure 13-15 Analog module connection example

Decoupling module pin assignment

The following table shows the pin assignments of the removable terminals:

Table 13- 11 Pin assignments of the removable terminals of the decoupling module

Connection	Assignment	
Upper terminals		
—		
Lower terminals		
SPE	System shielding	

Decoupling module connection example

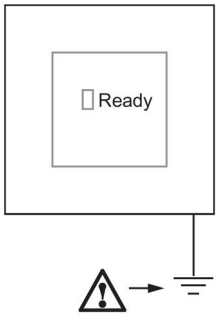


Figure 13-16 Circuit diagram of decoupling module

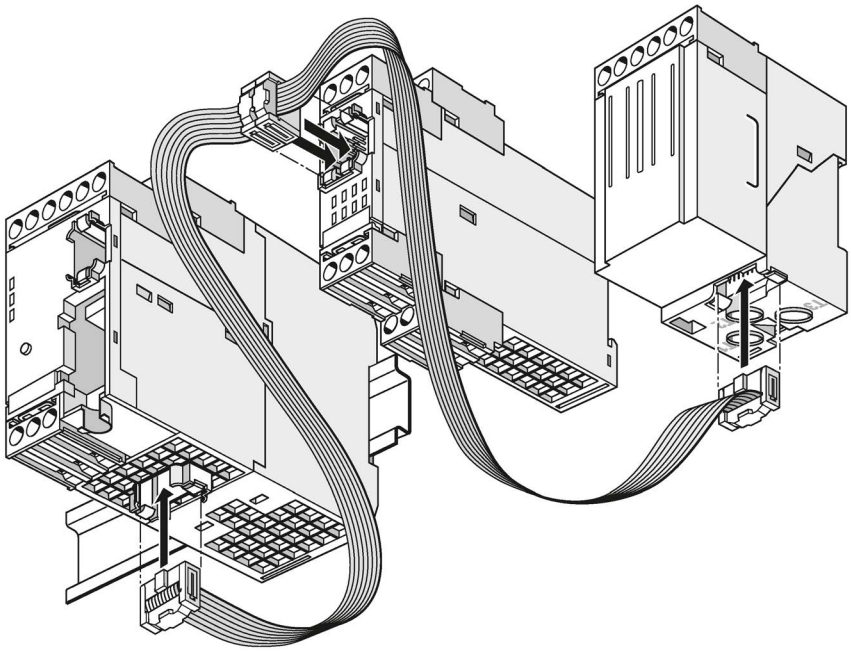


Figure 13-17 Decoupling module - configuration with basic unit and current / voltage measuring module

Wiring the removable terminals of the expansion modules and the decoupling module

Connect the equipment shield to the SPE terminal.

13.3.2 Digital modules DM-F Local and DM-F PROFIsafe

Wiring

See "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852), Chapter "Mounting and connection."

⚠ WARNING
Loss of safety function is possible
For the 24 V DC power supply, always use an SELV or PELV power supply unit!

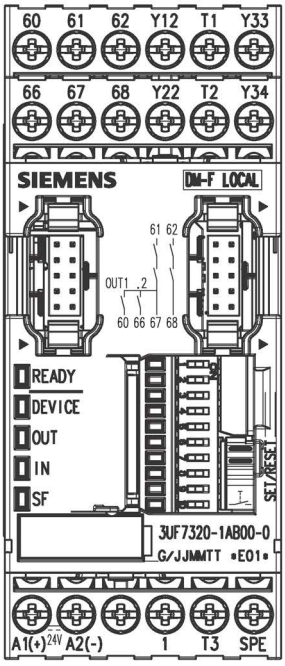
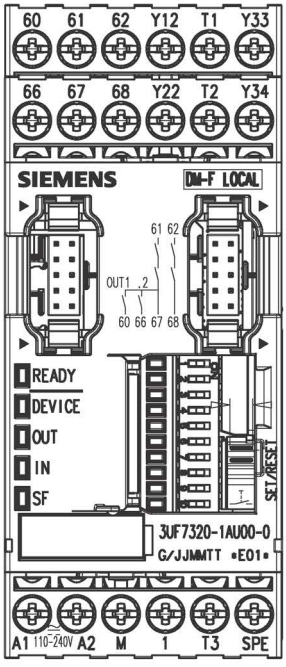
Note

Surge suppressors are required for inductive loads.

Pin assignment for digital module DM-F Local

The following table shows the pin assignments of the removable terminals:

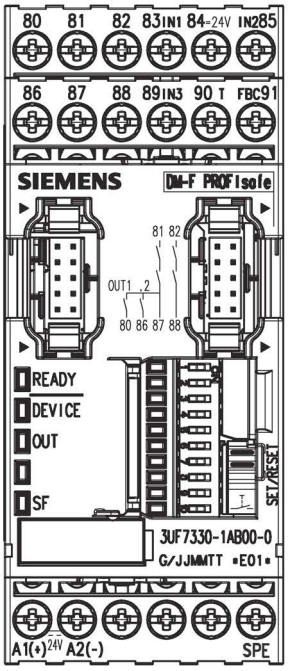
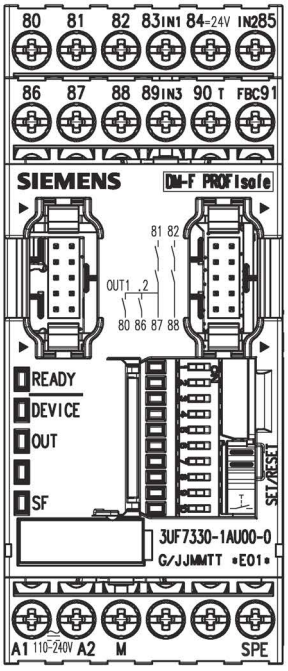
Table 13- 12 Terminal assignment of the removable terminals of the DM-F Local digital module, 24 V DC version and 110 to 240 V UC version

Connection	Assignment	
Upper terminals		
60, 66	Digital module, relay outputs 1 (60) and 2 (66)	
61, 67	Relay enabling circuit 1, NO	
62, 68	Relay enabling circuit 2, NO	
Y12, Y22	Sensor input channel 1, channel 2	
T1, T2	Supply for sensor inputs (24 V DC, pulsed)	
Y33	Start button (start after rising and falling edge)	
Y34	Feedback circuit	
Lower terminals		
A1 (+)	Power supply connection 110 to 240 V AC/DC or +24 V DC	
A2 (-)	N or -24 V	
M	Ground (reference potential for sensor inputs, 3UF7320-1AU00-0 only)	
1	Cascade input	
T3	Supply for sensor inputs (24 V DC, static)	
SPE	System shielding	

Pin assignment for digital module DM-F PROFIsafe

The following table shows the pin assignments of the removable terminals:

Table 13- 13 Pin assignment of the removable terminals of the DM-F PROFIsafe digital module, 24 V DC version and 110 to 240 V UC version

Connection	Assignment	
Upper terminals		
80, 86	Digital module, relay outputs 1 (80) and 2 (86)	
81, 87	Relay enabling circuit 1, NO	
82, 88	Relay enabling circuit 2, NO	
83 (IN1) 85 (IN2) 89 (IN3)	Digital module, inputs 1, 2, 3	
84	Digital module supply, inputs 1 to 3, 24 V DC	
90 (T)	Feedback circuit supply (FBC) 24 V DC	
91 (FBC)	Feedback circuit	
Lower terminals		
A1 (+)	Power supply connection 110 to 240 V AC/DC or +24 V DC	
A2 (-)	N or -24 V	
M	Ground (reference potential inputs, only 3UF7320-1AU00-0)	
1	Cascade input	
T3	Supply for sensor inputs (24 V DC, static)	
SPE	System shielding	

Digital module DM-F Local connection example

DM-F Local with cross-circuit detection, 2 NCs, 2 channels, monitored start

WARNING

Fuse protection required!

Always install the prescribed fuse protection.

This ensures safe tripping in the event of a fault.

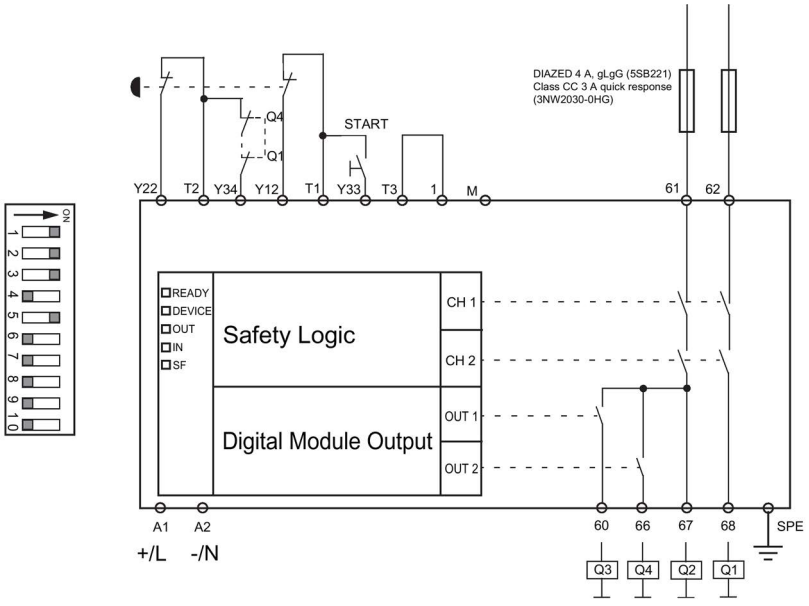


Figure 13-18 Connection example for "DM-F Local with cross-circuit detection, 2 NCs, 2 channels, monitored start"

For further connection examples: See "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852)

Digital module DM-F PROFIsafe connection example

WARNING

Fuse protection required!

Always install the prescribed fuse protection.

This ensures safe tripping in the event of a fault.

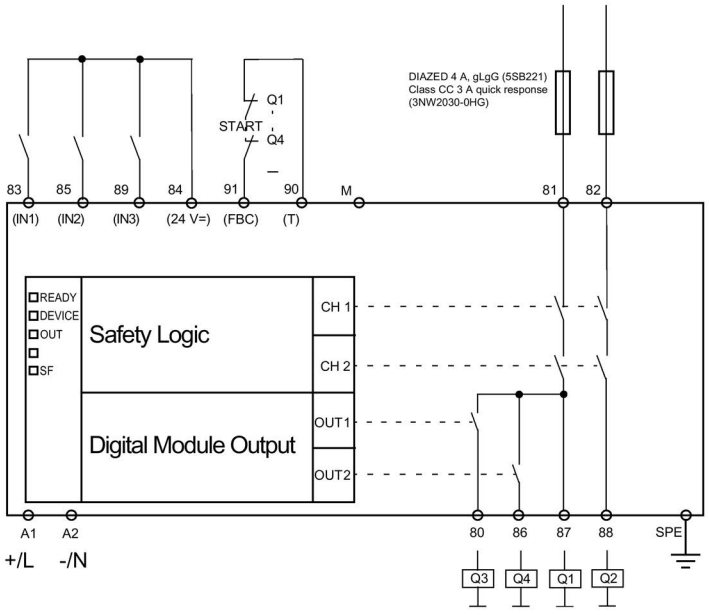


Figure 13-19 Block diagram of DM-F PROFIsafe

Connection examples: See "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852)

13.3.3 Current measuring module

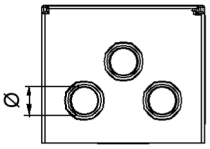
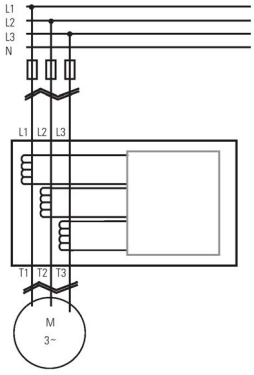
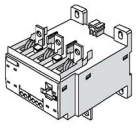
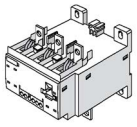
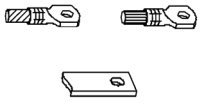
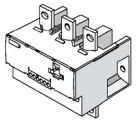
Selection

Select the appropriate current measuring module according to the motor current:

- Through-hole technology up to 200 A: The cables of the three phases are passed through the feed-through openings.
- Bus connection system from 20 A to 630 A, also for direct connection to Siemens contactors.

The following table shows the various current measuring modules:

Table 13- 14 Current measuring modules

Current measuring module		Main circuit connection	
3UF7100-1AA00-0, 0.3 to 3 A Ø feed-through openings: 7.5 mm		Through-hole technology 	
3UF7101-1AA00-0, 2.4 to 25 A Ø feed-through openings: 7.5 mm			
3UF7102-1AA00-0, 10 - 100 A Ø feed-through openings: 14 mm			
3UF7103-1AA00-0, 20 to 200 A Ø feed-through openings: 25 mm			
3UF7103-1BA00-0, 0 to 200 A Conductor cross section: 16 to 95 mm², AWG 5 to 3/0		Bus connection system 	
3UF7104-1BA00-0, 63 to 630 A Conductor cross section: 50 to 240 mm², AWG 1/0 to 500 kcmil			

Note

When connecting or routing the cables of the individual phases of the main circuit, ensure correct assignment of the phases on the current measuring module and correct routing direction!

Please note the information in the operating instructions. You will also find the operating instructions for SIMOCODE pro at Manuals/operating instructions (http://www.siemens.com/sirius/manuals)

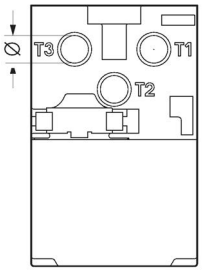
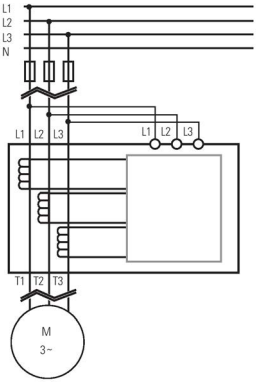
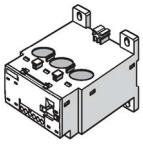
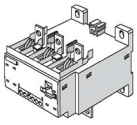
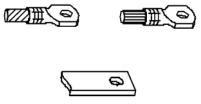
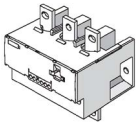
13.3.4 Current / voltage measuring modules

Select the appropriate current / voltage measuring module according to the motor current.

- Through-hole technology up to 200 A: The cables of the three phases are passed through the feed-through openings.
- Bus connection system from 20 A to 630 A, also for direct connection to Siemens contactors.

The following figure shows the various current / voltage measuring modules:

Table 13- 15 Current / voltage measuring modules

Current / voltage measuring module		Main circuit connection	
3UF7110-1AA00-0, 0.3 - 3 A Ø feed-through openings: 7.5 mm		Through-hole technology 	
3UF7111-1AA00-0, 2.4 - 25 A, Ø feed-through openings: 7.5 mm			
3UF7112-1AA00-0, 10 - 100 A Ø feed-through openings: 14 mm			
3UF7113-1AA00-0, 20 - 200 A Ø feed-through openings: 25 mm			
3UF7113-1BA00-0, 20 to 200 A Conductor cross section: 16 to 95 mm², AWG 5 to 3/0		Bus connection system 	
3UF7114-1BA00-0, 63 to 630 A Conductor cross section: 50 to 240 mm², AWG 1/0 to 500 kcmil			

Safety information

Note

Measurement of voltage or power-related variables

Connect the main circuit L1, L2, L3 of a current / voltage measuring module to the clamps (L1, L2, L3) of the removable terminal with a 3-core cable. The supply cables may require additional cable protection, for example, via short-circuit proof cable or fuses.

Note

Routing of cables

When connecting or routing the cables of the individual phases of the main circuit, ensure correct assignment of the phases on the current / voltage measuring module and correct routing direction! Please note the information in the operating instructions.

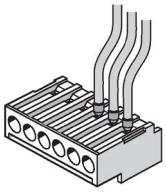
You will also find the operating instructions for SIMOCODE pro at Manuals/operating instructions (http://www.siemens.com/sirius/manuals)

Removable terminals

The following table shows cable cross sections, stripped lengths and tightening torques of the cables for the removable terminals:

The following figure shows the pin assignment of the removable terminals:

Table 13- 16 Cable cross sections, stripped lengths and tightening torques of the cables

Removable terminals	Screwdriver		Tightening torque
		PZ2 / Ø 5 to 6 mm	TORQUE: 7 to 10.3 LB.IN 0.8 to 1.2 Nm
	Stripped length		**Conductor cross section**
		Solid	2x 0.5 to 2.5 mm² / 1x 0.5 to 4 mm² 2x AWG 20 to 14 / 1x AWG 20 to 12
		Finely stranded with / without end sleeve	2x 0.5 - 1.5 mm² / 1x 0.5 - 2.5 mm² 2x AWG 20 to 16 / 1x AWG 20 to 14

The following figure shows the pin assignment of the removable terminals:

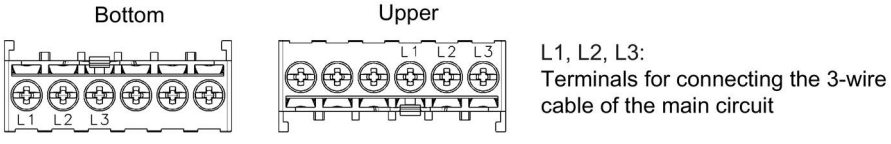


Figure 13-20 Pin assignment of the terminals of the current / voltage measuring modules

13.3.5 Measuring current with an external current transformer (interposing transformer)

Description

SIMOCODE pro can be operated with external current transformers. The secondary cables of the current transformer are looped through the three feed-through openings of the current measuring module, and short-circuited. The secondary current of the external current transformer is the primary current of the SIMOCODE pro current measuring module.

Note

If the main circuit is using rated current, the secondary current of the current transformer must be within the setting range of the current measuring module used!

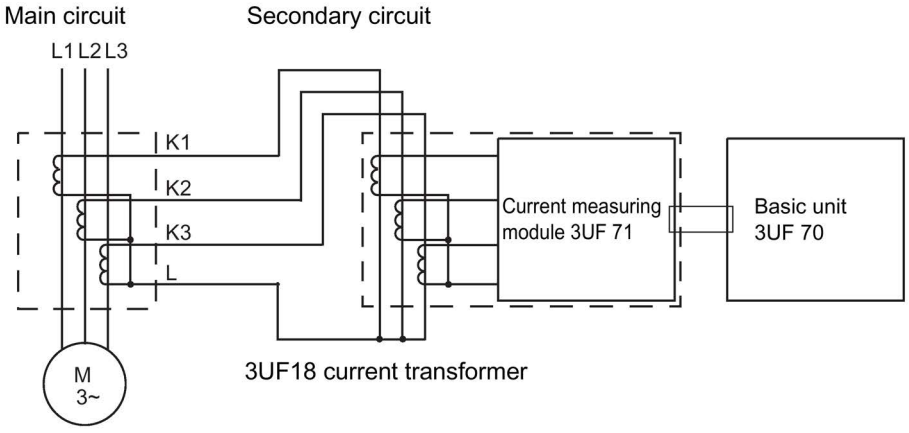


Figure 13-21 Measuring current with an external 3UF18 current transformer

Transformation ratio

The transformation ratio is calculated using the following formula:

$$\text{Transformation ratio} = \frac{\text{Primary current (external current transformer)}}{\underset{\text{(ext. current transformer)}}{\text{Secondary current}} \times \underset{\text{(current measuring module)}}{\text{number of loops n}}}$$

In the following examples, the displayed actual current flowing does not need to be converted, even when an interposing transformer is used, since SIMOCODE pro only outputs the proportional value, based upon the parameterized set current I_s.

Technical data of the current transformer

- Secondary current: 1 A
- Frequency: 50 Hz/60 Hz
- Transformer rating: Recommended ≥ 2.5 VA, depending on the secondary current and cable length
- Overcurrent factor: 5P10 or 10P10
- Accuracy class: 1

Example 1

- 3UF1868-3GA00 current transformer:
  - Primary current: 820 A at nominal load
  - Secondary current: 1 A.
- SIMOCODE pro with 3UF7100-1AA00-0 current measuring module, set current 0.3 A to 3 A. This means:
  - The secondary current of the current transformer is 1 A at rated load and is, therefore, within the 0.3 to 3 A setting range of the current measuring module used
  - The set current I_s to be parameterized in SIMOCODE pro is 1 A.

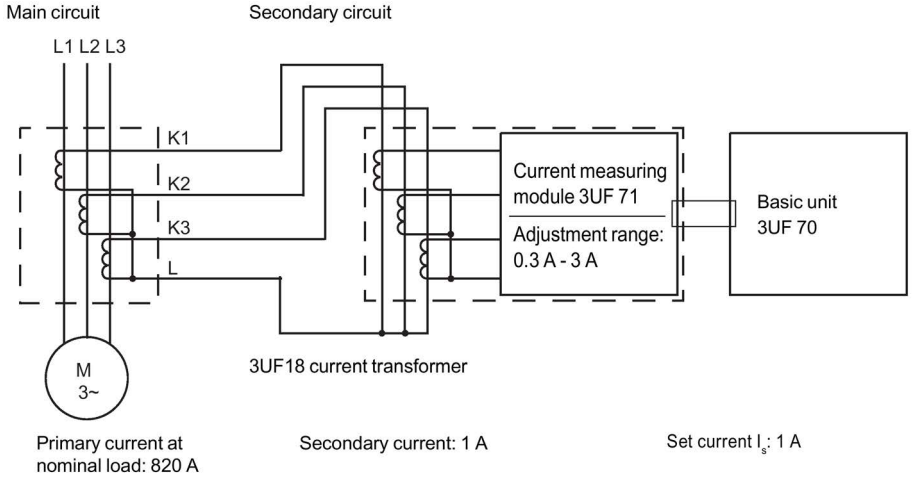


Figure 13-22 Example (1 of 2) for measuring current with an 3UF18 external current transformer

Example 2

- 3UF1868-3GA00 current transformer:
  - Primary current: 205 A at nominal load
  - Secondary current: 0.25 A.
- SIMOCODE pro with 3UF7100-1AA00-0 current measuring module, set current 0.3 to 3 A. This means:
  - The secondary current of the current transformer is 0.25 A at rated load and is, therefore, **not** within the 0.3 to 3 A setting range of the current measuring module used.
  - The secondary current must be boosted by multiple looping of the secondary cables through the feed-through openings of the current measuring module. Double-looping results in 2 x 0.25 A = 0.5 A.
  - The set current I_s to be parameterized in SIMOCODE pro is 0.5 A.

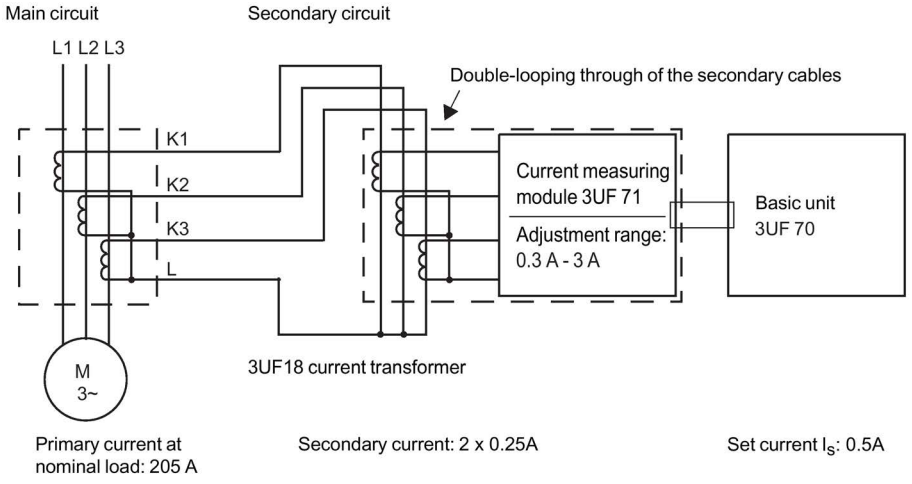


Figure 13-23 Example (2 of 2) for measuring current with an external 3UF18 current transformer

13.4 System interfaces

13.4.1 General

Information about the system interfaces

- SIMOCODE pro system components are connected to each other via the system interfaces. The system interfaces are provided on the front and bottom of the devices.
- Connecting cables of different lengths are available for connecting the system components.
- The PC cables and memory modules can be plugged directly into the system interface.
- The system is always configured according to the basic unit. Basic units have two system interfaces:
  - Lower/left: For outgoing connecting cable to the current measuring module.
  - Front side: For outgoing connecting cables leading to an expansion module or operator panel, or for PC cables, memory modules or addressing plugs.
- Current measuring modules have one system interface:
  - Bottom or front: Incoming connecting cable from the basic unit.
- Expansion modules have 2 interfaces on the front.
  - Left: For incoming connecting cables from the upstream expansion module or basic unit SIMOCODE pro V.
  - Right: For outgoing connecting cables leading to an expansion module or operator panel, and for PC cables, memory modules or addressing plugs.
- Decoupling modules have 2 interfaces on the front:
  - Left: For incoming connecting cable from the upstream expansion module or basic unit.
  - Right: Exclusively for the outgoing connecting cable to the current / voltage measuring module.
- Operator panels have two system interfaces:
  - Front side: For PC cables and memory modules
  - Rear side: For incoming connecting cable from the upstream expansion module or basic unit.
- System interfaces not in use are closed with the cover (see Closing the system interfaces with the system interface cover (Page 480)).

⚠ WARNING
Hazardous voltage Connect the system interfaces only when they are fully de-energized!

13.4.2 System interfaces on basic unit, expansion modules, decoupling module, current measuring modules and current / voltage measuring modules

Examples of connection of system components to the system interface and system structure

Use the system interface cover to close system interfaces which are not in use (see closure of system interfaces by means of the system interface cover Closing the system interfaces with the system interface cover (Page 480).

⚠ WARNING

System interface on the operator panels (degree of protection IP54):

To ensure degree of protection IP 54

- Press the cover firmly into the socket as far as it will go when it is used for the first time!
- When fastening the operator panel with the screws supplied, do not apply an excessive tightening torque.

⚠ WARNING

Hazardous voltage

Connect the system interfaces only when they are fully de-energized!

The following figure shows an example of connecting system components to the system interfaces - SIMOCODE pro V PN

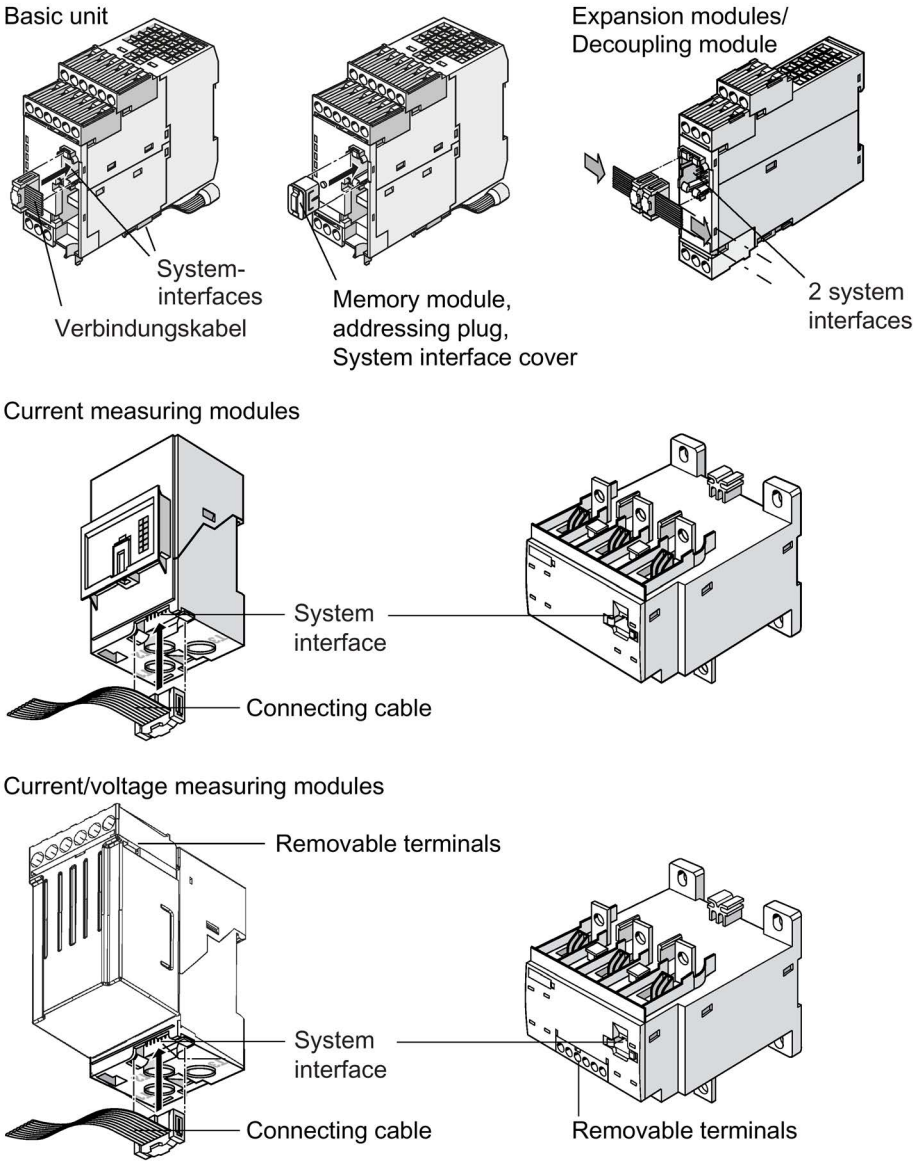


Figure 13-24 Connecting system components to the system interface

Sequence for connecting cables to the system interface

Proceed as follows:

Table 13- 17 Connecting to the system interface

Step	Description
1	Place the plug in the plug shaft, keeping it is as straight as possible. Ensure the locking mechanisms of the connector slot audibly snap onto the connector enclosure.
2	System interfaces not in use can be closed using the system interface cover.

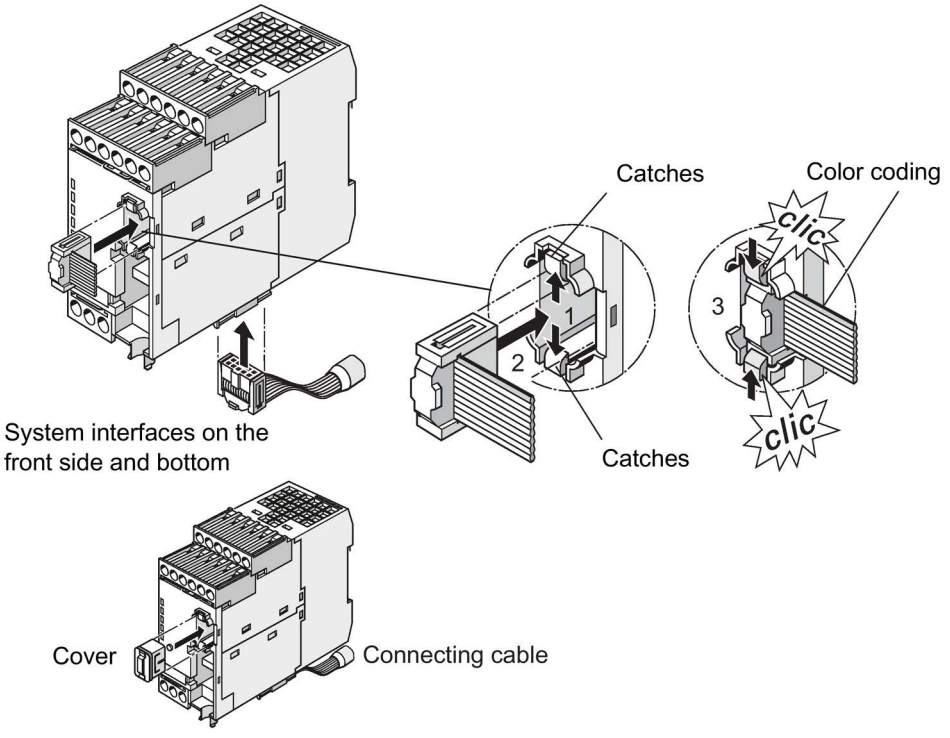


Figure 13-25 Procedure for connecting cables to the system interfaces

Safety information

Note

Only a current / voltage measuring module may be connected to the system interface on the right of the decoupling module. Memory modules, addressing plugs or PC cables will not be recognized there.

Note

Observe the color coding of the connecting cable (see diagram).

13.4.3 System interfaces on the digital modules DM-F Local and DM-F PROFIsafe

See System Manual "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852), Chapter "Mounting and connection."

13.4.4 System interfaces on the operator panel and the operator panel with display

The operator panel has two system interfaces:

- Rear system interface. This is not normally accessible on an integrated operator panel. The incoming cable from the basic unit or expansion module is always connected here.
- Front system interface. This is normally accessible on an integrated operator panel. Components are only connected directly when needed, and removed again after use. These can be:
  - Memory module
  - PC cable for connecting a PC / PG
  - Cover (if the system interface is not in use).

⚠ WARNING

Hazardous voltage

Connect the system interfaces only when they are fully de-energized!

⚠ WARNING

System interface on the operator panels (degree of protection IP54)

To ensure degree of protection IP54

- Press the cover firmly into the socket as far as it will go when it is used for the first time!
- When fastening the operator panel with the screws supplied, do not apply an excessive tightening torque.

Sequence for connecting cables to the system interface of the operator panel and the operator panel with display

Proceed as follows:

Table 13- 18 Connecting system components to the system interface

Step	Description
1	Place the plug in the plug shaft, keeping it is as straight as possible. Ensure the locking mechanisms of the connector slot audibly snap onto the connector enclosure. The incoming connecting cable is connected on the rear.
2	Use the cover to close system interfaces that are not in use

Note

Throughout connection, you can place the cover on one of the two "park positions" (see figure below).

Note

Observe the color coding of the connecting cable (see diagram).

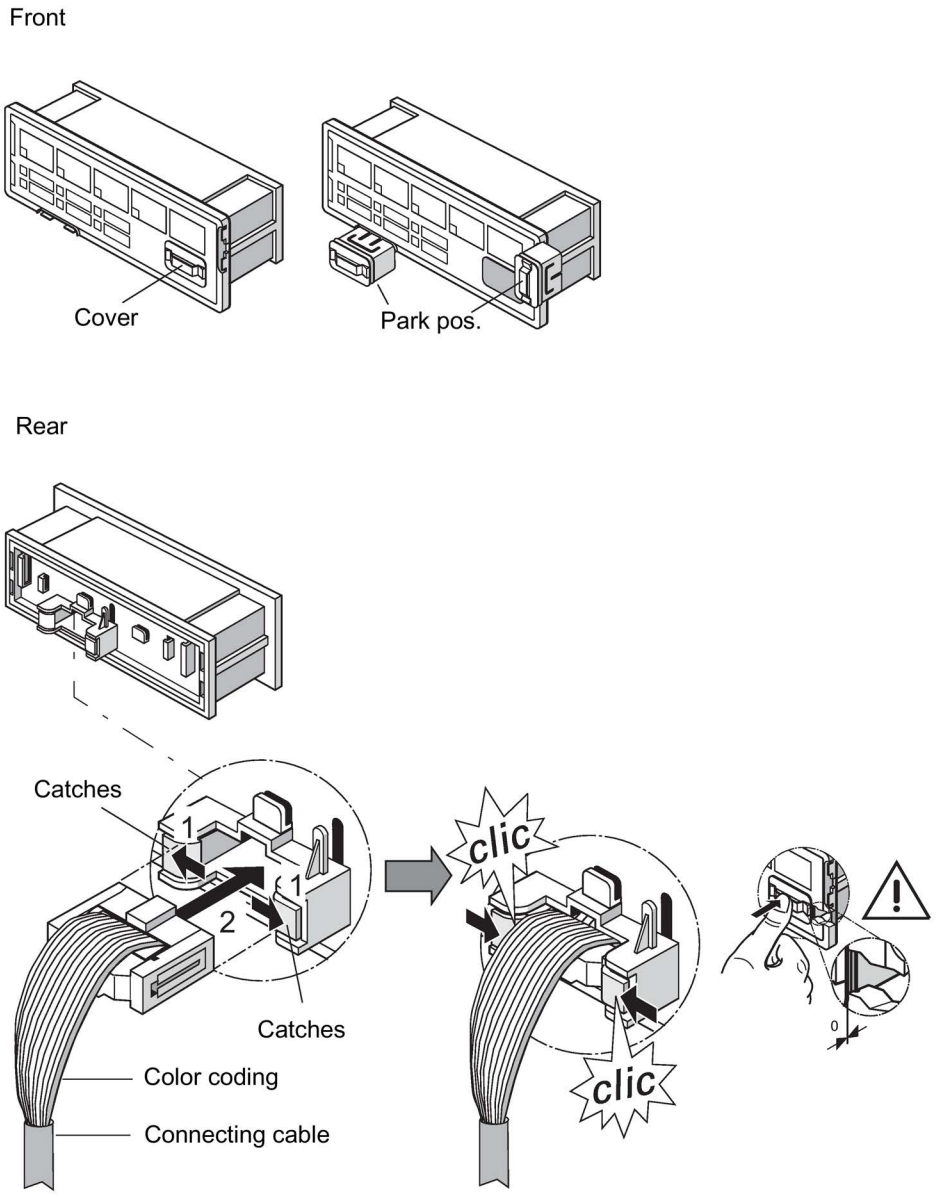


Figure 13-26 Sequence for connecting cables to the system interface of the operator panel

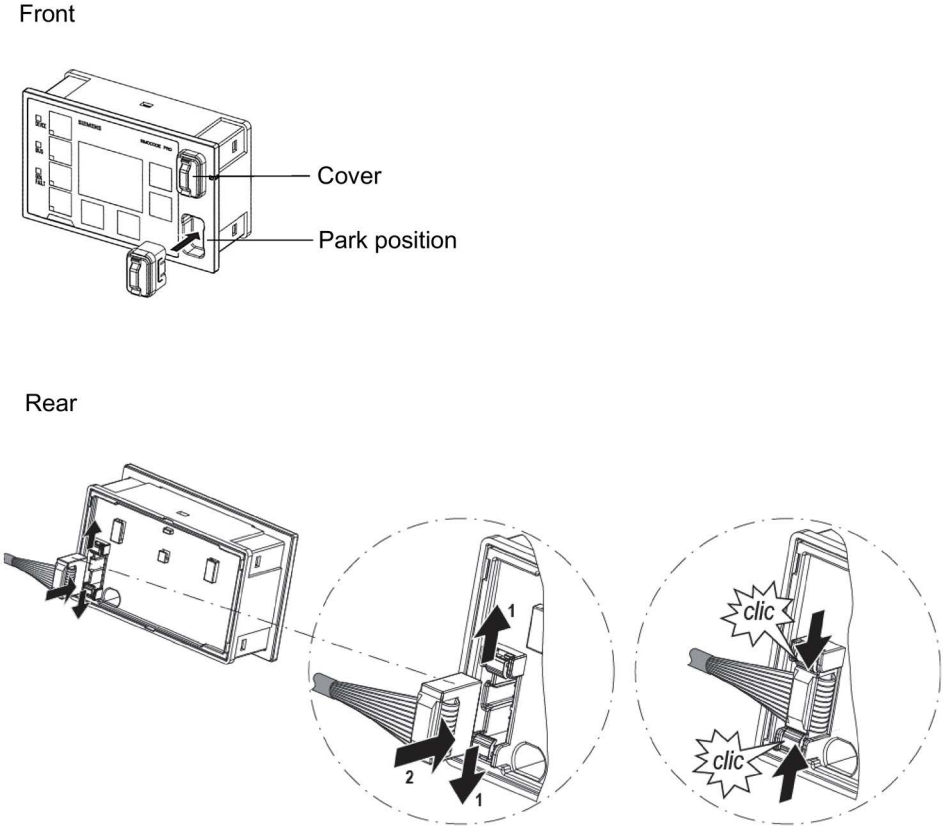


Figure 13-27 Sequence for connecting cables to the system interface of the operator panel with display

13.4.5 Closing the system interfaces with the system interface cover

Examples of closing the system interface with the system interface cover

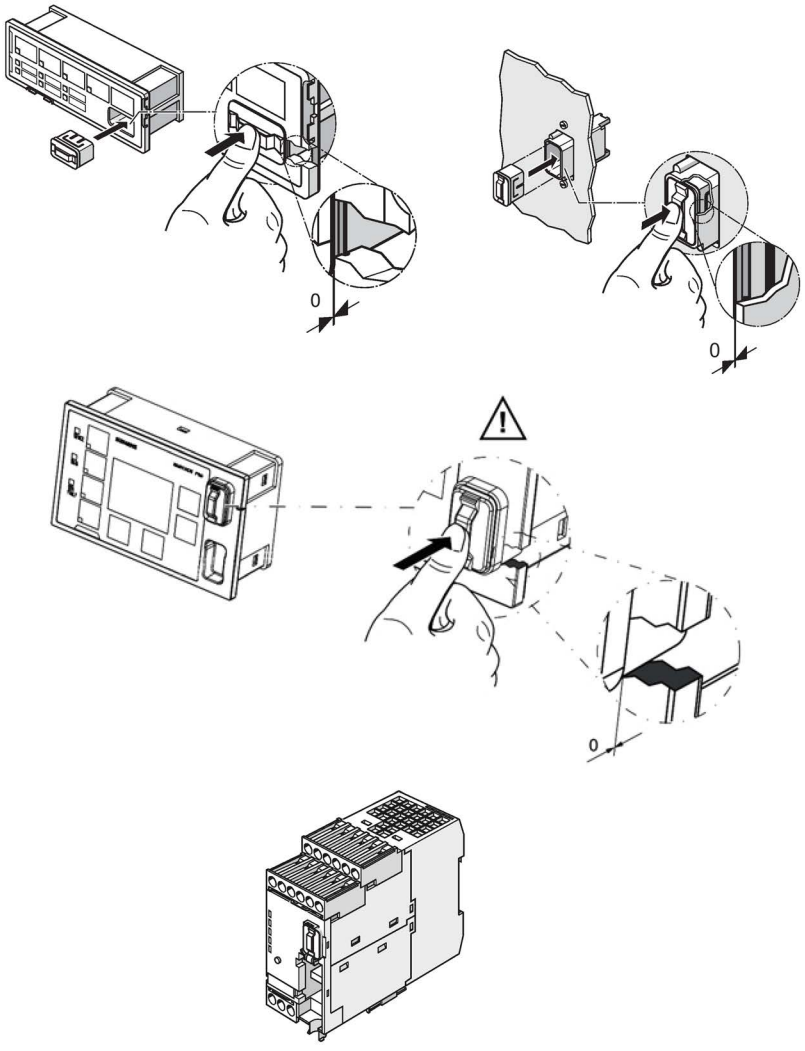


Figure 13-28 Examples of closing the system interface with the system interface cover

WARNING

System interface on the operator panels (degree of protection IP54):

To ensure degree of protection IP 54

- Press the cover firmly into the socket as far as it will go when it is used for the first time!
- When fastening the operator panel with the screws supplied, do not apply an excessive tightening torque.

13.4.6 Ethernet cable to RJ45 socket

The ETHERNET cable is connected to the basic unit.

NOTICE
Ethernet connector Connect using only industrial Ethernet connectors, e.g. • Siemens IE FC RJ45 PLUG 180 2x2, RJ45 connector (10/100MBIT/S) with robust metal housing and Fast Connect connection method, for IE FC Cable 2x2 180° cable outlet, order number 6GK1901-1BB10-2AA0 or • Siemens IE FC RJ45 PLUG 90 2x2, RJ45 connector (10/100MBIT/S) with robust metal housing and Fast Connect connection method, for IE FC Cable 2x2 90° cable outlet, order number 6GK1901-1BB20-2AA0.

Sequence for connecting ETHERNET to the basic unit

Proceed as follows:

Table 13- 19 Connecting the ETHERNET cable to the basic unit

Step	Description
1	Connect the Ethernet cable to the Ethernet interface 1 and/or Ethernet interface 2

The following connection options are available:

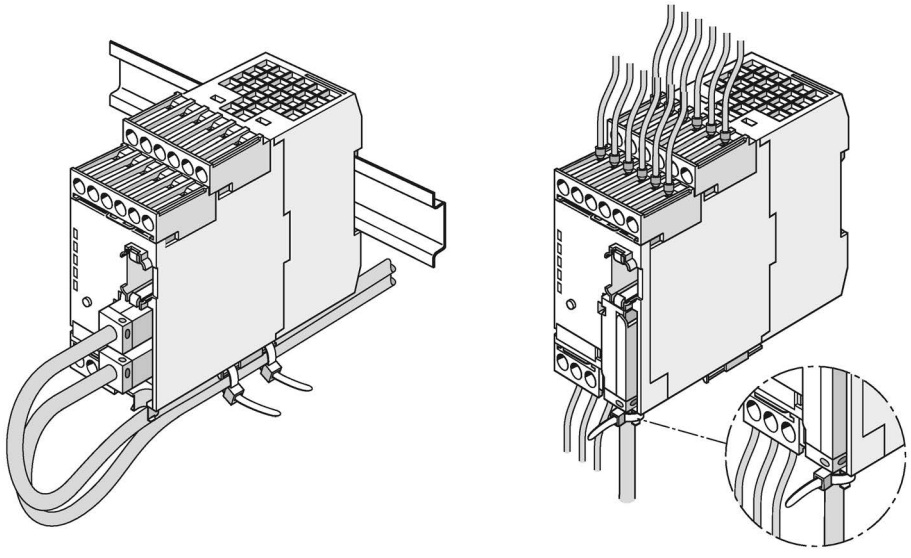


Figure 13-29 Connecting the Ethernet cable to the basic unit

- with connector IE FC RJ45 Plug 180 on interface 1 and/or interface 2 (left)
- with connector IE FC RJ45 Plug 90 on interface 1 (right).

13.4.7 Installation guidelines for the PROFINET

PROFINET installation guidelines

Please also note the PROFINET installation guidelines of the PROFIBUS user organization. These contain important information about planning, installing, and commissioning PROFINET networks.

Publisher:

PROFIBUS-Nutzerorganisation e. V.
Haid-und-Neu-Strasse 7
76131 Karlsruhe / Germany
Phone: ++49 721 965 85 90
Fax: ++49 721 965 85 89
Internet: PI - PROFIBUS & PROFINET International Home (http://www.profibus.com)

PROFINET installation guidelines:

- PROFINET planning
  Version: 1.04
  Order No.: 8.061
  Language: German
- PROFINET installation
  Version: 1.0
  Order No.: 8.071
  Language: German
- PROFINET commissioning
  Version: 1.01
  Order No.: 8.081
  Language: German
- PROFINET commissioning
  Checklist version: 1.01
  Order No.: 8.091
  Language: German.

For an overview of the structure and configuration of Industrial Ethernet networks with SIMATIC NET: See also "Industrial Ethernet Networking Manual" system manual (http://support.automation.siemens.com/WW/view/en/27069465)

Further information

See "SIMATIC NET PROFIBUS Networks" manual (http://support.automation.siemens.com/WW/view/en/1971286)

Commissioning and service

14

In this chapter

In this chapter, you will find information about how SIMOCODE pro is commissioned, how components are replaced and how statistics are read.

Target groups

This chapter addresses the following target groups:

- Commissioning engineers
- Technicians
- Service and maintenance personnel

Required knowledge

You will require the following knowledge:

- Basic general knowledge about SIMOCODE pro
- Parameterization with SIMOCODE ES

14.1 General information about commissioning and service

Safety information

⚠ WARNING

Hazardous voltage!

Can cause electric shock and burns.

Before starting work, disconnect the system and the device from the power supply.

Note

Please also observe the following SIMOCODE pro operating instructions (enclosed with the devices):

Table 14- 1 SIMOCODE pro operating instructions

Device	Order No.
Basic unit	3ZX1012-0UF70-3AA1
Operator panel	3ZX1012-0UF72-1AA1
Operator panel adapter	3ZX1012-0UF78-2BA1
Operator panel with display	3ZX3012-0UF72-2AA1
Digital module	3ZX1012-0UF73-1AA1
DM-F Local fail-safe digital module	3ZX1012-0UF73-1BA1
DM-F PROFIsafe fail-safe digital module	3ZX1012-0UF73-3BA1
Expansion modules	3ZX1012-0UF75-1BA1
Current measuring module	3ZX1012-0UF71-1AA1
Current / voltage measuring module	3ZX1012-0UF77-1BA1
Door adapter	3ZX1012-0UF78-1AA1
Decoupling module	3ZX1012-0UF71-5BA1
Initialization module	3ZX1012-0UF70-2AA1
You will also find the operating instructions for SIMOCODE pro at Manuals/operating instructions (http://www.siemens.com/industrial-controls/manuals)	

Requirements

The following requirements must be fulfilled for commissioning and servicing:

- SIMOCODE pro is already installed and wired
- The motor is switched off.

Parameterization methods

You can parameterize SIMOCODE pro as follows:

- With the memory module in which the parameters have already been saved from a basic unit. The memory module is plugged into the system interface. If the memory module is connected to the system interface and the supply voltage returns to the basic unit, the basic unit will be automatically parameterized by the memory module. The parameters can also be downloaded to the basic unit from the memory module by brief actuation of the TEST / RESET button.
- With the SIMOCODE ES software via serial or USB interface: The PC / PG is connected to the system interface with a PC cable.
- With an automation system and/or the SIMOCODE ES software via PROFINET: For this purpose, the Ethernet cable is connected to Ethernet interface 1 or 2 of the basic unit or to another free Ethernet interface in the network from which the basic unit can be accessed via PROFINET (e.g. to a free RJ-45 socket of a switch).
- With the initialization module in which the parameters have already been saved from a basic unit. The initialization module is permanently installed in the switchboard in a Motor Control Center (MCC). If a withdrawable unit with a SIMOCODE pro V PN basic unit is inserted into the MCC and the power supply returns to the basic unit, it will automatically be parameterized by the initialization module.

Commissioning options

There are two commissioning options:

1. Standard case: SIMOCODE pro has not yet been parameterized and has the factory setting
2. SIMOCODE pro has already been parameterized:
   - The parameters have already been loaded into the basic unit.
   - The parameters from a previous application still exist. Test whether the PROFINET parameters (IP parameters, device name) and the device parameters, such as current setting are correct for the new application. Change these accordingly, if necessary.

14.2 Commissioning

14.2.1 Step sequence

Please observe the information in Chapter General information about commissioning and service (Page 484).

To commission SIMOCODE pro, proceed as follows:

Table 14- 2 Commissioning the basic unit

Step	Description
1	Switch on the power supply. In a fault-free state, the following LEDS should light up green: • "Device" (lights up) • "PORT 1 / PORT 2" when the PROFINET cable is connected (lighted or flashing). Continue with step 2. Otherwise, carry out diagnostics according to the LED display. For more information, see Chapter Diagnostics via LED display on the basic unit and on the operator panel (Page 488). Try to rectify the fault.
2	If you want to make SIMOCODE pro available to PROFINET, you must set the IP parameters and the PROFINET device names. For more information, see Chapter Setting IP parameters and PROFINET device name (Page 487).
3	Parameterize SIMOCODE pro or check the existing parameterization, e.g. with a PC on which SIMOCODE ES software is installed. For this, connect the PC / PG to the system interface with the PC cable (see the figure below).
4	Start SIMOCODE ES.

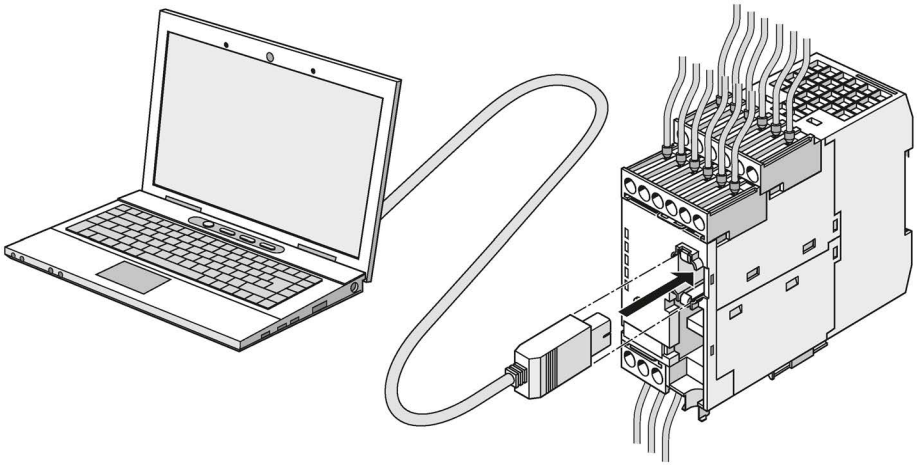


Figure 14-1 Connecting a PC to the basic unit

14.2.2 Setting IP parameters and PROFINET device name

Setting IP parameters and PROFINET device name on a plant-specific basis

The setting of IP parameters and the PROFINET device name is a mandatory step for communication via PROFINET.

These parameters can be set in different ways, depending on the needs of the plant configuration.

For a detailed description of these options, see Chapter Configuration of further properties of SIMOCODE pro V PN as an IO device (Page 395).

Setting IP parameters and PROFINET device name with SIMOCODE ES via PC cable

Proceed as follows:

Table 14- 3 Setting IP parameters and PROFINET device name with SIMOCODE ES via PC cable

Step	Description
1	Plug the PC cable into the system interface.
2	Start SIMOCODE ES.
3	Open the "Switching device" > "Open Online" menu.
4	In the "Local device interface" tab, select the associated COM interface. Click OK to confirm.
5	Open the "PROFINET parameters" dialog box.
6	Select "Overwrite IP parameters" and set the IP address, subnet mask, and router as appropriate.
7	Select "Overwrite device name in device" and assign the device name.
8	Save the data in the basic unit with "Target System > Load to Device." IP parameters and device name are now set.

Setting the PROFIsafe address on DM-F PROFIsafe

See Chapter Safety-oriented tripping (Page 334).

14.2.3 Set the time manually after switch-on or recovery of the supply voltage

Setting the timer with SIMOCODE ES

If the internal realtime clock of the devices is not automatically synchronized via NTP, you can make the setting manually with SIMOCODE ES.

To do so, follow these steps:

Set the time manually after switch-on or recovery of the supply voltage

Step	Description
1	Start SIMOCODE ES.
2	Establish an online connection with "Switching device → Open online."
3	Set the internal realtime clock of the device with "Target system → Command → Set time."

14.2.4 Diagnostics via LED display on the basic unit and on the operator panel

The basic unit and the operating panel have LEDs for displaying specific device states:

Table 14- 4 Diagnostics via LED display

LED	Status	Display	Description	Corrective measures for faults
Device	Device status	Green	Device ON	_
		Green – flickering	Internal fault	Send back the basic unit
		Yellow	Memory module recognized, TEST/RESET buttons control the memory module	_
		Yellow – flashing	Read in memory module; factory settings restored (duration: 3 s)	_
		Yellow – flickering	Memory module programmed (duration: 3 s)	_
		Red	Device defective (also GEN. FAULT on)	Replace the basic unit!
		Red – flashing	Memory module or expansion modules defective (also GEN. FAULT on - flashing)	Reprogram/replace the memory module, replace the expansion modules
		Off	Supply voltage too low	Check whether the supply voltage is connected/switched on
		Flashing green	PE energy saving mode active	_

LED	Status	Display	Description	Corrective measures for faults
Bus	Bus status	Off	No communication with the IO Controller of the PLC/PCS via PROFINET	Connect the bus or check PROFINET parameters (IP parameters, device name)
		Green	Communication with the IO Controller of the PLC/PCS via PROFINET is active	_
Gen. Fault	Fault status	Red	Fault pending; reset has been saved	Rectify fault, e.g., overload
		Red – flashing	Fault pending; reset has not been saved	_
		Off	No fault	_
PORT1 (only on basic unit)	Bus status	Green	Ethernet connection available	_
		Off	No Ethernet connection available	Check the Ethernet connection and the wiring
		Flashing	Station flash test for device location active	_
PORT2 (only on basic unit)	Bus status	Green	Ethernet connection available	_
		Off	No Ethernet connection available	Check the Ethernet connection and the wiring
		Flashing	Station flash test for device location active	_

14.2.5 Diagnostics via LED display on the modules DM-F Local or DM-F PROFIsafe

See Chapter Technical data of the DM-F LOCAL digital module (Page 641) and Technical data of the DM-F-PROFIsafe digital module (Page 643) or "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852)

14.3 Service

14.3.1 Preventive maintenance

Preventive maintenance - general information

Preventive maintenance is an important step towards avoiding faults and unforeseen costs. Industrial plants require regular professional maintenance so that e.g. production losses due to plant downtimes are avoided. Preventive maintenance ensures that all components are always kept in perfect working order.

Reading out statistical data

SIMOCODE pro makes statistical data available that can, for example, be read out with SIMOCODE ES under **Target System → Service data / statistical data**. For example, via "Motor Operating Hours" and "Number of Starts", you can decide whether motor and/or motor contactors should be replaced.

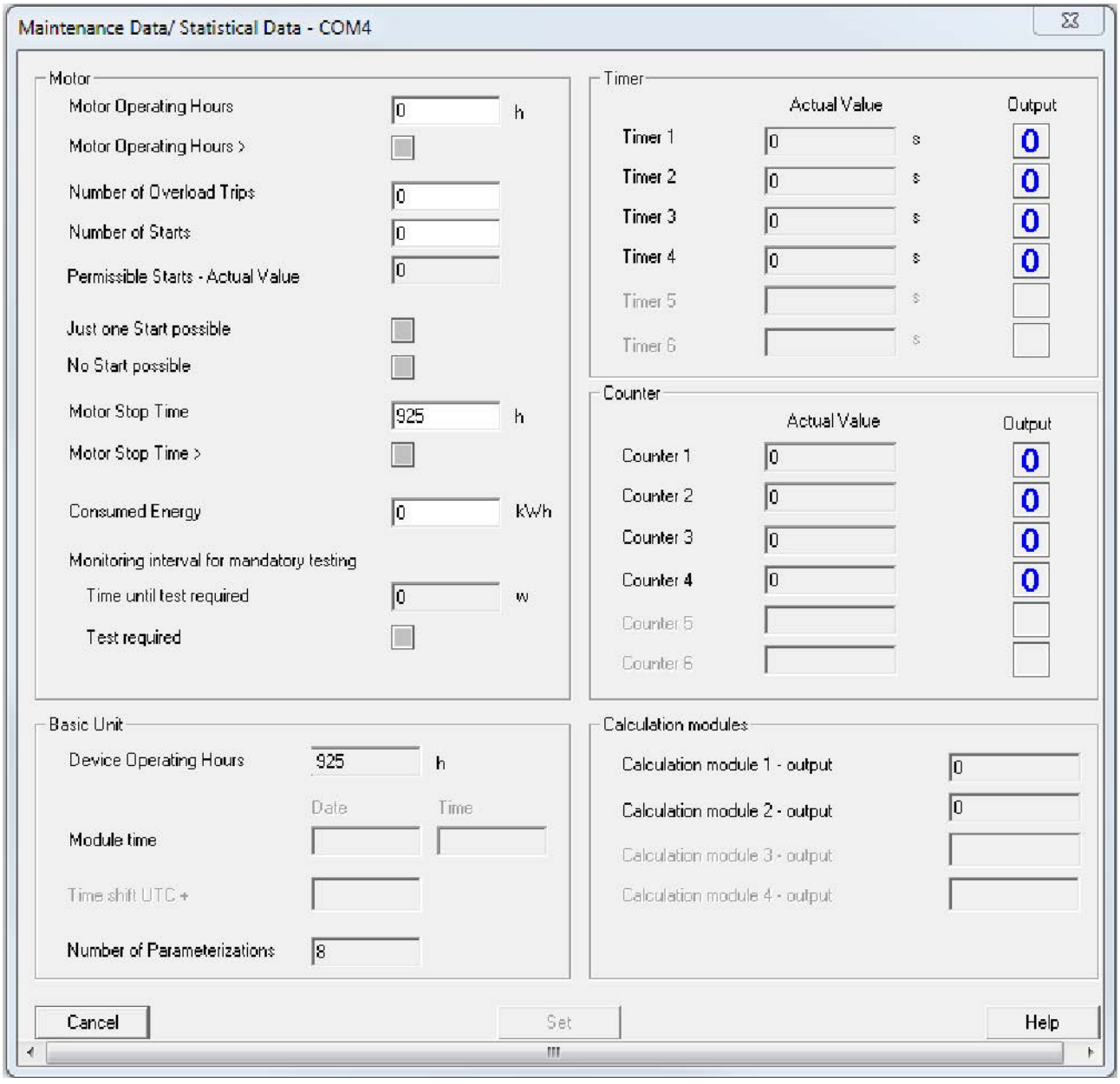


Figure 14-2 Reading out statistical data

14.3.2 Backing up and saving parameters

Always save the parameters in the memory module or in a SIMOCODE ES file. This particularly applies if you replace a basic unit, or if you wish to transfer data from one basic unit to another.

Saving parameters from the basic unit to the memory module

Note

This function will not be available if the "TEST/RESET" button has been disabled.

Proceed as follows:

Table 14- 5 Saving the parameters into the memory module

Step	Description
1.	Plug the memory module into the system interface. The "Device" LED lights up yellow for approx. 10 seconds. During this time, press the "TEST/RESET" button for approx. 3 seconds. The parameters will be saved in the memory module. After successful data transfer, the "Device" LED flickers yellow for approx. 3 seconds.
2.	If necessary, unplug the memory module from the system interface.

Saving parameters from the basic unit to a SIMOCODE ES file

Note

This function will not be available if the "TEST/RESET" button has been disabled.

Proceed as follows:

Table 14- 6 Saving parameters to a SIMOCODE ES file

Step	Description
1.	Plug the PC cable into the system interface.
2.	Start SIMOCODE ES.
3.	Open the menu **Target System → Load to PC**. The parameters are loaded into the main memory from the basic unit.
4.	Open menu **Switching Device → Save copy as ....**. The parameters are saved from the main memory into a SIMOCODE ES file.

Saving parameters from the memory module to the basic unit

Note

This function will not be available if the "TEST/RESET" button has been disabled.

Proceed as follows:

Table 14- 7 Saving parameters from the memory module to the basic unit

Step	Description
1.	Plug the memory module into the system interface. The "Device" LED lights up yellow for approx. 10 seconds. During this time, briefly press the "TEST / RESET" button. The parameters will be transferred to the basic unit. After successful data transfer, the "Device" LED flashes yellow for approx. 3 seconds.
2.	If necessary, unplug the memory module from the system interface.

Note

If the memory module is plugged in, the parameters will be transferred from the memory module to the basic unit when the supply voltage is switched on.

Saving parameters from a SIMOCODE ES file into the basic unit

Proceed as follows:

Table 14- 8 Saving parameters from a SIMOCODE ES file into the basic unit

Step	Description
1.	Plug the PC cable into the system interface.
2.	Start SIMOCODE ES.
3.	Open menu **Switching Device → Open**. The parameters from the SIMOCODE ES file are loaded into the main memory.
4.	Open menu **Target System → Load to Switching Device**. The parameters will be saved into the basic unit from the main memory.

14.3.3 Replacing SIMOCODE pro components

Safety information

WARNING

Requirement

The main power for the feeder and the supply voltage for the basic unit must be switched off before replacing current measuring modules and current / voltage measuring modules.

Note

Please observe the information contained in the operating instructions!

You will also find the operating instructions for SIMOCODE pro at Manuals/operating instructions (http://www.siemens.com/industrial-controls/manuals)

Note

It is not necessary to detach the wiring from the removable terminals to replace the components!

Replacing the basic unit

Proceed as follows:

Table 14- 9 Replacing the basic unit

Step	Description
1.	Save the parameters. For information on this, see Chapter Backing up and saving parameters (Page 492).
2.	Switch off the main power for the unit feeder and the power supply for the basic unit.
3.	Withdraw the PC cable if necessary, then remove the cover or the connecting cable from the system interface. Remove the PROFINET cable(s). Note which interface the cables are connected to.
4.	Withdraw the removable terminals. You do not need to detach the wiring.
5.	Dismantle the basic unit.
6.	Withdraw the removable terminals from the new basic unit.
7.	Mount the new basic unit.
8.	Connect the wired, removable terminals.
9.	Connect the cables to the system interfaces. Connect the PROFINET cable(s). Make sure the connector(s) is/are connected to the same PROFINET interface again.
10.	Switch on the supply voltage for the basic unit.
11.	Save the parameters into the basic unit. For information on this, see Chapter Backing up and saving parameters (Page 492).
12.	Switch on the main power for the unit feeder.

Replacing an expansion module or a decoupling module

Proceed as follows:

Table 14- 10 Replacing an expansion module or a decoupling module

Step	Description
1.	Switch off the main power for the feeder and switch off the power supply for the basic unit and the DM-F.
2.	Withdraw the PC cable if necessary, then remove the cover or the connecting cable from the system interface.
3.	Withdraw the removable terminals. You do not need to detach the wiring.
4.	Remove the expansion module or decoupling module.
5.	Withdraw the removable terminals from the new basic expansion module or decoupling module.
6.	Install the new expansion module or decoupling module.
7.	Connect the wired, removable terminals.
8.	Connect the cables to the system interfaces.
9.	Switch on the power supply for the DM-F Local and the basic unit.
10.	Switch on the main power for the unit feeder.

Replacing a DM-F

Proceed as follows:

Table 14- 11 Replacing a DM-F

Step	Description
1	First, switch off the main power for the feeder and then the supply voltage for the basic unit and the DM-F.
2	Withdraw the PC cable if necessary, then remove the cover or the connecting cable from the system interface.
3	Withdraw the removable terminals. You do not need to detach the wiring.
4	Dismantle the DM-F.
5	Withdraw the removable terminals from the new DM-F.
6	Mount the new DM-F.
7	Connect the wired, removable terminals.
8	Connect the cables to the system interfaces.
9	DM-F PROFIsafe only: Set the DIP switches for the PROFIsafe address according to the configuration in the F-controller (see Chapter "Configuring the DM-F PROFIsafe and integrating it into the fail-safe automation system" in "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852)).
10	Switch on the power supply for the DM-F and the basic unit.
11	DM-F LOCAL only: Configure the DM-F LOCAL accordingly (see Chapter "Configuring the DM-F Local" in "Fail-safe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852)).
12	Switch on the main power for the unit feeder.

Replacing the current measuring module and the current / voltage measuring module

Proceed as follows:

Table 14- 12 Replacing the current measuring module and the current / voltage measuring module

Step	Description
1	Switch off the main power for the unit feeder and the power supply for the basic unit.
2	Pull out the connecting cable from the system interface.
3	Remove the removable terminal from the module as illustrated below (current / voltage measuring modules only)
4	Disconnect the three cables of the three phases of the main circuit.
5	Replace the module.
6	Connect the three cables of the main circuit, leading them through the feed-hole openings.
7	Plug the removable terminals onto the module (current / voltage measuring modules only).
8	Connect the cable to the system interface.
9	Switch on the supply voltage for the basic unit.
10	Switch on the main power for the unit feeder.

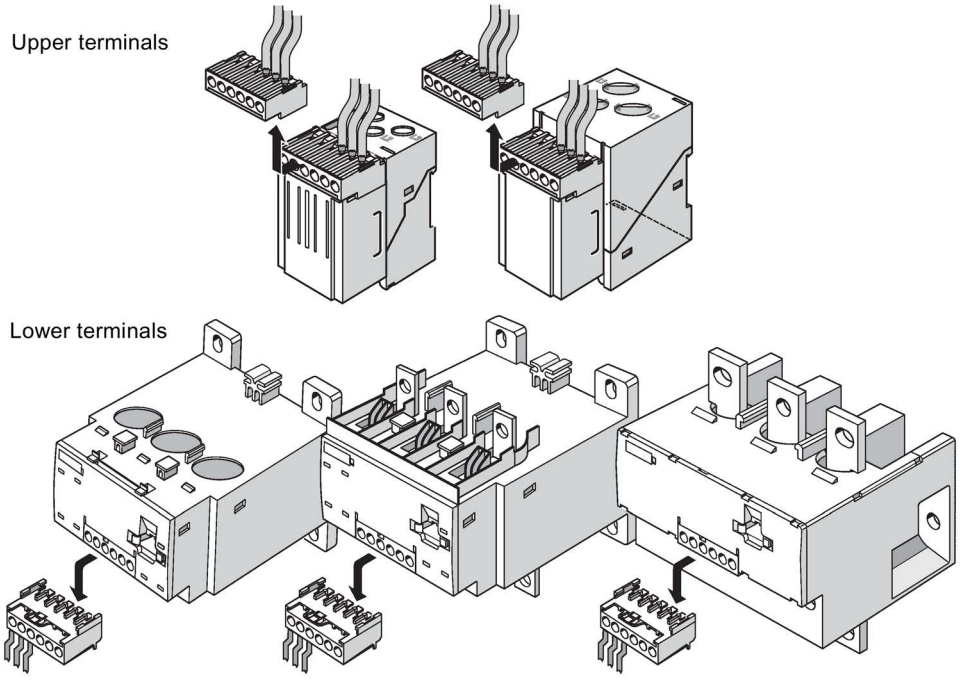


Figure 14-3 Replacing current / voltage measuring modules

14.3.4 Restoring factory settings

With the factory settings, all parameters are reset to the factory values.

Restoring the factory settings with the TEST/RESET button on the basic unit

Proceed as follows (also deletes any previous password setting!):

Table 14- 13 Restoring the factory settings with the "TEST/RESET" button

Step	Description
1	Switch off the supply voltage for the basic unit.
2	Press the "TEST/RESET" button on the basic unit and keep it pressed.
3	Switch on the supply voltage for the basic unit. The "Device" LED is yellow.
4	Release the "TEST/RESET" button after approx. two seconds.
5	Press the "TEST/RESET" button again after approx. two seconds.
6	Release the "TEST/RESET" button after approx. two seconds.
7	Press the "TEST/RESET" button again after approx. two seconds.
8	The factory setting is restored.

Note

If any of the steps stated above are not carried out correctly, the basic unit will revert to normal operation.

Note

This function is always active, irrespective of the "TEST/RESET keys disabled" parameter.

Restoring the factory settings with the SIMOCODE ES software

Requirement: SIMOCODE pro is connected to the PC / PG via PROFINET or via the system interface and SIMOCODE ES is started.

Proceed as follows (resets to factory settings, excluding the password):

Table 14- 14 Restoring the factory settings with the SIMOCODE ES software

Step	Description
1.	Select menu item **Switching device → Open online**.
2.	From the menu, select **Target system → Command → Factory Settings**.
3.	Confirm with "Yes".
4.	The factory setting is restored.

14.4 Reading our error buffer / error log (protocol)

SIMOCODE pro has an error buffer in which the 21 most recent errors / faults and "Power - On" events are recorded with a time stamp. Time stamps are based upon the operating hours of the device (resolution 1 s), i.e. the length of time for which the device is supplied with control supply voltage.

The "Error/Fault" and "Power - On" events are logged. Each of these events is given a time stamp.

- Error/Fault: The last 21 errors are stored in a ring buffer; the incoming error (rising edge) is always logged. An outgoing error (falling edge) will not be logged.
- Power on: If the most recent entry is "Power - On," this is not logged multiple times. Instead, the error number is used as a power-on counter. Thus, the error buffer cannot be deleted by frequent on/off operations.

Entry 1 is the most recent entry and entry 21 the oldest.

The data will be displayed via the "SIMOCODE ES" software.

Example:

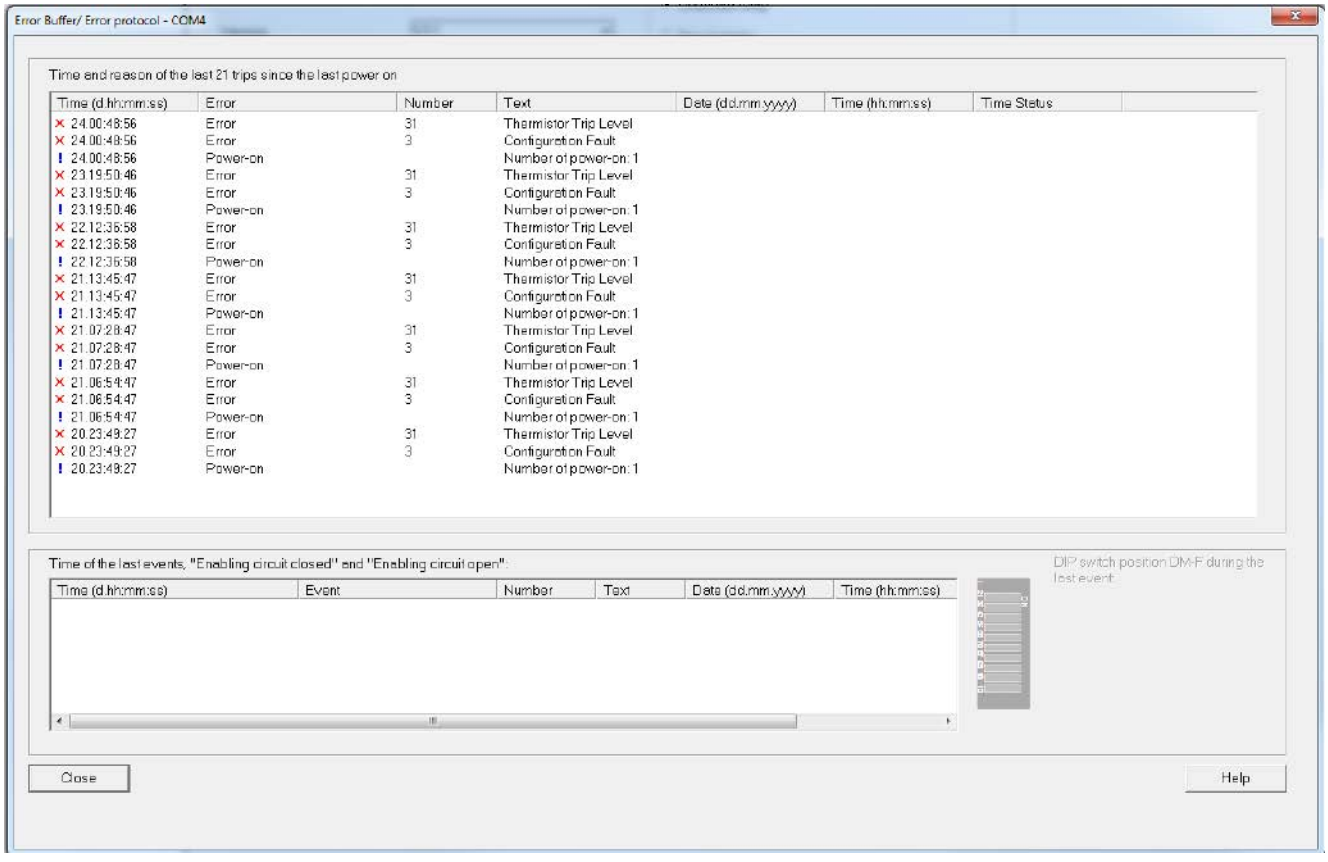


Figure 14-4 Example of event logging using the "SIMOCODE ES" software

If there is a valid time (synchronized via NTP or set manually with SIMOCODE ES), the events are additionally logged in the error buffer with date [tt.mm.yyyy] and time [hh:mm:ss] of the real time clock.

In addition the time status of the real time clock is logged:

- Invalid: Until completion of device power-up, this time status is set for a period of up to 30 s after switching on the supply voltage.
- Not set: The clock has not been set/synchronized since switching on the supply voltage. It was started with the saved value when switching on the supply voltage.
- Set: The clock has been set at least once (using the NTP server or parameterization).
- Synchronized: Synchronization takes place via the NTP server during 2x NTP SyncInterval. If synchronization does not take place within 2x NTP SyncInterval, the NTP time status is reset to "Set".

Example:

The most recent "Power - On" event was logged at a device operating time of 17 days, 21 hours and 31 minutes. Therefore, at the moment of "Power - On", the device was operating (supplied with voltage) for 17d 21h 31min. The "Number of starts >" fault was logged at a device operating time of 18 days, 22 hours, 17 minutes, i.e. 24h 46min after the most recent "Power - On."

When **using a DM-F**, the events "Enabling circuit closed" and "Enabling circuit open" are logged for the DM-F Local and/or the DM-F PROFIsafe in a separate window:

- Time
- Event: "Enabling circuit closed" or "Enabling circuit open"
  - Number:

    Line 1: 200 or 202

    Line 2: 201 or 203
  - Text:

    Line 1: "DM-F Local enabling circuit 0 → 1" or "DM-F PROFIsafe enabling circuit 0 → 1".

    Line 2 "DM-F Local enabling circuit 1 → 0" or "DM-F PROFIsafe enabling circuit 1 → 0".

The current DIP switch position of the "DM-F Local" and/or the "DM-F PROFIsafe" is displayed under "DIP switch position DM-F during the last event".

See also Chapter Data record 72 - Error buffer (Page 543).

14.5 Event memory

In addition to the error buffer, various events can be stored in the event buffer.

The following events are stored:

- Last event "DM-F enabling circuit closed"
- Last event "DM-F enabling circuit open"
- Initialization module read in
- Initialization module written.

See also Chapter Data record 73 - Event memory (Page 544).

Alarm, fault, and system events

15

In this chapter

In this chapter you will find information about troubleshooting.

Target groups

This chapter addresses the following target groups:

- Commissioning engineers
- Service and maintenance personnel
- Configuring engineers
- PLC programmers

Required knowledge

You will require the following knowledge:

- Basic general knowledge about SIMOCODE pro
- Knowledge about SIMOCODE ES software
- Knowledge about PROFINET

15.1 Alarms, faults, and system events - error handling

Table 15- 1 Alarm, fault, and system events

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. [1]
Analog module 1/2 open circuit	An open circuit has occurred in the analog value measuring circuit.	Check the measured value sensor and the measuring circuit.	Reset		64
Startup parameter block active	The startup parameter block prevents transfer of SIMOCODE pro parameters that can be transferred from the IO controller during startup. The block may not be set if SIMOCODE pro is integrated in STEP7 via the SIMOCODE pro object manager (OM). [2]				
Antivalence	Only for positioner control function: The change-over contacts of the limit switch do not issue an antivalent signal.	Limit switch defective, open circuit limit switch		Tripped	
Configuration error	The configured unit configuration does not match the actual configuration.	• Check whether all the configured components are available • Check the actual configuration with "Configuration".	Clear the fault; reset	Tripped	3
Execution stop command	The motor feeder could not be turned off after a STOP command was issued.	• The contactor contact is welded • Parameter execution time is too short • The "open" end position has not been reached during the parameterized runtime (only for the "Positioner" and "Solenoid valve" control functions).	Clear the fault; reset	Tripped	9
Execution ON command	The motor feeder could not be turned on after an ON command is issued.	• Main circuit is interrupted (fuse, circuit breaker) • The motor contactor or contactor control is defective • Parameter execution time is too short.	Reset	Tripped	8

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. [1]
Trip level cos phi <	The power factor cos phi has undershot the trip level. Possible cause: The motor is being operated without a load.	Please check the application that is being driven by the motor.		Tripped	44
Trip level I < undershot	The maximum current has undershot the trip level.	Please check the application that is being driven by the motor.		Tripped	41
Trip level I > overshot	The maximum current has overshot the trip level.	Please check the application that is being driven by the motor.		Tripped	40
Trip level P < undershot	The active power of the motor has undershot the trip level.	Please check the application that is being driven by the motor.		Tripped	43
Trip level P > overshot	The active power of the motor has overshot the trip level.	Please check the application that is being driven by the motor.		Tripped	42
Trip level U < undershot	The voltage in the motor feeder has undershot the trip level. Possible causes: • Undervoltage in the network • Fuse has tripped	Check the motor feeder.		Tripped	45
Trip level 0/4 - 20 mA < undershot	The measured value at the analog input has undershot the trip level.	Check the measuring station.		Tripped	47
Trip level 0/4 - 20 mA > overshot	The measured value at the analog input has overshot the trip level.	Check the measuring station.		Tripped	46
Operational protection OFF (OPO)	An "Operational Protection Off (OPO)" signal is pending. A switched-on motor feeder has been switched off. The feeder cannot be switched on while the OPO signal is active.		Reset	Tripped; for tioners QE1 or QE2 switched on until end position is reached - depending upon configuration	19
Motor operating hours >	The configured limit value for motor operating hours monitoring has been exceeded.	Please adopt the maintenance measures intended for the feeder.			

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. [1]
Stalled rotor	The maximum motor current has exceeded the threshold for stalled rotor protection. Possible cause: The motor is blocked.	Please check the application that is being driven by the motor.	Reset	Tripped	48
Stalled positioner	The torque switch has activated before or without the respective limit switch.	• The positioner may be blocked. • Acknowledge the fault by releasing with the "OPEN/CLOSED" counter command. • Please check the positioner application and the limit switches.	Counter command "OPEN / CLOSED!"	Tripped	12
DM-F feedback circuit	The DM-F Local or DM-F PROFIsafe has detected a fault in the feedback circuit (the feedback circuit must be closed as the enabling circuit is switched on); the "SF" (general fault) LED on the front of the DM-F Local or DM-F PROFIsafe is flashing red.	• Check the wiring of the feedback circuit • Check the contact blocks in the feedback circuit.	Rectify the fault so that the feedback circuit is closed.	Tripped	
DM-F safety-related tripping	The DM-F has tripped the enabling circuit for safety reasons.	The motor cannot be switched on again until the enabling circuits of the DM-F are closed again.	Acknowledge with "Reset", if auto-reset is not active.	Tripped	66
DM-F - test requirement	The enabling circuits of the DM-F Local or DM-F PROFIsafe have not been opened and closed again within the configured time period.	The function of the enabling circuit relay contacts can only be tested when they are switched. Perform a function test.	Please apply the maintenance measures prescribed for this scenario.		
DM-F wiring	DM-F module wiring fault (short-circuit to ground in the sensor circuit/feedback circuit); the "SF" (general fault) LED on the front of the DM-F Local is illuminated red.	• Check the wiring of the sensor circuits / feedback circuit • Rectify the fault.	Reset	Tripped	67

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. [1]
DM-FL - configuration deviation	The actual configuration of the DM-F Local does not correspond to the parameterized set configuration.	Check whether the effective configuration of the DM-F Local corresponds to the parameterized set configuration. Correct the effective configuration by changing the DIP switch settings or adjusting the set configuration by means of parameterization if required.			
DM-FL simultaneity	The DM-F Local has detected a discrepancy error in the two-channel sensor circuit.	Check the switching elements in the sensor circuit.	Rectify the fault by opening or closing the sensor inputs.	Tripped	
DM-FL configuration mode	The DM-F Local is in "configuration mode"; the "DEVICE" LED on the front of the DM-F Local is illuminated yellow.	Complete the configuration (see Manual SIMOCODE pro Safety fail-safe digital modules (http://support.automation.siemens.com/WW/view/en/50564852), Chapter 7.4).			
DM-FL cross circuit	Cross circuit in sensor circuit of DM-F Local; the "SF" (general fault) LED on the front of the DM-F Local is illuminated red.	• Check the wiring of both sensor circuits for cross circuiting • Rectify the fault.	Reset	Tripped	68
DM-FL waiting for start-up test	The DM-F LOCAL is in the "Waiting for start-up test" status.	Carry out the start-up test by actuating the sensor in the sensor circuit.			
DM-FP Prm error	The parameter settings of the PROFIsafe profile are incorrect or the set PROFIsafe address is not identical to the configured address.	Check the PROFINET / PROFIsafe parameters of SIMOCODE pro that were set on the IO controller.			
Double 0	Both torque switches have activated simultaneously. The motor feeder has been turned off.	• Open circuit torque switch. • Torque switch is defective.		Tripped	13
Double 1	Both limit switches have activated simultaneously.	Limit switch is defective.		Tripped	14
End position	Except positioner 5 control function: The state of the limit switch has changed without a command (positioner has left the end position without a command).		Counter command "OPEN / CLOSED!"	Tripped	15

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. [1]
External ground fault	External ground-fault monitoring has responded. An impermissibly high fault current is flowing.	Please check the motor connection cable for damage.	Reset	Tripped	29
External fault 1, 2, 3, 4, 5 or 6	A signal is pending at the input (socket) of the "External fault 1, 2, 3, 4, 5 or 6" standard function.	Check the motor feeder.		Tripped	56, 57, 58, 59, 60, 61
Required function is not supported	At least one parameterized function is not supported by the version of the basic unit.	Activate only the functions that are supported by the version of the basic unit.			
Hardware fault	The SIMOCODE pro basic unit hardware is faulty.	Replace the basic unit. See Chapter Replacing SIMOCODE pro components (Page 494).	Clear the fault.	Tripped	0
Initialization module write-protected	The initialization module is completely write-protected.	Deactivate write protection of the initialization module			
Initialization module write-protected, parameter changes not allowed	The initialization module is completely or partially write-protected. Reparameterization of SIMOCODE pro is denied because the initialization module is write-protected.	Deactivate write protection of the initialization module			
Initialization module - identification data write-protected	Reparameterization has been rejected because the initialization module is write-protected.	• Select a parameterization with identical addressing and I&M data • Deactivate the partial write protection of the initialization module			
Initialization module read in	The parameters of the initialization module were read into SIMOCODE.				
Initialization module programmed	The reparameterization was accepted in the initialization module.				
Initialization module cleared	The initialization module was cleared and is now back in the as-delivered state.				
Internal ground fault	Internal ground-fault monitoring has responded. An impermissibly high fault current is flowing.	Please check the motor connection cable for damage.	Reset	Tripped	28

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. [1]
No start permitted	The permissible number of starts in the monitoring timeframe has been attained. The next start should not be carried out until the interlocking time has expired.		Reset	Tripped	
Module fault	At least 1 SIMOCODE pro module is not ready for use.	• Connecting cable defective or incorrectly connected • Module defective. Replace the module. See Chapter Replacing SIMOCODE pro components (Page 494).	Clear the fault; reset	Tripped	1
Module supply voltage is not present	Supply voltage on the DM-F Local is too low or not present.	• The terminals are not wired properly • Module defective. Replace the module. See Chapter Replacing SIMOCODE pro components (Page 494).	Clear the fault; reset	Tripped	
Power failure (UVO)	The power failure lasted longer than the set power failure time.		Clear the fault; reset	Tripped	18
Just one start possible	The start after the next one should not be carried out until the interlocking time has expired.				
Parameter is incorrect ("General fault" category)	The parameter data is incorrect.	The designation of the faulty parameter can be found via the number (byte No.) in Chapter Tables (Page 513).	Clear the fault; reset	Tripped	4
Parameter is incorrect ("Event" category)	The parameter data transferred to the unit is incorrect. Errors in the parameter data can occur, for example, if the device has not been parameterized with SIMOCODE ES.	Check the parameter data (data records 130 - 135) that has been transmitted to the device for correct content. See Chapter Data formats and data records (Page 537)			
Parameter changes not allowed in the current operating state	You attempted to change at least one parameter that cannot be changed in the current operating state.	Many parameters can only be changed if the motor feeder is switched off and not in "Remote" mode. The following parameters can always be changed: See Chapter Data formats and data records (Page 537).			

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. [1]
Wrong password	SIMOCODE pro parameters are protected by a password. An attempt has been made to change the parameters without entering the password.	Please use the correct password for changing the parameters. If you do not know the password, new parameters can only be entered after the factory settings have been restored. For a description of how to restore the factory settings, see Chapter Restoring factory settings (Page 497).			
Phase unbalance	The limit value for phase unbalance has been exceeded. Phase unbalance can cause an overload. Possible causes: • Phase failure • Fault in the motor windings.	Check the motor feeder and the motor.	Reset	Tripped	25
Feedback (FB) OFF	The current flow in the motor feeder has been interrupted without the motor feeder being turned off.	• The main circuit has been interrupted (fuse, circuit breaker, main switch). • The motor contactor or contactor control is defective	Reset	Tripped	11
Feedback (FB) ON	Current is flowing in the motor feeder without the motor feeder being switched on	• Contactor contacts have been manually activated • Contactor has not been switched on via SIMOCODE	Clear the fault; reset	Tripped	10
Test position feedback (TPF)	Current is flowing in the motor feeder although the motor feeder is in the test position (TPF).	The main circuit is not interrupted in test operation.	Reset	Tripped	17
Memory module read in	The parameters of the memory module were read into SIMOCODE.				
Memory module cleared	The memory module was cleared and is now back in as-delivered state.				
Memory module programmed	The reparameterization was accepted in the memory module.				
Memory module write-protected	The memory module is completely write-protected.	Deactivate write protection of the memory module.			

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. [1]
Status - cooling down period active	The motor feeder has been switched off due to overload.	The motor can only be switched on again after the cooling down period has expired.			
Status - DM-F enabling circuit	Shows the status of the enabling circuit: • closed or • tripped				
Status - emergency start executed	The thermal memory has been deleted with the function "Emergency start".	The motor can be switched on again immediately after an overload trip.			
Status - test position (TPF)	The motor feeder is in the test position (TPF). The main circuit has been interrupted and the feeder can be "cold started".				17
Stop time >	The configured limit value for motor stop time monitoring has been exceeded.	Please adopt the maintenance measures intended for the feeder. If possible, switch on the feeder.			
Fault - bus	PROFINET communication has been interrupted or is interrupted.	Check the PROFINET connection (plugs, cables, etc.).	Reset, autoreset	Tripped	5
Fault - PLC/PCS	The PLC that controls the feeder was or is in STOP mode.	Check the operating state of the PLC.	Reset, autoreset	Tripped	6
Fault antivalence	The limit switches are not reporting any antivalent signals.	• Limit switch open circuit • Please check the positioner application and the limit switches.	Counter command "OPEN/CLOSED"	Tripped	16
Fault - EM open circuit	A short circuit has occurred in the wiring to the 3UL23 residual current transformer.	Check the wiring to the 3UL23 residual current transformer	Reset		38
Fault - EM short-circuit	A short-circuit has occurred in the wiring to the 3UL23 residual current transformer.	Check the wiring to the 3UL23 residual current transformer	Reset		39
Fault end position	Positioner/solenoid valve has left the end position without a command being issued. The motor feeder has been turned off.	Acknowledge the fault by releasing with the counter command "OPEN/CLOSED".	Reset; counter command	Tripped	15
Fault - temporary components (e.g. memory module)	One of the following components is defective: • Memory module • PC cable.	Replace the defective components. See Chapter Replacing SIMOCODE pro components (Page 494).	Clear the fault; reset	Tripped	2

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. [1]
Temperature module 1/2 - trip level exceeded	The temperature trip level has been overshot.	Check the temperature measuring station.			35
Temperature module 1/2 - warning level exceeded	The temperature warning level has been exceeded.	Check the temperature measuring station.			35
Temperature module 1/2 out of range	Temperature sensor is delivering impermissible values.	Check the temperature sensor.	Reset	Tripped	37
Temperature module 1/2 sensor fault	Either a short circuit or an open circuit has occurred in the temperature sensor circuit.	Check the temperature sensor and the sensor cable.	Clear the fault; reset	Tripped	36
Test trip	The motor feeder has been checked and switched off by a test trip.		Reset	Tripped	65
Thermistor trip level	Thermistor protection response. The temperature of the motor is too high.	Please check the motor and the application that is being driven by the motor. The motor cannot be switched on again until the temperature has reached the reset point of the thermistor.	Reset, autoreset	Tripped	31
Thermistor open circuit	An open circuit has occurred in the thermistor sensor cable.	Check the thermistor sensor cable and the thermistor.	Clear the fault; reset	Tripped	33
Thermistor short circuit	A short circuit has occurred in the thermistor sensor cable.	Check the thermistor sensor cable and the thermistor.	Clear the fault; reset	Tripped	32
Overload	The motor feeder has been overloaded.	Please check the motor and the application that is being driven by the motor. The motor can be switched on again after the cooling down period has expired or after an emergency start.	Reset, autoreset	Tripped	26
Overload and unbalance	There is a load unbalance on the motor feeder phases. Possible causes: • Phase failure • Fault in the motor windings.	Check the motor feeder and the motor. The motor can be switched on again after the cooling down period has expired or after an emergency start.	Reset, autoreset	Tripped	27
Prewarning overload (I > 115 %)	The motor feeder is in overload operation. If this condition continues to persist, the motor feeder will trip within a short period of time due to overload.	Please check the motor and the application that is being driven by the motor.			

Event (alphabetical)	Description	Troubleshooting	Acknowledgment / fault rectification	Contactor control	Error No. 1)
Warning level cos phi <	The power factor cos phi has undershot the warning level. Possible cause: The motor is being operated without a load.	Please check the application that is being driven by the motor.			
Warning level I< undershot	The maximum current has undershot the warning level.	Please check the application that is being driven by the motor.			
Warning level I> overshot	The maximum current has overshot the warning level.	Please check the application that is being driven by the motor.			
Warning level P< undershot	The active power of the motor has undershot the warning level.	Please check the application that is being driven by the motor.			
Warning level P> overshot	The active power of the motor has overshot the warning level.	Please check the application that is being driven by the motor.			
Warning level U< undershot	The voltage in the motor feeder has undershot the warning level. Possible causes: • Undervoltage in the network • Fuse has tripped.	Check the motor feeder.			
Warning level 0/4 - 20 mA < undershot	The measured value at the analog input has undershot the warning level.	Check the measuring station.			
Warning level 0/4 - 20 mA > overshot	The measured value at the analog input has overshot the warning level.	Check the measuring station.			
Permissible number of starts exceeded	The permissible number of starts in the monitoring timeframe has already been exceeded. The next start should not be carried out until the interlocking time has expired.		Reset	Tripped	52

1) See also "Error number" in Chapter Data record 72 - Error buffer (Page 543)

Note

2) Parameter block

On devices in the as-delivered condition or after the factory settings have been restored, the parameter block is not active!

Tables

16

In this chapter

In this chapter, you will find various tables that can help you when working with SIMOCODE pro.

Target groups

This chapter is addressed to the following target group: Configuring engineers.

Required knowledge

You need sound knowledge of SIMOCODE pro.

16.1 Active control stations, contactor controls, lamp controls and status information for the control functions

Table 16- 1 Active control stations of control functions

Designation/control function	Control station				
	ON <<	ON <	OFF	ON >	ON >>
Overload	-	-	-	-	-
Direct starter	-	-	OFF	ON	-
Reversing starter	-	LEFT	OFF	RIGHT	-
Circuit breaker	-	-	OFF	ON	-
Star-delta starter	-	-	OFF	ON	-
Star-delta reversing starter	-	LEFT	OFF	RIGHT	-
Dahlander	-	-	OFF	SLOW	FAST
Dahlander reversing starter	LEFT-FAST	LEFT-SLOW	OFF	RIGHT-SLOW	RIGHT-FAST
Pole-changing starter	-	-	OFF	SLOW	FAST
Pole-changing reversing starter	LEFT-FAST	LEFT-SLOW	OFF	RIGHT-SLOW	RIGHT-FAST
Solenoid valve	-	-	CLOSED	OPEN	-
Positioner 1	-	CLOSED	STOP	OPEN	-
Positioner 2	-	CLOSED	STOP	OPEN	-
Positioner 3	-	CLOSED	STOP	OPEN	-
Positioner 4	-	CLOSED	STOP	OPEN	-
Positioner 5	-	CLOSED	STOP	OPEN	-
Soft starter	-	-	OFF	ON	-
Soft starter with reversing contactor	-	LEFT	OFF	RIGHT	-

Table 16- 2 Contactor control with control functions

Designation/control function	Contactor control				
	QE1	QE2	QE3	QE4	QE5
Overload	-	-	Active	-	-
Direct starter	ON	-	-	-	-
Reversing starter	RIGHT	LEFT	-	-	-
Circuit breaker	ON pulse	-	OFF pulse	-	-
Star-delta starter	Star contactor	Delta contactor	Line contactor	-	-
Star-delta reversing starter	Star contactor	Delta contactor	RIGHT line contactor	LEFT line contactor	-
Dahlander	FAST	SLOW	Star contactor FAST	-	-

Designation/control function	Contactor control				
Dahlander reversing starter	RIGHT-FAST	RIGHT-SLOW	Star contactor FAST	LEFT-SLOW	LEFT-FAST
Pole-changing starter	FAST	SLOW	-	-	-
Pole-changing reversing starter	RIGHT-FAST	RIGHT-SLOW	-	LEFT-SLOW	LEFT-FAST
Solenoid valve	OPEN	-	-	-	-
Positioner 1	OPEN	CLOSED	-	-	-
Positioner 2	OPEN	CLOSED	-	-	-
Positioner 3	OPEN	CLOSED	-	-	-
Positioner 4	OPEN	CLOSED	-	-	-
Positioner 5	OPEN	CLOSED	-	-	-
Soft starter	ON line contactor	-	Reset	ON command	-
Soft starter with reversing contactor	RIGHT line contactor	LEFT line contactor	Reset	ON command	-

Table 16- 3 Lamp control with control functions

Designation/control function	Lamp control				
	QLE << (ON <<)	QLE < (ON <)	QLA (OFF)	QLE < (ON >)	QLE >> (ON >>)
Overload	-	-	-	-	-
Direct starter	-	-	OFF	ON	-
Reversing starter	-	LEFT	OFF	RIGHT	-
Circuit breaker	-	-	OFF	ON	-
Star-delta starter	-	-	OFF	ON	-
Star-delta reversing starter	-	LEFT	OFF	RIGHT	-
Dahlander	-	-	OFF	SLOW	FAST
Dahlander reversing starter	LEFT-FAST	LEFT-SLOW	OFF	RIGHT-SLOW	RIGHT-FAST
Pole-changing starter	-	-	OFF	SLOW	FAST
Pole-changing reversing starter	LEFT-FAST	LEFT-SLOW	OFF	RIGHT-SLOW	RIGHT-FAST
Solenoid valve	-	-	CLOSED	OPEN	-
Positioner 1	-	CLOSED	STOP	OPEN	-
Positioner 2	-	CLOSED	STOP	OPEN	-
Positioner 3	-	CLOSED	STOP	OPEN	-
Positioner 4	-	CLOSED	STOP	OPEN	-
Positioner 5	-	CLOSED	STOP	OPEN	-
Soft starter	-	-	OFF	ON	-
Soft starter with reversing contactor	-	LEFT	OFF	RIGHT	-

16.2 OPC UA variables

Node IDs

The name of the variable is composed of the namespace ID2 and the node ID as follows:

ns=http://siemens.com/automation/simocode/provpn;i=Node ID of the relevant variable.

Example:

You want to access the maximum motor current. You search for the node ID of the variable "Max. Current I_max" in the following table: Node ID=33

Table 16- 4 Node IDs (1)

Node ID	Data type	Description
Acyclic receive		
11	Boolean	Acyclic receive - Bit 0.0
12	Boolean	Acyclic receive - Bit 0.1
13	Boolean	Acyclic receive - Bit 0.2
14	Boolean	Acyclic receive - Bit 0.3
15	Boolean	Acyclic receive - Bit 0.4
16	Boolean	Acyclic receive - Bit 0.5
17	Boolean	Acyclic receive - Bit 0.6
18	Boolean	Acyclic receive - Bit 0.7
19	Boolean	Acyclic receive - Bit 1.0
20	Boolean	Acyclic receive - Bit 1.1
21	Boolean	Acyclic receive - Bit 1.2
22	Boolean	Acyclic receive - Bit 1.3
23	Boolean	Acyclic receive - Bit 1.4
24	Boolean	Acyclic receive - Bit 1.5
25	Boolean	Acyclic receive - Bit 1.6
26	Boolean	Acyclic receive - Bit 1.7
27	Unsigned word	Acyclic receive - analog value
Measured values		
30	Unsigned byte	Thermal memory
31	Unsigned byte	Phase unbalance
32	Unsigned byte	Cos phi
33	Unsigned word	Max. current I_max
34	Unsigned word	Current I_L1
35	Unsigned word	Current I_L2
36	Unsigned word	Current I_L3
37	Unsigned word	Last trip current
38	Unsigned word	Time to trip
39	Unsigned word	Cooling down period
40	Unsigned word	Phase voltage UL1-N

Node ID	Data type	Description
41	Unsigned word	Phase voltage UL2-N
42	Unsigned word	Phase voltage UL3-N
43	Unsigned word	AM1 output
44	Unsigned word	AM1 input 1
45	Unsigned word	AM1 input 2
46	Unsigned word	AM1 input 3
47	Unsigned word	TM1 max. temperature
48	Unsigned word	TM1 temperature 1
49	Unsigned word	TM1 temperature 2
50	Unsigned word	TM1 temperature 3
51	Unsigned Dword	Active power P
52	Unsigned Dword	Apparent power S
53	Unsigned word	AM2 output
54	Unsigned word	AM2 input 1
55	Unsigned word	AM2 input 2
56	Unsigned word	AM2 input 3
57	Unsigned word	Max. temperature
58	Unsigned word	TM2 temperature 1
59	Unsigned word	TM2 temperature 2
60	Unsigned word	TM2 temperature 3
61	Unsigned Word	EM Ground Fault Current
62	Unsigned Word	EM Last Trip Current
Statistics		
70	Unsigned byte	Permissible starts - actual value
71	Unsigned byte	Time until test required
72	Unsigned word	Number of parameterizations
73	Unsigned word	Number of overload trips
74	Unsigned word	Int. number of overload trips
75	Unsigned word	Motor stop time
76	Unsigned word	Timer 1
77	Unsigned word	Timer 2
78	Unsigned word	Timer 3
79	Unsigned word	Timer 4
80	Unsigned word	Counter 1
81	Unsigned word	Counter 2
82	Unsigned word	Counter 3
83	Unsigned word	Counter 4
84	Unsigned word	Calculation module 1 - output
85	Unsigned word	Calculation module 2 - output
86	Unsigned Dword	Motor operating hours
87	Unsigned Dword	Int. motor operating hours
88	Unsigned Dword	Device operating hours

Node ID	Data type	Description
89	Unsigned Dword	Number of starts
90	Unsigned Dword	Int. number of direct starts
91	Unsigned Dword	Int. number of reverse starts
92	Unsigned Dword	Consumed energy
93	Unsigned word	Timer 5
94	Unsigned word	Timer 6
95	Unsigned word	Counter 5
96	Unsigned word	Counter 6
97	Unsigned word	Calculation module 3 - output
98	Unsigned word	Calculation module 4 - output
99	Unsigned word	Analog multiplexer - output
Diagnostic status		
108	Boolean	Status - General fault
109	Boolean	Status - General warning
110	Boolean	Status - Device OK
111	Boolean	Status - Bus OK
112	Boolean	Status - PLC/DCS in run
113	Boolean	Status - Current flowing
114	Boolean	Status - PE command Start_Pause is pending
115	Boolean	Status - PE energy-saving mode active
116	Boolean	Status - On<<
117	Boolean	Status - On <
118	Boolean	Status - Off
119	Boolean	Status - On >
120	Boolean	Status - On >>
121	Boolean	Status - Start active
122	Boolean	Status - Interlocking time active
123	Boolean	Status - Change-over pause active
124	Boolean	Status - Positioner running in open direction
125	Boolean	Status - Positioner running in open direction
126	Boolean	Status - Feedback closed (FC)
127	Boolean	Status - Feedback open (FO)
128	Boolean	Status - Torque closed (TC)
129	Boolean	Status - Torque open (TO)
130	Boolean	Status - Test position (TPF)
131	Boolean	Status - Operational Protection OFF (OPO)
132	Boolean	Status - Remote mode
133	Boolean	Status - Emergency start executed
134	Boolean	Status - Cooling down period active
135	Boolean	Status - Pause time active
136	Boolean	Status - Device check active
137	Boolean	Status - Phase-sequence 1-2-3

Node ID	Data type	Description
138	Boolean	Status - Phase-sequence 3-2-1
139	Boolean	Status - Enabling circuit closed
Diagnostic events		
140	Boolean	Event - Prewarning overload (I>115%Is)
141	Boolean	Event - Unbalance
142	Boolean	Event - Overload
143	Boolean	Event - Overload + loss of phase
144	Boolean	Event - Internal ground fault
145	Boolean	Event - External Ground Fault
146	Boolean	Event - Warning external ground fault
147	Boolean	Event - Thermistor trip level
148	Boolean	Event - Thermistor short circuit
149	Boolean	Event - Thermistor open circuit
150	Boolean	Event - TM1 warning level T>
151	Boolean	Event - TM1 trip level T>
152	Boolean	Event - TM1 sensor fault
153	Boolean	Event - TM1 out of range
154	Boolean	Event - EM Open Circuit
155	Boolean	Event - EM Short Circuit
156	Boolean	Event - Warning level I>
157	Boolean	Event - Warning level I<
158	Boolean	Event - Warning level P>
159	Boolean	Event - Warning level P<
160	Boolean	Event - Warning level cos phi<
161	Boolean	Event - Warning level U<
162	Boolean	Event - AM1 warning level 0/4-20mA>
163	Boolean	Event - AM1 warning level 0/4-20mA<
164	Boolean	Event - Trip level I>
165	Boolean	Event - Trip level I<
166	Boolean	Event - Trip level P>
167	Boolean	Event - Trip level P<
168	Boolean	Event - Trip level cos phi<
169	Boolean	Event - Trip level U<
170	Boolean	Event - AM1 trip level 0/4-20mA>
171	Boolean	Event - AM1 trip level 0/4-20mA<
172	Boolean	Event - Stalled rotor
175	Boolean	Event - No start possible
176	Boolean	Event - No. of starts>
177	Boolean	Event - Just one start possible
178	Boolean	Event - Motor operating hours >
179	Boolean	Event - Motor stop time >
180	Boolean	Event - Limit monitor 1

Node ID	Data type	Description
181	Boolean	Event - Limit monitor 2
182	Boolean	Event - Limit monitor 3
183	Boolean	Event - Limit monitor 4
184	Boolean	Event - External fault 1
185	Boolean	Event - External fault 2
186	Boolean	Event - External fault 3
187	Boolean	Event - External fault 4
188	Boolean	Event - External fault 5
189	Boolean	Event - External fault 6
192	Boolean	Event - AM1 open circuit
193	Boolean	Event - DM-F safety-related tripping
194	Boolean	Event - Monitoring interval for mandatory testing - test required
195	Boolean	Event - Time set (NTP)
196	-	-
197	Boolean	Event - Time synchronized (NTP)
198	Boolean	Event - DM-F LOCAL o.k.
199	Boolean	Event - DM-F PROFIsafe active
200	Boolean	Event - Configured operation panel missing
201	Boolean	Event - Module not supported
202	Boolean	Event - No module voltage
204	Boolean	Event - Memory module read in
205	Boolean	Event - Memory module programmed
206	Boolean	Event - Memory module cleared
208	Boolean	Event - Initialization module read in
209	Boolean	Event - Initialization module programmed
210	Boolean	Event - Initialization module cleared
212	Boolean	Event - Parameter blocking during start-up active
213	Boolean	Event - Parameter changes not allowed in the current operating state
214	Boolean	Event - Device does not support the required functions
215	Boolean	Event - Wrong parameter
216	Boolean	Event - Wrong password
217	Boolean	Event - Password protection active
218	Boolean	Event - Factory settings
219	Boolean	Event - Parameter setting active
220	Unsigned byte	Event - Prm error number
228	Boolean	Event - DM-F LOCAL configuration mode
229	Boolean	Event - DM-F LOCAL - actual configuration and desired configuration different
230	Boolean	Event - DM-F LOCAL waiting for start-up test
231	Boolean	Event - DM-F incorrect PROFIsafe address or incorrect PROFIsafe parameter

Node ID	Data type	Description
232	Boolean	Event - Initialization Module write protected, parameter changes not allowed
233	Boolean	Event - Memory module write-protected
234	Boolean	Event - Initialization module write-protected
235	Boolean	Event - Initialization module identification data write-protected
Diagnostic warnings (1)		
236	Boolean	Warning - Prewarning overload (I>115%Is)
237	Boolean	Warning - Unbalance
238	Boolean	Warning - Overload
239	Boolean	Warning - Overload + loss of phase
240	Boolean	Warning - Internal ground fault
241	Boolean	Warning - External ground fault
243	Boolean	Warning - Thermistor trip level
244	Boolean	Warning - Thermistor short circuit
245	Boolean	Warning - Thermistor open circuit

Table 16- 5 Node IDs (2)

Node ID	Data type	Description
Diagnostic warnings (2)		
246	Boolean	Warning - TM1 warning level T>
248	Boolean	Warning - TM1 sensor fault
249	Boolean	Warning - TM1 out of range
250	Boolean	Warning - EM Open Circuit
251	Boolean	Warning - EM Short Circuit
252	Boolean	Warning - Warning level I>
253	Boolean	Warning - Warning level I<
254	Boolean	Warning - Warning level P>
255	Boolean	Warning - Warning level P<
256	Boolean	Warning - Warning level cos phi<
257	Boolean	Warning - Warning level U<
258	Boolean	Warning - AM1 warning level 0/4-20mA>
259	Boolean	Warning - AM1 warning level 0/4-20mA<
260	Boolean	Warning - Stalled rotor
263	Boolean	Warning - No start possible
264	Boolean	Warning - No. of starts>
265	Boolean	Warning - Just one start possible
266	Boolean	Warning - Motor operating hours >
267	Boolean	Warning - Motor stop time >
268	Boolean	Warning - External fault 1

Node ID	Data type	Description
269	Boolean	Warning - External fault 2
270	Boolean	Warning - External fault 3
271	Boolean	Warning - External fault 4
272	Boolean	Warning - External fault 5
273	Boolean	Warning - External fault 6
276	Boolean	Warning - AM1 open circuit
277	Boolean	Warning - Safety-related tripping
278	Boolean	Warning - Test required
282	Boolean	Warning - Feedback circuit
283	Boolean	Warning - Simultaneity
Diagnostic trips		
284	Boolean	Trip - Hardware fault basic unit
285	Boolean	Trip - Module fault
286	Boolean	Trip - Temporary components
287	Boolean	Trip - Configuration fault
288	Boolean	Trip - Parameterization
289	Boolean	Trip - Bus
290	Boolean	Trip - PLC/DCS
292	Boolean	Trip - Execution on-command
293	Boolean	Trip - Execution stop command
294	Boolean	Trip - Feedback on
295	Boolean	Trip - Feedback off
296	Boolean	Trip - Stalled positioner
297	Boolean	Trip - Double 0
298	Boolean	Trip - Double 1
299	Boolean	Trip - End position
300	Boolean	Trip - Antivalence
301	Boolean	Trip - Test position feedback (TPF)
302	Boolean	Trip - Power failure (UVO)
303	Boolean	Trip - Operational Protection OFF (OPO)
309	Boolean	Trip - Unbalance
310	Boolean	Trip - Overload
311	Boolean	Trip - Overload + loss of phase
312	Boolean	Trip - Internal ground fault
313	Boolean	Trip - External ground fault
315	Boolean	Trip - Thermistor trip level
316	Boolean	Trip - Thermistor short circuit
317	Boolean	Trip - Thermistor open circuit
319	Boolean	Trip - TM1 trip level T>
320	Boolean	Trip - TM1 sensor fault
321	Boolean	Trip - TM1 out of range
322	Boolean	Trip - EM Open Circuit

Node ID	Data type	Description
323	Boolean	Trip - EM Short Circuit
324	Boolean	Trip - Trip level I>
325	Boolean	Trip - Trip level I<
326	Boolean	Trip - Trip level P>
327	Boolean	Trip - Trip level P<
328	Boolean	Trip - Trip level cos phi<
329	Boolean	Trip - Trip level U<
330	Boolean	Trip - AM1 trip level 0/4-20mA>
331	Boolean	Trip - AM1 trip level 0/4-20mA<
332	Boolean	Trip - Stalled rotor
336	Boolean	Trip - No. of starts >
340	Boolean	Trip - External fault 1
341	Boolean	Trip - External fault 2
342	Boolean	Trip - External fault 3
343	Boolean	Trip - External fault 4
344	Boolean	Trip - External fault 5
345	Boolean	Trip - External fault 6
348	Boolean	Trip - AM1 open circuit
349	Boolean	Trip - Test shutdown
350	Boolean	Trip - Safety-related tripping
351	Boolean	Trip - Wiring
352	Boolean	Trip - Cross circuit
356	Boolean	Trip - TM2 trip level T>
357	Boolean	Trip - TM2 sensor fault
358	Boolean	Trip - TM2 out of range
364	Boolean	Trip - AM2 trip level 0/4-20mA>
365	Boolean	Trip - AM2 trip level 0/4-20mA<
372	Boolean	Trip - AM2 open circuit
Diagnostic warnings		
388	Boolean	Warning - TM2 warning level T>
390	Boolean	Warning - TM2 sensor fault
391	Boolean	Warning - TM2 out of range
396	Boolean	Warning - AM2 warning level 0/4-20mA>
397	Boolean	Warning - AM2 warning level 0/4-20mA<
404	Boolean	Warning - AM2 open circuit
Diagnostic events		
420	Boolean	Event - TM2 warning level T>
421	Boolean	Event - TM2 trip level T>
422	Boolean	Event - TM2 sensor fault
423	Boolean	Event - TM2 out of range
428	Boolean	Event - AM2 warning level 0/4-20mA>
429	Boolean	Event - AM2 warning level 0/4-20mA<

Node ID	Data type	Description
430	Boolean	Event - AM2 trip level 0/4-20mA>
431	Boolean	Event - AM2 trip level 0/4-20mA<
432	Boolean	Event - Limit monitor 5
433	Boolean	Event - Limit monitor 6
444	Boolean	Event - AM2 open circuit
Acyclic send		
450	Boolean	Acyclic send data 0.0
451	Boolean	Acyclic send data 0.1
452	Boolean	Acyclic send data 0.2
453	Boolean	Acyclic send data 0.3
454	Boolean	Acyclic send data 0.4
455	Boolean	Acyclic send data 0.5
456	Boolean	Acyclic send data 0.6
457	Boolean	Acyclic send data 0.7
458	Boolean	Acyclic send data 1.0
459	Boolean	Acyclic send data 1.1
460	Boolean	Acyclic send data 1.2
461	Boolean	Acyclic send data 1.3
462	Boolean	Acyclic send data 1.4
463	Boolean	Acyclic send data 1.5
464	Boolean	Acyclic send data 1.6
465	Boolean	Acyclic send data 1.7

16.3 Abbreviations and specifications

Abbreviations

The following abbreviations are used in the tables:

Table 16- 6 Abbreviations

Abbreviation	Meaning
BU	Basic unit
IM	Current measuring module
UM	Current / voltage measuring module
DM1	Digital module 1
DM2	Digital module 2
DM-FL	DM-F Local fail-safe digital module
DM-FP	DM-F PROFIsafe fail-safe digital module
OP	Operator panel
OPD	Operator panel with display
AM	Analog module
EM	3UF7500 ground-fault module
EM+	3UF7510 ground-fault module
TM	Temperature module
Th	Thermistor
GF	General fault, control function
Cycl.	Cyclic
Acycl.	Acyclic
F	Fault
M	Event
W	Warning

Specifications

The following specifications apply in the tables:

Table 16- 7 Table specifications (example)

Designation	Type	Range	Unit	Information
*Reserved *)*	*Byte[4] *)*			
Max. current I_max	Word	0 … 65535	1 % / I_s	
*) Items in italics are not relevant (reserved) and must be filled with "0" when written to.				
Parameters that can be changed during operation.				

Event - PRM error number (bytes):

If parameterization is not possible, the number of the parameter group (PRM group) which caused the error is transmitted here.

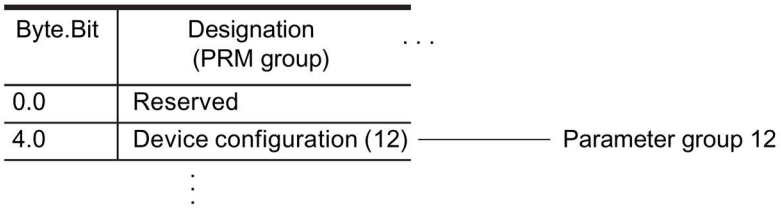


Figure 16-1 Example for parameter group

16.4 Socket assignment table - digital

This table contains all assignment numbers (No.) of the sockets (digital). You only need these assignment numbers if you, for example, use a user program to fill data records and write these back.

Table 16- 8 Socket assignment table - digital

No.	Designation	Designation	Information
0	Static level	Not connected	
1		Fixed level value,0	
2		Fixed level value,1	
3		*Reserved*	
4	Events – Level monitoring	Event – Warning 0/4 - 20mA>	AM2
5	Events – Level monitoring	Event – Warning 0/4 - 20mA<	AM2
6		Event – Trip 0/4 - 20mA>	AM2
7		Event – Trip 0/4 - 20mA<	AM2
8	Basic unit (BU)	BU - Test / Reset button	
9		BU - Input 1	
10		BU - Input 2	
11		BU - Input 3	
12		BU - Input 4	
13		*Reserved*	
14		*Reserved*	
15		*Reserved*	
16	Digital module DM	DM1 - Input 1	DM1
17		DM1 - Input 2	DM1
18		DM1 - Input 3	DM1
19		DM1 - Input 4	DM1
20		DM2 - Input 1	DM2
21		DM2 - Input 2	DM2
22		DM2 - Input 3	DM2
23		DM2 - Input 4	DM2
24		DM-FL sensor channel 1 Y12	DM-FL
25		DM-FL sensor channel 1 Y22	DM-FL
26		*Reserved*	
27		*Reserved*	
28	Events - Protection	Event – TM2 sensor fault	TM2
29		Event – TM2 out of range	TM2
30		Event – TM2 warning T>	TM2
31		Event – TM2 trip T>	TM2
32	Operator panel OP / OPD	OP – Test / Reset button	OP, OPD
33		OP – Button 1	OP, OPD
34		OP – Button 2	OP, OPD

No.	Designation	Designation	Information
35		OP – Button 3	OP, OPD
36		OP – Button 4	OP, OPD
37		*Reserved*	
38	Events – Limit 5+6	Event – Limit 5	
39		Event – Limit 6	
40	PC/OPC-UA [OCM]	Acyclic receive data - Bit 0.0	
41		Acyclic receive data - Bit 0.1	
42		Acyclic receive data - Bit 0.2	
43		Acyclic receive data - Bit 0.3	
44		Acyclic receive data - Bit 0.4	
45		Acyclic receive data - Bit 0.5	
46		Acyclic receive data - Bit 0.6	
47		Acyclic receive data - Bit 0.7	
48		Acyclic receive data - Bit 1.0	
49		Acyclic receive data - Bit 1.1	
50		Acyclic receive data - Bit 1.2	
51		Acyclic receive data - Bit 1.3	
52		Acyclic receive data - Bit 1.4	
53		Acyclic receive data - Bit 1.5	
54		Acyclic receive data - Bit 1.6	
55		Acyclic receive data - Bit 1.7	
56	PLC/PCS interface PLC [PN] (cyclic data)	Cyclic receive data - Bit 0.0	
57		Cyclic receive data - Bit 0.1	
58		Cyclic receive data - Bit 0.2	
59		Cyclic receive data - Bit 0.3	
60		Cyclic receive data - Bit 0.4	
61		Cyclic receive data - Bit 0.5	
62		Cyclic receive data - Bit 0.6	
63		Cyclic receive data - Bit 0.7	
64		Cyclic receive data - Bit 1.0	
65		Cyclic receive data - Bit 1.1	
66		Cyclic receive data - Bit 1.2	
67		Cyclic receive data - Bit 1.3	
68		Cyclic receive data - Bit 1.4	
69		Cyclic receive data - Bit 1.5	
70		Cyclic receive data - Bit 1.6	
71		Cyclic receive data - Bit 1.7	

No.	Designation	Designation	Information
72	Enabled control command	Enabled control command ON<<	Dependent on the control function
73		Enabled control command ON<	
74		Enabled control command - OFF	
75		Enabled control command ON>	
76		Enabled control command ON>>	
77		*Reserved*	
78		*Reserved*	
79		*Reserved*	
80	Contactor controls	Contactor controls 1 QE1	Dependent on the control function
81		Contactor controls 2 QE2	
82		Contactor controls 3 QE3	
83		Contactor controls 4 QE4	
84		Contactor controls 5 QE5	
85		*Reserved*	
86		*Reserved*	
87		*Reserved*	
88	Lamp controls	Display - QLE<<(ON<<)	Dependent on the control function
89		Display - QLE<(ON<)	
90		Indication - QLA (OFF)	
91		Display - QLE>(ON>)	
92		Display - QLE>>(ON>>)	
93		Indication - QLS (fault)	
94		*Reserved*	
95		*Reserved*	
96	Status information - General	Status - General fault	
97		Status - General warning	
98		Status - Device	
99		Status - Bus	
100		Status - PLC/PCS	
101		Status - Motor current flowing	IM UM
102		Status – PE command Start_Pause pending	
103		*Reserved*	
104	Status information - Receive	Status - ON<<	Dependent on the control function
105		Status - ON<	
106		Status - Off	
107		Status - ON>	
108		Status - ON>>	
109		Status - Start active	
110		Status - Interlocking time active	All reversing starters and positioners
111		Status - Change-over pause active	Star-delta, Dahlander, pole-changing starters

No.	Designation	Designation	Information
112		Status - Runs in open direction	Dependent on the control function
113		Status - Runs in closed direction	
114		Status - FC	
115		Status - FO	
116		Status - TC	
117		Status - TO	
118		Status - Cold start (TPF)	
119		Status - OPO	
120		Status - Remote mode	
121	Status information - Protection	Status - Emergency start executed	IM UM
122		Status - Cooling down period active	IM UM
123		Status - Pause time active	IM UM
124	Status information - Miscellaneous	Status - Device check active	
125		Status - Phase sequence 1-2-3	UM
126		Status - Phase sequence 3-2-1	UM
127		Status - DM-F enabling circuit	DM-F
128	Events - Protection	Event - Overload operation	IM UM
129		Event - Unbalance	IM UM
130		Event - Overload	IM UM
131		Event - Overload + loss of phase	IM UM
132		Event - Internal ground fault	IM UM
133		Event - External ground fault	EM
134		Event - Warning ext. ground fault	EM
135		Event - Thermistor overload	Th
136		Event - Thermistor short-circuit	Th
137		Event - Thermistor open circuit	Th
138		Event - TM1 warning T>	TM1
139		Event - TM1 trip T>	TM1
140		Event - TM1 sensor fault	TM
141		Event - TM1 out of range	TM
142		Event - EM+ open circuit	EM+
143		Event - EM+ short-circuit	EM+
144	Events - Level monitoring	Event - Warning I>	IM UM
145		Event - Warning I<	IM UM
146		Event - Warning P>	UM
147		Event - Warning P<	UM
148		Event - Warning cos phi<	UM
149		Event - Warning U<	UM
150		Event - warning 0/4 - 20mA>	AM1
151		Event - warning 0/4 - 20mA<	AM1
152		Event - Trip I>	IM UM
153		Event - Trip I<	IM UM

No.	Designation	Designation	Information
154		Event - Trip P>	UM
155		Event - Trip P<	UM
156		Event - Trip cos phi<	UM
157		Event - Trip U<	UM
158		Event - Trip 0/4-20 mA>	AM1
159		Event - Trip 0/4-20 mA<	AM1
160		Event - Stalled rotor	IM UM
161		*Reserved*	
162		*Reserved*	
163		Event - No start possible	
164		Event - No. of starts >	
165		Event - Just one start possible	
166		Event - Motor operating hours >	
167		Event - Motor stop time >	
168		Event - Limit 1	
169		Event - Limit 2	
170		Event - Limit 3	
171		Event - Limit 4	
172	Events - Miscellaneous	Event - External fault 1	
173		Event - External fault 2	
174		Event - External fault 3	
175		Event - External fault 4	
176		Event - External fault 5	
177		Event - External fault 6	
178		*Reserved*	
179		Event - AM2 open circuit	AM2
180		Event - AM1 open circuit	AM1, AM2
181		Event - DM-F safety-related tripping	DM-F
182		Event - DM-F - Test requirement	DM-F
183		*Reserved*	
184		*Reserved*	
185		*Reserved*	
186	Events - Miscellaneous	Event - DM-FL safety o.k	DM-FL
187		Event - DM-FP PROFIsafe active	DM-FP
188	Events - System interface	Event - Configured operator panel missing	
189		*Reserved*	
190	Warnings - Miscellaneous	Warning - DM-F feedback circuit	DM-F
191		Warning - DM-FL simultaneity	DM-FL
192	Faults - General	Fault - HW fault basic unit	
193		Fault - Module fault (e.g. IM, DM)	
194		Fault - temporary components (e.g. memory module)	

No.	Designation	Designation	Information
195		Fault - Configuration fault	
196		Fault - Parameterization	
197		Fault - Bus	
198		Fault - PLC/PCS	
199		*Reserved*	
200	Faults - Control	Fault - Execution Time ON	Not for overload relays
201		Fault - Execution time OFF	
202		Fault - FB ON	
203		Fault - FB OFF	
204		Fault - Stalled positioner	Positioner
205		Fault - Double 0	Solenoid valve / positioner
206		Fault - Double 1	Solenoid valve / positioner
207		Fault - End position	Solenoid valve / positioner
208		Fault - Antivalence	Positioner
209		Fault - Cold start (TPF) fault	
210		Fault - UVO fault	
211		Fault - OPO fault	
212		*Reserved*	
213		*Reserved*	
214	Freely programmable elements	Signal conditioner 5 output	
215		Signal conditioner 6 output	
216		Truth table 1 3I/1O output	
217		Truth table 2 3I/1O output	
218		Truth table 3 3I/1O output	
219		Truth table 4 3I/1O output	
220		Truth table 5 3I/1O output	
221		Truth table 6 3I/1O output	
222		Truth table 7 2I/1O output	
223		Truth table 8 2I/1O output	
224		Truth table 9 5I/2O output 1	
225		Truth table 9 5I/2O output 2	
226		Truth table 10 3I/1O output	
227		Truth table 11 3I/1O output	
228		Counter 5 output	
229		Counter 6 output	
230		Timer 5 output	
231		Timer 6 output	
232		Timer 1 output	
233		Timer 2 output	
234		Timer 3 output	

No.	Designation	Designation	Information
235		Timer 4 output	
236		Counter 1 output	
237		Counter 2 output	
238		Counter 3 output	
239		Counter 4 output	
240		Signal conditioner 1 output	
241		Signal conditioner 2 output	
242		Signal conditioner 3 output	
243		Signal conditioner 4 output	
244		Non-volatile Element 1 output	
245		Non-volatile Element 2 output	
246		Non-volatile Element 3 output	
247		Non-volatile Element 4 output	
248		Flashing 1 output	
249		Flashing 2 output	
250		Flashing 3 output	
251		Flicker 1 output	
252		Flicker 2 output	
253		Flicker 3 output	
254		PWM output	
255		*Reserved*	

16.5 Socket assignment table - analog

This table contains all assignment numbers (No.) of the sockets (analog). You only need these assignment numbers if you, for example, use a user program to fill data records and write these back. All inputs for analog data can only process values of type "Word" (2 bytes). In order to also be able to process values of type "Byte", the following applies: The byte value is processed as a low byte, the high byte is always 0.

Table 16- 9 Socket assignment table - analog

No.	Designation	Unit	Information
0	Not connected		
1	Fixed level		
2	*Reserved*		
3	*Reserved*		
4	Timer 1 - Actual value	100 ms	
5	Timer 2 - Actual value	100 ms	
6	Timer 3 - Actual value	100 ms	
7	Timer 4 - Actual value	100 ms	
8	Counter 1 - Actual value		
9	Counter 2 - Actual value		
10	Counter 3 - Actual value		
11	Counter 4 - Actual value		
12	Counter 5 - Actual value		
13	Counter 6 - Actual value		
14	Timer 5 - Actual value	100 ms	
15	Timer 6 - Actual value	100 ms	
16	Max. current I_max	1 % / Is	IM UM
17	Current I_L1	1 % / Is	IM UM
18	Current I_L2	1 % / Is	IM UM
19	Current I_L3	1 % / Is	IM UM
20	Phase unbalance	1 %	IM UM
21	*Reserved*		
22	*Reserved*		
23	Voltage U_min	1 V	UM
24	Voltage U_L1	1 V see 2)	UM
25	Voltage U_L2	1 V see 2)	UM
26	Voltage U_L3	1 V see 2)	UM
27	Cos phi	1 %	UM
28	*Reserved*		
29	*Reserved*		
30	Number of overload trips		
31	Int. number of overload trips		
32	Thermal motor model	2 %	IM UM
33	Time to trip	100 ms	IM UM

No.	Designation	Unit	Information
34	Recovery time	100 ms	IM UM
35	Last trip current	1 % / Is	IM UM
36	TM1 - max. temperature	1 K	TM1
37	TM1 - temperature 1	1 K	TM1
38	TM1 - temperature 2	1 K	TM1
39	TM1 - temperature 3	1 K	TM1
40	Permissible starts - Actual value		
41	Motor stop time	1 h	
42	DM-F - Time until test required	1 week	DM-F
43	EM+ - last trip current	1 mA	EM+
44	AM1 - input 1	See 1)	AM1
45	AM1 - input 2	See 1)	AM1
46	AM1 - input 3	See 1)	
47	EM+ - ground fault current	1 mA	
48	Acyclic receive data - analog value		
49	Cyclic receive data - analog value 1		
50	Cyclic receive data - analog value 2		
51	Number of parameterizations		
52	Motor operating hours - H word	1 s	
53	Motor operating hours - L word	1 s	
54	Int. motor operating hours - H word	1 s	
55	Int. motor operating hours - L word	1 s	
56	Device operating hours - H word	1 s	
57	Device operating hours - L word	1 s	
58	Number of starts - H word		
59	Number of starts - L word		
60	Int. number of starts right - H word		
61	Int. number of starts CW - L word		
62	Int. number of starts left - H word		
63	Int. number of starts left - L word		
64	Energy W - high word	1 kWh	UM
65	Energy W - low word	1 kWh	UM
66	*Reserved*		
..	*Reserved*		
69	*Reserved*		
70	Active power P - H word	1 W	
71	Active power P - L word	1 W	
72	Apparent power S - H word	1 VA	
73	Apparent power S - L word	1 VA	
74	*Reserved*		
..	*Reserved*		
85	*Reserved*		

No.	Designation	Unit	Information
86	Calculation module 1 - Output		
87	*Reserved*		
88	*Reserved*		
89	*Reserved*		
90	Calculation module 2 - Output		
91	Analog arithmetic 1 output		
92	Analog arithmetic 2 output		
93	Analog multiplexer output		
94	*Reserved*		
..	*Reserved*		
103	*Reserved*		
104	Max. current I_max_10mA	10 mA	UM IM
105	Current I_L1_10mA	10 mA	UM IM
106	Current I_L2_10mA	10 mA	UM IM
107	Current I_L3_10mA	10 mA	UM IM
108	Max. current I_max_100mA	100 mA	UM IM
109	Current I_L1_100mA	100 mA	UM IM
110	Current I_L2_100mA	100 mA	UM IM
111	Current I_L3_100mA	100 mA	UM IM
112	*Reserved*		
113	*Reserved*		
114	*Reserved*		
115	*Reserved*		
116	TM2 - max. temperature	1 K	TM2
117	TM2 - temperature 1	1 K	TM2
118	TM2 - temperature 2	1 K	TM2
119	TM2 - temperature 3	1 K	TM2
120	AM2 - input 1		AM2
121	AM2 - input 2		AM2
122	AM2 - input 3		AM2
123	*Reserved*		
..	*Reserved*		
255	*Reserved*		

1) S7 format: 0/4mA=0; 20mA=27648

2) If "line-to-line voltage = 1," "Voltage U_Lx" contain the line-to-line voltages

Data formats and data records

17

In this chapter

In this chapter, you will find information about the data records of SIMOCODE pro.

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- PLC programmers

Required knowledge

You will require the following knowledge:

- Sound knowledge of writing/reading data records
- Sound knowledge of SIMOCODE pro

Data records - overview

Table 17- 1 Data records - overview

Data record No.	Length [byte]	Description	Read / write
63	200	Analog value recording	Read
67	10	Process image output	Read
69	30	Process image input	Read
72	126	Error buffer	Read
73	168	Event memory	Read
92	46	Device diagnostics (faults, warnings, status information)	Read
94	172	Measured values	Read
95	148	Service / statistical data	Read / write
130	92	Basic device parameter 1	Read / write
131	124	Basic device parameter 2	Read / write
132	144	Extended device parameter 1	Read / write
133	100	Extended device parameter 2	Read / write
134	180	Extended device parameter 1	Read / write
135	114	Extended device parameter 2	Read / write
139	200	Marking	Read / write
140	200	Markings 2	Read / write
165	168	Identification	Read / write
224	24	Password protection	Write

17.1 Handling data records

17.1.1 Writing / reading data records

Access to data records via the slot and index

- Index: Data record number

Writing / reading data records with STEP7

You can access the data records from the user program.

- Writing data records: By calling SFB 53 "WR_REC"
- Reading data records: By calling SFB 52 "RD_REC"

Further information

You can find additional information about the SFBs

- in System Software for S7-300/400, System and Standard Functions reference manual (http://support.automation.siemens.com/WW/view/en/1214574)
- In the STEP7 online help

Byte arrangements

When data longer than one byte is stored, the bytes are arranged as follows ("big endian"):

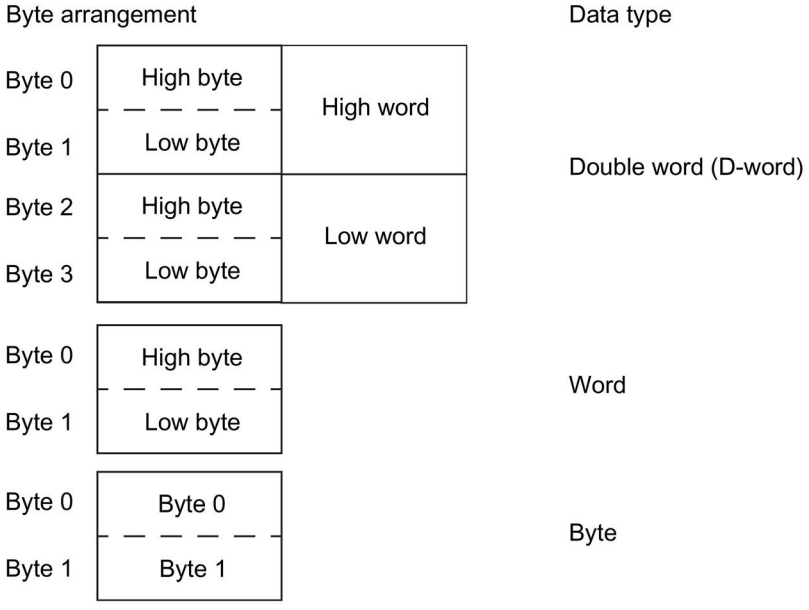


Figure 17-1 Byte arrangement in "big endian" format

17.1.2 Abbreviations

The following abbreviations are used in the tables:

Table 17- 2 Abbreviations

Abbreviation	Meaning
BU	Basic unit
IM	Current measuring module
UM	Current / voltage measuring module
DM1	Digital module 1
DM2	Digital module 2
DM-FL	DM-F Local fail-safe digital module
DM-FP	DM-F PROFIsafe fail-safe digital module
OP	Operator panel
OPD	Operator panel with display
AM	Analog module
EM	Ground-fault module
TM	Temperature module
Th	Thermistor
GF	Control function
Cycl.	Cyclic
Acycl.	Acyclic
F	Fault
M	Event
W	Warning

17.1.3 Specifications

The following specifications apply in the tables:

Table 17- 3 Table specifications (example)

Designation	Type	Range	Unit	Information
*Reserved *)*	*Byte[4] *)*			
Max. current I_max	Word	0 … 65535	1 % / I_s	
*) Items in italics are not relevant (reserved) and must be filled with "0" when written to.  Parameters that can be changed during operation.				

Settings are valid/can only be made when the corresponding system components are used.

17.2 Data record 63 - Analog value recording

You can read out the data of the "Analog value recording" function stored in the device.

Table 17- 4 Data record 63 - Analog value recording

Byte.Bit	Designation	Type	Range	Information
0.0	StartPos	Word	0	
2.0	Channel No.	Byte	1	
3.0	Analog value record currently running	Bit	0, 1	
3.1	Trigger event occurred	Bit	0, 1	
3.2	*Reserved*	*Bit[6]*	*0*	
4.0	Measured value (0)	Word	0 - 65535	
6.0	Measured value (1)	Word	0 - 65535	
...				
122.0	Measured value (59)	Word	0 - 65535	
124.0	*Reserved*	*Byte[76]*	*0*	

The unit of the measured value is dependent on the assigned analog value. You will find all available analog values with their units in Chapter Socket assignment table - analog (Page 534).

17.3 Data record 67 - Process image output

Table 17- 5 Data record 67 - Process image output

Byte.Bit	Designation	Default (also see parameters)	Type	Information
0.0	Cyclic receive - Bit 0.0	Control station - PLC/PCS [PN] ON<	Bit	
0.1	Cyclic receive - Bit 0.1	Control station - PLC/PCS [PN] OFF	Bit	
0.2	Cyclic receive - Bit 0.2	Control station - PLC/PCS [PN] ON>	Bit	
0.3	Cyclic receive - Bit 0.3	Test 1	Bit	
0.4	Cyclic receive - Bit 0.4	Motor protection - Emergency start	Bit	
0.5	Cyclic receive - Bit 0.5	Mode selector S1	Bit	
0.6	Cyclic receive - Bit 0.6	Reset 1	Bit	
0.7	Cyclic receive - Bit 0.7	Not assigned	Bit	
1.0	Cyclic receive - Bit 1.0	Not assigned	Bit	
1.1	Cyclic receive - Bit 1.1	Not assigned	Bit	
1.2	Cyclic receive - Bit 1.2	Not assigned	Bit	
1.3	Cyclic receive - Bit 1.3	Not assigned	Bit	
1.4	Cyclic receive - Bit 1.4	Not assigned	Bit	
1.5	Cyclic receive - Bit 1.5	Not assigned	Bit	
1.6	Cyclic receive - Bit 1.6	Not assigned	Bit	
1.7	Cyclic receive - Bit 1.7	Not assigned	Bit	
2.0	Cyclic receive - analog value 1	Not assigned	Word	
4.0	Cyclic receive - analog value 2	Not assigned	Word	
6.0	*Reserved*		*Bytes[4]*	

17.4 Data record 69 - Process image input

Table 17- 6 Data record 69 - Process image input

Byte.Bit	Designation	Default (also see parameters)	Type	Information
0.0	Cyclic send - Bit 0.0	Status - ON<	Bit	
0.1	Cyclic send - Bit 0.1	Status - Off	Bit	
0.2	Cyclic send - Bit 0.2	Status - ON>	Bit	
0.3	Cyclic send - Bit 0.3	Event - Overload operation	Bit	
0.4	Cyclic send - Bit 0.4	Status - Interlocking time active	Bit	
0.5	Cyclic send - Bit 0.5	Status - Remote mode	Bit	
0.6	Cyclic send - Bit 0.6	Status - General fault	Bit	
0.7	Cyclic send - Bit 0.7	Status - General warning	Bit	
1.0	Cyclic send - Bit 1.0	Not assigned	Bit	
1.1	Cyclic send - Bit 1.1	Not assigned	Bit	
1.2	Cyclic send - Bit 1.2	Not assigned	Bit	
1.3	Cyclic send - Bit 1.3	Not assigned	Bit	
1.4	Cyclic send - Bit 1.4	Not assigned	Bit	
1.5	Cyclic send - Bit 1.5	Not assigned	Bit	
1.6	Cyclic send - Bit 1.6	Not assigned	Bit	
1.7	Cyclic send - Bit 1.7	Not assigned	Bit	
2.0	PLC/PCS analog input 1	Max. current I_max	Word	
4.0	PLC/PCS analog input 2	Not assigned	Word	
6.0	PLC/PCS analog input 3	Not assigned	Word	
8.0	PLC/PCS analog input 4	Not assigned	Word	
10.0	PLC/PCS analog input 5	Not assigned	Word	
12.0	PLC/PCS analog input 6	Not assigned	Word	
14.0	PLC/PCS analog input 7	Not assigned	Word	
16.0	PLC/PCS analog input 8	Not assigned	Word	
18.0	PLC/PCS analog input 9	18.0	Word	
20.0	*Reserved*		*Bytes[10]*	

17.5 Data record 72 - Error buffer

Table 17- 7 Data record 72 - Error buffer

Byte.Bit	Entry	Designation	Type	Information
0.0	1	Time stamp	D-word	
4.0		Type	Byte	
5.0		Error number	Byte	
6.0	2	Time stamp	D-word	
10.0		Type	Byte	
11.0		Error number	Byte	
...				
120.0	21	Time stamp	D-word	
124.0		Type	Byte	
125.0		Error number	Byte	

Time stamp

The operating hours of the device are used as a time stamp (resolution: 1 s).

Type/error number

If the type has the value 71, the entry contains an error: Refer to the error numbers for detailed information. You will find the mean in Chapter Data record 92 - Device diagnostics (Page 545) in column "Error number" of table "Data record 92 - Device diagnostics."

If the type has the value 255, the entry displays "Power - On". In this case, the error number contains the number of power ON operations, reduced by 1 (0 = 1x power ON, ...).

17.6 Data record 73 - Event memory

Table 17- 8 Data record 73 - Event memory

Byte.Bit	Entry	Designation	Type	Information
0.0	1	Time stamp	D-word	
4.0		Entry - Type	Byte	
5.0		Entry - Info	Byte[3]	
8.0	2	Time stamp	D-word	
12.0		Entry - Type	Byte	
13.0		Entry - Info	Byte[3]	
16.0	3	Time stamp	D-word	
20.0		Entry - Type	Byte	
21.0		Entry - Info	Byte[3]	
...				
160.0	21	Time stamp	D-word	
164.0		Entry - Type	Byte	
165.0		Entry - Info	Byte[3]	

The high byte of the system number is 98 in the event memory.

17.7 Data record 92 - Device diagnostics

Table 17- 9 Data record 92 - Diagnostics

Byte.Bit	Designation		Information	PNIO Diagn. **)	Error No. ***)
0.0		*Reserved*			
1.0	Status information - General	Status - General fault			
1.1		Status - General warning			
1.2		Status - Device			
1.3		Status - Bus			
1.4		Status - PLC/PCS			
1.5		Status - Motor current flowing	IM UM		
1.6	*Reserved*				
1.7	*Reserved*				
2.0	Status information - Receive	Status - ON<<	Dependent on the control function		
2.1		Status - ON<			
2.2		Status - Off			
2.3		Status - ON>			
2.4		Status - ON>>			
2.5		Status - Start active			
2.6		Status - Interlocking time active	All reversing starters and positioners		
2.7		Status - Change-over pause active	Star-delta, Dahlander, pole-changing starters		
3.0		Status - Runs in open direction	Dependent on the control function		
3.1		Status - Runs in close direction			
3.2		Status - FC			
3.3		Status - FO			
3.4		Status - TC			
3.5		Status - TO			
3.6		Status - Cold starting (TPF)		1	0x1009
3.7		Status - OPO			
4.0		Status - Auto mode			
4.1	Status information - Protection	Status - Emergency start executed	IM UM	1	0x1031
4.2		Status - Cooling down period active	IM UM	1	0x1032
4.3		Status - Pause time active	IM UM		
4.4	Status information - Miscellaneous	Status - Device check active			
4.5		Status - Phase sequence 1-2-3	UM		

Byte.Bit	Designation		Information	PNIO Diagn. **)	Error No. ***)
4.6		Status - Phase sequence 3-2-1	UM		
4.7		Status - DM-F enabling circuit	DM-F		
5.0	Events - Protection	Event - Overload operation	IM UM		
5.1		Event - Unbalance	IM UM		
5.2		Event - Overload	IM UM		
5.3		Event - Overload + loss of phase	IM UM		
5.4		Event - Internal ground fault	IM UM		
5.5		Event - External ground fault	EM		
5.6		Event - Warning ext. ground fault	EM		
5.7		Event - Thermistor overload	Th		
6.0		Event - Thermistor short-circuit	Th		
6.1		Event - Thermistor open circuit	Th		
6.2		Event - TM1 warning T>	TM1		
6.3		Event - TM1 trip T>	TM1		
6.4		Event - TM1 sensor fault	TM1		
6.5		Event - TM1 out of range	TM		
6.6		Event - EM+ open circuit	EM+ 1)		
6.7		Event - EM+ short-circuit	EM+ 1)		
7.0	Events - Level monitoring	Event - Warning I>	IM UM		
7.1		Event - Warning I<	IM UM		
7.2		Event - Warning P>	UM		
7.3		Event - Warning P<	UM		
7.4		Event - Warning cos phi<	UM		
7.5		Event - Warning U<	UM		
7.6		Event - Warning 0/4-20 mA>	AM1		
7.7		Event - Warning 0/4-20 mA<	AM1		
8.0		Event - Trip I>	IM UM		
8.1		Event - Trip I<	IM UM		
8.2		Event - Trip P>	UM		
8.3		Event - Trip P<	UM		
8.4		Event - Trip cos phi<	UM		
8.5		Event - Trip U<	UM		
8.6		Event - Trip 0/4-20 mA>	AM1		
8.7		Event - Trip 0/4-20 mA<	AM1		
9.0		Event - Stalled rotor	IM UM		
9.1		*Reserved*			
9.3		Event - No start possible			
9.4		Event - No. of starts >			
9.5		Event - Just one start possible			
9.6		Event - Motor operating hours >			
9.7		Event - Motor stop time >			

Byte.Bit	Designation		Information	PNIO Diagn. **)	Error No. ***)
10.0		Event - Limit 1			
10.1		Event - Limit 2			
10.2		Event - Limit 3			
10.3		Event - Limit 4			
10.4	Events - Miscella-neous	Event - Ext. fault 1			
10.5		Event - Ext. fault 2			
10.6		Event - Ext. fault 3			
10.7		Event - Ext. fault 4			
11.0		Event - Ext. fault 5			
11.1		Event - Ext. fault 6			
11.2		*Reserved*			
11.3		*Reserved*			
11.4		Event - AM1 open circuit	AM1		
11.5		Event - DM-F safety-related trip-ping	DM-F		
11.6		Event - DM-F - Test requirement	DM-F		
11.7		Event - NTP clock set			
12.0	Events - Time stamp function	Event - Timestamping function active + OK			
12.1	Events - Miscella-neous	Event - NTP clock synchronized			
12.2		Event - DM-FL safety ok	DM-FL		
12.3		Event - DM-FP PROFIsafe active	DM-FP		
12.4	Events - System interfaces	Event - Configured operator panel missing			
12.5		Event - Module not supported			
12.6		Event - No module voltage			
12.7		*Reserved*			
13.0	Events - Memory module / initializa-tion module	Event - Memory module read in			
13.1		Event - Memory module pro-grammed			
13.2		Event - Memory module cleared			
13.3		*Reserved*			
13.4		Event - Initialization module read in			
13.5		Event - Initialization module pro-grammed			
13.6		Event - Initialization module cleared			
13.7	*Reserved*				
14.0	Events - parameter-ization	Event - Start-up parameter block active			***)

Byte.Bit	Designation		Information	PNIO Diagn. **)	Error No. ***)
14.1		Event - Parameter changes not allowed in the current operating state		1	0x0010
14.2		Event - Device does not support the required functions		1	0x0010
14.3		Event - Wrong parameter		1	0x0010
14.4		Event - Wrong password		1	0x0010
14.5		Event - Password protection active			
14.6		Event - Factory settings			
14.7		Event - Parameterization active			
15.0		Event - PRM error number (bytes)			
16.0		Event - DM-FL configuration mode			
16.1		Event - DM-FL configuration deviation			
16.2		Event - DM-FL waiting for start-up test			
16.3		Event - DM-FP F-Prm error *)		3	0x0010
16.4		Event - Initialization module write-protected, parameter changes not allowed		1	0x0010
16.5	Events - Memory module - initialization module (InM)	Event - Memory module write-protected			
16.6		Event - Initialization module write-protected			
16.7		Event - Initialization module identification data write-protected			
17.0	Warnings - Protection	Warning - Overload operation	IM UM	2	0x1020
17.1		Warning - Unbalance	IM UM	2	0x1021
17.2		Warning - Overload	IM UM	2	0x1022
17.3		Warning - Overload + phase failure	IM UM	2	0x1023
17.4		Warning - Internal ground fault	IM UM	2	0x1027
17.5		Warning - External ground fault	EM	2	0x1028
17.6		*Reserved*			
17.7		Warning - Thermistor overload	Th	2	0x1024
18.0		Warning - Thermistor short circuit	Th	2	0x1025
18.1		Warning - Thermistor open circuit	Th	2	0x1026
18.2		Warning - TM1 warning T >	TM1	2	0x102B
18.3		*Reserved*			
18.4		Warning - TM1 sensor fault	TM1	2	0x102C
18.5		Warning - TM1 out of range	TM1	2	0x102D
18.6		Warning - EM+ open circuit	EM+ 1)	2	0x1029
18.7		Warning - EM+ short-circuit	EM+ 1)	2	0x102A

Byte.Bit	Designation		Information	PNIO Diagn. **)	Error No. ***)
19.0	Warnings - Level monitoring	Warning - Warning I>	IM UM	2	0x1040
19.1		Warning - Warning I<	IM UM	2	0x1041
19.2		Warning - Warning P>	UM	2	0x1042
19.3		Warning - Warning P<	UM	2	0x1043
19.4		Warning - Warning cos phi<	UM	2	0x1045
19.5		Warning - Warning U<	UM	2	0x1047
19.6		Warning - Warning 0/4-20 mA>	AM1	2	0x1048
19.7		Warning - Warning 0/4-20 mA<	AM1	2	0x1049
20.0		Warning - Stalled rotor	IM UM	2	0x104C
20.1		*Reserved*			
20.3		Warning - No start possible		2	0x1056
20.4		Warning - Number of starts >		2	0x1057
20.5		Warning - Just one start possible		2	0x1058
20.6		Warning - Motor operating hours>		2	0x1059
20.7		Warning - Motor stop time >		2	0x105A
21.0	Warnings - Miscel-laneous	Warning - Ext. fault 1		2	0x1070
21.1		Warning - Ext. fault 2		2	0x1071
21.2		Warning - Ext. fault 3		2	0x1072
21.3		Warning - Ext. fault 4		2	0x1073
21.4		Warning - Ext. fault 5		2	0x1074
21.5		Warning - Ext. fault 6		2	0x1075
21.6		*Reserved*			
21.7		*Reserved*			
22.0		Warning - AM1 open circuit	AM1	2	0x105B
22.1		Warning - DM-F safety-related tripping	DM-F	2	0x0019
22.2		Warning - DM-F test requirement	DM-F	2	0x105E
22.3		*Reserved*			
22.6		Warning - DM-F feedback circuit	DM-F	2	0x105F
22.7		Warning - DM-FL simultaneity	DM-FL	2	0x1060
23.0	Faults - General	Fault - HW fault basic unit		3	0x0009
23.1		Fault - Module fault (e.g. module IM, UM, DM)		3	0x0009
23.2		Fault - Temporary components (e.g. memory module)		3	0x0009
23.3		Fault - Configuration fault		3	0x0010
23.4		Fault - Parameterization		3	0x0010
23.5		Fault - Bus			
23.6		Fault - PLC/PCS			
23.7		*Reserved*			

Byte.Bit	Designation		Information	PNIO Diagn. **)	Error No. ***)
24.0	Faults - Control	Fault - Execution ON command		3	0x1000
24.1		Fault - Execution STOP command		3	0x1001
24.2		Fault - FB ON		3	0x1002
24.3		Fault - FB OFF		3	0x1003
24.4		Fault - Stalled positioner	CF = positioner	3	0x1004
24.5		Fault - Double 0	CF = positioner	3	0x1005
24.6		Fault - Double 1	CF = positioner	3	0x1006
24.7		Fault - End position	CF = positioner	3	0x1007
25.0		Fault - Antivalence	CF = positioner	3	0x1008
25.1		Fault - Cold starting (TPF) fault		3	0x100A
25.2		Fault - UVO fault		3	0x100B
25.3		Fault - OPO fault		3	0x100C
25.4		*Reserved*			
26.0		*Reserved*			
26.1	Fault - Protection	Fault - Unbalance	IM UM	3	0x1021
26.2		Fault - Overload	IM UM	3	0x1022
26.3		Fault - Overload + phase failure	IM UM	3	0x1023
26.4		Fault - Int. ground fault	IM UM	3	0x1027
26.5		Fault - Ext. ground fault	EM	3	0x1028
26.6		*Reserved*			
26.7		Fault - Thermistor overload	Th	3	0x1024
27.0		Fault - Thermistor short circuit	Th	3	0x1025
27.1		Fault - Thermistor open circuit	Th	3	0x1026
27.2		*Reserved*			
27.3		Fault - TM1 trip T>	TM1	3	0x102B
27.4		Fault - TM1 sensor fault	TM1	3	0x102C
27.5		Fault - TM1 out of range	TM1	3	0x102D
27.6		Fault - EM+ open circuit	EM+	3	0x1029
27.7		Fault - EM+ short-circuit	EM+	3	0x102A
28.0	Faults - Level monitoring	Fault - Trip I>	IM UM	3	0x1040
28.1		Fault - Trip I<	IM UM	3	0x1041
28.2		Fault - Trip P>	UM	3	0x1042
28.3		Fault - Trip P<	UM	3	0x1043
28.4		Fault - Trip cos phi<	UM	3	0x1045
28.5		Fault - Trip U<	UM	3	0x1047
28.6		Fault - Trip 0/4-20 mA>	AM1	3	0x1048
28.7		Fault - Trip 0/4-20 mA<	AM1	3	0x1049
29.0		Fault - Stalled rotor	IM UM	3	0x104C
29.1		*Reserved*			
29.4		Fault - Number of starts >		3	0x1057
29.5		*Reserved*			

Byte.Bit	Designation		Information	PNIO Diagn. **)	Error No. ***)
30.0	Faults - Miscellaneous	Fault - External fault 1		3	0x1070
30.1		Fault - External fault 2		3	0x1071
30.2		Fault - External fault 3		3	0x1072
30.3		Fault - External fault 4		3	0x1073
30.4		Fault - External fault 5		3	0x1074
30.5		Fault - External fault 6		3	0x1075
30.6		*Reserved*			
30.7		*Reserved*			
31.0		Fault - AM1 open circuit	AM1	3	0x105B
31.1		Fault - Test trip		3	0x1055
31.2		Fault - DM-F safety-related tripping	DM-F	3	0x0019
31.3		Fault - DM-F wiring	DM-FL	3	0x1061
31.4		Fault - DM-FL cross circuit	DM-FL	3	0x1062
31.5		*Reserved*			
32.0	Faults - Protection extended	Fault - TM2 trip T >	TM2	3	0x102E
32.1		Fault - TM2 sensor fault	TM2	3	0x102F
32.2		Fault - TM2 out of range	TM2	3	0x1030
32.3		*Reserved*			
33.0	Faults - Level monitoring extended	Fault - Trip 0/4-20mA >	AM2	3	0x104A
33.1		Fault - Trip 0/4-20mA <	AM2	3	0x104B
33.2		*Reserved*			
34.0	Faults - Miscellaneous extended	Fault - AM2 open circuit	AM2	3	0x105C
34.1		*Reserved*			
36.0	Warnings - Protection extended	Warning - TM2 warning T >	TM2	2	0x102E
36.1		*Reserved*			
36.2		Warning - TM2 sensor fault	TM2	2	0x102F
36.3		Warning - TM2 out of range	TM2	2	0x1030
36.4		*Reserved*			
37.0	Warnings - Level monitoring extended	Warning - Warning 0/4-20mA >	AM2	2	0x104A
37.1		Warning - Warning 0/4-20mA <	AM2	2	0x104B
37.2		*Reserved*			
38.0	Warnings - Miscellaneous extended	Warning - AM2 open circuit	AM2	2	0x105C
38.1		*Reserved*			
39.0		*Reserved*			
40.0	Events - Protection extended	Event - TM2 warning T>	TM2		
40.1		Event - TM2 trip T>	TM2		

Byte.Bit	Designation		Information	PNIO Diagn. **)	Error No. ***)
40.2		Event - TM2 sensor fault	TM2		
40.3		Event – TM2 out of range	TM2		
40.4		*Reserved*			
41.0	Events - Level monitoring	Event - Warning 0/4-20mA >	AM2		
41.1		Event - Warning 0/4-20mA <	AM2		
41.2		Event - Trip 0/4-20mA > 2	AM2		
41.3		Event - Trip 0/4-20mA <	AM2		
41.4		Event - Limit 5	Limit monitor 5		
41.5		Event - Limit 6	Limit monitor 6		
41.6		*Reserved*			
42.0		*Reserved*			
43.0	Events - Miscellaneous extended	Event - AM2 open circuit	AM2		
43.1		*Reserved*			
44.0		*Reserved Bit[16]*			

*) The "GEN. FAULT" LED on the basic unit is not controlled; instead, the "SF" LED lights up on the DM-FP (because PROFIsafe is not active)

**) Left column: PNIO diagnostics status for the raised alarm:

- 1 = Maintenance required
- 2 = Maintenance demanded
- 3 = Failure

Right column: PNIO error number (channel error type)

***) No PNIO diagnostics

1) 3UF7510-1AA00-0 ground-fault module

17.8 Data record 94 - measured values

Table 17- 10 Data record 94 - measured values

Byte.Bit	Designation	Type	Range	Unit	Information
0.0	*Reserved*	*Byte[4]*			
4.0	Thermal motor model	Byte	0 - 255	See 2)	IM UM
5.0	Phase unbalance	Byte	0 - 100	1 %	IM UM
6.0	cos phi	Byte	0 - 100	1 %	UM
7.0	*Reserved*	*Byte[5]*			
12.0	Max. current I_max	Word	0 - 65535	1 % / I_s	IM UM
14.0	Current I_L1	Word	0 - 65535	1 % / I_s	IM UM
16.0	Current I_L2	Word	0 - 65535	1 % / I_s	IM UM
18.0	Current I_L3	Word	0 - 65535	1 % / I_s	IM UM
20.0	Last trip current	Word	0 - 65535	1 % / I_s	IM UM
22.0	Time to trip	Word	0 - 65535	100 ms	IM UM
24.0	Cooling down period	Word	0 - 65535	100 ms	IM UM
26.0	Voltage U_L1	Word	0 - 65535	1 V	UM
28.0	Voltage U_L2	Word	0 - 65535	1 V	UM
30.0	Voltage U_L3	Word	0 - 65535	1 V	UM
32.0	AM1 - output	Word	0 - 32767	See 1)	AM1
34.0	AM1 - input	Word	0 - 32767		AM1
36.0	AM1 - input 2	Word	0 - 32767		AM1
38.0	*Reserved*				
40.0	TM1 - max. temperature	Word	0 - 65535	1 K see 3)	TM1
42.0	TM1 - temperature 1	Word	0 - 65535		TM1
44.0	TM1 - temperature 2	Word	0 - 65535		TM1
46.0	TM1 - temperature 3	Word	0 - 65535		TM1
48.0	EM+ 4) - ground-fault current	Word	0 - 65535		EM+
50.0	EM+ 4 - last trip current	Word	0 - 65535		EM+
52.0	Active power P	D-word	0 - 0xFFFFFFFF	1 W	UM
56.0	Apparent power S	D-word	0 - 0xFFFFFFFF	1 VA	UM
60.0	*Reserved*	*Byte[14]*			
64.0	*Reserved*	*Byte[28]*			
92.0	*Reserved*	*Byte[24]*			
116.0	AM2 - output	Word	0 - 32767	See 1)	AM2
118.0	AM2 - input 1	Word	0 - 32767		AM2
120.0	AM2 - input 2	*Word*	0 - 32767		AM2
122.0	*Reserved*				

Byte.Bit	Designation	Type	Range	Unit	Information
124.0	TM2 - max. temperature	Word	0 - 65535	1 K see 3)	TM2
126.0	TM2 - temperature 1	Word	0 - 65535		TM2
128.0	TM2 - temperature 2	Word	0 - 65535		TM2
130.0	TM2 - temperature 3	Word	0 - 65535		TM2
132.0	*Reserved*				
140.0	*Reserved*	*Byte[32]*			

1) S7 format:

0/4 mA = 0

20 mA = 27648

2) Representation of the "Thermal motor model":

Value always refers to symm. trip level,
representation in steps of 2% in bits 6 - 0 (range 0 to 254%), bit 7 shows unbalance (fixed level 50%).

3) Representation in Kelvin.

4) 3UF7510-1AA00-0 ground-fault module

17.9 Data record 95 - Service data/statistical data

Writing the service data/statistical data

Writing is only possible if password protection is not active.

Additional abbreviations:

- r / w = value can be written / changed
- r = value can only be read

Table 17- 11 Data record 95 - service data/statistical data

Byte.Bit	Designation	Type	Range	Unit		Information
0.0	*Coordination*	*Byte[4]*				
4.0	Permissible starts - Actual value	Byte	0 - 255		r[1)]	
5.0	DM-F - Time until test required	Byte	0 - 255	1 week	r	
6.0	*Reserved*	*Byte[2]*				
8.0	Number of parameterizations	Word	0 - 65535		r	
10.0	Number of overload trips	Word	0 - 65535		r / w	
12.0	Number of internal overload trips	Word	0 - 65535		r	
14.0	Motor stop time	Word	0 - 65535	1 h	r / w	
16.0	Timer 1 - Actual value	Word	0 - 65535	100 ms	r	
18.0	Timer 2 - Actual value	Word	0 - 65535	100 ms	r	
20.0	Timer 3 - Actual value	Word	0 - 65535	100 ms	r	
22.0	Timer 4 - Actual value	Word	0 - 65535	100 ms	r	
24.0	Counter 1 - Actual value	Word	0 - 65535		r	
26.0	Counter 2 - Actual value	Word	0 - 65535		r	
28.0	Counter 3 - Actual value	Word	0 - 65535		r	
30.0	Counter 4 - Actual value	Word	0 - 65535		r	
32.0	Calculation module 1 - Output	Word	0 - 65535		r	
34.0	Calculation module 2 - Output	Word	0 - 65535		r	
36.0	*Reserved*	*Byte[4]*	*0*			
40.0	Motor operating hours	D-word	0 - 0xFFFFFFFF	1 s	r / w	
44.0	Int. motor operating hours	D-word	0 - 0xFFFFFFFF	1 s	r	
48.0	Device operating hours	D-word	0 - 0xFFFFFFFF	1 s	r	
52.0	Number of starts	D-word	0 - 0xFFFFFFFF		r / w	
56.0	Internal number of starts CW	D-word	0 - 0xFFFFFFFF		r	
60.0	Internal number of starts CCW	D-word	0 - 0xFFFFFFFF		r	
64.0	Energy consumed	D-word	0 - 0xFFFFFFFF	1 kWh	r / w	UM
68.0	*Reserved*	*D-word[2]*				
76.0	*Reserved*	*D-word[6]*				
100.0	*Reserved*	*Byte[16]*				
116.0	Timer 5 - Actual value	Word	0 - 65535	100 ms	r	

Byte.Bit	Designation	Type	Range	Unit		Information
118.0	Timer 6 - Actual value	Word	0 - 65535	100 ms	r	
120.0	Counter 5 - Actual value	Word	0 - 65535		r	
122.0	Counter 6 - Actual value	*Word*	0 - 65535		r	
124.0	Analog arithmetic 1 output	Word	0 - 65535		r	
126.0	Analog arithmetic 2 output	Word	0 - 65535		r	
128.0	Analog multiplexer output	Word	0 - 65535		r	
130	*Reserved*	*Word[9]*				

1) Can only be written when the start monitoring function is active!

17.10 Data record 130 - Basic device parameters 1

Table 17- 12 Data record 130 - Basic device parameters 1

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
0.0	Coordination (byte[4]	Byte					
4.0	Device class	Byte	5, 7, 9, 13			5 = BU1 7 = BU0 9 = BU2 13 = BU3	
5.0	Thermistor (Th)	Bit	0, 1			1 = active; thermistor in the BU	
5.1	*Reserved*	*Bit[5]*					
5.6	*Reserved*						
5.7	Initialization module (InM)	Bit	0, 1				
6.0	Operator panel (OP)	Bit	0, 1				
6.1	Analog module (AM1)	Bit	0, 1				
6.2	Temperature module (TM1)	Bit	0, 1				
6.3	Ground-fault module (EM)	Bit	0, 1				
6.4	Digital module 1 (DM1)	Bit[2]	0 - 3			0 = no digital module 1 = monostable 2 = bistable 3 = DM-F (see Byte.Bit 3.4)	
6.6	Digital module 2 (DM2)	Bit[2]	0 - 2				
7.0	Operator panel with display (OPD)	Bit	0, 1				
7.1	Ground-fault module for 3UL23 transformer (EM+)	Bit	0, 1				
7.2	Analog module 2 (AM2)	Bit	0, 1				
7.3	Temperature module 2 (TM2)	Bit	0, 1				
7.4	DM1 - Special type	Bit[2]	0, 1			0 = DM-FL 1 = DM-FP	
7.6	*Reserved*						
8.0	Current measuring (IM)	Bit[7]	0 .. 5			0 = no current measurement 1 = 0.3 A - 3 A 2 = 2.4 A - 25 A 3 = 10 A - 100 A 4 = 20 A - 200 A 5 = 63 A - 630 A	
8.7	Voltage measuring module (UM)	Bit	0, 1				
9.0	*Reserved*						

Byte. Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
10.0	Control function (CF)	Byte	0x00 0x10 0x11 0x12 0x20 0x21 0x30 0x31 0x40 0x41 0x50 0x60 0x61 0x62 0x63 0x64 0x70 0x71			0x00 = Overload 0x10 = Direct starter 0x11 = Reversing starter 0x12 = Linked device 0x20 = Star-delta starter 0x21 = Star-delta reversing starter 0x30 = Dahlander 0x31 = Reversing Dahlander starter 0x40 = Pole-changing starter 0x41 = Pole-changing reversing starter 0x50 = Solenoid valve 0x60 = Positioner 1 0x61 = Positioner 2 0x62 = Positioner 3 0x63 = Positioner 4 0x64 = Positioner 5 0x70 = Soft starter 0x71 = Soft starter with reversing contactor	
11.0	*Reserved*	*Bit[8]*					
12.0	**Bit parameters (16)**						
12.0	No configuration fault due to OP	Bit	0, 1		0		
12.1	Startup parameter block active	Bit	0, 1		1		
12.2	Test/Reset keys disabled	Bit	0, 1		0		
12.3	Bus and PLC/PCS - Reset	Bit	0, 1		0	0 = Manual 1 = Auto	
12.4	*Reserved*	*Bit*			*0*		
12.5	*Reserved*	*Bit*			*0*		
12.6	*Reserved*	*Bit*			*0*		
12.7	*Reserved*	*Bit*			*0*		
13.0	Diagnostics for process events	Bit	0, 1		0		
13.1	Diagnostics for process warnings	Bit	0, 1		1		
13.2	Diagnostics for process faults	Bit	0, 1		1		
13.3	Diagnostics for device faults	Bit	0, 1		1		
13.4	*Reserved*	*Bit*			*0*		
13.5	*Reserved*	*Bit*			*0*		

Byte. Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
13.6	Bus monitoring	Bit	0, 1		1		
13.7	PLC/PCS monitoring	Bit	0, 1		1		
14.0	Overload protection - Load type	Bit	0, 1		0	0 = 3-phase 1 = 1-phase	IM UM
14.1	Overload protection - Reset	Bit	0, 1		0	0 = Manual 1 = Auto	IM UM
14.2	*Reserved*	*Bit*			*0*		
14.3	Save change-over command	Bit	0, 1		0		
14.4	Non-maintained command mode	Bit	0, 1		0		
14.5	Cold start level (TPF)	Bit	0, 1		0	0 = NO contact 1 = NC contact	
14.6	Type of consumer load	Bit	0, 1		0	0 = Motor 1 = Resistive load	
14.7	*Reserved*	*Bit*			*0*		
15.0	External fault 1 - Type	Bit	0, 1		0	0 = NO contact 1 = NC contact	
15.1	External fault 2 - Type	Bit	0, 1		0		
15.2	External fault 3 - Type	Bit	0, 1		0		
15.3	External fault 4 - Type	Bit	0, 1		0		
15.4	External fault 1 - Activity	Bit	0, 1		0	0 = Always 1 = Only motor ON	
15.5	External fault 2 - Activity	Bit	0, 1		0		
15.6	External fault 3 - Activity	Bit	0, 1		0		
15.7	External fault 4 - Activity	Bit	0, 1		0		
16.0	**Bit[2] - Parameters (20)**						
16.0	Thermistor - Overload response	Bit[2]	1, 2, 3		3	0 = Deactivated 1 = Signaling 2 = Warning 3 = Tripping	Th
16.2	Thermistor - Response to sensor fault	Bit[2]	0, 1, 2, 3		2		Th
16.4	Internal ground fault - Response	Bit[2]	0, 1, 2, 3		0		
16.6	Motor protection - Overload response	Bit[2]	0, 1, 2, 3		3		IM
17.0	Motor protection - Overload response	Bit[2]	0, 1, 2		2		IM
17.2	Unbalance protection - Response	Bit[2]	0, 1, 2, 3		2		IM
17.4	Trip response I>	Bit[2]	0, 1, 3		0		
17.6	Warning response I>	Bit[2]	0, 1, 2		0		
18.0	Trip response I<	Bit[2]	0, 1, 3		0		
18.2	Warning response I<	Bit[2]	0, 1, 2		0		
18.4	Stalled rotor - Response	Bit[2]	0, 1, 2, 3		0		
18.6	EM+ [1]- Response to sensor fault	Bit[2]	0, 1, 2, 3		0		

Byte. Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
19.0	Monitoring the number of starts - Response to overshoot	Bit[2]	0, 1, 2, 3		0		
19.2	Monitoring the number of starts - Response to prewarning	Bit[2]	0, 1, 2		0		
19.4	Motor operating hours monitoring - Response	Bit[2]	0, 1, 2		0		
19.6	Motor stop time monitoring - Response	Bit[2]	0, 1, 2		0		
20.0	External fault 1 – Response	Bit[2]	1, 2, 3		1		
20.2	External fault 2 – Response	Bit[2]	1, 2, 3		1		
20.4	External fault 3 – Response	Bit[2]	1, 2, 3		1		
20.6	External fault 4 – Response	Bit[2]	1, 2, 3		1		
21.0	*Reserved*	*Bit[2]*			*0*		
21.2	Basic unit - Delays inputs	Bit[2]	0 - 3	10 ms	1	Offset 6 ms	
21.4	Timer 1 - Type	Bit[2]	0, 1, 2, 3		0	0 = With closing delay, 1 = Closing delay with memory 2 = With opening delay 3 = With fleeting closing	
21.6	Timer 2 - Type	Bit[2]	0, 1, 2, 3		0		
22.0	Signal conditioner 1 - Type	Bit[2]	0, 1, 2, 3		0	0 = Non-inverting 1 = Inverting 2 = Edge rising with memory 3 = Edge falling with memory	
22.2	Signal conditioner 2 - Type	Bit[2]	0, 1, 2, 3		0		
22.4	Non-volatile element 1 - Type	Bit[2]	0, 1, 2, 3		0		
22.6	Non-volatile element 2 - Type	Bit[2]	0, 1, 2, 3		0		
23.0	EM+ [2] - monitoring	Bit[2]	0, 1, 2, 3		0	0 = on 1 = on+ 2 = run 3 = run+	
23.2	EM+ [2] - monitoring warning	Bit[2]	0, 1, 2, 3		0		
23.4	EM - response to an external ground fault	Bit[2]	1, 3		1	0 = Deactivated 1 = Signaling 2 = Warning 3 = Tripping	
23.6	EM - response to warning of an external ground fault	Bit[2]	0, 1, 2		0		
24.0	**Bit[4] - Parameters (24)**						
24.0	External fault 1 - Reset also by	Bit[4]	0 - 1111B		0101B	Bit[0] = Panel reset Bit[1] = Auto-reset Bit[2] = Remote reset Bit[4] = OFF command reset	
24.4	External fault 2 - Reset also by	Bit[4]	0 - 1111B		0101B		
25.0	External fault 3 - Reset also by	Bit[4]	0 - 1111B		0101B		
25.4	External fault 4 - Reset also by	Bit[4]	0 - 1111B		0101B		

Byte. Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
26.0	Limit monitor - Hysteresis for limit monitoring	Bit[4]	0 - 15	1 %	5		
26.4	EM+ 2) - hysteresis	Bit[4]	0 - 15	1 %	5		
27.0	*Reserved*	*Bit[4]*			*0*		
27.4	*Reserved*	*Bit[4]*			*0*		
28.0	**Byte parameters (28)**						
28.0	Internal ground fault - Delay	Byte	0 .. 255	100 ms	5		IM UM
29.0	Overload protection - Class	Byte	5, 10 .. 35, 40		10		
30.0	Motor protection - Delay with overload operation	Byte	0 - 255	100 ms	5		IM UM
31.0	Motor protection - unbalance protection level	Byte	0 - 100	1 %	40		IM UM
32.0	Motor protection - Unbalance protection - Delay in the event of unbalance	Byte	0 - 255	100 ms	5		IM UM
33.0	Interlocking time	Byte	0 - 255	1 s	0		
34.0	FB time	Byte	0 - 255	100 ms	5	0 = Deactivated	
35.0	Trip level I>	Byte	0 - 255	4 % / I_s	0		IM UM
36.0	Warning level I>	Byte	0 - 255	4 % / Is	0		IM UM
37.0	Trip level I<	Byte	0 - 255	4 % / Is	0		IM UM
38.0	Warning level I<	Byte	0 - 255	4 % / Is	0		IM UM
39.0	Stalled rotor level	Byte	0 - 255	4 % / Is	0		IM UM
40.0	Trip delay I>	Byte	0 - 255	100 ms	5		IM UM
41.0	Warning delay I>	Byte	0 - 255	100 ms	5		IM UM
42.0	Trip delay I<	Byte	0 - 255	100 ms	5		IM UM
43.0	Warning delay I<	Byte	0 - 255	100 ms	5		IM UM
44.0	Blocking delay	Byte	0 - 255	100 ms	5		IM UM
45.0	Monitoring the number of starts - Permissible starts	Byte	1 - 255		1		
46.0	*Reserved*	*Byte*			*0*		
47.0	EM+ 2) - delay	Byte	0 - 255	100 ms	0		
48.0	Truth table 1 type 3I/1O	Byte	0 - 11111111 B		0		
49.0	Truth table 2 type 3I/1O	Byte	0 - 11111111 B		0		
50.0	Truth table 3 type 3I/1O	Byte	0 - 11111111 B		0		
51.0	*Reserved*	*Byte*			*0*		

Byte. Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
52.0	**Word parameters (32)**						
52.0	Motor protection - Cooling down period	Word	600 - 65535	100 ms	3000		IM UM
54.0	Motor protection - Pause time	Word	0 - 65535	100 ms	0	0 = Deactivated	IM UM
56.0	Execution time	Word	0 - 65535	100 ms	10	0 = Deactivated	
58.0	Monitoring the number of starts - Time range for starts	Word	0 - 65535	1 s	0		
60.0	Monitoring the number of starts - Interlocking time	Word	0 - 65535	1 s	0		
62.0	Motor stop time level >	Word	0 - 65535	1 h	0		
64.0	Timer 1 - Limit	Word	0 - 65535	100 ms	0		
66.0	Timer 2 - Limit	Word	0 - 65535	100 ms	0		
68.0	Counter 1 - Limit	Word	0 - 65535		0		
70.0	Counter 2 - Limit	Word	0 - 65535		0		
72.0	EM+ 2) - trip level	Word	30 - 40000	1 mA	1000		
74.0	EM+ 2) - warning level	Word	30 - 40000	1 mA	500		
76.0	**D-word parameters (36)**						
76.0	Operator control enables	Bit[32]	0 - 1-1B		0-0B		
80.0	Motor protection - Set current I_s1	D-word	1)	10 mA	30		IM UM
84.0	Motor operating hours level >	D-word	0 - 0xFFFFFFFF	1 s	0		
88.0	*Reserved*	*D-word*			*0*		

1) Value range dependent on current range of the IM / UM and the conversion factor Bit 31 = 1, i.e. conversion factor active.

2) 3UF7510-1AA00-0 ground-fault module

17.11 Data record 131 - Basic device parameters 2 (plug binary)

Table 17- 13 Data record 131 - Basic device parameters 2

Byte.Bit	Designation (PRM group)	Type	Range	Default	Note	Information
0.0	*Reserved*	*Byte[4]*				
4.0	**Byte parameters (40)**					
4.0	BU - Output 1	Byte	0 - 255	0		
5.0	BU - Output 2	Byte	0 - 255	0		
6.0	BU - Output 3	Byte	0 - 255	0		
7.0	*Reserved*	*Byte*		*0*		
8.0	OP - LED green 1	Byte	0 - 255	0		OP OPD
9.0	OP - LED green 2	Byte	0 - 255	0		OP OPD
10.0	OP - LED green 3	Byte	0 - 255	0		OP OPD
11.0	OP - LED green 4	Byte	0 - 255	0		OP OPD
12.0	OP - LED yellow 1	Byte	0 - 255	0		OP
13.0	OP - LED yellow 2	Byte	0 - 255	0		OP
14.0	OP - LED yellow 3	Byte	0 - 255	0		OP
15.0	*Reserved*	*Byte*		*0*		
16.0	Cyclic send - Bit 0.0	Byte	0 - 255	105	Default: Status - ON<	
17.0	Cyclic send - Bit 0.1	Byte	0 - 255	106	Default: Status - Off	
18.0	Cyclic send - Bit 0.2	Byte	0 - 255	107	Default: Status - ON>	
19.0	Cyclic send - Bit 0.3	Byte	0 - 255	128	Default: Event - Overload operation	
20.0	Cyclic send - Bit 0.4	Byte	0 - 255	110	Default: Status - Interlocking time active	
21.0	Cyclic send - Bit 0.5	Byte	0 - 255	120	Default: Status - Auto mode	
22.0	Cyclic send - Bit 0.6	Byte	0 - 255	96	Default: Status - General fault	
23.0	Cyclic send - Bit 0.7	Byte	0 - 255	97	Default: Status - General warning	
24.0	OPC-UA send - Bit 1.0	Byte	0 - 255	0		
25.0	OPC-UA send - Bit 1.1	Byte	0 - 255	0		
26.0	OPC-UA send - Bit 1.2	Byte	0 - 255	0		
27.0	OPC-UA send - Bit 1.3	Byte	0 .. 255	0		
28.0	OPC-UA send - Bit 1.4	Byte	0 - 255	0		
29.0	OPC-UA send - Bit 1.5	Byte	0 - 255	0		
30.0	OPC-UA send - Bit 1.6	Byte	0 - 255	0		
31.0	OPC-UA send - Bit 1.7	Byte	0 - 255	0		
32.0	OPC-UA send - Bit 0.0	Byte	0 - 255	0		
33.0	OPC-UA send - Bit 0.1	Byte	0 - 255	0		
34.0	OPC-UA send - Bit 0.2	Byte	0 - 255	0		
35.0	OPC-UA send - Bit 0.3	Byte	0 - 255	0		
36.0	OPC-UA send - Bit 0.4	Byte	0 - 255	0		

Byte.Bit	Designation (PRM group)	Type	Range	Default	Note	Information
37.0	OPC-UA send - Bit 0.5	Byte	0 - 255	0		
38.0	OPC-UA send - Bit 0.6	Byte	0 - 255	0		
39.0	OPC-UA send - Bit 0.7	Byte	0 - 255	0		
40.0	OPC-UA send - Bit 1.0	Byte	0 - 255	0		
41.0	OPC-UA send - Bit 1.1	Byte	0 - 255	0		
42.0	OPC-UA send - Bit 1.2	Byte	0 - 255	0		
43.0	OPC-UA send - Bit 1.3	Byte	0 - 255	0		
44.0	OPC-UA send - Bit 1.4	Byte	0 - 255	0		
45.0	OPC-UA send - Bit 1.5	Byte	0 - 255	0		
46.0	OPC-UA send - Bit 1.6	Byte	0 - 255	0		
47.0	OPC-UA send - Bit 1.7	Byte	0 - 255	0		
48.0	Monitoring PLC/PCS input	Byte	0 - 255	0		
49.0	Motor protection - Emergency start	Byte	0 - 255	60	Default: Cyclic receive - Bit 0.4	IM UM
50.0	*Reserved*	*Byte*		*0*		
51.0	*Reserved*	*Byte*		*0*		
52.0	Mode selector S1	Byte	0 - 255	61	Default: Cyclic receive - Bit 0.5	
53.0	Mode selector S2	Byte	0 - 255	2	Default: Fixed level value "1"	
54.0	Control station - Local control [LC] ON<	Byte	0 - 255	0		Dependent on the control function
55.0	Control station - Local control [LC] OFF	Byte	0 - 255	0		
56.0	Control station - Local control [LC] ON>	Byte	0 - 255	0		
57.0	Control station - PLC/PCS [PN] ON<	Byte	0 - 255	56	Default: Cyclic receive - Bit 0.0	
58.0	Control station - PLC/PCS [PN] OFF	Byte	0 - 255	57	Default: Cyclic receive - Bit 0.1	
59.0	Control station - PLC/PCS [PN] ON>	Byte	0 - 255	58	Default: Cyclic receive - Bit 0.2	
60.0	Control station - PC/OPC-UA[OCM] ON<	Byte	0 - 255	0		
61.0	Control station - PC/OPC-UA[OCM] OFF	Byte	0 - 255	0		
62.0	Control station - PC/OPC-UA[OCM] ON>	Byte	0 - 255	0		
63.0	Control station - Operator panel [OP] ON<	Byte	0 - 255	0		
64.0	Control station - Operator panel [OP] OFF	Byte	0 - 255	0		
65.0	Control station - Operator panel [OP] ON>	Byte	0 - 255	0		
66.0	Control function - ON<	Byte	0 - 255	73	Default: Group control station ON<	

Byte.Bit	Designation (PRM group)	Type	Range	Default	Note	Information
67.0	Control function - OFF	Byte	0 - 255	74	Default: Group control station OFF	
68.0	Control function - ON>	Byte	0 - 255	75	Default: Group control station ON>	
69.0	Control function - Feedback ON	Byte	0 - 255	101	Default: Status - Motor current flowing	
70.0	External fault 1 - Input	Byte	0 - 255	0		
71.0	External fault 2 - Input	Byte	0 - 255	0		
72.0	External fault 3 - Input	Byte	0 - 255	0		
73.0	External fault 4 - Input	Byte	0 - 255	0		
74.0	External fault 1 - Reset	Byte	0 - 255	0		
75.0	External fault 2 - Reset	Byte	0 - 255	0		
76.0	External fault 3 - Reset	Byte	0 - 255	0		
77.0	External fault 4 - Reset	Byte	0 - 255	0		
78.0	Cold start (TPF)	Byte	0 - 255	0		
79.0	Test 1 - Input	Byte	0 - 255	59	Default: Cyclic receive - Bit 0.3	
80.0	Test 2 - Input	Byte	0 - 255	0		
81.0	Reset 1 - Input	Byte	0 - 255	62	Default: Cyclic receive - Bit 0.6	
82.0	Reset 2 - Input	Byte	0 - 255	0		
83.0	Reset 3 - Input	Byte	0 - 255	0		
84.0	*Reserved*	*Byte*		*0*		
85.0	*Reserved*	*Byte*		*0*		
86.0	*Reserved*	*Byte*		*0*		
87.0	*Reserved*	*Byte*		*0*		
88.0	Truth table 1 3I/1O - Input 1	Byte	0 - 255	0		
89.0	Truth table 1 3I/1O - Input 2	Byte	0 - 255	0		
90.0	Truth table 1 3I/1O - Input 3	Byte	0 - 255	0		
91.0	Truth table 2 3I/1O - Input 1	Byte	0 - 255	0		
92.0	Truth table 2 3I/1O - Input 2	Byte	0 - 255	0		
93.0	Truth table 2 3I/1O - Input 3	Byte	0 - 255	0		
94.0	Truth table 3 3I/1O - Input 1	Byte	0 - 255	0		
95.0	Truth table 3 3I/1O - Input 2	Byte	0 - 255	0		
96.0	Truth table 3 3I/1O - Input 3	Byte	0 - 255	0		
97.0	*Reserved*	*Byte*		*0*		
98.0	Timer 1 - Input	Byte	0 - 255	0		
99.0	Timer 1 - Reset	Byte	0 - 255	0		
100.0	Timer 2 - Input	Byte	0 - 255	0		
101.0	Timer 2 - Reset	Byte	0 - 255	0		
102.0	Counter 1 - Input +	Byte	0 - 255	0		
103.0	Counter 1 - Input -	Byte	0 - 255	0		
104.0	Counter 1 - Reset	Byte	0 - 255	0		

Byte.Bit	Designation (PRM group)	Type	Range	Default	Note	Information
105.0	Counter 2 - Input +	Byte	0 - 255	0		
106.0	Counter 2 - Input -	Byte	0 - 255	0		
107.0	Counter 2 - Reset	Byte	0 - 255	0		
108.0	Signal conditioner 1 - Input	Byte	0 - 255	0		
109.0	Signal conditioner 1 - Reset	Byte	0 - 255	0		
110.0	Signal conditioner 2 - Input	Byte	0 - 255	0		
111.0	Signal conditioner 2 - Reset	Byte	0 - 255	0		
112.0	Non-volatile element 1 - Input	Byte	0 - 255	0		
113.0	Non-volatile element 1 - Reset	Byte	0 - 255	0		
114.0	Non-volatile element 2 - Input	Byte	0 - 255	0		
115.0	Non-volatile element 2 - Reset	Byte	0 - 255	0		
116.0	Flashing 1 - Input	Byte	0 - 255	0		
117.0	Flashing 2 - Input	Byte	0 - 255	0		
118.0	Flashing 3 - Input	Byte	0 - 255	0		
119.0	Flicker 1 - Input	Byte	0 - 255	0		
120.0	Flicker 2 - Input	Byte	0 - 255	0		
121.0	Flicker 3 - Input	Byte	0 - 255	0		
122.0	**Analog parameters (44)**					
122.0	PLC/PCS analog input	Byte	0 - 255	16	Default: Max. current I_max	
123.0	*Reserved*	*Byte*		*0*		

17.12 Data record 132 - Extended device parameters 1

Table 17- 14 Data record 132 - Extended device parameters 1

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
0.0	*Reserved*	*Byte[4]*					
4.0	**Bit parameters (17)**						
4.0	*Reserved*						
4.1	*Reserved*						
4.2	*Reserved*	*Bit*			*0*		
4.3	*Reserved*	*Bit*			*0*		
4.4	*Reserved*	*Bit*			*0*		
4.5	*Reserved*	*Bit*			*0*		
4.6	*Reserved*	*Bit*			*0*		
4.7	*Reserved*	*Bit*			*0*		
5.0	*Reserved*	*Bit*			*0*		
5.1	Voltage measuring - Type of load	Bit	0, 1		0	0 = 3-phase 1 = 1-phase	
5.2	OPD - Warnings	Bit	0, 1		0	0 = Do not display 1 = Display	
5.3	OPD - Faults	Bit	0, 1		1		
5.4	AM1 - Measuring range input	Bit	0, 1		0	0 = 0-20mA 1 = 4-20mA	AM1
5.5	AM1 - Measuring range output	Bit	0, 1		0		AM1
5.6	*Reserved*	*Bit*			*0*		
5.7	*Reserved*	*Bit*			*0*		
6.0	Overshooting/undershooting limit 1	Bit	0, 1		0	0 = ">" (overshooting) 1 = "<" (undershooting)	
6.1	Overshooting/undershooting limit 2	Bit	0, 1		0		
6.2	Overshooting/undershooting limit 3	Bit	0, 1		0		
6.3	Overshooting/undershooting limit 4	Bit	0, 1		0		
6.4	Line-to-line voltage	Bit	0, 1		0	0 = No 1 = Yes	
6.5	OPO level	Bit	0, 1		0	0 = NO contact 1 = NC contact	
6.6	Positioner response for OPO	Bit	0, 1		0	0 = CLOSED 1 = OPEN	
6.7	Star-delta - Transformer mounting	Bit	0, 1		0	0 = Delta 1 = In supply line	
7.0	External fault 5 - Type	Bit	0, 1		0	0 = NO contact 1 = NC contact	
7.1	External fault 6 - Type	Bit	0, 1		0		
7.2	*Reserved*	*Bit*			*0*		

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
7.3	*Reserved*	*Bit*			*0*		
7.4	Monitoring external fault 5	Bit	0, 1		0	0 = Always	
7.5	Monitoring external fault 6	Bit	0, 1		0	1 = Only motor ON	
7.6	*Reserved*	*Bit*			*0*		
7.7	*Reserved*	*Bit*			*0*		
8.0	Calculator 2, Operating mode	Bit	0, 1		0	0 = Word 1 = D-word	
8.1	*Reserved*	*Bit*			*0*		
8.2	DM-F - Safe tripping function	Bit	0, 1		0	0 = No 1 = Yes	DM-F
8.3	DM-F - Safety-related tripping reset	Bit	0, 1		0	0 = Manual 1 = Auto	DM-F
8.4	*Reserved*						
8.5	*Reserved*	*Bit*			*0*		
8.6	*Reserved*	*Bit*			*0*		
8.7	*Reserved*	*Bit*			*0*		
9.0	DM-FL - Configuration 1	Bit	0, 1		0	Configurable parameters comparable with the module configuration	DM-FL
9.1	DM-FL - Configuration 2	Bit	0, 1		0		DM-FL
9.2	DM-FL - Configuration 3	Bit	0, 1		0		DM-FL
9.3	DM-FL - Configuration 4	Bit	0, 1		0		DM-FL
9.4	DM-FL - Configuration 5	Bit	0, 1		0		DM-FL
9.5	DM-FL - Configuration 6	Bit	0, 1		0		DM-FL
9.6	DM-FL - Configuration 7	Bit	0, 1		0		DM-FL
9.7	DM-FL - Configuration 8	Bit	0, 1		0		DM-FL
10.0	**Bit[2] - Parameters (21)**						
10.0	*Reserved*	*Bit[2]*					
10.2	*Reserved*	*Bit[2]*			*0*		
10.4	UVO timebase	Bit[2]	0, 1, 2		0		
10.6	UVO operating mode	Bit[2]	0, 1, 2		0	0 = Deactivated 1 = Activated	
11.0	Trip monitoring U<	Bit[2]	0, 1, 2		1	0 = ON (always)	UM
11.2	Warning monitoring U<	Bit[2]	0, 1, 2		1	1 = ON+ (always, not TPF) 2 = RUN (motor ON, not TPF)	UM
11.4	*Reserved*	*Bit[2]*			*0*		
11.6	*Reserved*	*Bit[2]*			*0*		
12.0	Trip monitoring 0/4-20 mA>	Bit[2]	0, 1, 2, 3		0	0 = ON (always)	AM1
12.2	Warning monitoring 0/4-20 mA>	Bit[2]	0, 1, 2, 3		0	1 = ON + (always, not TPF)	AM1
12.4	Trip monitoring 0/4-20 mA<	Bit[2]	0, 1, 2, 3		0	2 = RUN (motor ON,	AM1

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
12.6	Warning monitoring 0/4-20 mA<	Bit[2]	0, 1, 2, 3		0	not TPF) 3 = RUN+ (motor ON, not TPF, startup override)	AM1
13.0	Monitoring limit 1	Bit[2]	0, 1, 2, 3		0		
13.2	Monitoring limit 2	Bit[2]	0, 1, 2, 3		0		
13.4	Monitoring limit 3	Bit[2]	0, 1, 2, 3		0		
13.6	Monitoring limit 4	Bit[2]	0, 1, 2, 3		0		
14.0	*Reserved*	*Bit[2]*			*0*		
14.2	*Reserved*	*Bit[2]*			*0*		
14.4	*Reserved*	*Bit[2]*			*0*		
14.6	AM1 - active inputs	Bit[2]	0, 1, 2		0	0 = 1 input 1 = 2 inputs 2 = 3 inputs	AM1
15.0	DM - Delays inputs	Bit[2]	0, 1, 2, 3	10 ms	1	Offset 6ms	DM1 DM 2
15.2	AM1 - Response for open circuit	Bit[2]	1, 2, 3		2	0 = Deactivated 1 = Signaling 2 = Warning 3 = Tripping	AM1
15.4	EM - Response to external ground fault	Bit[2]	1, 3		1		EM EM+
15.6	EM - response to warning of an external ground fault	Bit[2]	0, 1, 2		0		EM EM+
16.0	*Reserved*	*Bit[2]*			*0*		
16.2	*Reserved*	*Bit[2]*			*0*		
16.4	DM-F - Test requirement response	Bit[2]	0, 1, 2		0	0 = Deactivated 1 = Signaling 2 = Warning 3 = Tripping	DM-F
16.6	DM-F - safety-related tripping response	Bit[2]	0, 1, 2, 3		0		DM-F
17.0	TM1 - Trip response T>	Bit[2]	1, 3		3		TM1
17.2	TM1 - Warning response T>	Bit[2]	0, 1, 2		2		TM1
17.4	TM1 - Response to a sensor fault / out of range	Bit[2]	0, 1, 2, 3		2		TM1
17.6	TM1 - Active sensors	Bit[2]	0, 1, 2		2	0 = 1 sensor 1 = 2 sensors 2 = 3 sensors	TM1
18.0	Trip response P>	Bit[2]	0, 1, 3		0	0 = Deactivated 1 = Signaling 2 = Warning 3 = Tripping	UM
18.2	Warning response P>	Bit[2]	0, 1, 2		0		UM
18.4	Trip response P<	Bit[2]	0, 1, 3		0		UM
18.6	Warning response P<	Bit[2]	0, 1, 2		0		UM
19.0	Trip response cos phi <	Bit[2]	0, 1, 3		0		UM
19.2	Warning response cos phi <	Bit[2]	0, 1, 2		0		UM
19.4	Trip response U<	Bit[2]	0, 1, 3		0		UM
19.6	Warning response U<	Bit[2]	0, 1, 2		0		UM
20.0	Trip response 0/4-20 mA>	Bit[2]	0, 1, 3		0		AM1

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Infor-mation
20.2	Warning response 0/4-20 mA>	Bit[2]	0, 1, 2		0		AM1
20.4	Trip response 0/4-20 mA<	Bit[2]	0, 1, 3		0		AM1
20.6	Warning response 0/4-20 mA<	Bit[2]	0, 1, 2		0		AM1
21.0	*Reserved*	*Bit[2]*			*0*		
21.2	*Reserved*	*Bit[2]*			*0*		
21.4	*Reserved*	*Bit[2]*			*0*		
21.6	*Reserved*	*Bit[2]*			*0*		
22.0	External fault 5 – Response	Bit[2]	1, 2, 3		1	0 = Deactivated	
22.2	External fault 6 – Response	Bit[2]	1, 2, 3		1	1 = Signaling 2 = Warning 3 = Tripping	
22.4	*Reserved*	*Bit[2]*			*0*		
22.6	*Reserved*	*Bit[2]*			*0*		
23.0	Analog-value recording - Trigger edge	Bit[2]	0, 1		0	0 = positive 1 = negative	
23.2	*Reserved*	*Bit[2]*			*0*		
23.4	*Reserved*	*Bit[2]*			*0*		
23.6	*Reserved*	*Bit[2]*			*0*		
24.0	*Reserved*	*Bit[2]*			*0*		
24.2	*Reserved*	*Bit[2]*			*0*		
24.4	*Reserved*	*Bit[2]*			*0*		
24.6	*Reserved*	*Bit[2]*			*0*		
25.0	Timer 3 - Type	Bit[2]	0, 1, 2, 3		0	0 = With closing delay 1 = Closing delay with memory 2 = With opening delay 3 = With fleeting closing	
25.2	Timer 4 - Type	Bit[2]	0, 1, 2, 3		0		
25.4	Signal conditioner 3 - Type	Bit[2]	0, 1, 2, 3		0	0 = Non-inverting 1 = Inverting 2 = Edge rising with memory 3 = Edge falling with memory	
25.6	Signal conditioner 4 - Type	Bit[2]	0, 1, 2, 3		0		
26.0	Non-volatile element 3 - Type	Bit[2]	0, 1, 2, 3		0		
26.2	Non-volatile element 4 - Type	Bit[2]	0, 1, 2, 3		0		
26.4	Calculator 2, Operator	Bit[2]	0, 1, 2, 3		0	0 = + 1 = - 2 = * 3 = /	
26.6	*Reserved*	*Bit[2]*			*0*		

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
27.0	*Reserved*	*Bit[2]*			*0*		
27.2	*Reserved*	*Bit[2]*			*0*		
27.4	OPD - Operator panel display (bit 0 to 1)	Bit[2]	0 - 4		2	0 = Manual 1 = 3 s 2 = 10 s 3 = 1 min 4 = 5 min	
27.6	OPD - Operator panel display (bit 2 to 3)	Bit[2]	0 - 4		2		
28.0	**Bit[4] - Parameters (25)**						
28.0	TM1 - sensor type	Bit[3] + Bit	000B to 100B		000B	000B = PT100 001B = PT100 010B = KTY83 011B = KTY84 100B = NTC	TM1
28.4	OPD language	Bit[4]	0 - 7		1	0 = English 1 = German 2 = French 3 = Polish 4 = Spanish 5 = Portuguese 6 = Italian 7 = Finnish	
29.0	External fault 5 - Reset also by	Bit[4]	0 - 1111B		0101B	Bit[0] = Panel reset Bit[1] = Auto-reset Bit[2] = Remote reset Bit[3] = OFF command reset	
29.4	External fault 6 - Reset also by	Bit[4]	0 - 1111B		0101B		
30.0	OPD - Contrast (bit 0 to 3)	Bit[4]	0 - 255	1 %	50		
30.4	OPD - Contrast (bit 4 to 7)	Bit[4]					
31.0	OPD - Profile (bit 0 to 3)	*Bit[4]*	0 - 26		*0*		
31.4	OPD - Profile (bit 4 to 7)	*Bit[4]*					
32.0	Truth table 7 type 2I/1O	Bit[4]	0 - 1111B		0		
32.4	Truth table 8 type 2I/1O	Bit[4]	0 - 1111B		0		
33.0	I_s1 conversion factor - Denominator	Bit[4]	0 - 15		0		
33.4	I_s2 conversion factor - Denominator	Bit[4]	0 - 15		0		
34.0	Hysteresis P - Cos phi - U	Bit[4]	0 - 15		5	1 %	UM
34.4	Hysteresis 0/4-20 mA	Bit[4]	0 - 15		5	1 %	AM1 AM2
35.0	Hysteresis free limits	Bit[4]	0 - 15		5	1 %	

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
35.4	OPD - Lighting	Bit[4]	0 - 4		2	0 = Off 1 = 3 s 2 = 10 s 3 = 1 min 4 = 5 min	
36.0	**Byte parameters (29)**						
36.0	*Reserved*	*Byte*			*0*		
37.0	EM - Delay	Byte	0 - 255	100 ms	5		EM
38.0	Trip level cos phi<	Byte	0 - 100	1 %	0		UM
39.0	Warning level cos phi<	Byte	0 - 100	1 %	0		UM
40.0	Trip level U<	Byte	0 - 255	8 V	0		UM
41.0	Warning level U<	Byte	0 - 255	8 V	0		UM
42.0	Trip level 0/4-20 mA>	Byte	0 - 255	*128	0		AM1
43.0	Warning level 0/4-20 mA>	Byte	0 - 255	*128	0		AM1
44.0	Trip level 0/4-20 mA<	Byte	0 - 255	*128	0		AM1
45.0	Warning level 0/4-20 mA<	Byte	0 - 255	*128	0		AM1
46.0	Trip delay P>	Byte	0 - 255	100 ms	5		UM
47.0	Warning delay P>	Byte	0 - 255	100 ms	5		UM
48.0	Trip delay P<	Byte	0 - 255	100 ms	5		UM
49.0	Warning delay P<	Byte	0 - 255	100 ms	5		UM
50.0	Trip delay cos phi<	Byte	0 - 255	100 ms	5		UM
51.0	Warning delay cos phi<	Byte	0 - 255	100 ms	5		UM
52.0	Trip delay U<	Byte	0 - 255	100 ms	5		UM
53.0	Warning delay U<	Byte	0 - 255	100 ms	5		UM
54.0	Trip delay 0/4-20 mA>	Byte	0 - 255	100 ms	5		AM1
55.0	Warning delay 0/4-20 mA>	Byte	0 - 255	100 ms	5		AM1
56.0	Trip delay 0/4-20 mA<	Byte	0 - 255	100 ms	5		AM1
57.0	Warning delay 0/4-20 mA<	Byte	0 - 255	100 ms	5		AM1
58.0	Delay limit 1	Byte	0 - 255	100 ms	5		
59.0	Delay limit 2	Byte	0 - 255	100 ms	5		
60.0	Delay limit 3	Byte	0 - 255	100 ms	5		
61.0	Delay limit 4	Byte	0 - 255	100 ms	5		
62.0	TM - Hysteresis	Byte	0 - 255	1 K	5		TM1 TM2
63.0	Max. star time	Byte	0 - 255	1 s	20	Star-delta starter	
64.0	UVO time	Byte	0 - 255	100 ms	0		

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
65.0	Staggering time	Byte	0 - 255	1 s	0		
66.0	Analog value recording - Sampling rate	Byte	0 - 20	5 %	0		
67.0	Calculator 2, Denominator 1	Byte	0 - 255		0		
68.0	Calculator 2, Numerator 2	Byte	0 - 255		0		
69.0	Calculator 1, Denominator	Byte	0 - 255		0		
70.0	Truth table 4 type 3I/1O	Byte	0 - 1111111 1B		0		
71.0	Truth table 5 type 3I/1O	Byte	0 - 1111111 1B		0		
72.0	Truth table 6 type 3I/1O	Byte	0 - 1111111 1B		0		
73.0	Calculator 2, Numerator 1	Byte	-128 - 127		0		
74.0	Calculator 2, Denominator 2	Byte	-128 - 127		0		
75.0	DM-F - Test requirement level	Byte	0 - 255	1 week	0		
76.0	**Word parameters (33)**						
76.0	Analog module - Start value output	Word	0 - 65535		0	Value for 0/4mA	AM1
78.0	Analog Module - End value output	Word	0 - 65535		27648	Value for 20mA	AM1
80.0	TM1 - Trip level T>	Word	0 - 65535	1 K	0		TM1
82.0	TM1 - Warning level T>	Word	0 - 65535	1 K	0		TM1
84.0	Limit monitor 1 - Limit	Word	0 - 65535		0		
86.0	Limit monitor 2 - Limit	Word	0 - 65535		0		
88.0	Limit monitor 3 - Limit	Word	0 - 65535		0		
90.0	Limit monitor 4 - Limit	Word	0 - 65535		0		
92.0	Timer 3 - Limit	Word	0 - 65535	100 ms	0		
94.0	Timer 4 - Limit	Word	0 - 65535	100 ms	0		
96.0	Counter 3 - Limit	Word	0 - 65535		0		
98.0	Counter 4 - Limit	Word	0 - 65535		0		
100.0	Change-over pause	Word	0 - 65535	10 ms	0		
102.0	Analog value recording - Sampling rate	Word	1 - 50000	1 ms	100		
104.0	I_s1 conversion factor - Numerator	Word	0 - 65535		0		

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
106.0	I_s2 conversion factor - Numerator	Word	0 - 65535		0		
108.0	**D-word parameters (37)**						
108.0	Motor protection - Set current I_s2	D-word	1)	10 mA	0		
112.0	Trip level P>	D-word	0 - 0xFFFFFFFF	1 W	0		UM
116.0	Warning level P>	D-word	0 - 0xFFFFFFFF	1 W	0		UM
120.0	Trip level P<	D-word	0 - 0xFFFFFFFF	1 W	0		UM
124.0	Warning level P<	D-word	0 - 0xFFFFFFFF	1 W	0		UM
128.0	Truth Table 9 5I/2O type - Output 1	Bit[32]	0 - 1-1B		0		
132.0	Truth Table 9 5I/2O type - Output 2	Bit[32]	0 - 1-1B		0		
136.0	Calculator 2, Offset	D-word	-0x80000000 - 0x7FFFFFFF		0		
140.0	Calculator 1, Numerator/Offset	D-word	2x - 32768 - 32767		0		

1) Value range dependent on current range of the IM / UM and the conversion factor

17.13 Data record 133 - Extended device parameters 2 (plug binary)

Table 17- 15 Data record 133 - Extended device parameters

Byte.Bit	Designation (PRM group)	Type	Range	Default	Note	Information
0.0	*Reserved*	*Byte[4]*				
4.0	**Byte parameters (41)**					
4.0	DM1 - Output 1	Byte	0 - 255	0		DM1 DM-F
5.0	DM1 - Output 2	Byte	0 - 255	0		DM1 FM-F
6.0	DM2 - Output 1	Byte	0 - 255	0		DM2
7.0	DM2 - Output 2	Byte	0 - 255	0		DM2
8.0	*Reserved*	*Byte*		*0*		
9.0	*Reserved*	*Byte*		*0*		
10.0	*Reserved*	*Byte*		*0*		
11.0	*Reserved*	*Byte*		*0*		
12.0	*Reserved*					
13.0	*Reserved*					
14.0	*Reserved*					
15.0	*Reserved*					
16.0	*Reserved*					
17.0	*Reserved*					
18.0	*Reserved*					
19.0	*Reserved*					
20.0	Analog value recording - Trigger input	Byte	0 - 255	0		
21.0	*Reserved*	*Byte*		*0*		
22.0	Control station - Local control [LC] ON<<	Byte	0 - 255	0		Dependent on the control function
23.0	Control station - Local control [LC] ON>>	Byte	0 - 255	0		
24.0	Control station - PLC/PCS [PN] ON<<	Byte	0 - 255	0		
25.0	Control station - PLC/PCS [PN] ON>>	Byte	0 - 255	0		
26.0	Control station - PC/OPC-UA[OCM] ON<<	Byte	0 - 255	0		
27.0	Control station - PC/OPC-UA[OCM] ON<<	Byte	0 - 255	0		
28.0	Control station - Operator panels [OP] ON>>	Byte	0 - 255	0		
29.0	Control station - Operator panels [OP]<>/<<>>	Byte	0 - 255	0		
30.0	Control function - ON<<	Byte	0 - 255	0		
31.0	Control function - ON>>	Byte	0 - 255	0		
32.0	Auxiliary control input - FC	Byte	0 - 255	0		
33.0	Auxiliary control input - FO	Byte	0 - 255	0		
34.0	Auxiliary control input - TC	Byte	0 - 255	0		
35.0	Auxiliary control input - TO	Byte	0 - 255	0		
36.0	External fault 5 - Input	Byte	0 - 255	0		
37.0	External fault 6 - Input	Byte	0 - 255	0		
38.0	*Reserved*	*Byte*		*0*		

Byte.Bit	Designation (PRM group)	Type	Range	Default	Note	Information
39.0	*Reserved*	*Byte*		*0*		
40.0	External fault 5 - Reset	Byte	0 - 255	0		
41.0	External fault 6 - Reset	Byte	0 - 255	0		
42.0	*Reserved*	*Byte*		*0*		
43.0	*Reserved*	*Byte*		*0*		
44.0	UVO fault	Byte	0 - 255	0		
45.0	OPO error	Byte	0 - 255	0		
46.0	Truth table 4 3I/1O - Input 1	Byte	0 - 255	0		
47.0	Truth table 4 3I/1O - Input 2	Byte	0 - 255	0		
48.0	Truth table 4 3I/1O - Input 3	Byte	0 - 255	0		
49.0	Truth table 5 3I/1O - Input 1	Byte	0 - 255	0		
50.0	Truth table 5 3I/1O - Input 2	Byte	0 - 255	0		
51.0	Truth table 5 3I/1O - Input 3	Byte	0 - 255	0		
52.0	Truth table 6 3I/1O - Input 1	Byte	0 - 255	0		
53.0	Truth table 6 3I/1O - Input 2	Byte	0 - 255	0		
54.0	Truth table 6 3I/1O - Input 3	Byte	0 - 255	0		
55.0	Truth table 7 2I/1O - Input 1	Byte	0 - 255	0		
56.0	Truth table 7 2I/1O - Input 2	Byte	0 - 255	0		
57.0	Truth table 8 2I/1O - Input 1	Byte	0 - 255	0		
58.0	Truth table 8 2I/1O - Input 2	Byte	0 - 255	0		
59.0	Truth table 9 5I/2O - Input 1	Byte	0 - 255	0		
60.0	Truth table 9 5I/2O - Input 2	Byte	0 - 255	0		
61.0	Truth table 9 5I/2O - Input 3	Byte	0 - 255	0		
62.0	Truth table 9 5I/2O - Input 4	Byte	0 - 255	0		
63.0	Truth table 9 5I/2O - Input 5	Byte	0 - 255	0		
64.0	Timer 3 - Input	Byte	0 - 255	0		
65.0	Timer 3 - Reset	Byte	0 - 255	0		
66.0	Timer 4 - Input	Byte	0 - 255	0		
67.0	Timer 4 - Reset	Byte	0 - 255	0		
68.0	Counter 3 - Input +	Byte	0 - 255	0		
69.0	Counter 3 - Input -	Byte	0 - 255	0		
70.0	Counter 3 - Reset	Byte	0 - 255	0		
71.0	Counter 4 - Input +	Byte	0 - 255	0		
72.0	Counter 4 - Input -	Byte	0 - 255	0		
73.0	Counter 4 - Reset	Byte	0 - 255	0		
74.0	Signal conditioning 3 - Input	Byte	0 - 255	0		
75.0	Signal conditioning 3 - Reset	Byte	0 - 255	0		
76.0	Signal conditioning 4 - Input	Byte	0 - 255	0		
77.0	Signal conditioning 4 - Reset	Byte	0 - 255	0		
78.0	Non-volatile element 3 - Input	Byte	0 - 255	0		
79.0	Non-volatile element 3 - Reset	Byte	0 - 255	0		
80.0	Non-volatile element 4 - Input	Byte	0 - 255	0		

Byte.Bit	Designation (PRM group)	Type	Range	Default	Note	Information
81.0	Non-volatile element 4 - Reset	Byte	0 - 255	0		
82.0	*Reserved*	*Byte*		*0*		
83.0	*Reserved*	*Byte*		*0*		
84.0	*Reserved*	*Byte*		*0*		
85.0	*Reserved*	*Byte*		*0*		
86.0	*Reserved*	*Byte*		*0*		
87.0	*Reserved*	*Byte*		*0*		
88.0	**Analog parameters (45)**					
88.0	AM1 - Output	Byte	0 - 255	0		AM1
89.0	Analog input limit 1	Byte	0 - 255	0		
90.0	Analog input limit 2	Byte	0 - 255	0		
91.0	Analog input limit 3	Byte	0 - 255	0		
92.0	Analog input limit 4	Byte	0 - 255	0		
93.0	Calculator 1, Input	Byte	0 - 255	0		
94.0	Analog value recording - Analog input	Byte	0 - 255	0		
95.0	PLC/PCS analog input 2	Byte	0 - 255	0		
96.0	PLC/PCS analog input 3	Byte	0 - 255	0		
97.0	PLC/PCS analog input 4	Byte	0 - 255	0		
98.0	Calculator 2, Input 1	Byte	0 - 255	0		
99.0	Calculator 2, Input 2	Byte	0 - 255	0		

17.14 Data record 134 - Extended device parameters 1

Table 17- 16 Data record 134 - ExtendedPlus device parameters

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Infor-mation
0.0	**Coordination**	Byte[4]					
4.0	**Part - Bit parameters**						
4.0	AM2 - Measuring range input	Bit	0, 1		0	0 = 0 - 20 mA	AM2
4.1	AM2 - Measuring range output	Bit	0, 1		0		AM2
4.2	Overshooting/undershooting limit 5				0		
4.3	Overshooting/undershooting limit 6				0		
4.4	*Reserved*						
4.5	*Reserved*						
4.6	*Reserved*						
4.7	*Reserved*						
5.0	*Reserved*						
5.1	*Reserved*						
5.2	*Reserved*						
5.3	*Reserved*						
5.4	*Reserved*						
5.5	*Reserved*						
5.6	*Reserved*						
5.7	*Reserved*						
6.0	*Reserved*						
6.1	*Reserved*						
6.2	*Reserved*						
6.3	*Reserved*						
6.4	*Reserved*						
6.5	*Reserved*						
6.6	*Reserved*						
6.7	*Reserved*						
7.0	*Reserved*						
7.1	*Reserved*						
7.2	*Reserved*						
7.3	*Reserved*						
7.4	*Reserved*						
7.5	*Reserved*						
7.6	*Reserved*						
7.7	*Reserved*						

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
8.0	**Part - Bit[2] parameters**						
8.0	Trip monitoring 0/4-20 mA>	Bit[2]	0, 1, 2, 3		0	0 = ON (always) 1 = on+ (always, not TPF) 2 = run (motor ON, not TPF, startup override)	AM2
8.2	Warning monitoring 0/4-20 mA>	Bit[2]	0, 1, 2, 3		0		AM2
8.4	Trip monitoring 0/4-20 mA<	Bit[2]	0, 1, 2, 3		0		AM2
8.6	Warning monitoring 0/4-20 mA<	Bit[2]	0, 1, 2, 3		0		AM2
9.0	Monitoring limit 5	Bit[2]	0, 1, 2, 3		0		
9.2	Monitoring limit 6	Bit[2]	0, 1, 2, 3		0		
9.4	AM2 - Active inputs	Bit[2]	0, 1, 2		0	Like AM1	AM2
9.6	AM2 - Response to open circuit	Bit[2]	1, 2, 3		2	0 = deactivated 1 = signaling 2 = warning 3 = tripping	AM2
10.0	TM2 - Trip response T>	Bit[2]	1 , 3		3		TM2
10.2	TM2 - Warning response T>	Bit[2]	0, 1, 2		2		TM2
10.4	TM2 - Response to a sensor fault / out of range	Bit[2]	0, 1, 2, 3		2		TM2
10.6	TM2 - Active sensors	Bit[2]	0, 1, 2		2	0 = 1 sensor 1 = 2 sensors 2 = 3 sensors	TM2
11.0	Trip response 0/4-20mA >	Bit[2]	0, 1, 3		0	0 = deactivated 1 = signaling 2 = warning 3 = tripping	AM2
11.2	Warning response 0/4-20 mA>	Bit[2]	0, 1, 2		0		AM2
11.4	Trip response 0/4-20 mA<	Bit[2]	0, 1, 3		0		AM2
11.6	Warning response 0/4-20 mA<	Bit[2]	0, 1, 2		0		AM2
12.0	Timer 5 type	Bit[2]	0, 1, 2, 3		0		
12.2	Timer 6 type	Bit[2]	0, 1, 2, 3		0		
12.4	Signal conditioning 5 type	Bit[2]	0, 1, 2, 3		0		
12.6	Signal conditioning 6 type	Bit[2]	0, 1, 2, 3		0		
13.0	Calculator 3 Operator 1	Bit[2]	0, 1, 2, 3		0	0 = +, 1 = - 2 = * 3 = /	
13.2	Calculator 3 Operator 2	Bit[2]	0, 1, 2, 3		0		
13.4	Calculator 3 Operator 3	Bit[2]	0, 1, 2, 3		0		
13.6	*Reserved*						
14.0	Calculator 4 Operator 1	Bit[2]	0, 1, 2, 3		0	0 = +, 1 = - 2 = * 3 = /	
14.2	Calculator 4 Operator 2	Bit[2]	0, 1, 2, 3		0		
14.4	Calculator 4 Operator 3	Bit[2]	0, 1, 2, 3		0		
14.6	*Reserved*						
15.0	Calculator 3 Priority 1	Bit[2]	0, 1, 2		2	0 = L, 1 = M, 2 = H	
15.2	Calculator 3 Priority 2	Bit[2]	0, 1, 2		1		
15.4	Calculator 3 Priority 3	Bit[2]	0, 1, 2		0		
15.6	*Reserved*						

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Infor-mation
16.0	Calculator 4 Priority 1	Bit[2]	0, 1, 2		2	0 = L,	
16.2	Calculator 4 Priority 2	Bit[2]	0, 1, 2		1	1 = M,	
16.4	Calculator 4 Priority 3	Bit[2]	0, 1, 2		0	2 = H	
16.6	*Reserved*						
17.0	*Reserved*						
17.2	*Reserved*						
17.4	*Reserved*						
17.6	*Reserved*						
18.0	*Reserved*						
18.2	*Reserved*						
18.4	*Reserved*						
18.6	*Reserved*						
19.0	*Reserved*						
19.2	*Reserved*						
19.4	*Reserved*						
19.6	*Reserved*						
20.0	*Reserved*						
20.2	*Reserved*						
20.4	*Reserved*						
20.6	*Reserved*						
21.0	*Reserved*						
21.2	*Reserved*						
21.4	*Reserved*						
21.6	*Reserved*						
22.0	**Part - Bit[4] parameters**						
22.0	TM2 - sensor type	Bit[3+1]	000B to 100B		000B	Like TM1	TM2
22.4	*Reserved*						
23.0	*Reserved*						
23.4	*Reserved*						
24.0	*Reserved*						
24.4	*Reserved*						
25.0	*Reserved*						
25.4	*Reserved*						
26.0	*Reserved*						
26.4	*Reserved*						
27.0	*Reserved*						
27.4	*Reserved*						
28.0	*Reserved*						
28.4	*Reserved*						
29.0	*Reserved*						
29.4	*Reserved*						

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Infor-mation
30.0	**Part - Byte parameters**						
30.0	Trip level 0/4-20 mA >	Byte	0 - 255	*128	0		AM2
31.0	Warning level 0/4-20 mA >	Byte	0 - 255	*128	0		AM2
32.0	Trip level 0/4-20 mA <	Byte	0 - 255	*128	0		AM2
33.0	Warning level 0/4-20 mA <	Byte	0 - 255	*128	0		AM2
34.0	Trip delay 0/4-20 mA >	Byte	0 - 255	100 ms	5		AM2
35.0	Warning delay 0/4-20 mA >	Byte	0 - 255	100 ms	5		AM2
36.0	Trip delay 0/4-20 mA <	Byte	0 - 255	100 ms	5		AM2
37.0	Warning delay 0/4-20 mA <	Byte	0 - 255	100 ms	5		AM2
38.0	Delay limit 5	Byte	0 - 255	100 ms	5		
39.0	Delay limit 6	Byte	0 - 255	100 ms	5		
40.0	Truth table 10 type 3I/1O	Byte	0 - 11111111B			0	
41.0	Truth table 11 type 3I/1O	Byte	0 - 11111111B			0	
42.0	*Reserved*						
43.0	*Reserved*						
44.0	*Reserved*						
45.0	*Reserved*						
46.0	*Reserved*						
47.0	*Reserved*						
48.0	*Reserved*						
49.0	*Reserved*						
50.0	*Reserved*						
51.0	*Reserved*						
52.0	*Reserved*						
53.0	*Reserved*						
54.0	*Reserved*						
55.0	*Reserved*						
56.0	*Reserved*						
57.0	*Reserved*						

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Infor-mation
58.0	*Reserved*						
59.0	*Reserved*						
60.0	**Part - Word parameters**						
60.0	AM2 - Start value output	Word	0 - 65535		0	Value for 0/4 mA	AM2 
62.0	AM2 - End value output	Word	0 - 65535		27648	Value for 20 mA	AM2 
64.0	TM2 - Trip level T>	Word	0 - 65535	1K	0		TM2 
66.0	TM2 - Warning level T>	Word	0 - 65535	1K	0		TM2 
68.0	Limit level 5	Word	0 - 65535		0		
70.0	Limit level 6	Word	0 - 65535		0		
72.0	Timer 5 value	Word	0 - 65535	100 ms	0		
74.0	Timer 6 value	Word	0 - 65535	100 ms	0		
76.0	Counter 5 value	Word	0 - 65535		0		
78.0	Counter 6 value	Word	0 - 65535		0		
80.0	Calculator 3 const 1	Word	0 - 65535		0		
82.0	Calculator 3 const 2	Word	0 - 65535		0		
84.0	Calculator 3 const 3	Word	0 - 65535		0		
86.0	Calculator 3 const 4	Word	0 - 65535		0		
88.0	Calculator 4 const 1	Word	0 - 65535		0		
90.0	Calculator 4 const 2	Word	0 - 65535		0		
92.0	Calculator 4 const 3	Word	0 - 65535		0		
94.0	Calculator 4 const 4	Word	0 - 65535		0		
96.0	Analog multiplexer const 1	Word	0 - 65535		0		
98.0	Analog multiplexer const 2	Word	0 - 65535		0		
100.0	Analog multiplexer const 3	Word	0 - 65535		0		
102.0	Analog multiplexer const 4	Word	0 - 65535		0		
104.0	PWM input const	Word	0 - 65535		0		
106.0	PWM input Min	Word	0 - 65535		0		
108.0	PWM input Max	Word	0 - 65535		0		
110.0	PWM duration	Word	0 - 65535	100 ms	20		
112.0	*Reserved*	Word					
114.0	*Reserved*	Word					
116.0	*Reserved*	Word					
118.0	*Reserved*	Word					

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
120.0	*Reserved*	Word					
122.0	*Reserved*	Word					
124.0	*Reserved*	Word					
126.0	*Reserved*	Word					
128.0	*Reserved*	Word					
130.0	*Reserved*	Word					
132.0	*Reserved*	Word					
134.0	*Reserved*	Word					
136.0	*Reserved*	Word					
138.0	*Reserved*	Word					
140.0	**Part - D-word parameters**						
140.0	PE - min. pause time motor	D-word	0 - FFFFFFFF	1 ms	0		
144.0	*Reserved*	D-word					
148.0	*Reserved*	D-word					
152.0	*Reserved*	D-word					
156.0	*Reserved*	D-word					
160.0	*Reserved*	D-word					
164.0	*Reserved*	D-word					
168.0	*Reserved*	D-word					
172.0	*Reserved*	D-word					
176.0	*Reserved*	D-word					

17.15 Data record 135 - Extended device parameters 2

Table 17- 17 Data record 135 - ExtendedPlus device parameters 2

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
0.0	**Coordination**	Byte[4]					
4.0	**Part - DI byte parameters**						
4.0	Truth table 10 3I/1O - Input 1	DI byte	0 - 255		0		
5.0	Truth table 10 3I/1O - Input 2	DI byte	0 - 255		0		
6.0	Truth table 10 3I/1O - Input 3	DI byte	0 - 255		0		
7.0	Truth table 11 3I/1O - Input 1	DI byte	0 - 255		0		
8.0	Truth table 11 3I/1O - Input 2	DI byte	0 - 255		0		
9.0	Truth table 11 3I/1O - Input 3	DI byte	0 - 255		0		
10.0	Timer 5 input	DI byte	0 - 255		0		
11.0	Timer 5 reset	DI byte	0 - 255		0		
12.0	Timer 6 input	DI byte	0 - 255		0		
13.0	Timer 6 reset	DI byte	0 - 255		0		
14.0	Counter 5 input +	DI byte	0 - 255		0		
15.0	Counter 5 input -	DI byte	0 - 255		0		
16.0	Counter 5 reset	DI byte	0 - 255		0		
17.0	Counter 6 input +	DI byte	0 - 255		0		
18.0	Counter 6 input -	DI byte	0 - 255		0		
19.0	Counter 6 reset	DI byte	0 - 255		0		
20.0	Signal conditioning 5 input	DI byte	0 - 255		0		
21.0	Signal conditioning 5 reset	DI byte	0 - 255		0		
22.0	Signal conditioning 6 input	DI byte	0 - 255		0		
23.0	Signal conditioning 6 reset	DI byte	0 - 255		0		
24.0	Analog multiplexer S1	DI byte	0 - 255		0		
25.0	Analog multiplexer S2	DI byte	0 - 255		0		
26.0	*Reserved*						
27.0	*Reserved*						
28.0	*Reserved*						
29.0	*Reserved*						
30.0	*Reserved*						
31.0	*Reserved*						
32.0	*Reserved*						
33.0	*Reserved*						
34.0	*Reserved*						
35.0	*Reserved*						
36.0	*Reserved*						
37.0	*Reserved*						
38.0	*Reserved*						
39.0	*Reserved*						

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
40.0	*Reserved*						
41.0	*Reserved*						
42.0	*Reserved*						
43.0	*Reserved*						
44.0	*Reserved*						
45.0	*Reserved*						
46.0	*Reserved*						
47.0	*Reserved*						
48.0	*Reserved*						
49.0	*Reserved*						
50.0	*Reserved*						
51.0	*Reserved*						
52.0	*Reserved*						
53.0	*Reserved*						
54.0	*Reserved*						
55.0	*Reserved*						
56.0	*Reserved*						
57.0	*Reserved*						
58.0	*Reserved*						
59.0	*Reserved*						
60.0	*Reserved*						
61.0	*Reserved*						
62.0	*Reserved*						
63.0	*Reserved*						
64.0	**Part - AI byte parameters**						
64.0	AM2 - Output	AI byte	0 - 255		0		AM2
65.0	SPS/PLS_analog input 5	AI byte	0 - 255		0		
66.0	SPS/PLS_analog input 6	AI byte	0 - 255		0		
67.0	SPS/PLS_analog input 7	AI byte	0 - 255		0		
68.0	SPS/PLS_analog input 8	AI byte	0 - 255		0		
69.0	SPS/PLS_analog input 9	AI byte	0 - 255		0		
70.0	Analog input limit 5	AI byte	0 - 255		0		
71.0	Analog input limit 6	AI byte	0 - 255		0		
72.0	Analog arithmetic 1 input 1	AI byte	0 - 255		0		
73.0	Analog arithmetic 1 input 2	AI byte	0 - 255		0		
74.0	Analog arithmetic 1 input 3	AI byte	0 - 255		0		
75.0	Analog arithmetic 1 input 4	AI byte	0 - 255		0		
76.0	Analog arithmetic 2 input 1	AI byte	0 - 255		0		
77.0	Analog arithmetic 2 input 2	AI byte	0 - 255		0		
78.0	Analog arithmetic 2 input 3	AI byte	0 - 255		0		
79.0	Analog arithmetic 2 input 4	AI byte	0 - 255		0		
80.0	Analog multiplexer input 1	AI byte	0 - 255		0		

Byte.Bit	Designation (PRM group)	Type	Range	Unit	Default	Note	Information
81.0	Analog multiplexer input 2	AI byte	0 - 255		0		
82.0	Analog multiplexer input 3	AI byte	0 - 255		0		
83.0	Analog multiplexer input 4	AI byte	0 - 255		0		
84.0	PWM input	AI byte	0 - 255		0		
85.0	*Reserved*	AI byte					
86.0	*Reserved*	AI byte					
87.0	*Reserved*	AI byte					
88.0	*Reserved*	AI byte					
89.0	*Reserved*	AI byte					
90.0	*Reserved*	AI byte					
91.0	*Reserved*	AI byte					
92.0	*Reserved*	AI byte					
93.0	*Reserved*	AI byte					
94.0	*Reserved*	AI byte					
95.0	*Reserved*	AI byte					
96.0	*Reserved*	AI byte					
97.0	*Reserved*	AI byte					
98.0	*Reserved*	AI byte					
99.0	*Reserved*	AI byte					
100.0	*Reserved*	AI byte					
101.0	*Reserved*	AI byte					
102.0	*Reserved*	AI byte					
103.0	*Reserved*	AI byte					
104.0	*Reserved*	AI byte					
105.0	*Reserved*	AI byte					
106.0	*Reserved*	AI byte					
107.0	*Reserved*	AI byte					
108.0	*Reserved*	AI byte					
109.0	*Reserved*	AI byte					
110.0	*Reserved*	AI byte					
111.0	*Reserved*	AI byte					
112.0	*Reserved*	AI byte					
113.0	*Reserved*	AI byte					

17.16 Data record 139 - Marking

For external faults, limit monitors, and monitoring functions of the temperature and analog modules, user-specific texts can be configured for marking.

You can access the following texts via data record 139:

- External fault 1 to 6 (status information, warnings, and faults)
- Limit 1 to 4 (status information)
- TM1 warnings T> / trip T> (status information, warnings, and faults)
- AM1 warning/tripping 0/4 - 20 mA<> (status information, warnings and faults).

Can be parameterized to have various meanings, e.g. fill level >, bearing hot, etc. To simplify diagnostics, these texts can be saved in the device. These can be created, read out and displayed, for example, with **SIMOCODE ES**. The texts do not contain any functions.

Note

Changing the marking

Each change to the marking requires that the communication interface be restarted when the web server is active. A new start interrupts all Ethernet and PROFINET links and reestablishes them afterward.

Table 17- 18 Data record 139 - Marking

Byte.Bit	Designation	Type	Information
0.0	*Reserved*	*Byte[4]*	
4.0	*Reserved*	*Byte[6]*	
10.0	Marking - External fault 1	Byte[10]	
20.0	Marking - External fault 2	Byte[10]	
30.0	Marking - External fault 3	Byte[10]	
40.0	Marking - External fault 4	Byte[10]	
50.0	Marking - External fault 5	Byte[10]	
60.0	Marking - External fault 6	Byte[10]	
70.0	*Reserved*	*Byte[10]*	
80.0	*Reserved*	*Byte[10]*	
90.0	Marking limit 1	Byte[10]	
100.0	Marking limit 2	Byte[10]	
110.0	Marking limit 3	Byte[10]	
120.0	Marking limit 4	Byte[10]	
130.0	Marking - TM warning T>	Byte[10]	
140.0	Marking - TM trip T>	Byte[10]	
150.0	Marking - Warning 0/4-20 mA>	Byte[10]	
160.0	Marking - Warning 0/4-20 mA<	Byte[10]	
170.0	Marking - Trip 0/4-20 mA>	Byte[10]	
180.0	Marking - Trip 0/4-20 mA<	Byte[10]	
190.0	*Reserved*	*Byte[10]*	

17.17 Data record 140 - Marking 2

For limit monitors, and monitoring functions of the temperature and analog modules, user-specific texts can be configured for marking.

You can access the following texts via data record 140:

- Limit 5 and 6
- TM2 warnings T> / trip T>
- AM2 warning / trip 0/4-20mA<>.

Note

Changing the marking

Each change to the marking requires that the communication interface be restarted when the web server is active. A new start interrupts all Ethernet and PROFINET links and reestablishes them afterward.

Table 17- 19 Data record 140 - Marking 2

Byte.Bit	Designation	Type	Information
0.0	Coordination	Byte[4]	
4.0	*Reserved*		
10.0	Marking limit 5	Byte[10]	
20.0	Marking limit 6	Byte[10]	
30.0	Marking - TM2 warning T>	Byte[10]	
40.0	Marking - TM2 trip T>	Byte[10]	
50.0	Marking - Warning 0/4-20 mA>	Byte[10]	
60.0	Marking - Warning 0/4-20 mA<	Byte[10]	
70.0	Marking - Trip 0/4-20 mA>	Byte[10]	
80.0	Marking - Trip 0/4-20 mA>	Byte[10]	
90.0	*Reserved*	*Byte[110]*	

17.18 Data record 165 - Identification

You can access the following identifiers stored in the device:

- Plant identifier
- Location designation
- Installation date
- Comment.

Table 17- 20 Data record 165 - Identification

Byte.Bit	Designation	Type	Information
0.0	*Reserved*	*Byte[4]*	
4.0	Plant identifier	Byte[32]	
36.0	Location designation	Byte[22]	
58.0	Date	Byte[16]	
74.0	*Reserved*	*Byte[38]*	
112.0	Comment	Byte[54]	

17.19 Data record 224 - Password protection

Description

- Password protection ON

  If the data record is received with this control flag, the password protection is activated and the password applied. If "Password protection on" and the password are not identical at the time of receipt, the event "Event - Wrong password" is set and no change will be made.

- Password protection OFF

  If the data record is received with this control flag, the password protection is deactivated. If the password is incorrect, the event "Event - Wrong password" is set and no change is made.

Table 17- 21 Data record 224 - Password protection

Byte.Bit	Designation	Type	Information
0.0	*Reserved*	*Byte[4]*	
4.0	Control flag: 0 = Password protection off, 1 = Password protection on	Bit	
4.1	*Reserved*	*Bit[31]*	
8.0	Password	Byte[8]	
16.0	*Reserved*	*Byte[8]*	

17.20 Assignment of cyclic receive and send data for existing control functions

17.20.1 Overload relay

Table 17- 22 Assignment of cyclic receive / send data, overload relay

Cycl. receive data	
Bit 0.0	Not connected
Bit 0.1	Not connected
Bit 0.2	Not connected
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Not connected
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Not connected
Bit 0.1	Not connected
Bit 0.2	Not connected
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Not connected
Bit 0.5	Not connected
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected

Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic types 1 and 3 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.2 Direct starter

Table 17- 23 Assignment of cyclic receive / send data, direct starter

Cycl. receive data	
Bit 0.0	Not connected
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Not connected
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Not connected

Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.3 Reversing starter

Table 17- 24 Assignment of cyclic receive / send data, reversing starter

Cycl. receive data	
Bit 0.0	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected

Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Status - ON<
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Status - Interlocking time active
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.4 Molded-case circuit breaker (MCCB)

Table 17- 25 Assignment of cyclic receive / send data, molded-case circuit breaker (MCCB)

Cycl. receive data	
Bit 0.0	Not connected
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Not connected
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Not connected
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected

Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.5 Star-delta starter

Table 17- 26 Assignment of cyclic receive / send data, star/delta starter

Cycl. receive data	
Bit 0.0	Not connected
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Not connected
Bit 0.1	Status - Off
Bit 0.2	Status - ON
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Status - Change-over pause active
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected

Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.6 Star-delta reversing starter

Table 17- 27 Assignment of cyclic receive / send data, star/delta reversing starter

Cycl. receive data	
Bit 0.0	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON <
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON >
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test°/ Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected

Cycl. send data	
Bit 0.0	Status - ON<
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Status - Change-over pause active
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Status - Interlocking time active
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.7 Dahlander

Table 17- 28 Assignment of cyclic receive / send data, Dahlander

Cycl. receive data	
Bit 0.0	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON >>
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON >
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected

Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Status - ON>>
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Status - Change-over pause active
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.8 Dahlander reversing starter

Table 17- 29 Assignment of cyclic receive / send data, Dahlander reversing starter

Cycl. receive data	
Bit 0.0	Device parametersr → Motor controlr → Control stations → PLC/PCS [PN]r → ON >>
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON >
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON <<
Bit 1.1	Not connected
Bit 1.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON <
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Status - ON>>
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Status - Change-over pause active
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Status - ON<<
Bit 1.1	Not connected
Bit 1.2	Status - ON<
Bit 1.3	Status - Interlocking time active
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected

Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.9 Pole-changing starter

Table 17- 30 Assignment of cyclic receive / send data, pole-changing starter

Cycl. receive data	
Bit 0.0	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON >>
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON >
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Status - ON>>
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Status - Change-over pause active
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected

Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.10 Pole-changing reversing starter

Table 17- 31 Assignment of cyclic receive / send data, pole-changing reversing starter

Cycl. receive data	
Bit 0.0	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON >>
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON >
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON <<
Bit 1.1	Not connected
Bit 1.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON <
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected

Cycl. send data	
Bit 0.0	Status - ON>>
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Status - Change-over pause active
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Status - ON<<
Bit 1.1	Not connected
Bit 1.2	Status - ON<
Bit 1.3	Status - Interlocking time active
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.11 Solenoid valve

Table 17- 32 Assignment of cyclic receive/send data, solenoid valve

Cycl. receive data	
Bit 0.0	Not connected
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → CLOSED
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OPEN
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Not connected
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input

Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Not connected
Bit 0.1	Status - OFF (Closed)
Bit 0.2	Status - ON > (Open)
Bit 0.3	Not connected
Bit 0.4	Not connected
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Not connected
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.12 Positioner

Table 17- 33 Assignment of cyclic receive / send data, positioner

Cycl. receive data	
Bit 0.0	Device parameters → Motor control → Control stations → PLC/PCS [PN] → CLOSED
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → Stop
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OPEN
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Status - ON < (Closed)
Bit 0.1	Status - OFF (Stop)
Bit 0.2	Status - ON > (Open)
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Status - Interlocking time active
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Status - Positioner runs in open direction
Bit 1.1	Not connected
Bit 1.2	Status - Positioner runs in close direction
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected

Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.13 Soft starter

Table 17- 34 Assignment of cyclic receive / send data, soft starter

Cycl. receive data	
Bit 0.0	Not connected
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected
Cycl. send data	
Bit 0.0	Not connected
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Not connected
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected

Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

17.20.14 Soft starter with reversing contactor

Table 17- 35 Assignment of cyclic receive / send data, soft starter with reversing contactor

Cycl. receive data	
Bit 0.0	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON <
Bit 0.1	Device parameters → Motor control → Control stations → PLC/PCS [PN] → OFF
Bit 0.2	Device parameters → Motor control → Control stations → PLC/PCS [PN] → ON >
Bit 0.3	Further function blocks → Standard functions → Test / Reset → Test1 - Input
Bit 0.4	Further function blocks → Standard functions → Emergency start → Emergency start - Input
Bit 0.5	Device parameters → Motor control → Control stations → Mode selector S1
Bit 0.6	Further function blocks → Standard functions → Test / Reset → Reset 1 - Input
Bit 0.7	Not connected
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 *) (analog value)	Not connected
Byte 4/5 **) (analog value)	Not connected

Cycl. send data	
Bit 0.0	Status - ON<
Bit 0.1	Status - Off
Bit 0.2	Status - ON>
Bit 0.3	Event - Prewarning overload (I>115 %)
Bit 0.4	Status - Interlocking time active
Bit 0.5	Status - Remote mode
Bit 0.6	Status - General fault
Bit 0.7	Status - General warning
Bit 1.0	Not connected
Bit 1.1	Not connected
Bit 1.2	Not connected
Bit 1.3	Not connected
Bit 1.4	Not connected
Bit 1.5	Not connected
Bit 1.6	Not connected
Bit 1.7	Not connected
Byte 2/3 (analog value)	Maximum current I_max
Byte 4/5 *) (analog value)	Not connected
Byte 6/7 *) (analog value)	Not connected
Byte 8/9 *) (analog value)	Not connected
Byte 10/11 **) (analog value)	Not connected
Byte 12/13 **) (analog value)	Not connected
Byte 14/15 **) (analog value)	Not connected
Byte 16/17 **) (analog value)	Not connected
Byte 18/19 **) (analog value)	Not connected

*) for SIMOCODE pro V PN, basic type 1 only

**) for SIMOCODE pro V PN, basic type 3 only

Dimension drawings

18

In this chapter

This chapter contains the technical dimension drawings of the SIMOCODE pro system components.

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- Technicians

Required knowledge

You need sound knowledge of switchgear configuration.

18.1 3UF70 basic unit

18.1.1 SIMOCODE pro V PN basic unit 3UF7011

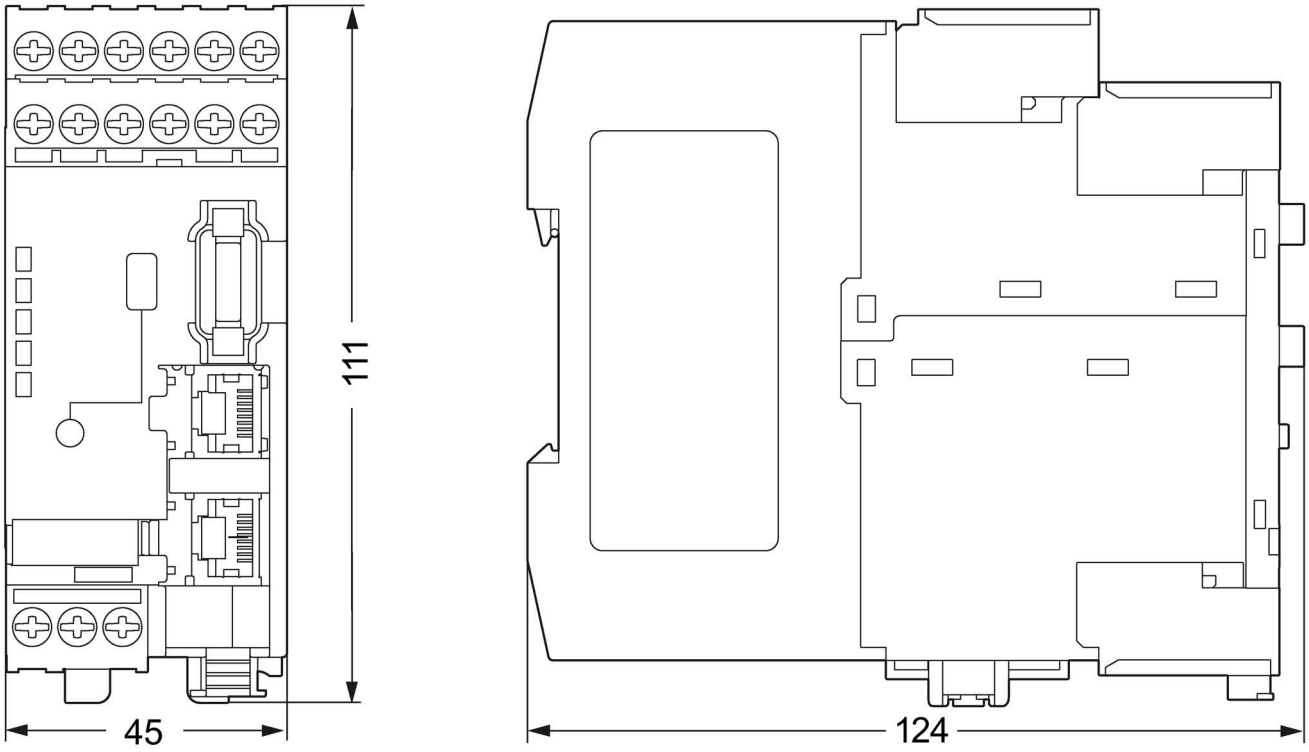


Figure 18-1 SIMOCODE pro V PN basic unit 3UF7011

18.2 3UF710 current measuring module

18.2.1 Current measuring module (through-hole converter) 3UF7100, 0.3 A to 3 A, 3UF7101, 2.4 A to 25 A

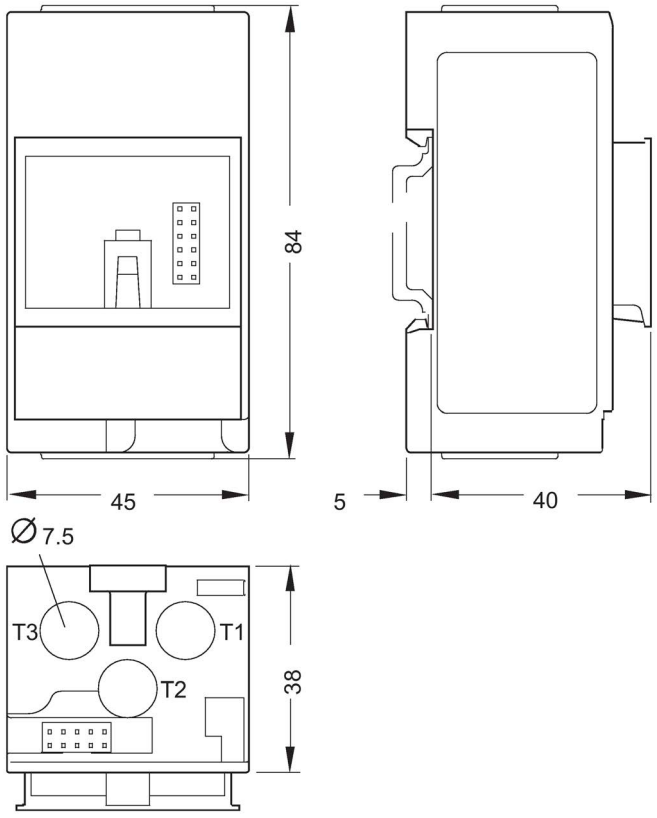


Figure 18-2 Current measuring module (through-hole converter) 3UF7100. 0.3 A to 3 A, 3UF7101, 2.4 A to 25 A

18.2.2 Current measuring module (through-hole converter) 3UF7102, 10 A to 100 A

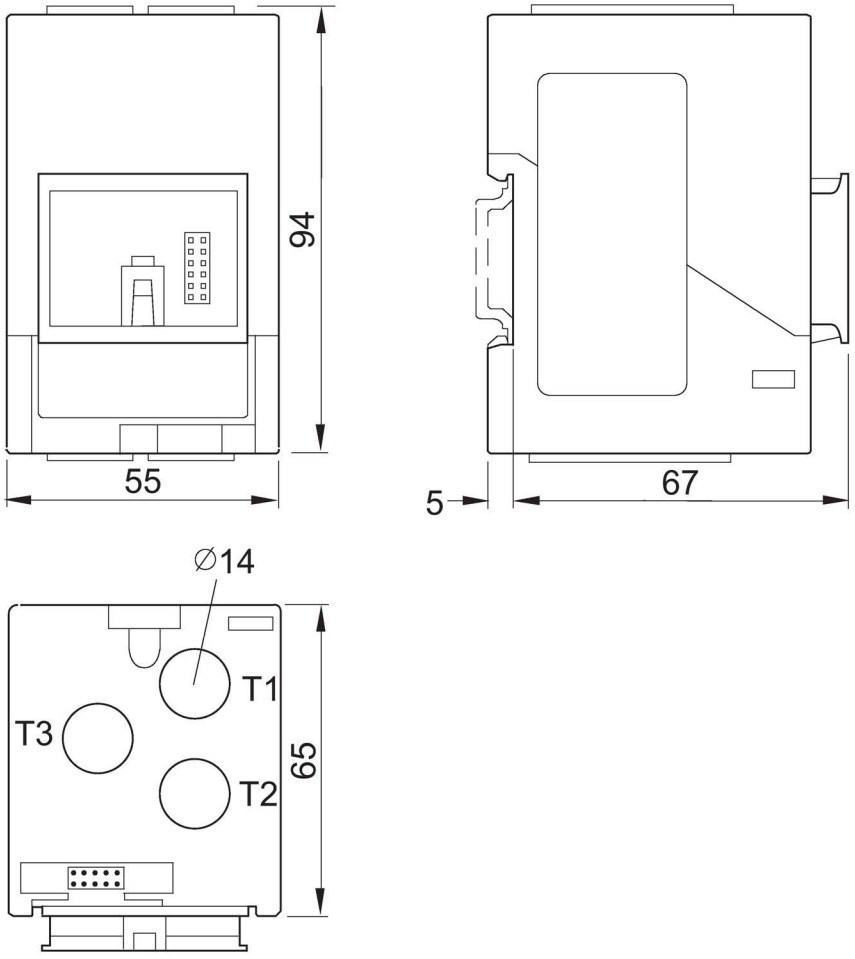


Figure 18-3 Current measuring module (through-hole converter) 3UF7102, 10 A to 100 A

18.2.3 Current measuring module (through-hole converter) 3UF7103, 20 A to 200 A

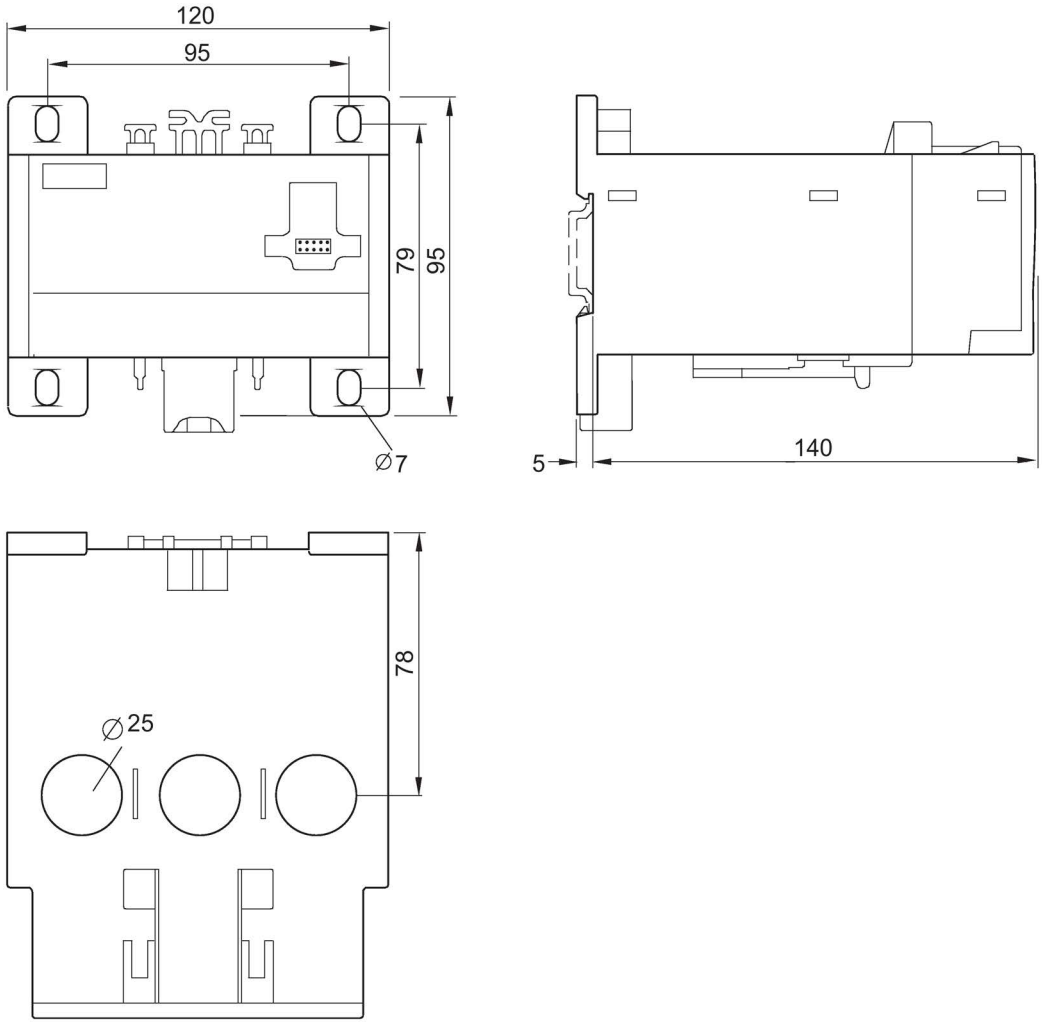


Figure 18-4 Current measuring module (through-hole converter) 3UF7103, 20 A to 200 A

18.2.4 Current measuring module (bus connection) 3UF7103, 20 A to 200 A

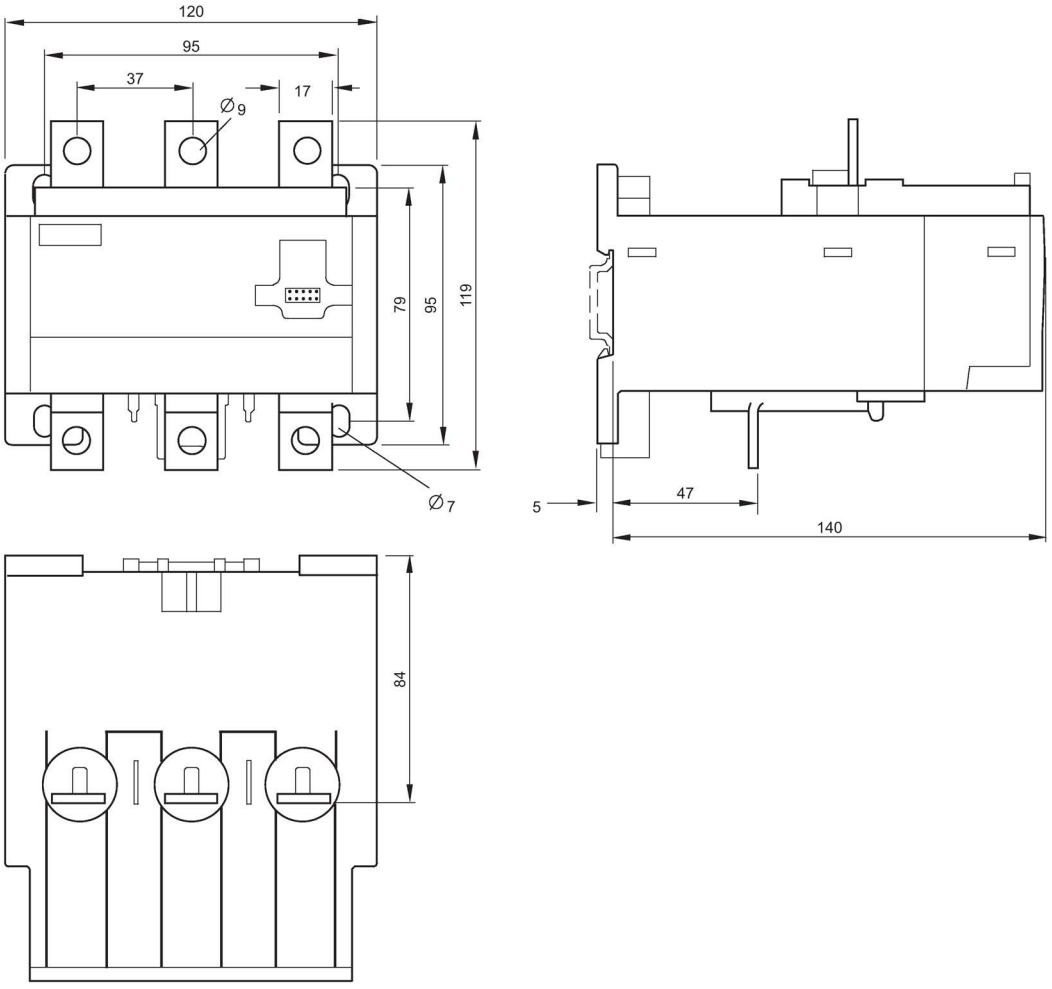


Figure 18-5 Current measuring module (bus connection) 3UF7103, 20 A to 200 A

18.2.5 Current measuring module (bus connection) 3UF7104, 63 A to 630 A

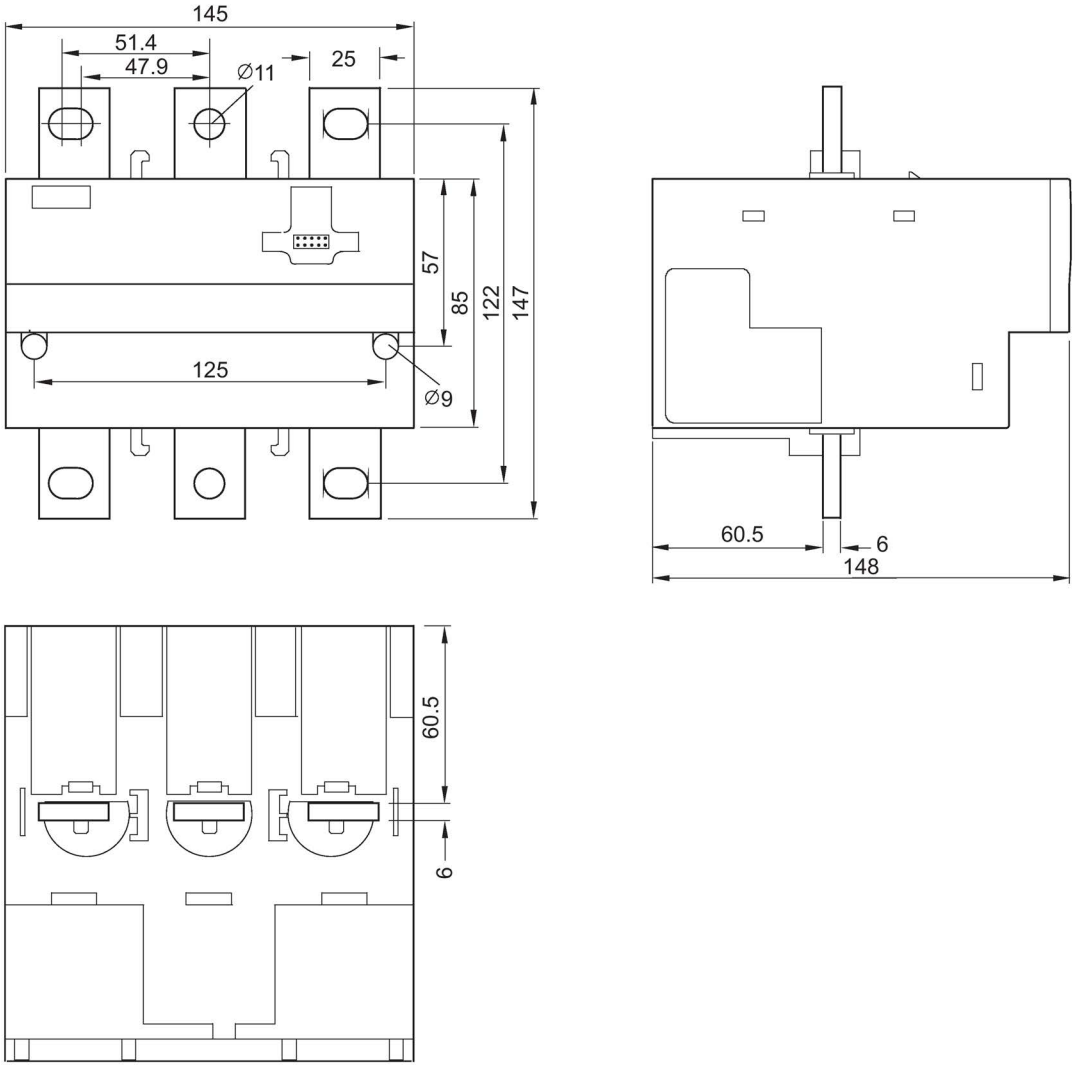


Figure 18-6 Current measuring module (bus connection) 3UF7104, 63 A to 630 A

18.3 Current / voltage measuring modules

18.3.1 Current / voltage measuring module (through-hole converter) 3UF7110, 0.3 A to 3 A, 3UF7111, 2.4 A to 25 A

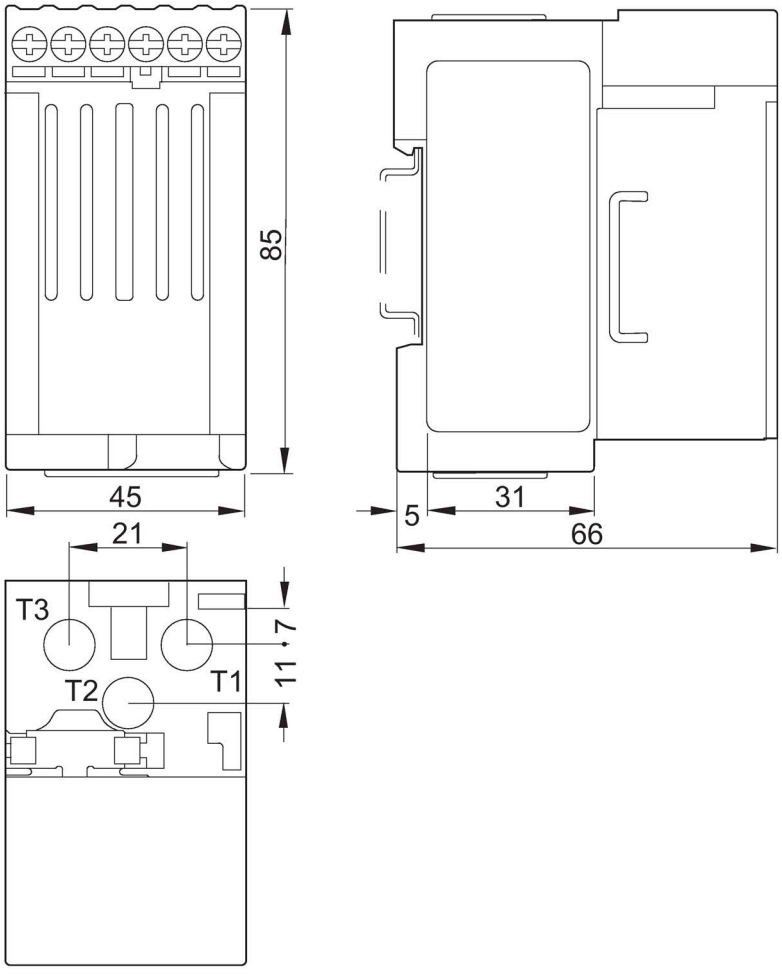


Figure 18-7 Current / voltage measuring module (through-hole converter) 3UF7110, 0.3 A to 3 A, 3UF7111, 2.4 A to 25 A

18.3.2 Current measuring module (through-hole converter) 3UF7112, 10 A to 100 A

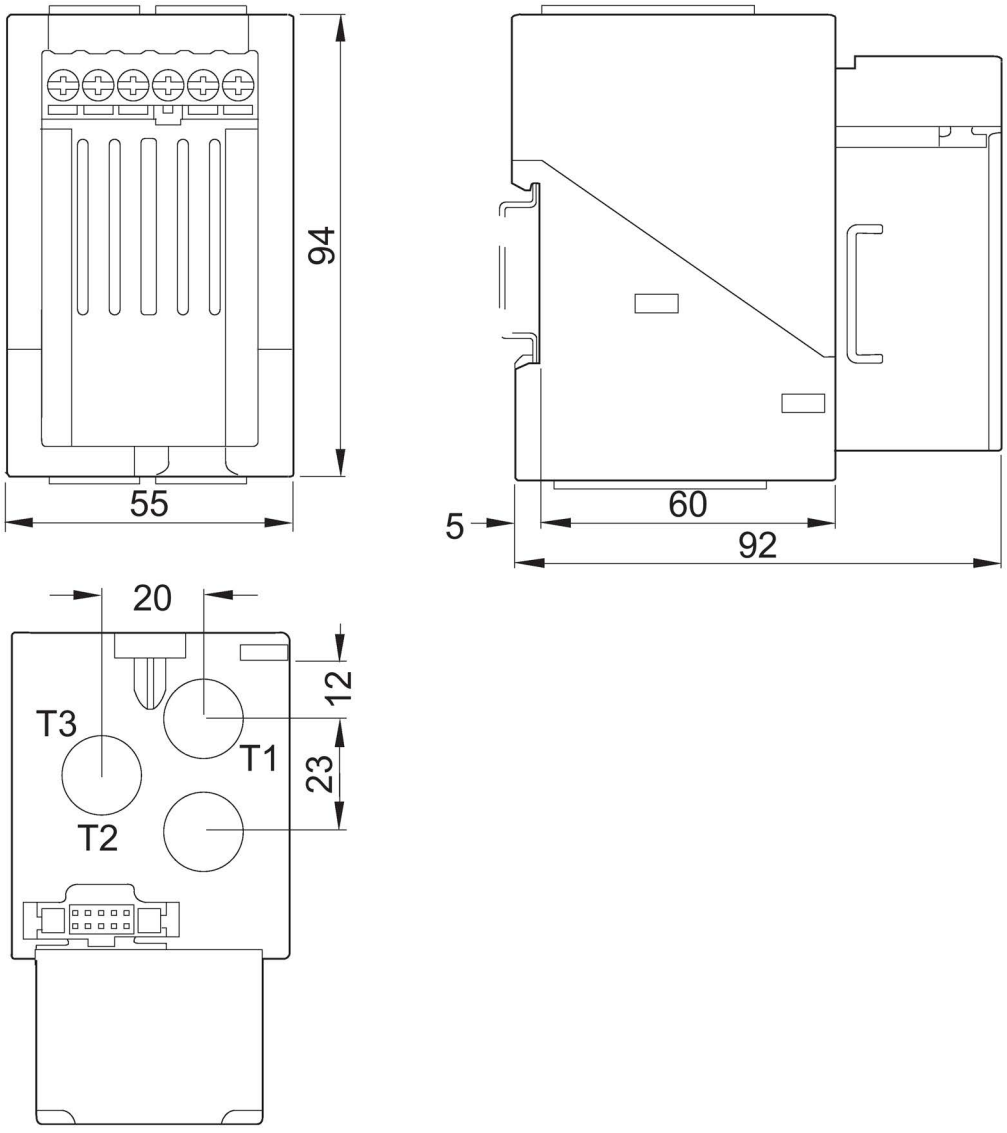


Figure 18-8 Current / voltage measuring module (through-hole converter) 3UF7112, 10 A to 100 A

18.3.3 Current measuring module (through-hole converter) 3UF7113-1AA, 20 A to 200 A

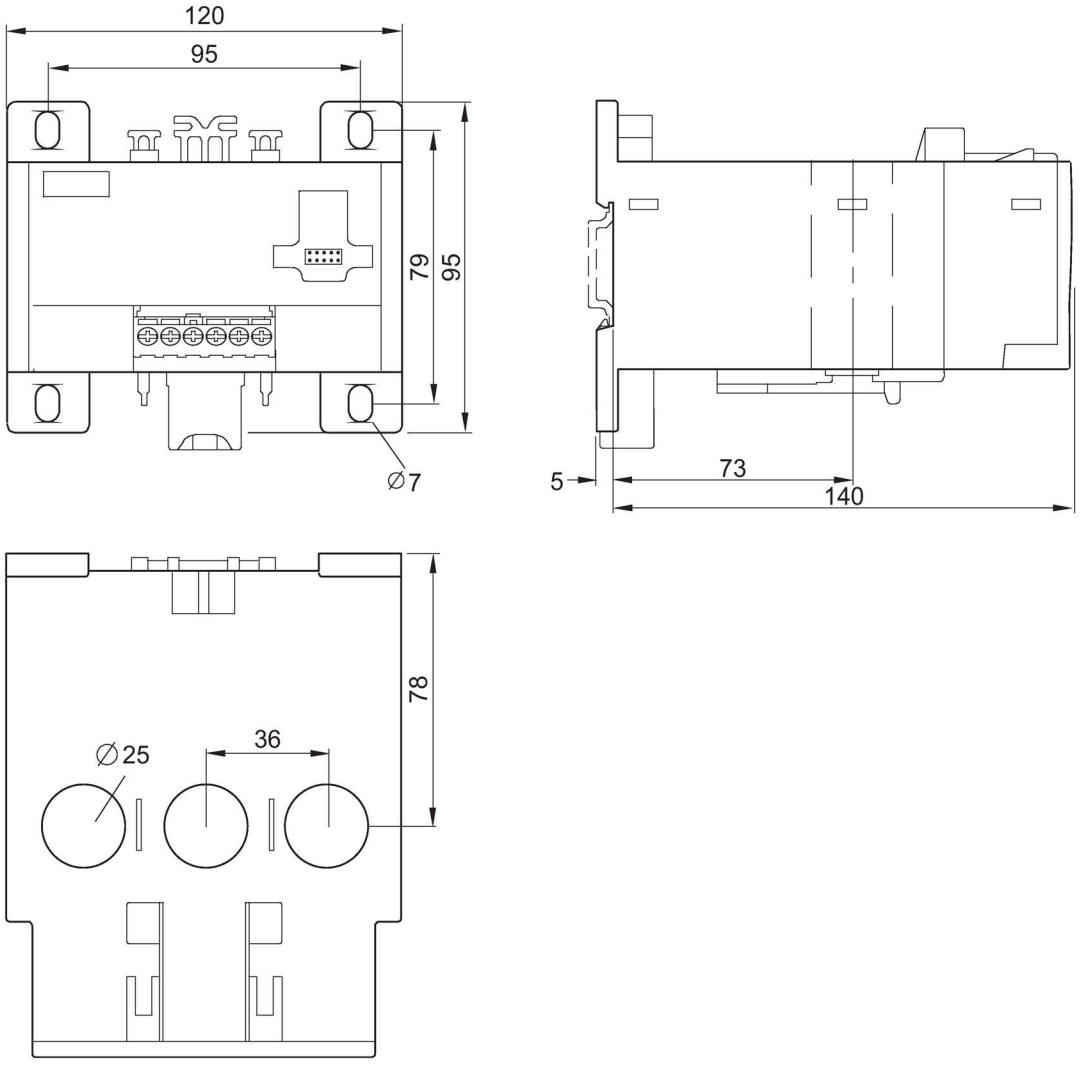


Figure 18-9 Current / voltage measuring module (through-hole converter) 3UF7113-1AA, 20 A to 200 A

18.3.4 Current measuring module (bus connection) 3UF7113-1BA, 20 A to 200 A

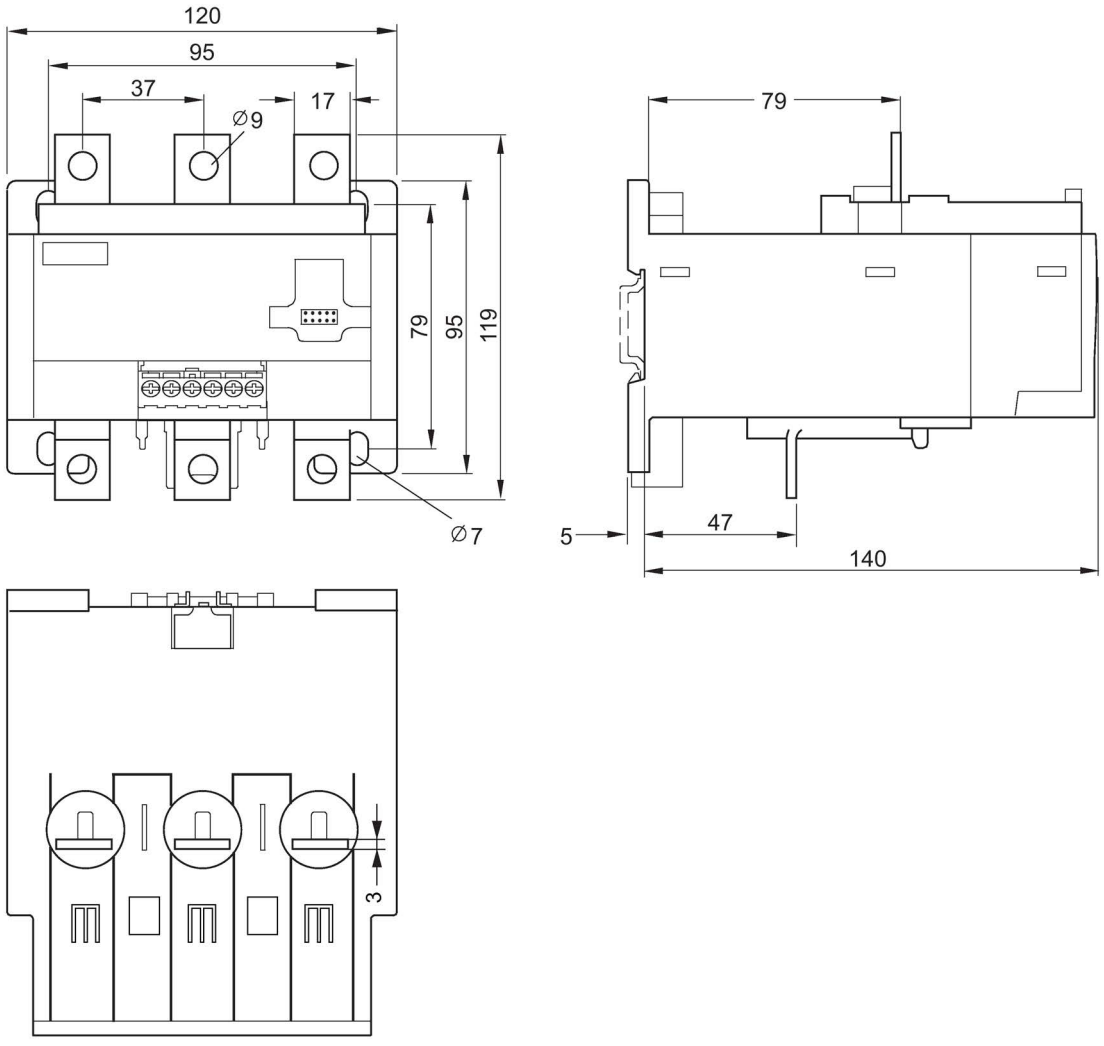


Figure 18-10 Current / voltage measuring module (bus connection) 3UF7113-1BA, 20 A to 200 A

18.3.5 Current measuring module (bus connection) 3UF7114, 63 A to 630 A

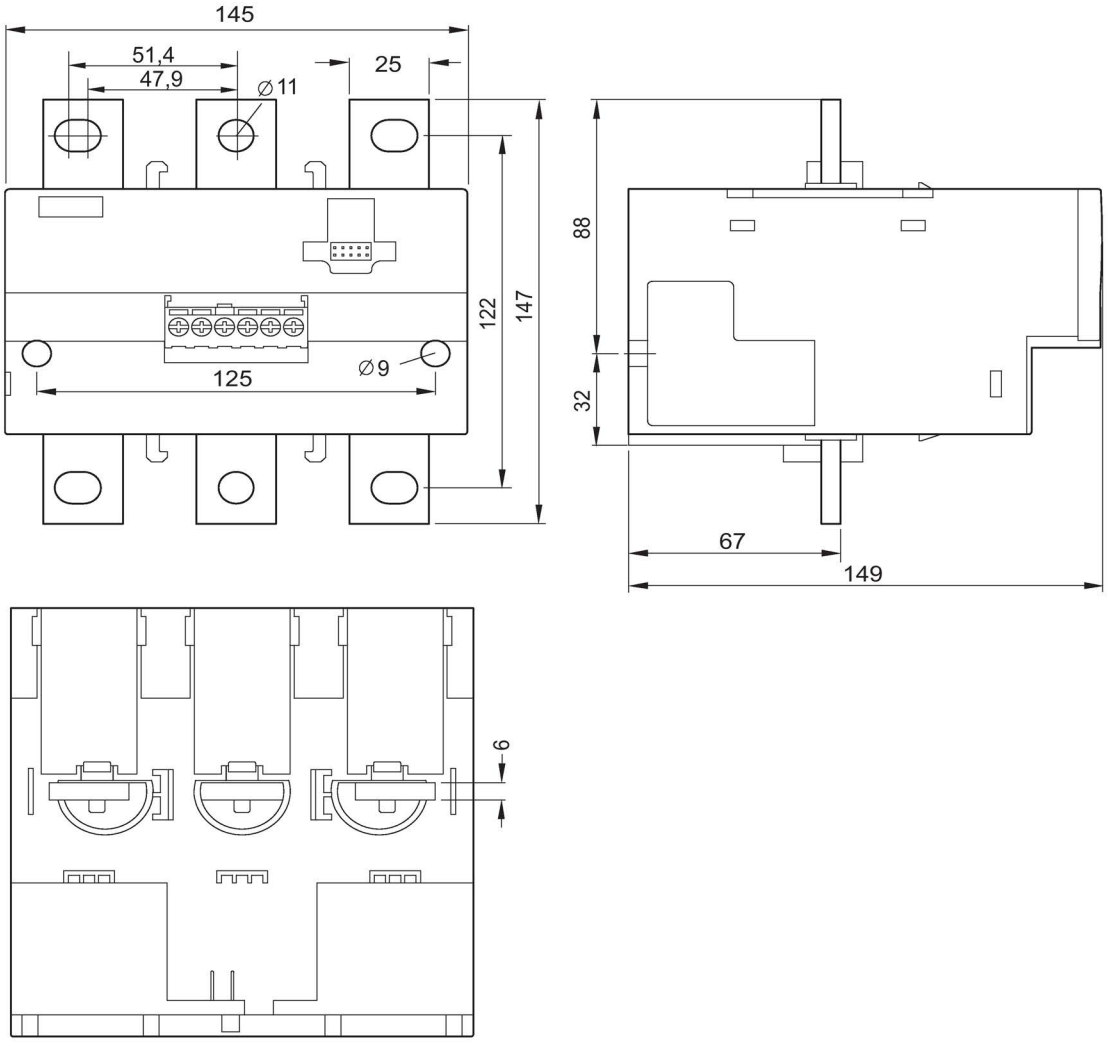


Figure 18-11 Current measuring module (bus connection) 3UF7114, 63 A to 630 A

18.4 3UF7200 and 3UF7210 operator panels

18.4.1 3UF7200 operator panel

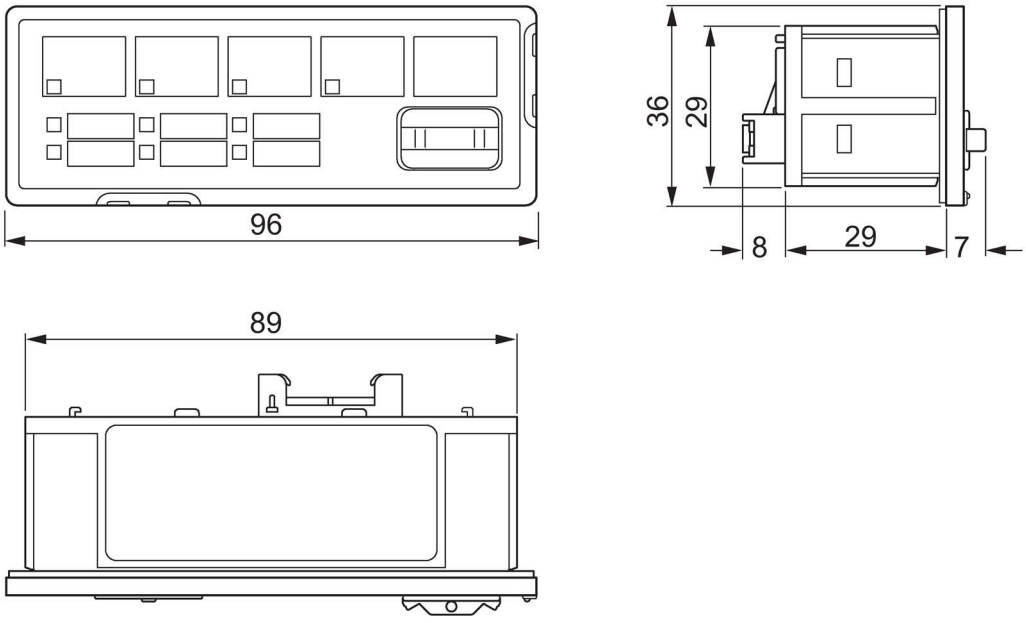


Figure 18-12 3UF7200 operator panel

18.4.2 3UF7210 operator panel with display

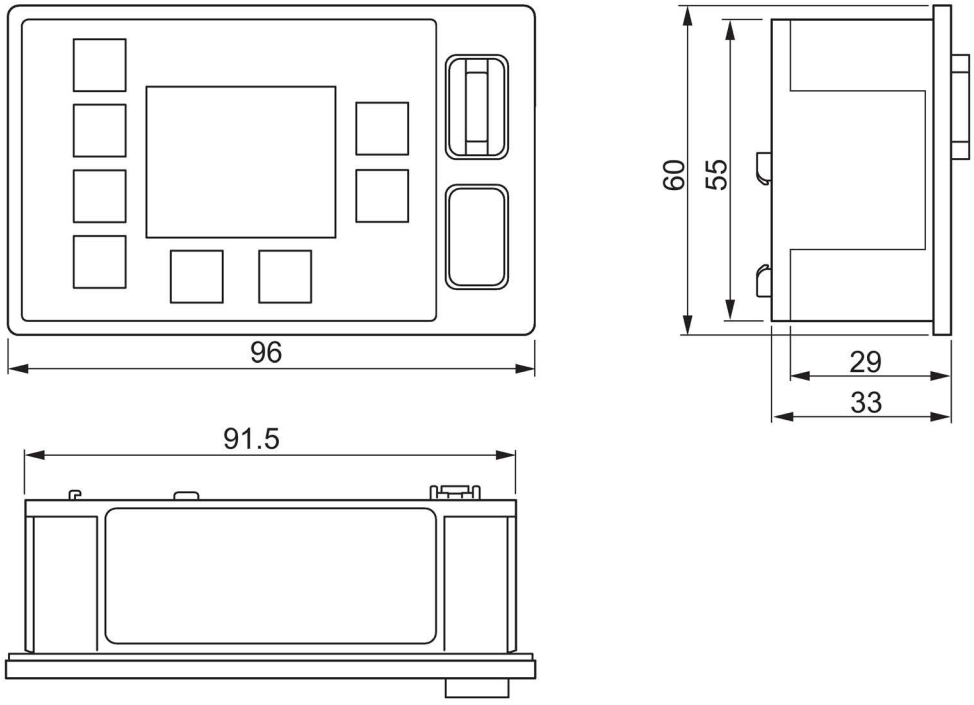


Figure 18-13 3UF7210 operator panel with display

18.5 Expansion modules/decoupling module

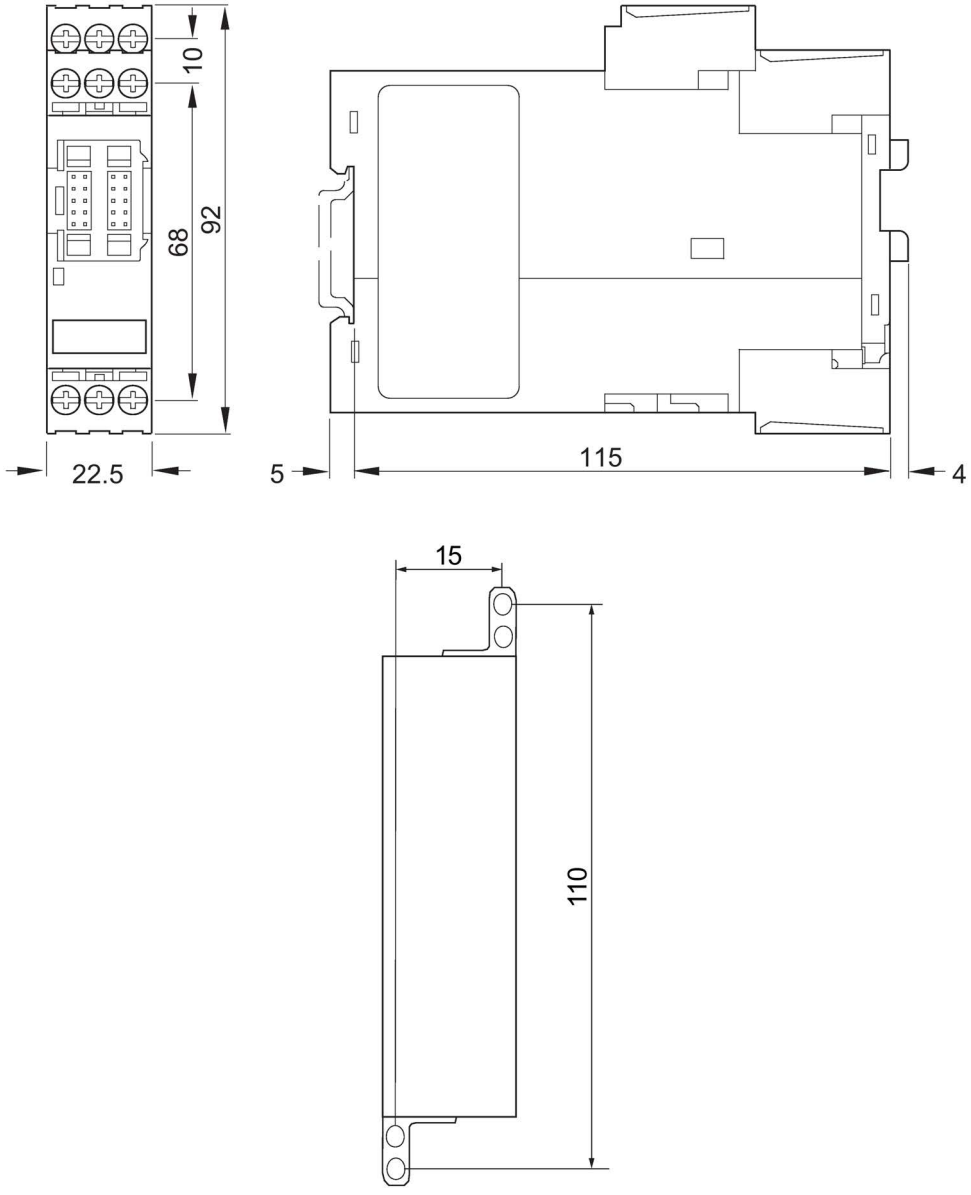


Figure 18-14 Expansion modules/decoupling module

- 3UF73 digital modules
- 3UF7500-1AA00-0 and 3UF510-1AA00-0 ground-fault modules
- 3UF7700 temperature module
- 3UF7400 analog module
- 3UF715 decoupling module

18.6 Digital modules DM-F Local, DM-PROFIsafe

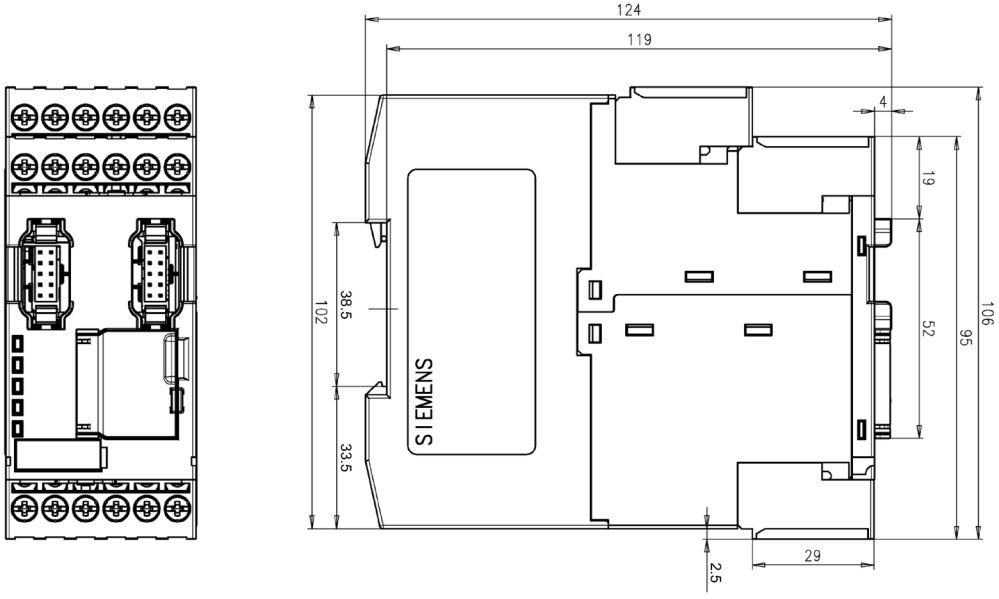


Figure 18-15 Digital module DM-F Local, DM-PROFIsafe

18.7 Accessories

18.7.1 Door adapter

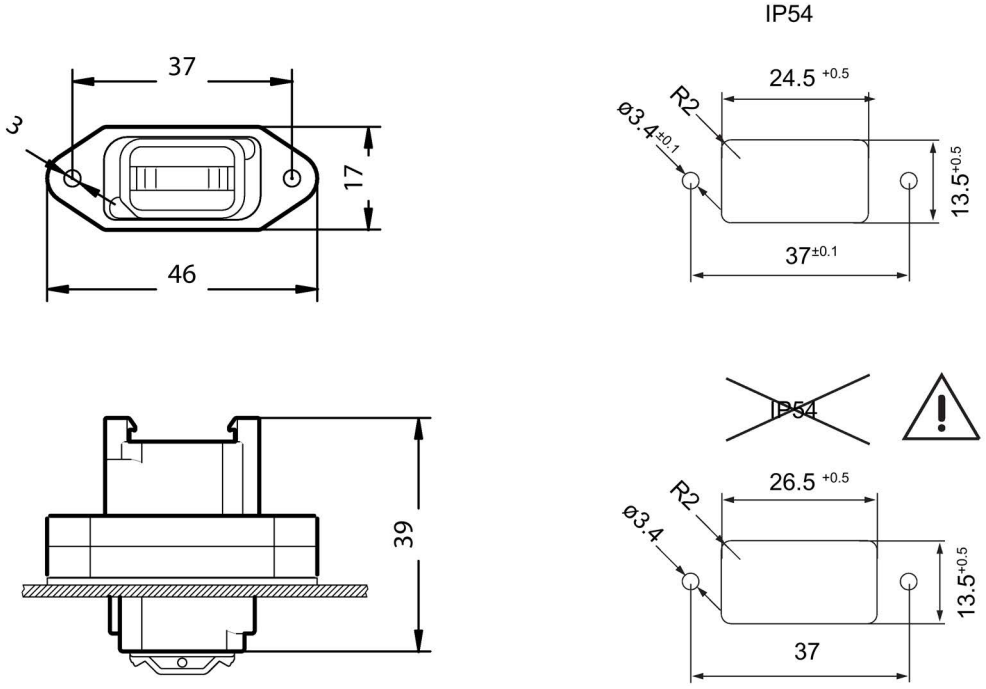


Figure 18-16 Door adapter

18.7.2 Operator panel adapter

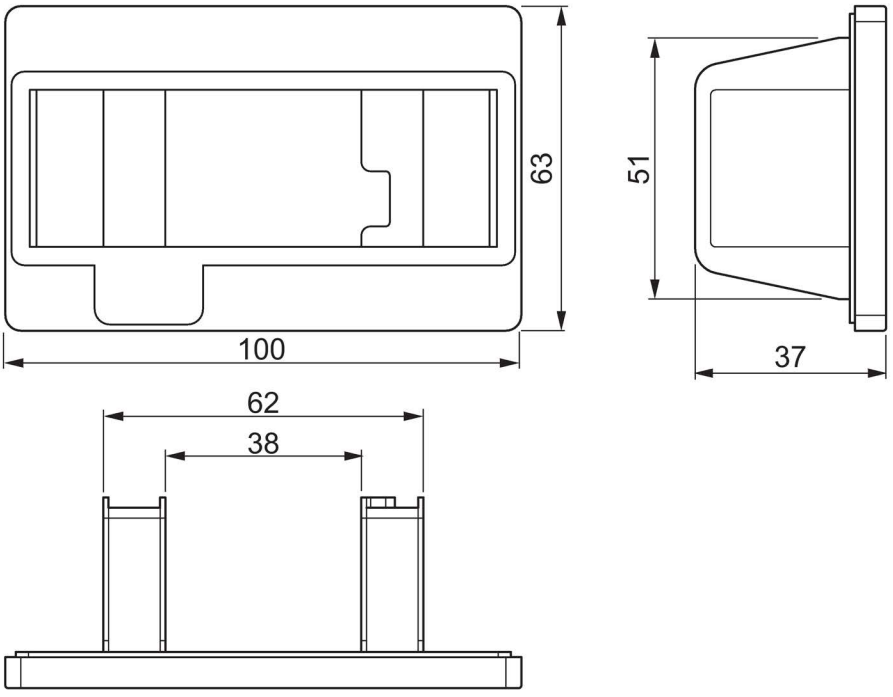


Figure 18-17 Operator panel adapter

18.7.3 Initialization module

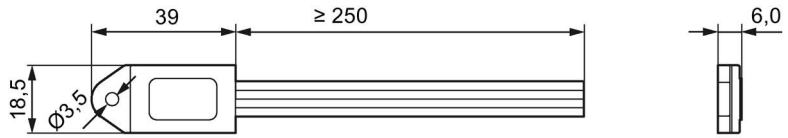


Figure 18-18 Initialization module

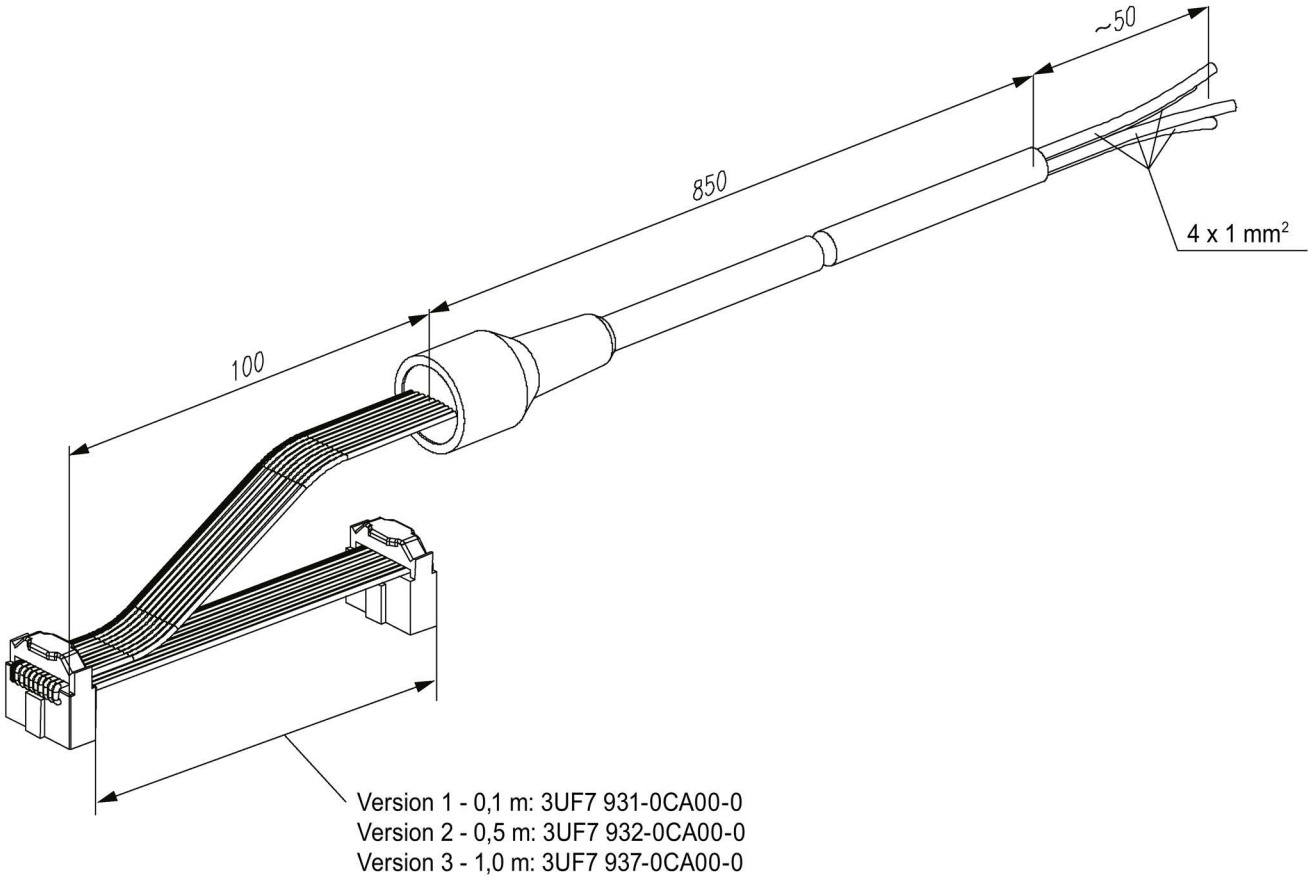


Figure 18-19 Y connecting cable

18.7.4 3UL23 residual current transformer

Dimension drawings residual current transformer 3UL23

See Manual "3UG4/3RR2 Monitoring Relay"
(http://support.automation.siemens.com/WW/view/en/50426183/133300).

19 Technical data

In this chapter

This chapter contains information about SIMOCODE pro technical data.

Target groups

This chapter is addressed to the following target group:

- Configuring engineers

Required knowledge

You will require the following knowledge:

- Sound knowledge of switchgear configuration
- Sound knowledge of SIMOCODE pro

19.1 Common technical data

Common technical data		
Standards	EN 60204-1, EN 1760-1, ISO 13849-1, IEC 61508, IEC/EN 60947-4-1, IEC/EN 60947-5-1	
Test verification documents	See Certificates (http://www.siemens.com/sirius/approvals).	
Permissible ambient temperature		
In operation	-25 to +60°C [1]	
For storage and transport	-40 to +80°C [2]	
at installation altitude above MSL		
≤ 3000 m	Max. +50 °C (no safe isolation)	
≤ 4000 m	Max. +40 °C (no safe isolation)	
Relative humidity during operation	5 ... 95 %	
Degree of protection (according to IEC 60529)		
All components (except current measuring modules with bus connection, operator panel and door adapter)		IP20
Current measuring modules with bus connection		IP00
Operator panel (front) and door adapter (front) with cover		IP54
Vibration resistance		1-6 Hz / 15 mm; 6-500 Hz / 2 g
Shock resistance (sine pulse) acc. to DIN EN 60068-2-27		15 g / 11 ms
Mounting position		Any
Frequencies		50/60 Hz ±5 %
EMC stability according to IEC 60947-1 • IEC 60947-1, IEC 60947-5-1, SN 27095, NE21 • DM-F: IEC 61326-3-1		Corresponds to degree of severity 3
Conducted interference, burst according to IEC 61000-4-4		2 kV (power ports) **Surge suppressor is required for inductive loads.** 1 kV (signal ports)
Conducted interference, high-frequency according to IEC 61000-4-6		10 V
Conducted interference, surge according to IEC 61000-4-5		2 kV (line to ground) 1 kV (line to line)
Electrostatic discharge, ESD according to IEC 61000-4-2 [4]		8 kV (air discharge) 6 kV (contact discharge) [3]
Field-related interference according to IEC 61000-4-3		10 V/m

Common technical data	
This is a Class A product. This product can cause radio interference if used in a domestic environment. Therefore, the user may need to implement suitable countermeasures. Conducted and radiated interference emission	DIN EN 55011/DIN EN 55022 (CISPR11/CISPR22) (corresponds to Degree of Severity A)
Safe isolation according to IEC 60947-1	All SIMOCODE pro circuits are isolated from each other according to IEC 60947-1, i.e. dimensioned with double creepage distance and air clearance.
	Notice Please observe the information in the "Protective Separation" test report, No. 2668.
3UF7 93 connecting cable	
Rated insulation voltage	300 V
Rated operating voltage	24 V

1) for operator panel with display 3UF721 0 - 60 °C

2) for operator panel with display 3UF721 -20 - 70 °C

3) for operator panel with display 3UF721 4kV

19.2 Technical data of the basic unit

Technical data of the basic unit	
Mounting	Snap-mounted onto 35 mm standard mounting rail or screw-mounted using additional push-in lugs
Mounting position	Any
Display	
Red/green/yellow "DEVICE" LED	• Red: "Function test negative, device disabled" • Green: "Ready for operation" • Yellow: "Memory module detected" • OFF: "No control supply voltage"
Green "BUS" LED	• Continuous light: "Communication with PLC/PCS" • Flashing: "Baud rate recognized/communication with PC/PG"
Red "GEN. FAULT" LED	Continuous light/flashing: "Feeder fault", e.g. overload tripping
Green "PORT1" LED	• Continuous light: Ethernet connection available • Flashing: Station flash test
Green "PORT2" LED	• Continuous light: Ethernet connection available • Flashing: Station flash test
"TEST/RESET" button	• Resets the device after tripping • Function test (system self-test) • Operation of memory module
System interfaces	
Front	For connecting an operator panel or expansion modules. The memory module or a PC cable can also be connected to the system interface for parameterization purposes.
Bottom	Connection of a current measuring module or a current / voltage measuring module
ETHERNET interface	
Connection system	2 x RJ45 (LAN)
Transmission rate	Max. 100 Mbit/s
Number of interfaces according to PROFINET	2
PROFINET conformity class	B
Protocols supported	PROFINET IO, PROFIsafe, LLDP, SNMP, Address Resolution Protocol (ARP), HTTP, HTTPS, OPC UA Server, NTP
Autonegation	Yes
Autosensing	Yes
MRP/MRRT redundancy method	Yes
PROFINET IO system redundancy	Yes
PROFIenergy measured values	Yes
PROFIenergy shutdown	Yes

Technical data of the basic unit		
Rated control supply voltage Us (according to DIN EN 61131-2) ⚠ **Warning** For the 24 V DC power supply, always use an SELV or PELV power supply unit!	110 V - 240 V AC/DC, 50/60 Hz	24 V DC
Operating range	0.85 x Us to 1.1 x Us	0.85 x Us to 1.2 x Us (startup) 0.80 x Us to 1.2 x Us (operation)
Power consumption		
(including two expansion modules connected to basic unit)	12 VA/8 W	8 W
Rated insulation voltage U_i	300 V (at pollution degree 3)	
Rated impulse withstand voltage U_{imp}	4 kV	
Power failure backup time(longer power failures lead to shutdown of the relay outputs (monostable))	• 24 V DC • 110 V to 240 V AC/DC	Typ. 20 ms
Relay outputs		
Number	3 monostable relay outputs	
Function	Isolated NO contacts (NO contact response parameterizable via internal signal conditioning), 2 relay outputs connected to common potential, one separate relay output, freely-assignable to control functions (e.g. line, star or delta contactor or operating state status information.)	
Stipulated short-circuit protection for auxiliary contacts (relay outputs)	• Fuse links, operating class gG 6 A, quick-response 10 A (IEC 60947-5-1) • Miniature circuit breaker 1.6 A, C characteristic (IEC 60947-5-1) • Miniature circuit breaker 6 A, C characteristic (I_k < 500 A)	
Rated uninterrupted current	• 5 A • 6 A at max. +50 °C	
Rated switching capacity	• AC-15: 6 A / 24 V AC; 6 A / 120 V AC; 3 A / 230 V AC • DC-13: 2 A/24 V DC; 0.55 A/60 V DC; 0.25 A/125 V DC	
Contact rating of the auxiliary contacts according to UL	B300/R300	
Electrical durability (operating cycles)	Typical: 100.000	
Mechanical durability (operating cycles)	Typical: 10.000.000	

Technical data of the basic unit		
Inputs (binary)	4 inputs connected to common potential that are supplied via the device electronics (24 V DC) for measuring process signals (e.g. local control station, key-operated switch, limit switch, etc.), freely-assignable to control functions.	
24 V DC		
Cable lengths (single)	300 m	
Input characteristic	Type 1 according to EN 61131-2	
Thermistor motor protection (PTC binary)		
Total cold resistance	≤ 1.5 kOhm	
Response value	3.4 kOhm to 3.8 kOhm	
Return value	1.5 kOhm to 1.65 kOhm	
Cable lengths (single), conductor cross sections:	Cross section:	Length:
	2.5 mm^2	250 m
	1.5 mm^2	150 m
	0.5 mm^2	50 m
Connection		
Tightening torque	TORQUE: 7 LB.IN to 10.3 LB.IN; 0.8 Nm to 1.2 Nm	
Connection cross sections		
• Solid	2 x 0.5 mm^2 - 2.5 mm^2; 1 x 0.5 mm^2 - 4 mm^2; 2 x AWG 20 to 14 / 1 x AWG 20 to 12	
• Finely stranded with end sleeve	2 x 0.5 mm^2 - 1.5 mm^2; 1 x 0.5 mm^2 - 2.5 mm^2; 2 x AWG 20 to 16 / 1 x AWG 20 to 14	

19.3 Technical data of the current measuring modules or current / voltage measuring modules

Technical data of the current measuring modules or current / voltage measuring modules		
Mounting		
Set current I_s = 0.3 A to 3 A; 2.4 A to 25 A; 10 A to 100 A (3UF71.0, 3UF71.1, 3UF71.2)	Snap-mounted onto 35 mm standard mounting rail or screw-mounted using additional push-in lugs	
Set current I_s = 20 A to 200 A (3UF7103, 3UF7113)	Snap-on mounting onto 35 mm standard mounting rails, screw attachment onto the mounting plate or direct mounting onto the contactor	
Set current I_s = 63 A to 630 A (3UF7104, 3UF7 114)	Screw attachment to the mounting plate or direct mounting onto the contactor	
System interface for main circuit	For connection to a basic unit or decoupling module	
Set current I_s	3UF71.0: 0.3 A - ´3 A 3UF71.1: 2.4 A - 25 A 3UF71.2: 10 A - 100 A	3UF71.3: 20 A - 200 A 3UF71.4: 63 A - 630 A
Rated insulation voltage U_i (at pollution degree 3)	690 V[1)]	
Rated operating voltage U_e	690 V	
Rated impulse withstand voltage U_{imp}	6 kV[2)]	
Rated frequency	50 / 60 Hz	
Type of current	Three-phase	
Short circuit	Additional short-circuit protection is required in the main circuit [3)]	
Accuracy of current measuring (ranging from 1 x minimum set current I_u to 8 x maximum set current I_o)	+/- 3 %	
Typical voltage measuring range		
Line-to-line voltage / voltage between lines (e.g.: U_{L1L2})	110 V - 690 V (only the phase voltages are available in the system as measured values)	
Phase voltage (e.g. U_{L1})	65 V to 400 V	
Voltage measuring accuracy in the range from 230 V to 400 V	+/- 3 % (typical)	
Accuracy of cos phi measurement (in the nominal load range cos phi = 0.4 to 0.8)	+/- 5 % (typical)	
Accuracy of apparent power measurement (in the nominal load range)	+/- 5 % (typical)	
Notes on voltage measurement		
Current / voltage measuring modules must be used with a decoupling module for certain network types. See Table 1-35 in Chapter Decoupling module (DCM) for current / voltage measuring modules (Page 103), device series SIMOCODE pro V PN.	**Caution** Note that the supply cables for voltage measurement may require additional cable protection.	

Technical data of the current measuring modules or current / voltage measuring modules		
Feed-through opening	Diameter	
Set current 0.3 A to 3 A; 2.4 A to 25 A	7.5 mm	
Set current 10 A - 100 A:	14.0 mm	
Set current 20 A - 200 A:	25.0 mm	
Bus connection 4)		
Set current I_s	20 A - 200 A	63 A - 630 A
Connection screw	M8x25	M10x30
Tightening torque	10 Nm - 14 Nm	14 Nm - 24 Nm
Solid with cable lug	16 mm^2 - 95 mm^2 4) 5)	50 mm^2 - 240 mm^2 4) 6)
Stranded with cable lug	25 mm^2 - 120 mm^2 4) 5)	70 mm^2 - 240mm^2 4) 6)
AWG cable	6 kcmil - 300 kcmil	1/0kcmil - 500 kcmil
Connection for voltage measurement		
Tightening torque	TORQUE: 7 LB.IN - 10.3 LB.IN; 0.8 Nm - 1.2 Nm	
Connection cross sections		
• Solid	2 x 0.5 mm^2 to 2.5 mm^2 / 1 x 0.5 mm^2 - 4 mm^2; 2 x AWG 20 to 14 / 1 x AWG 20 to 12	
• Finely stranded with end sleeve	2 x 0.5 mm^2 - 1.5 mm^2 / 1 x 0.5 mm^2 - 2.5 mm^2; 2 x AWG 20 to 16 / 1 x AWG 20 to 14	

1) for 3UF7103 or 3UF104 to 1000 V

2) for 3UF7103 or 3UF104 to 8 kV

3) You will find more information at SIMOCODE (http://www.siemens.com/simocode) and in Chapter Short-circuit protection with fuses for motor feeders for short-circuit currents up to 100 kA and 690 V (Page 652).

4) Screw connection is possible with an appropriate 3RT19 box terminal.

5) When connecting cable lugs complying with DIN 46235 to cables with a cross section larger than 95 mm^2, the 3RT19 56-4EA1 terminal cover is required to maintain phase separation.

6) When connecting cable lugs complying with DIN 46234 to cables with a cross section larger than 240 mm^2 and when connecting cable lugs complying with DIN 46235 to cables with a cross section larger than 185 mm^2, the 3RT19 56-4EA1 terminal cover is required to maintain phase separation.

19.4 Technical data of the decoupling module

Technical data of the decoupling module	
Mounting	Snap-mounted onto 35-mm standard mounting rail or screw-mounted using additional push-in lugs
Display	
• Green "READY" LED	
System interfaces	The left interface is for connection to a basic unit or an expansion module, the right interface is exclusively for connection to a current / voltage measuring module.
Connection	
Tightening torque	Torque: 7 LB.IN - 10.3 LB.IN; 0.8 Nm to 1.2 Nm
Connection cross sections	
• Solid	2 x 0.5 mm^2 to 2.5 mm^2 / 1 x 0.5 mm^2 - 4 mm^2; 2 x AWG 20 to 14 / 1 x AWG 20 to 12
• Finely stranded with end sleeve	2 x 0.5 mm^2 - 1.5 mm^2 / 1 x 0.5 mm^2 - 2.5 mm^2; 2 x AWG 20 to 16 / 1 x AWG 20 to 14

19.5 Technical data of the expansion modules

19.5.1 Technical data of the digital modules

Technical data of the digital modules	
Mounting	Snap-mounted onto 35-mm standard mounting rail or screw-mounted using additional push-in lugs
Display	
Green "READY" LED	• Continuous light: "Ready for operation" • Flashing: "No connection to basic unit"
System interfaces	For connecting to a basic unit, an additional expansion module, a current measuring module or a current / voltage measuring module or the operator panel
Control circuit	
Rated insulation voltage U_i	300 V (at pollution degree 3)
Rated impulse withstand voltage U_{imp}	4 kV
Relay outputs	
• Number	2 monostable or bistable relay outputs (depending on the variant)
• Function	Isolated NO contacts (NC contact response parameterizable via internal signal conditioning), relay outputs all with connection to common potential, freely-assignable to control functions (e.g. line, star or delta contactor or operating state status information).
• Stipulated short-circuit protection for auxiliary contacts (relay outputs)	• Fuse links, operating class gL/gG 6 A, quick-response 10 A (IEC 60947-5-1) • Miniature circuit breaker 1.6 A, C characteristic (IEC 60947-5-1) • Miniature circuit breaker 6 A, C characteristic (I_k < 500 A)
• Rated uninterrupted current	• 5 A • 6 A at max. +50 °C
• Rated switching capacity	
AC-15	6 A / 24 V AC; 6 A / 120 V AC; 3 A / 230 V AC
DC-13	2 A / 24 V DC; 0.55 A/60 V DC; 0.25 A/125 V DC
Inputs (binary)	4 externally supplied, isolated inputs (24 V DC or 110 V - 240 V AC / DC, depending on version), connected to common potential for measuring process signals (e.g. local control station, key-operated switches, limit switches, ...), freely-assignable to control functions.

Technical data of the digital modules	
24 V DC:	
Cable lengths (single)	300 m
Input characteristic	Type 2 according to EN 61131-2
110 V to 240 V AC/DC:	
Cable lengths (single)	200 m (cable capacitance 300 nF/km)
Input characteristic	-
Connection	Removable terminal block with screw connection
Tightening torque	Torque: 7 LB.IN to 10.3 LB.IN; 0.8 Nm to 1.2 Nm
Connection cross sections	
• Solid	2 x 0.5 mm^2 to 2.5 mm^2 / 1 x 0.5 mm^2 - 4 mm^2; 2 AWG 20 to 14 / 1 x AWG 20 to 12
• Finely stranded with end sleeve	2 x 0.5 mm^2 - 1.5 mm^2 / 1 x 0.5 mm^2 - 2.5 mm^2; 2 x AWG 20 to 16 / 1 x AWG 20 to 14

19.5.2 Technical data, digital modules DM-F Local and DM-F PROFIsafe

Technical data, digital modules DM-F Local and DM-F PROFIsafe

Technical data, digital modules DM-F Local and DM-F PROFIsafe	
Mounting	Snap-mounted onto 35 mm standard mounting rail or screw-mounted using additional push-in lugs
Enclosure width	45 mm
System interfaces	For connecting to a basic unit, an additional expansion module, a current measuring module or a current / voltage measuring module or the operator panel
Rated control supply voltage U_s (according to DIN EN 61131-2)	• 24 V DC • 110 V - 240 V AC/DC, 50/60 Hz
Operating range	• 24 V DC: 0.8 to 1.2 x U_s • 110 V to 240 V AC/DC: 0.85 to 1.1 x U_s
Power consumption	DM-F LOCAL: • 24 V DC: 3 W • 110 V to 240 V AC/DC: 9.5 VA/4.5 W DM-F PROFIsafe: • 24 V DC: 4 W • 110 V to 240 V AC/DC: 11.0 VA/5.5 W
Safe isolation according to IEC 60947-1	Between relay enabling circuits / relay outputs and electronics
Rated insulation voltage U_i	300 V (at pollution degree 3)
Rated impulse withstand voltage U_{imp}	4 kV

Technical data, digital modules DM-F Local and DM-F PROFIsafe	
Mains buffering time	• 24 V DC, typ. 20 ms at 0.8 x Us • 110 V - 240 V AC/DC: typ. 20 ms at 0.85 x Us; typ. 200 ms at 230 V
Relay outputs	2 monostable relay outputs
• Number	Common potential connection is internally disconnected in a fail-safe manner by a relay enabling circuit
• Function	Normally open contact, freely assignable to the control functions
Electrical service life of relay outputs	0.1 million switching cycles (AC-15, 230 V/3 A)
Relay enabling circuits	
• Number	2 common switching-type, fail-safe relay enabling circuits
• Function	Fail-safe normally open contacts
• Stipulated short-circuit protection for relay enabling circuits / relay outputs	Fuse links operating class gL/gG 4 A (IEC 60947-5-1), separate for each relay enabling circuit
• Rated uninterrupted current of relay enabling circuits	5 A
• Rated switching capacity of relay enabling circuits	AC-15: 3 A / 24 V AC; 3 A / 120 V AC; 1.5 A / 230 V AC; DC-13: 4 A / 24 V DC; 0.55 A / 60 V DC; 0.22 A / 125 V DC; 0.11 A / 250 V DC
• Electrical service life of relay enabling circuits	0.1 million switching cycles (AC-15, 240 V/ 2 A)
• Switching rate of the relay enabling circuits	2000/h
Connection	Removable terminals with screw connection
Tightening torque	TORQUE: 7 LB.IN to 10.3 LB.IN 0.8 Nm to 1.2 Nm
Connection cross sections	
• Solid	2x 0.5 mm^2 to 2.5 mm^2 / 1x 0.5 $mm^2$to 4 mm^2; 2x AWG 20 to 14 / 1x AWG 20 to 12
• Finely stranded with end sleeve	2x 0.5 mm^2 to 1.5 mm^2 / 1x 0.5 $mm^2$to 2.5 mm^2; 2x AWG 20 to 16 / 1x AWG 20 to 14

19.5.3 Technical data of the DM-F LOCAL digital module

Technical data of the DM-F Local digital module			
LEDs on DM-F LOCAL		**Color**	**Meaning**
"READY"		OFF	System interface not connected/supply voltage too low/device defective
		Green	Device ON/system interface OK
		Flashing green	Device ON/system interface not active or not OK
"DEVICE"		OFF	Supply voltage too low
		Green	Device ON
		Flashing green	Self-test
		Yellow	Configuration mode
		Flashing yellow	Error in configuration
		Red	Device defective or faulty
"OUT"		OFF	Safety-related output not active
		Green	Safety-related output active
		Flashing green	Feedback circuit not closed although start condition satisfied
"IN"		OFF	Input not active
		Green	Input active
		Flashing green	Fault detected (e.g., cross-circuit at input, sensor simultaneity not fulfilled)
"GF"		OFF	No general fault
		Red	Group fault (wiring error, cross-circuit, configuration error)
		Flashing red	Group fault (feedback circuit fault, simultaneity condition not satisfied)
"1"		OFF	Cross-circuit detection Off
		Yellow	Cross-circuit detection On
		Flashing yellow	Configuration mode, waiting for confirmation
		Flickering yellow	Error in configuration
"2"		OFF	NC contact/NO contact
		Yellow	NC contact/NC contact
		Flashing yellow	Configuration mode, waiting for confirmation
		Flickering yellow	Error in configuration
"3"		OFF	2 x 1-channel
		Yellow	1 x 2-channel
		Flashing yellow	Configuration mode, waiting for confirmation
		Flickering yellow	Error in configuration
"4"		OFF	Debounce time Y12, Y22, Y34 ~ 50 ms
		Yellow	Debounce time Y12, Y22, Y34 ~ 10 ms
		Flashing yellow	Configuration mode, waiting for confirmation
		Flickering yellow	Error in configuration
"5"		OFF	Sensor circuit, automatic start
		Yellow	Sensor circuit, monitored start
		Flashing yellow	Configuration mode, waiting for confirmation
		Flickering yellow	Error in configuration

Technical data of the DM-F Local digital module			
"6"		OFF	Cascading input 1, automatic start
		Yellow	Cascading input 1, monitored start
		Flashing yellow	Configuration mode, waiting for confirmation
		Flickering yellow	Error in configuration
"7"		OFF	With start-up testing
		Yellow	Without start-up testing
		Flashing yellow	Configuration mode, waiting for confirmation
		Flickering yellow	Error in configuration
"8"		OFF	Automatic starting after power failure
		Yellow	No automatic starting after power failure
		Flashing yellow	Configuration mode, waiting for confirmation
		Flickering yellow	Error in configuration
DIP switch		for setting safety functions	
"SET/RESET" button		• Application of parameters set via DIP switch • Resetting of faults (also possible via "TEST/RESET" button on basic unit)	
Inputs with safety relay function		2 sensor inputs 24 V DC (Y12, Y22) • Supply via terminal T1 and T2 with cross-circuit detection or external supply (static +24 V DC) without cross-circuit detection • Functions parameterizable via DIP switch	
		1 start signal input 24 V DC (Y33) • For monitored reconnection of the relay enabling circuits after a safety-related trip • Supply via terminal T1 with/without T3 (static +24 V DC) without cross-circuit detection	
		1 cascading input 24 V DC (1) • For use in connection with a higher-level safety relay • Supply via terminal T3 (static +24 V DC)	
		1 feedback circuit input 24 V DC (Y34) • For contactor monitoring of the motor and incoming supply contactors via series-connected auxiliary switch normally-closed contacts • Supply via terminal T2 with/without T3 (static +24 V DC) without cross-circuit detection	
Cable length (single)		1500 m	
Input characteristic		Type 2 according to EN 61131-2	

19.5.4 Technical data of the DM-F-PROFIsafe digital module

Technical data of the DM-F PROFIsafe digital module			
LED display DM-F PROFIsafe		Color	Meaning
"READY"		OFF	System interface not connected/supply voltage too low/device defective
		Green	Device ON/system interface OK
		Flashing green	Device ON/system interface not active or not OK
"DEVICE"		OFF	Supply voltage too low
		Green	Device ON
		Red	Device defective or faulty
"OUT"		OFF	Safety-related output not active
		Green	Safety-related output active
		Flashing green	Feedback circuit not closed although start condition satisfied
"GF"		OFF	No general fault
		Red	Group fault (PROFIsafe not active, incorrect PROFIsafe address, wiring error, device defective)
"1"		Yellow	PROFIsafe address 1
"2"		Yellow	PROFIsafe address 2
"3"		Yellow	PROFIsafe address 4
"4"		Yellow	PROFIsafe address 8
"5"		Yellow	PROFIsafe address 16
"6"		Yellow	PROFIsafe address 32
"7"		Yellow	PROFIsafe address 64
"8"		Yellow	PROFIsafe address 128
"9"		Yellow	PROFIsafe address 256
"10"		Yellow	PROFIsafe address 512
DIP switch		for setting the PROFIsafe address	
"SET/RESET" button		• Displays the set PROFIsafe address • Application of the set PROFIsafe address (restart of the module) • Resetting of faults (also possible via "TEST/RESET" button on basic unit)	
Inputs binary		• 3 inputs (83, 85, 89) 24 V DC • Supply via terminal 84 or external supply (static +24 V) • Common connected, electrically isolated inputs for acquiring process signals (e.g., local control station, keyswitch, limit switch, etc.), freely assignable to control functions	
Input with safety relay function		• 1 feedback circuit input (91/FBC) 24 V DC • For contactor monitoring of the motor and incoming supply contactors via series-connected auxiliary switch contacts • Supply via terminal 90/T	
Cable length (single)		300 m	
Input characteristic		Type 2 according to EN 61131-2	

19.5.5 Safety-related technical data of the digital modules DM-F Local and DM-F PROFIsafe

See Chapter "Technical data" in "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852).

19.5.6 Technical data of the analog module

Technical data of the analog module	
Mounting	Snap-mounted onto 35 mm standard mounting rail or screw-mounted using additional push-in lugs
Display	
Green "READY" LED	• Continuous light: "Ready for operation" • Flashing: "No connection to basic unit"
System interfaces	For connecting to a basic unit, an additional expansion module, a current measuring module or a current / voltage measuring module or the operator panel.
Control circuit	
Connection type:	2-wire connection
Inputs:	
• Channels	2 (passive)
• Parameterizable measuring ranges	0/4 mA - 20 mA
• Cable shielding	Recommended for up to 30 m and outside the control cabinet; shielding mandatory for cables over 30 m
• Max. input current (destruction limit)	40 mA
• Accuracy	±1 %
• Input resistance	50 ohm
• Conversion time	150 ms
• Resolution	12 bits
• Open-circuit detection	For measuring range 4 mA - 20 mA
• Isolation of the inputs to the device electronics	No

Technical data of the analog module	
Output:	
• Channels	1
• Parameterizable output range	0/4 mA - 20 mA
• Cable shielding	Recommended for up to 30 m and outside the control cabinet; shielding mandatory for cables over 30 m
• Max. output voltage	30 V DC
• Accuracy	±1 %
• Max. output load	500 ohm
• Conversion time	25 ms
• Resolution	12 bits
• Short-circuit proof	Yes
• Isolation of the outputs to the device electronics	No
Connection	
Tightening torque	TORQUE: 7 LB.IN to 10.3 LB.IN; 0.8 Nm to 1.2 Nm
Connection cross sections	
• Solid	2x 0.5 mm^2 to 2.5 mm^2 / 1x 0.5 $mm^2$to 4 mm^2; 2x AWG 20 to 14 / 1x AWG 20 to 12
• Finely stranded with end sleeve	2x 0.5 mm^2 to 1.5 mm^2 / 1x 0.5 $mm^2$to 2.5 mm^2; 2x AWG 20 to 16 / 1x AWG 20 to 14

19.5.7 Technical data of the ground-fault module 3UF7500-1AA00-0

Technical data of the ground-fault module 3UF7500-1AA00-0	
Mounting	Snap-mounted onto 35-mm standard mounting rail or screw-mounted using additional push-in lugs.
Display	
Green "READY" LED	• Continuous light: "Ready for operation" • Flashing: "No connection to basic unit"
System interface	For connecting to a basic unit, an additional expansion module, a current measuring module or a current / voltage measuring module or the operator panel.
Control circuit	
Connectable 3UL22 residual current transformer with rated fault currents I_N	0.3 / 0.5 / 1 A
• $I_{ground\ fault} \leq 50\ \%\ I_N$	No tripping
• $I_{ground\ fault} \geq 100\ \%\ I_N$	Tripping
Response delay (conversion time)	300 ms to 500 ms, additional delay possible
Connection	
Tightening torque	TORQUE: 7 LB.IN to 10.3 LB.IN 0.8 Nm to 1.2 Nm
Connection cross sections	
• Solid:	2x 0.5 mm^2 to 2.5 mm^2 / 1x 0.5 mm^2 to 4 mm^2; 2x AWG 20 to 14 / 1x AWG 20 to 12
• Finely stranded with end sleeve:	2x 0.5 mm^2 to 1.5 mm^2 / 1x 0.5 $mm^2$to 2.5 mm^2; 2x AWG 20 to 16 / 1x AWG 20 to 14

19.5.8 Technical data of the ground-fault module 3UF7510-1AA00-0

Table 19- 1 Technical data of the ground-fault module

Technical data of the ground-fault module					
Mounting	Snap-mounted onto 5-mm standard mounting rail or screw-mounted using additional push-in lugs.				
Display					
• Green "READY" LED	• Continuous light: "Ready for operation" • Flashing: "No connection to basic unit"				
System interface	For connecting to a basic unit, an additional expansion module, a current measuring module or a current / voltage measuring module or the operator panel.				
Control circuit					
Cable to the residual current transformer **Notice** • We recommend using twisted cables. • Cables of lengths > 10 m must additionally be shielded and grounded.					
Conductor cross section	0.5 mm^2	1.0 mm^2	1.5 mm^2	2.5 mm^2	4.0 mm^2
AWG	20 kcmil	18 kcmil	16 kcmil	14 / 12 kcmil	10 kcmil
Max. cable length	70 m	140 m	210 m	300 m	550 m
Connectable residual current transformer 3UL23 [1] - feed-through diameter	35 mm to 210 mm				
Type of current to be monitored	AC and pulsating DC (type A)				
Measurable line frequency	16 Hz to 400 Hz				
Response value current (settable)	0.03 A to 40 A				
Measuring accuracy (relative) ground-fault module	±5 %				
Measuring accuracy (relative) transformer 3UL23	±2,5 %				
Reaction time (maximal)	100 ms				
Connection					
Tightening torque	TORQUE: 7 LB.IN to 10.3 LB.IN 0.8 Nm to 1.2 Nm				
Connection cross sections					
• Solid	2x 0.5 mm^2 to 2.5 mm^2 / 1x 0.5 mm^2 to 4 mm^2 2x AWG 20 to 14 / 1x AWG 20 to 12				
• Finely stranded with end sleeve	2x 0.5 mm^2 to 1.5 mm^2 / 1x 0.5 mm^2 to 2.5 mm^2 2x AWG 20 to 16 / 1x AWG 20 to 14				

1) Technical data residual current transformer 3UL23: See Manual "3UG4/3RR2 Monitoring Relay" (http://support.automation.siemens.com/WW/view/en/50426183/133300).

19.5.9 Technical data of the temperature module

Technical data of the temperature module	
Mounting	Snap-mounted onto 35 mm standard mounting rail or screw-mounted using additional push-in lugs.
Display	
Green "READY" LED	• Continuous light: "Ready for operation" • Flashing: "No connection to basic unit"
System interfaces	For connecting to a basic unit, an additional expansion module, a current measuring module or a current / voltage measuring module or the operator panel.
Sensor circuit	
Conversion time	500 ms
Type of connection	2-wire or 3-wire connection
Typical sensor current:	
• PT100	1 mA (typical)
• PT1000 / KTY83 / KTY84 / NTC	0.2 mA (typical)
Open circuit detection / short-circuit detection / measuring range:	
• PT100/PT1000	Open circuit, short circuit; measuring range: -50 °C to +500 °C
• KTY83-110	Open circuit, short circuit; measuring range: -50 °C to +175 °C
• KTY84	Open circuit, short circuit; measuring range: -40 °C to +300 °C
• NTC	Short circuit; measuring range: +80 °C to +160 °C
Measuring accuracy at an ambient temperature of 20 °C (T20)	< ±2 K, ±1 digit
Deviation due to ambient temperature (as % of measured value)	0.05 per K deviation from T20
Isolation of the inputs to the device electronics	No
Connection	
Tightening torque	TORQUE: 7 LB.IN to 10.3 LB.IN 0.8 Nm to 1.2 Nm
Connection cross sections	
• Solid	2x 0.5 mm^2 to 2.5 mm^2 / 1x 0.5 mm^2 to 4 mm^2 2x AWG 20 to 14 / 1x AWG 20 to 12
• Finely stranded with end sleeve	2x 0.5 mm^2 to 1.5 mm^2 / 1x 0.5 mm^2 to 2.5 mm^2 2x AWG 20 to 16 / 1x AWG 20 to 14

19.6 Technical data of the operator panels

19.6.1 Technical data of the operator panel

Technical data of the operator panel	
Mounting	Installation in a control cabinet door or in a front panel, with IP54 system interface cover.
LED displays	
• Red/green/yellow "DEVICE" LED	• Red blocked: "Function test negative, device disabled" • Green: "Ready for operation" • Flashing green: "No connection to basic unit" • Yellow: "Memory module detected" • OFF: "No control supply voltage"
• Green "BUS" LED	• Continuous light: "Communication with PLC/PCS" • Flashing: "Baud rate recognized/communication with PC/PG"
• Red "GEN. FAULT" LED	• Continuous light/flashing: "Feeder fault", e.g. overload tripping
• 3 yellow LEDs / 4 green LEDs	For freely assigning any status signals
Buttons	
• TEST/RESET	• Resets the device after tripping • Function test (system self-test) • Operation of memory module
• Control buttons	• For controlling the motor feeder, freely assignable
System interfaces	
• Front	For connecting a memory module or a PC cable for parameterization purposes
• Rear	For connecting a cable to the basic unit or the expansion module

19.6.2 Technical data of the operator panel with display

Table 19- 2 Technical data of the operator panel with display

Technical data of the operator panel with display	
Mounting	Installation in a control cabinet door or in a front panel, with IP54 system interface cover.
LED displays	
• Red/green/yellow "DEVICE" LED	• Red blocked: "Function test negative, device disabled" • Green: "Ready for operation" • Flashing green: "No connection to basic unit" • Yellow: "Memory module detected" • OFF: "No control supply voltage"
• Green "BUS" LED	• Continuous light: "Communication with PLC/PCS"
• Red "GEN. FAULT" LED	• Continuous light/flashing: "Feeder fault", e.g. overload tripping
• 4 green LEDs	For freely assigning any status signals (preferably for feedback on the switching state, e.g. ON, OFF, LEFT, RIGHT)
Display	Graphic display of actual measured values, operating and diagnostics data or status information.
Buttons	
• Control buttons	• Control of the motor feeder, freely assignable
• Arrow keys	• Navigation in the display menu
• Softkeys	• Various functions, depending upon the menu, e.g. test, reset, operation of memory module
System interfaces	
• Front	For connecting a memory module or a PC cable for parameterization purposes
• Rear	Connection to the basic unit or to an expansion module

Note

Product version of the operator panel with display

For use with the SIMOCODE pro V PN basic unit, an operator panel with display version *E07* or higher is required.

19.7 Technical data compartment identification

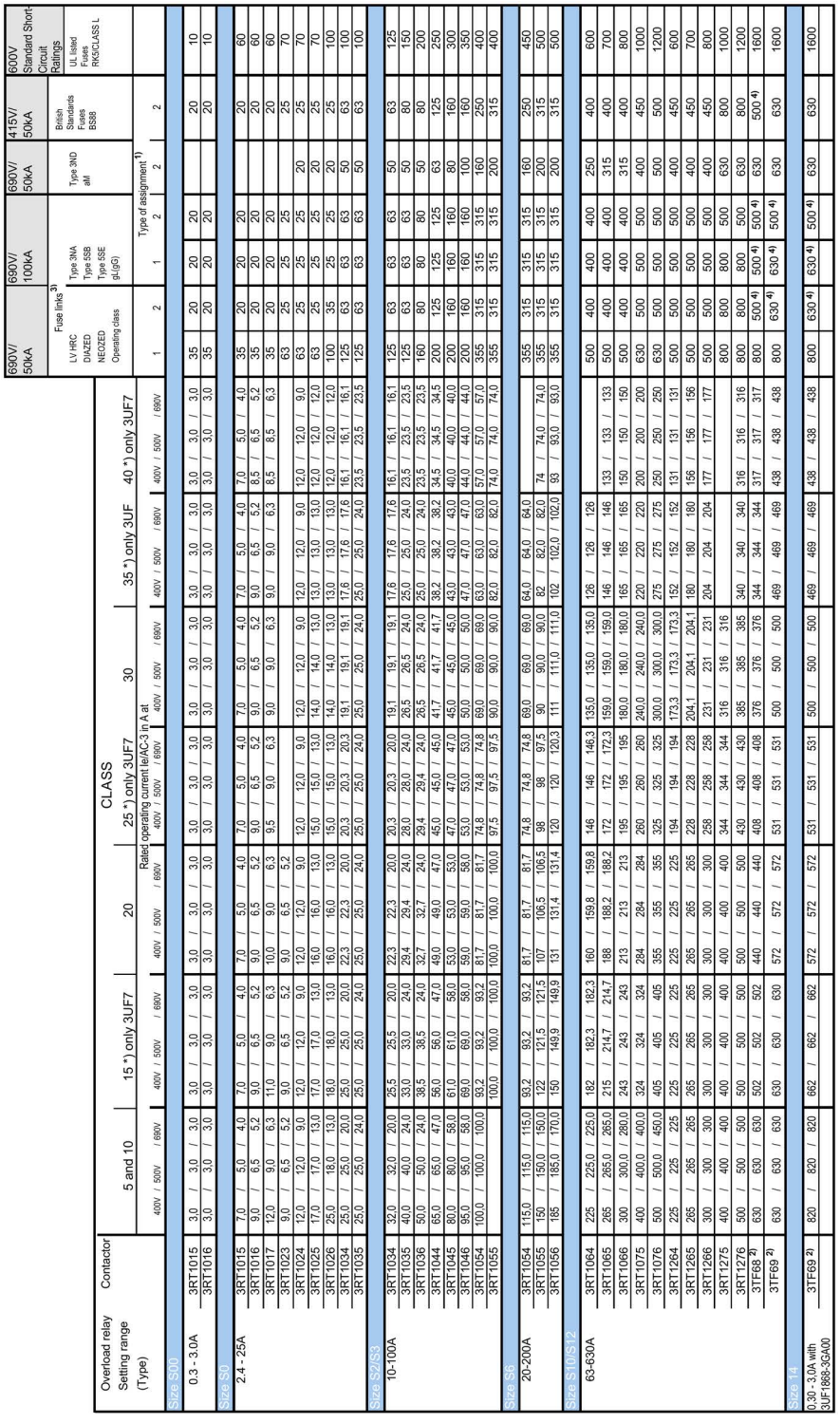
Technical data of the initialization module

Technical data of the initialization module	
Order No. (MLFB)	3UF7 902-0AA00-0
Ambient temperature	-25 to +80 °C
Rated voltage	300 V
Rated operating voltage	24 V

Technical data of the Y connecting cable

Technical data of the Y connecting cable	
Order No. (MLFB)	3UF7 931-0CA00-0, 3UF7 932-0CA00-0, 3UF7 937-0CA00-0
Lengths of system cable / open end of cable	
3UF7 931-0CA00-0	0.1 m / 1.0 m
3UF7 932-0CA00-0	0.5 m / 1.0 m
3UF7 937-0CA00-0	1.0 m / 1.0 m

19.8 Short-circuit protection with fuses for motor feeders for short-circuit currents up to 100 kA and 690 V

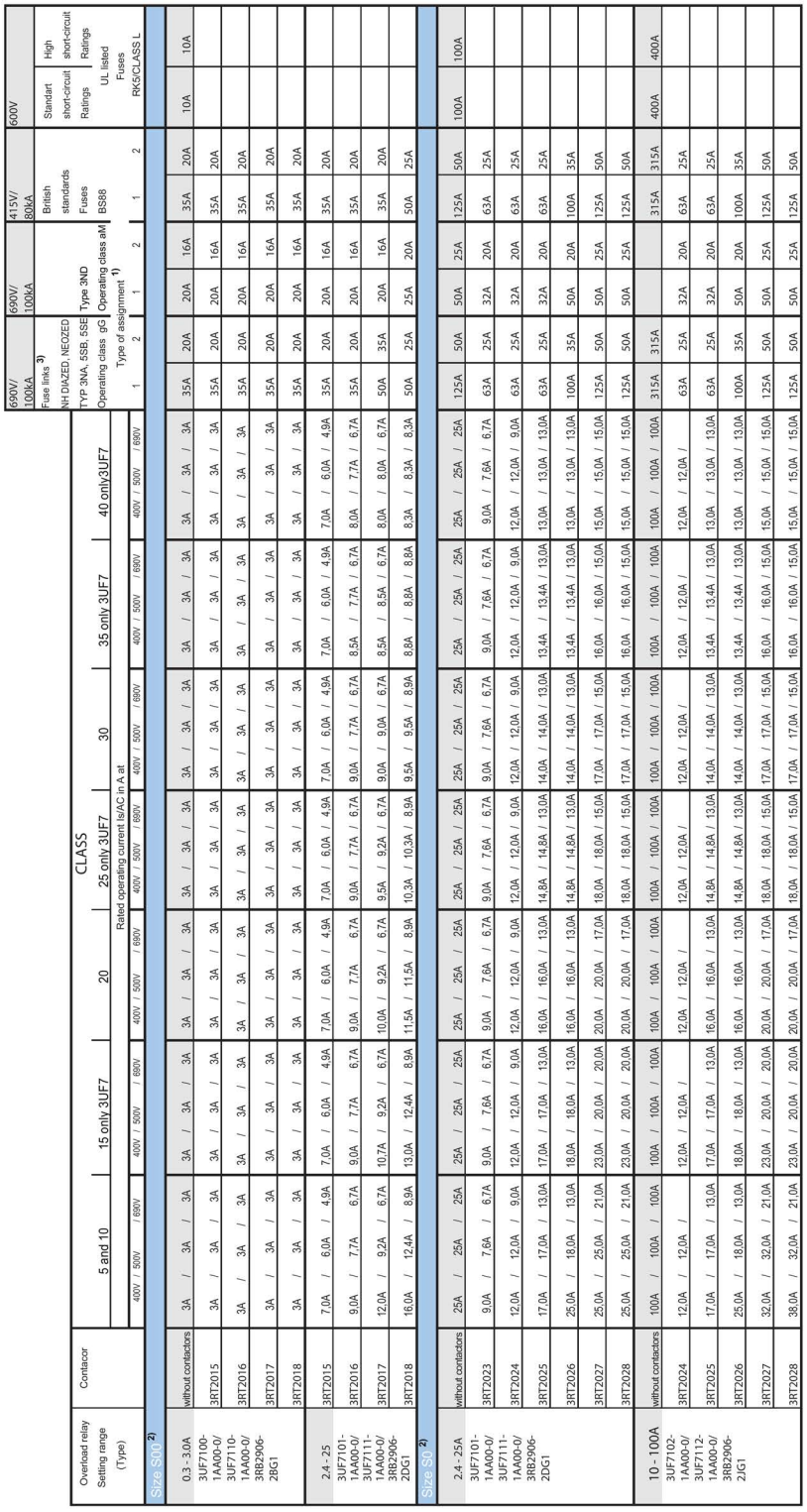


Overload relay Setting range (Type)	Contactor	CLASS 5 and 10			15 *) only 3UF7			20			25 *) only 3UF7			30			35 *) only 3UF			40 *) only 3UF7			690V/ 50kA	690V/ 100kA		690V/ 50kA	415V/ 50kA	600V Standard Short-Circuit Ratings
		Rated operating current Ie/AC-3 in A at																					Fuse links [3]			Type of assignment [1]			
		400V /	500V /	690V	400V /	500V /	690V	400V /	500V /	690V	400V /	500V /	690V	400V /	500V /	690V	400V /	500V /	690V	400V /	500V /	690V	LV HRC DIAZED NEOZED Operating class	Type 3NA Type 3SB Type 3SE gL/gG	Type 3ND aM	British Standards Fuses BS88	UL listed Fuses RK5/CLASS L	
																										1 2	1 2	1 2	1 2	
Size S00																														
0.3 - 3.0A	3RT1015	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	35	20	20	20		20		10
	3RT1016	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	35	20	20	20		20		10
Size S00																														
2.4 - 25A	3RT1015	7,0	5,0	4,0	7,0	5,0	4,0	7,0	5,0	4,0	7,0	5,0	4,0	7,0	5,0	4,0	7,0	5,0	4,0	7,0	5,0	4,0	35	20	20	20		20		60
	3RT1016	9,0	6,5	5,2	9,0	6,5	5,2	9,0	6,5	5,2	9,0	6,5	5,2	9,0	6,5	5,2	9,0	6,5	5,2	8,5	6,5	5,2	35	20	20	20		20		60
	3RT1017	12,0	9,0	6,3	11,0	9,0	6,3	10,0	9,0	6,3	9,5	9,0	6,3	9,0	9,0	6,3	9,0	9,0	6,3	8,5	8,5	6,3	35	20	20	20		20		60
	3RT1023	9,0	6,5	5,2	9,0	6,5	5,2	9,0	6,5	5,2													63	25	25	25		25		70
	3RT1024	12,0	12,0	9,0	12,0	12,0	9,0	12,0	12,0	9,0	12,0	12,0	9,0	12,0	12,0	9,0	12,0	12,0	9,0	12,0	12,0	9,0	63	25	25	25	20	25		70
	3RT1025	17,0	17,0	13,0	17,0	17,0	13,0	16,0	16,0	13,0	15,0	15,0	13,0	14,0	14,0	13,0	13,0	13,0	13,0	12,0	12,0	12,0	63	25	25	25	20	25		70
	3RT1026	25,0	18,0	13,0	18,0	16,0	13,0	16,0	16,0	13,0	15,0	15,0	13,0	14,0	14,0	13,0	13,0	13,0	13,0	12,0	12,0	12,0	100	35	25	25	20	25		100
	3RT1034	25,0	25,0	20,0	25,0	25,0	20,0	22,3	22,3	20,0	20,3	20,3	20,3	19,1	19,1	19,1	17,6	17,6	17,6	16,1	16,1	16,1	125	63	63	63	50	63		100
	3RT1035	25,0	25,0	24,0	25,0	25,0	24,0	25,0	25,0	24,0	25,0	25,0	24,0	25,0	25,0	24,0	25,0	25,0	24,0	23,5	23,5	23,5	125	63	63	63	50	63		100
Size S2/S3																														
10-100A	3RT1034	32,0	32,0	20,0	25,5	25,5	20,0	22,3	22,3	20,0	20,3	20,3	20,0	19,1	19,1	19,1	17,6	17,6	17,6	16,1	16,1	16,1	125	63	63	63	50	63		125
	3RT1035	40,0	40,0	24,0	33,0	33,0	24,0	29,4	29,4	24,0	28,0	28,0	24,0	26,5	26,5	24,0	25,0	25,0	24,0	23,5	23,5	23,5	125	63	63	63	50	80		150
	3RT1036	50,0	50,0	24,0	38,5	38,5	24,0	32,7	32,7	24,0	29,4	29,4	24,0	26,5	26,5	24,0	25,0	25,0	24,0	23,5	23,5	23,5	160	80	80	80	50	80		200
	3RT1044	65,0	65,0	47,0	56,0	56,0	47,0	49,0	49,0	47,0	46,0	45,0	45,0	41,7	41,7	41,7	38,2	38,2	38,2	34,5	34,5	34,5	200	125	125	125	63	125		250
	3RT1045	80,0	80,0	58,0	61,0	61,0	58,0	53,0	53,0	53,0	47,0	47,0	47,0	45,0	45,0	45,0	43,0	43,0	43,0	40,0	40,0	40,0	200	160	160	160	80	160		300
	3RT1046	95,0	95,0	58,0	69,0	69,0	58,0	59,0	59,0	58,0	53,0	53,0	53,0	50,0	50,0	50,0	47,0	47,0	47,0	44,0	44,0	44,0	200	160	160	160	100	160		350
	3RT1054	100,0	100,0	100,0	93,2	93,2	93,2	81,7	81,7	81,7	74,8	74,8	74,8	69,0	69,0	69,0	63,0	63,0	63,0	57,0	57,0	57,0	355	315	315	315	160	250		400
	3RT1055				100,0	100,0	100,0	100,0	100,0	100,0	97,5	97,5	97,5	90,0	90,0	90,0	82,0	82,0	82,0	74,0	74,0	74,0	355	315	315	315	200	315		400
Size S6																														
20-200A	3RT1054	115,0	115,0	115,0	93,2	93,2	93,2	81,7	81,7	81,7	74,8	74,8	74,8	69,0	69,0	69,0	64,0	64,0	64,0				355	315	315	315	160	250		450
	3RT1055	150	150,0	150,0	122	121,5	121,5	107	106,5	106,5	98	98	97,5	90	90,0	90,0	82	82,0	82,0	74	74,0	74,0	355	315	315	315	200	315		500
	3RT1056	185	185,0	170,0	150	149,9	149,9	131	131,4	131,4	120	120	120,3	111	111,0	111,0	102	102,0	102,0	93	93,0	93,0	355	315	315	315	200	315		500
Size S10/S12																														
63-630A	3RT1064	225	225,0	225,0	182	182,3	182,3	160	159,8	159,8	146	146	146,3	135,0	135,0	135,0	126	126	126				500	400	400	400	250	400		600
	3RT1065	265	265,0	265,0	215	214,7	214,7	188	188,2	188,2	172	172	172,3	159,0	159,0	159,0	146	146	146	133	133	133	500	400	400	400	315	400		700
	3RT1066	300	300,0	280,0	243	243	243	213	213	213	195	195	195	180,0	180,0	180,0	165	165	165	150	150	150	500	400	400	400	315	400		800
	3RT1075	400	400,0	400,0	324	324	324	284	284	284	260	260	260	240,0	240,0	240,0	220	220	220	200	200	200	630	500	500	500	400	450		1000
	3RT1076	500	500,0	450,0	405	405	405	355	355	355	325	325	325	300,0	300,0	300,0	275	275	275	250	250	250	630	500	500	500	500	500		1200
	3RT1264	225	225	225	225	225	225	225	225	225	194	194	194	173,3	173,3	173,3	152	152	152	131	131	131	500	500	500	500	400	450		600
	3RT1265	265	265	265	265	265	265	265	265	265	228	228	228	204,1	204,1	204,1	180	180	180	156	156	156	500	500	500	500	400	450		700
	3RT1266	300	300	300	300	300	300	300	300	300	258	258	258	231	231	231	204	204	204	177	177	177	500	500	500	500	400	450		800
	3RT1275	400	400	400	400	400	400	400	400	400	344	344	344	316	316	316							800	800	800	630	800	800		1000
	3RT1276	500	500	500	500	500	500	500	500	500	430	430	430	385	385	385	340	340	340	316	316	316	800	800	800	630	800	800		1200
	3TF68 [2]	630	630	630	502	502	502	440	440	440	408	408	408	376	376	376	344	344	344	317	317	317	800	500 [4]	500 [4]	630	500 [4]	800		1600
	3TF69 [2]	630	630	630	630	630	630	572	572	572	531	531	531	500	500	500	469	469	469	438	438	438	800	630 [4]	630 [4]	630	500 [4]	630		1600
Size S12																														
0.30 - 3.0A with 3UF1868-3GA00	3TF69 [2]	820	820	820	662	662	662	572	572	572	531	531	531	500	500	500	469	469	469	438	438	438	800	630 [4]	630 [4]	630	500 [4]	630		1600

Figure 19-1 Short-circuit protection with fuses for motor feeder for short-circuit currents up to 100 kA and 690 V for 3UF7 8 (1)

You will find the selection tables for fuseless motor feeders in the manuals "Configuring SIRIUS Innovations - Selection Data for Fuseless and Fused Load Feeders" (http://support.automation.siemens.com/WW/view/en/39714188) and "SIRIUS Configuration - Selection Data for Fuseless Load Feeders" (http://support.automation.siemens.com/WW/view/en/40625241).

1) , 2) , 3) , 4): See below.



| Overload relay Setting range (Type) | Contactor | CLASS 5 and 10 | | | | | | | | | | | | CLASS 15 only 3UF7 | | | | | | | | | | | | CLASS 20 | | | | | | | | | | | | CLASS 25 only 3UF7 | | | | | | | | | | | | CLASS 30 | | | | | | | | | | | | CLASS 35 only 3UF7 | | | | | | | | | | | | CLASS 40 only3UF7 | | | | | | | | | | | | 690V/ 100kA Fuse links 3) NH DIAZED, NEOZED TYP 3NA, 5SB, 5SE Operating class gG Type of assignment 1) | | 690V/ 100kA Type 3ND Operating class aM | | 415V/ 80kA British standards Fuses BS88 | | 600V Standart short-circuit Ratings UL listed Fuses RK5/CLASS L | 600V High short-circuit Ratings |
|---|---|---

You will find the selection tables for fuseless motor feeders in the following manuals.

- "Configuring SIRIUS Innovations - Selection Data for Fuseless and Fused Load Feeders" (http://support.automation.siemens.com/WW/view/en/39714188)
- "Configuration Manual Configuring SIRIUS Innovations UL - Selection Data for Fuseless and Fused Load Feeders" (http://support.automation.siemens.com/WW/view/en/53433538)
- "Configuration Manual Configuring SIRIUS - Selection Data for Load Feeders in Fuseless Design" (http://support.automation.siemens.com/WW/view/en/40625241).

1) Assignment and short-circuit protective devices acc. to IEC 60947-4-1

⚠ WARNING

Type of coordination 1

With type of coordination 1, the contactor or starter must not pose a hazard to people or equipment in the event of a short circuit!

The contactor or starter must be suitable for further operation without repair and replacement of parts.

⚠ WARNING

Type of coordination 2

With type of coordination 2, the contactor or starter must not pose a hazard to people or equipment in the event of a short circuit!

The contactor or starter must be suitable for further use.

There is a risk of contact welding.

2) No contactor installation possible

3)

NOTICE

Operating voltage

Pay attention to the operating voltage!

4)

⚠ WARNING

Maximum AC3 operating current

Ensure that there is a sufficient safety margin between the maximum AC-3 operating current and the rated fuse current.

19.9 Typical reaction times of SIMOCODE pro V PN device series

	Time: Inputs	Time: Processing	Time: Outputs
Basic unit	Set debounce time	5 ms	10 ms
Thermistor	400 ms		-
PROFINET	5 ms		5 ms
Current measurement	300 ms		-
Voltage measurement	300 ms		-
Active power / cos phi	1000 ms		-
Internal ground fault	300 ms - 600 ms + set delay		-
Ground-fault module / external ground fault	100 ms + set delay		-
Digital module (24 V)	15 ms + debounce time		25 ms
Digital module (110 V - 240 V)	50 ms + debounce time		25 ms
Analog module	150 ms		25 ms
Temperature module	500 ms		-
DM-F Local	≤ 75 ms + debounce time		30 ms
DM-F PROFIsafe	15 ms + debounce time		30 ms

1) Based upon a typical hardware set-up: Basic unit + current measuring module + 2 expansion modules

Reaction time = inputs conversion time + internal processing time + outputs conversion time

Example:

You wish to switch a relay output of the basic unit via PROFINET when the "remote" bit is set: Reaction time = 5 ms + 5 ms + 10 ms = 20 ms

Example circuits

20

In this chapter

In this chapter you will find example circuits for the following parameterizable control functions:

- Overload relay
- Direct starter
- Reversing starter
- Molded-case circuit breaker (MCCB)
- Star-delta starter
- Star-delta reversing starter
- Dahlander
- Dahlander reversing starter
- Pole-changing starter
- Pole-changing reversing starter
- Solenoid valve
- Positioner
- Soft starter
- Soft starter with reversing contactor
- Direct starter for single-phase loads

Target groups

This manual is addressed to the following target groups:

- Planners
- Configuring engineers
- Technicians
- Electricians
- Commissioning engineers

Required knowledge

You will require the following knowledge:

- Basic SIMOCODE pro knowledge (see Chapter System description (Page 21))
- Basic knowledge about SIMOCODE ES parameterization software.

20.1 Example circuits - purpose, steps, preconditions

Purpose of example circuits

The example circuits should:

- Show you how to implement a circuit for a specific control function using SIMOCODE pro
- Help you modify these examples for your respective application
- Help you implement other applications easily.

Fundamental steps

- Implementation of external wiring (for control and feedback of main circuit devices and control and signaling devices)
- Implementation / activation of internal SIMOCODE pro functions, with control and evaluation of the SIMOCODE pro inputs / outputs (internal SIMOCODE pro wiring) (see function circuit diagrams with the function blocks of the graphic editor of the "SIMOCODE ES" configuration software)
- Setting up the cyclic receive and send data for the communication of SIMOCODE pro with a PLC (see function circuit diagrams and the "Assignment of cyclic receive and send data" tables).

Requirements

- Load feeder / motor is present
- PLC/PCS with PROFINET interface is present
- The main circuit is already connected.
- PC / PG is present
- SIMOCODE ES software is installed
- The basic unit has the factory settings. You can find out how to restore the basic factory settings in Section " Restoring factory settings."

20.2 "Overload relay" example circuit

20.2.1 "Overload relay" circuit diagram

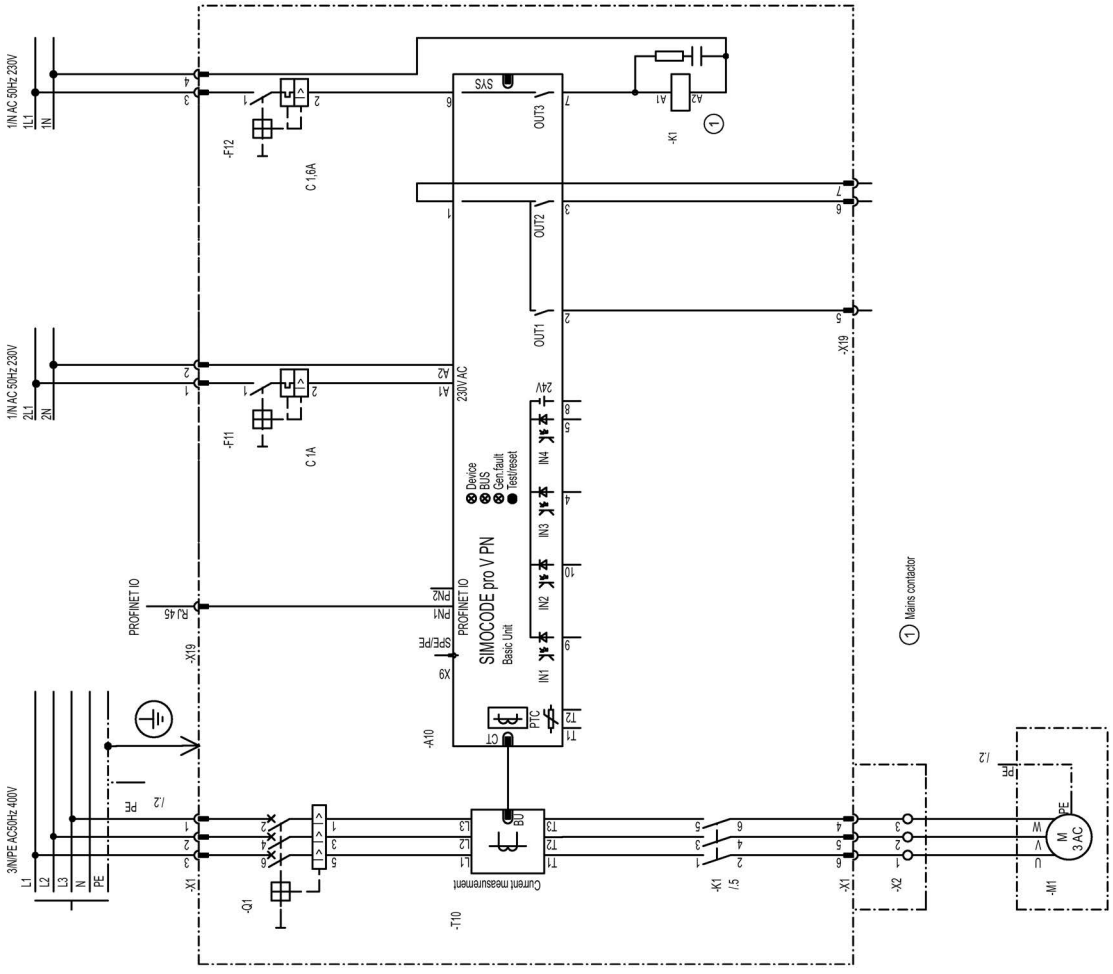


Figure 20-1 "Overload relay" circuit diagram

20.2.2 "Overload relay" function circuit diagram

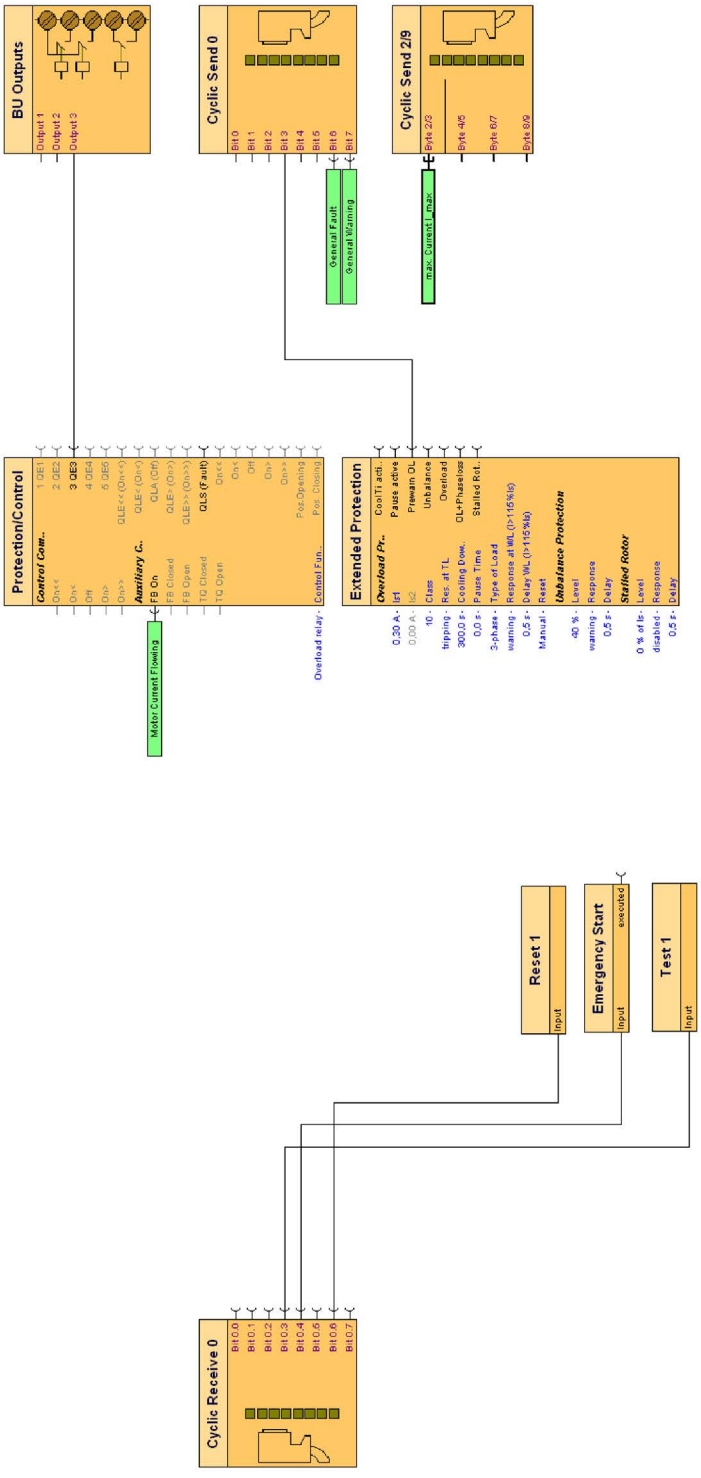


Figure 20-2 "Overload relay" function circuit diagram

20.3 "Direct-on-line starter" example circuit

20.3.1 "Direct starter" circuit diagram

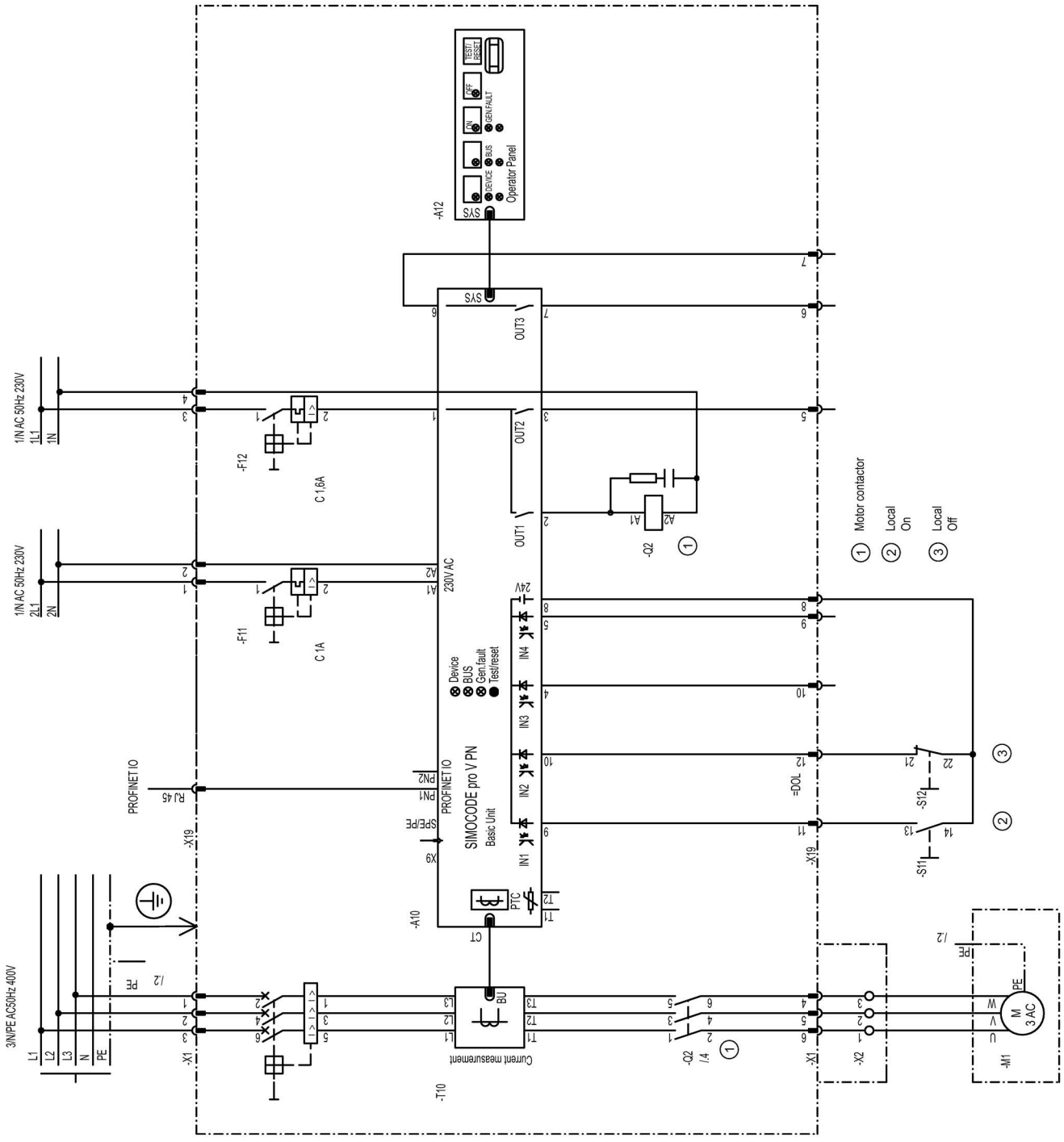


Figure 20-3 "Direct starter" circuit diagram

20.3.2 "Direct starter" function circuit diagram

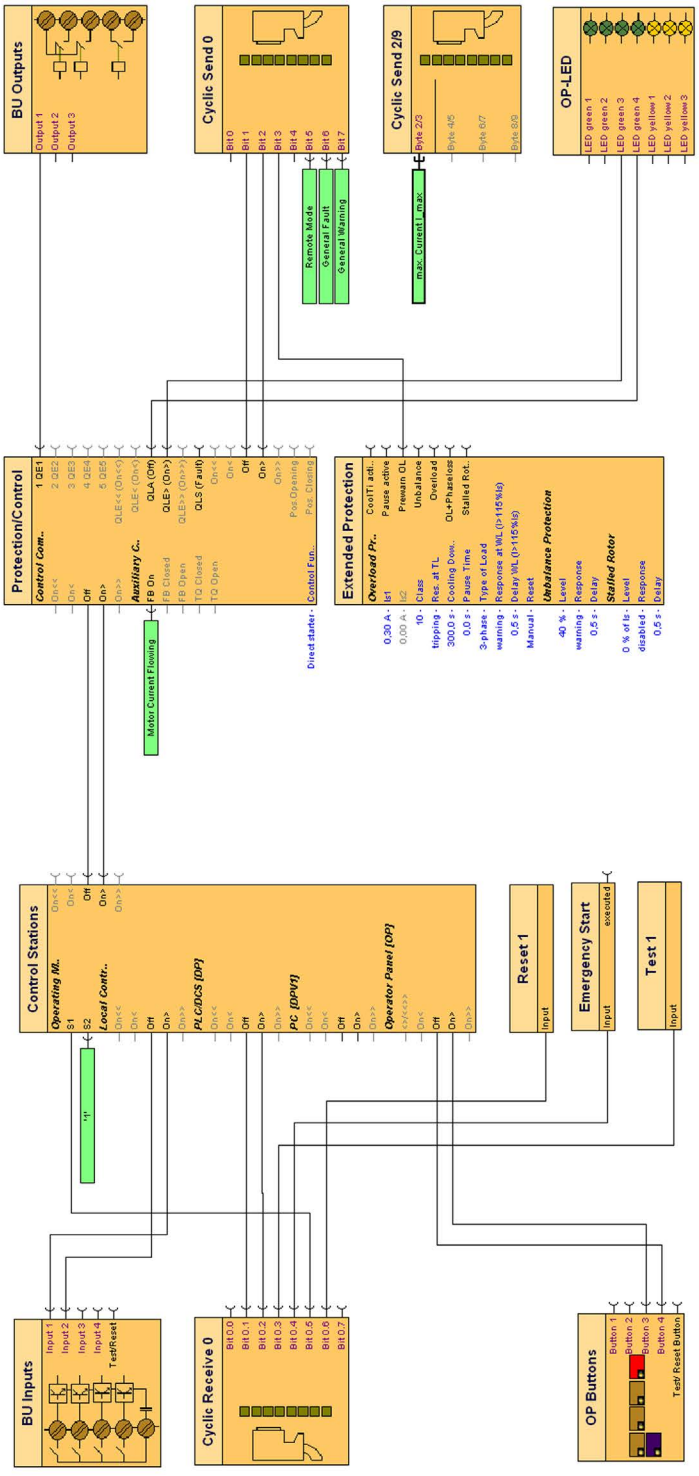


Figure 20-4 "Direct starter" function circuit diagram

20.4 "Reversing starter" example circuit

20.4.1 "Reversing starter" circuit diagram

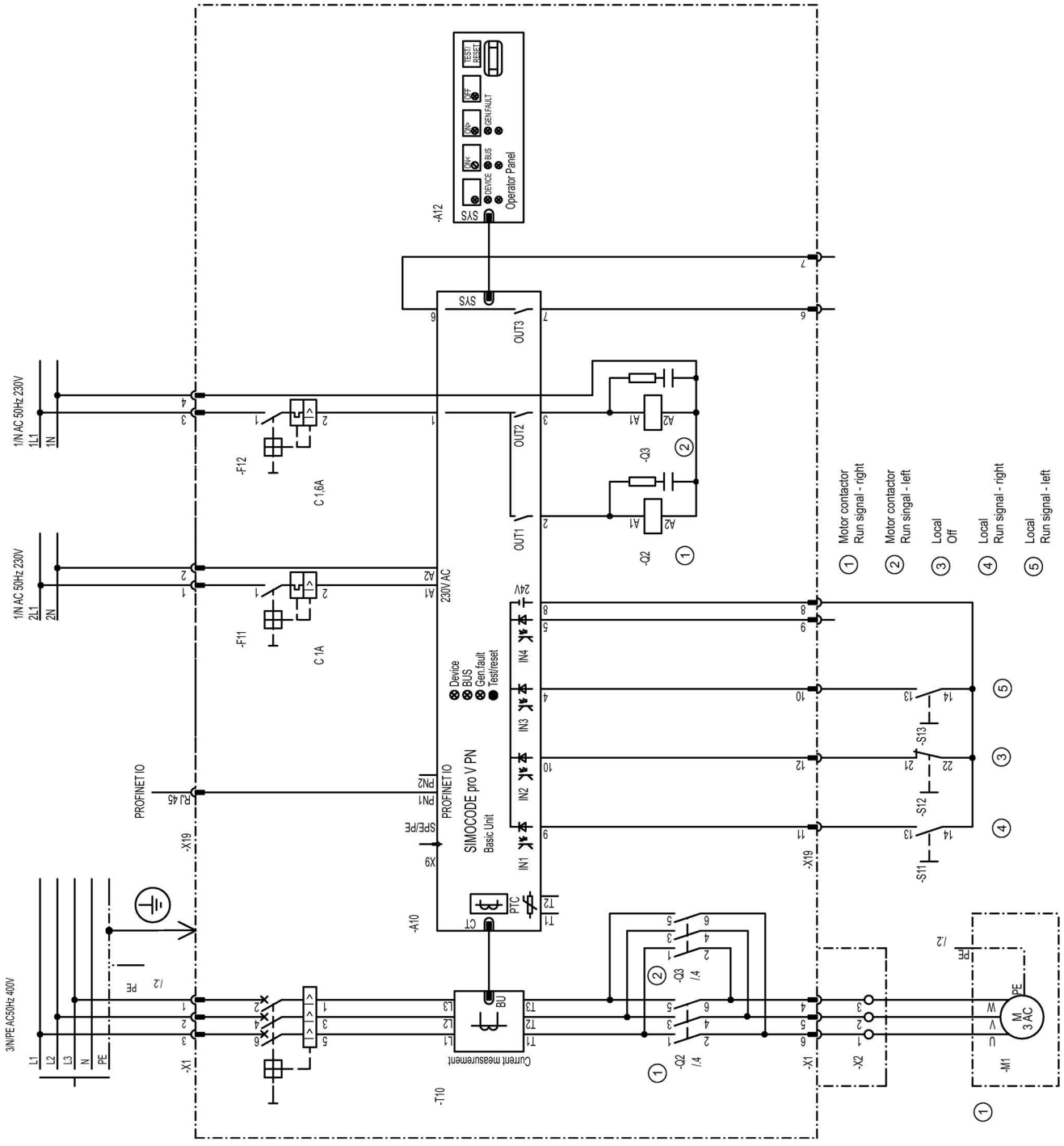


Figure 20-5 "Reversing starter" circuit diagram

20.4.2 "Reversing starter" function circuit diagram

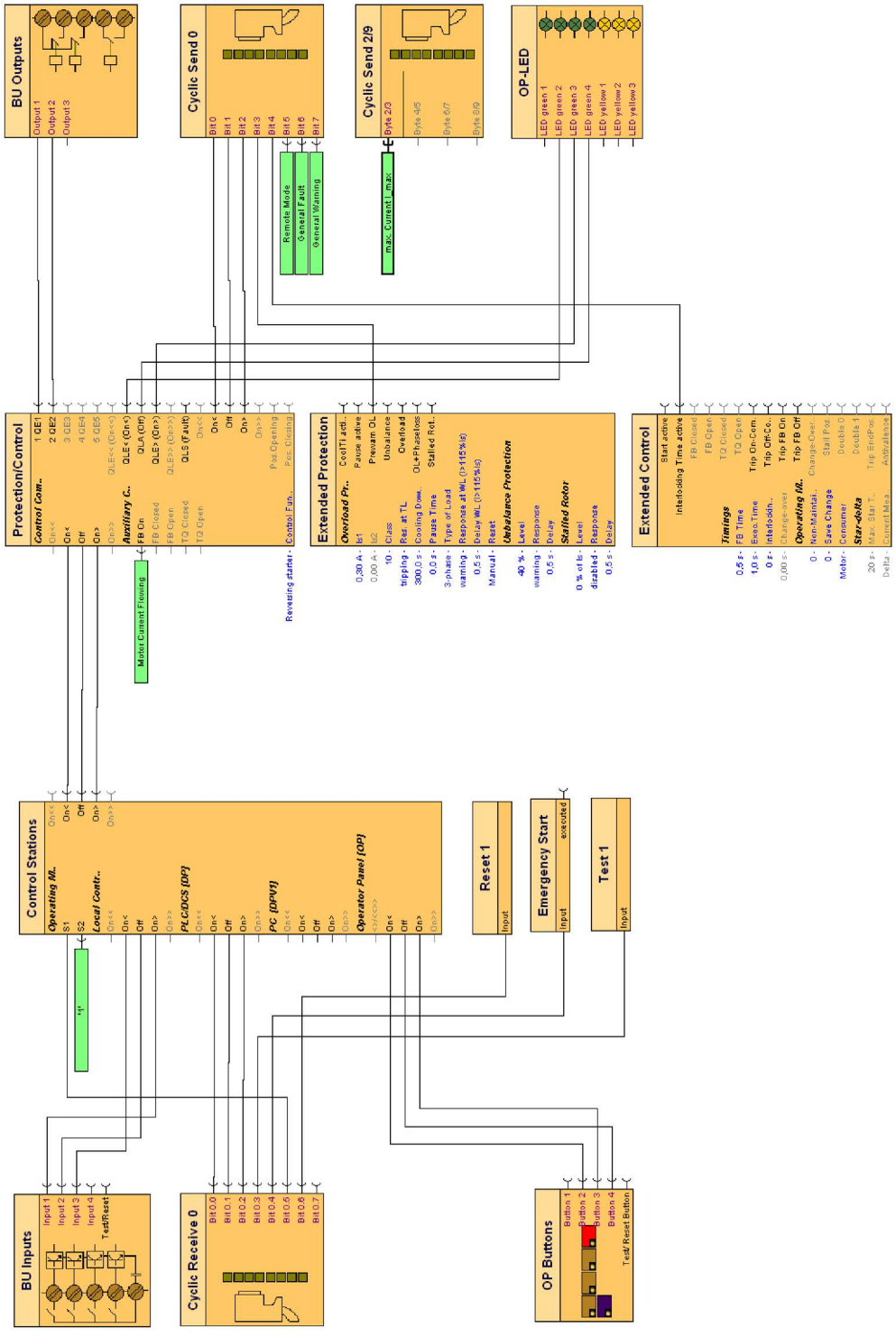


Figure 20-6 "Reversing starter" function circuit diagram

20.5 "3VL molded-case circuit breaker (MCCB)" example circuit

20.5.1 "3VL molded-case circuit breaker (MCCB)" circuit diagram

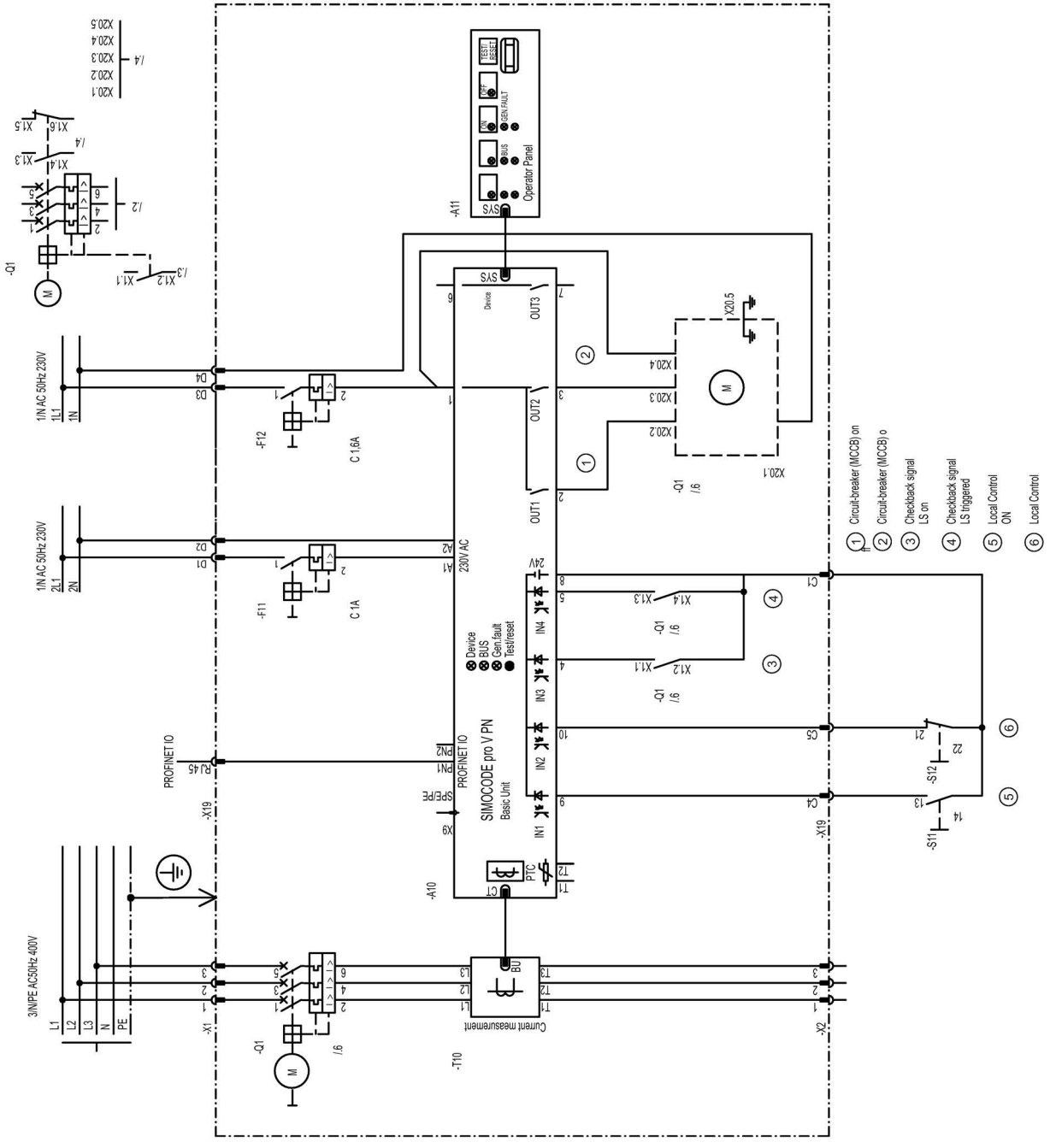


Figure 20-7 "3VL molded-case circuit breaker (MCCB)" circuit diagram

20.5.2 "3VL molded-case circuit breaker (MCCB)" function circuit diagram

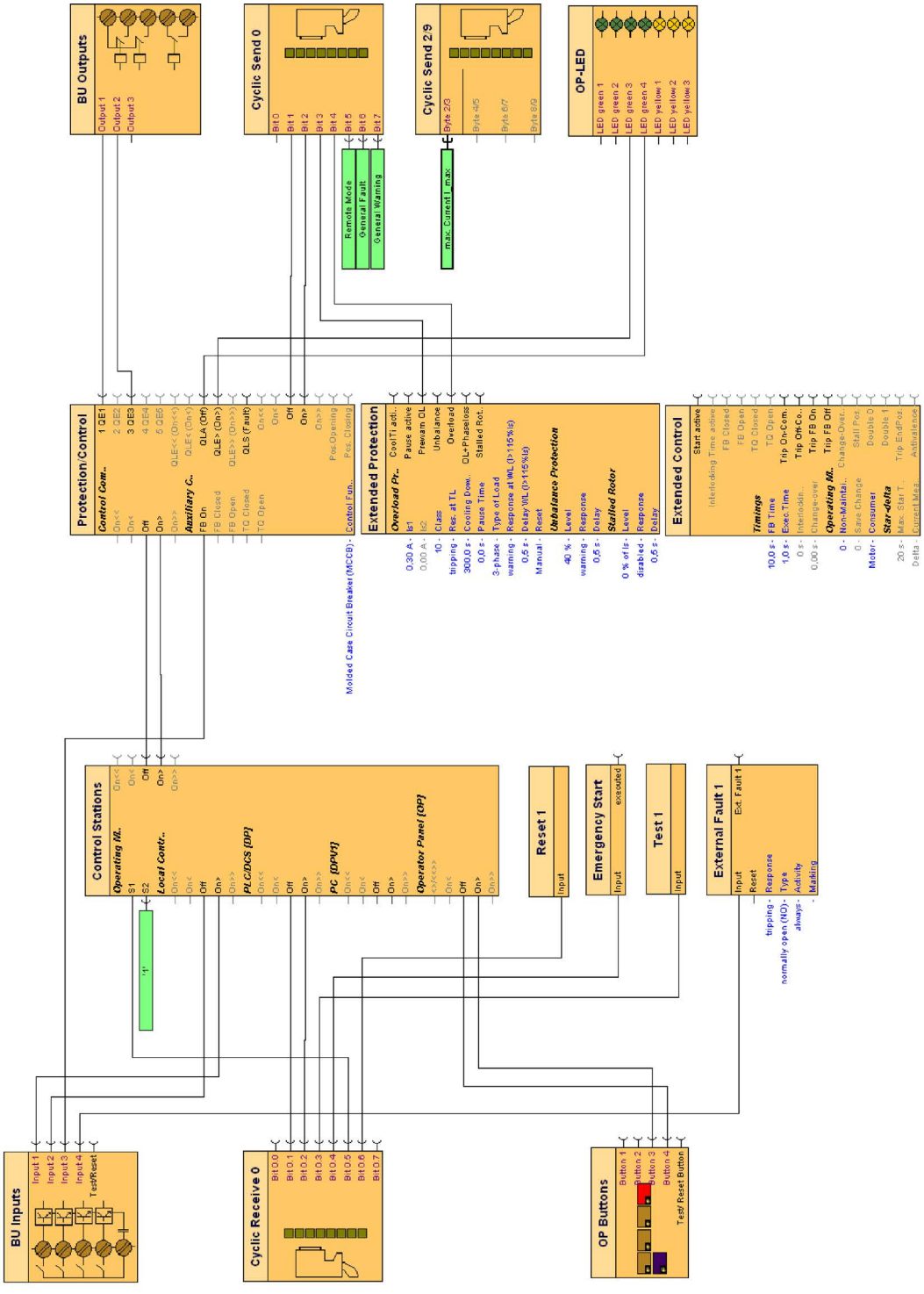


Figure 20-8 "3VL molded-case circuit breaker (MCCB)" function circuit diagram

20.6 "Star-delta starter" circuit example

20.6.1 "Star-delta starter" circuit diagram (current measuring in delta)

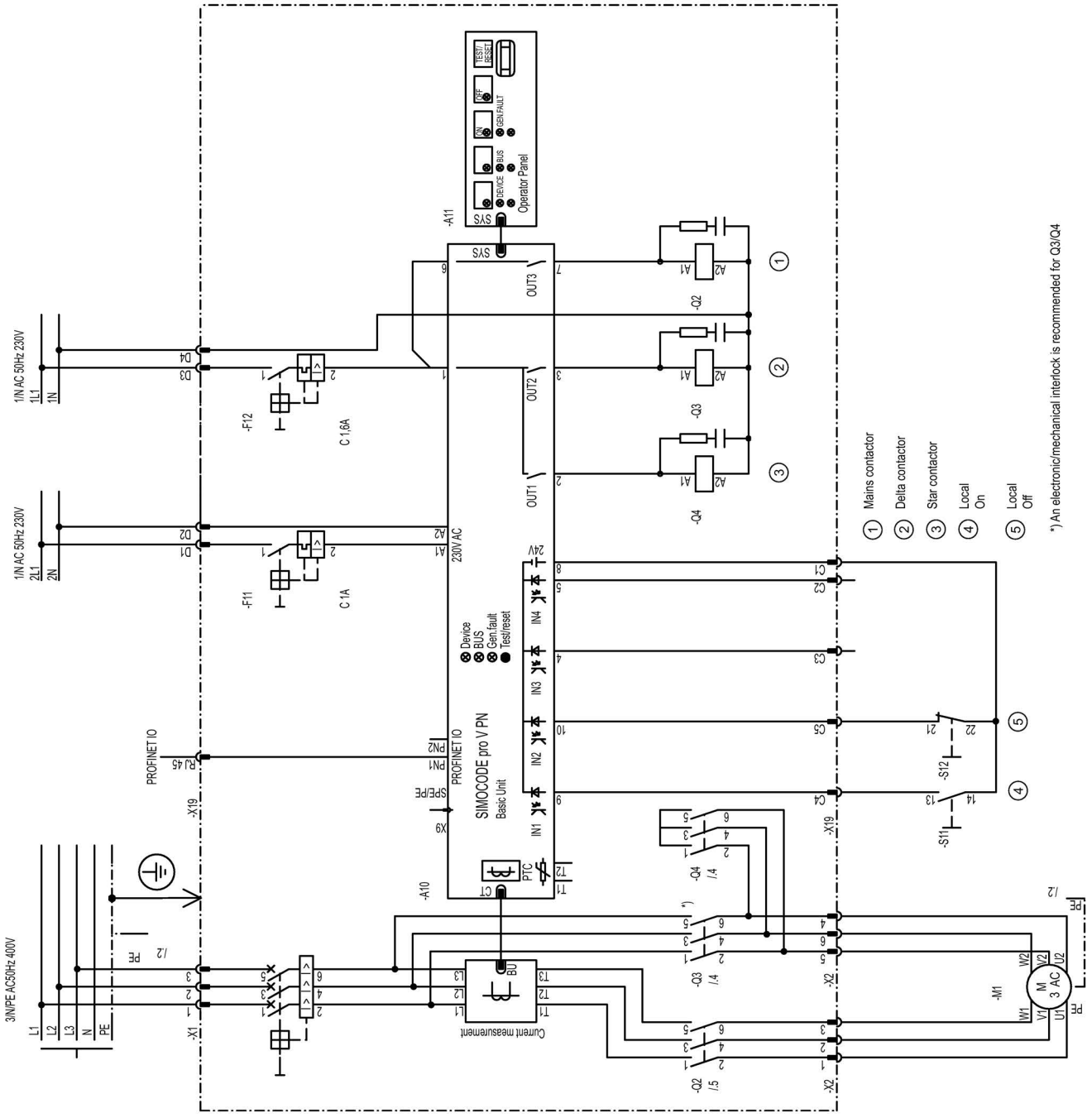


Figure 20-9 "Star-delta starter" circuit diagram (current measuring in delta)

20.6.2 "Star-delta starter" function circuit diagram (current measuring in delta)

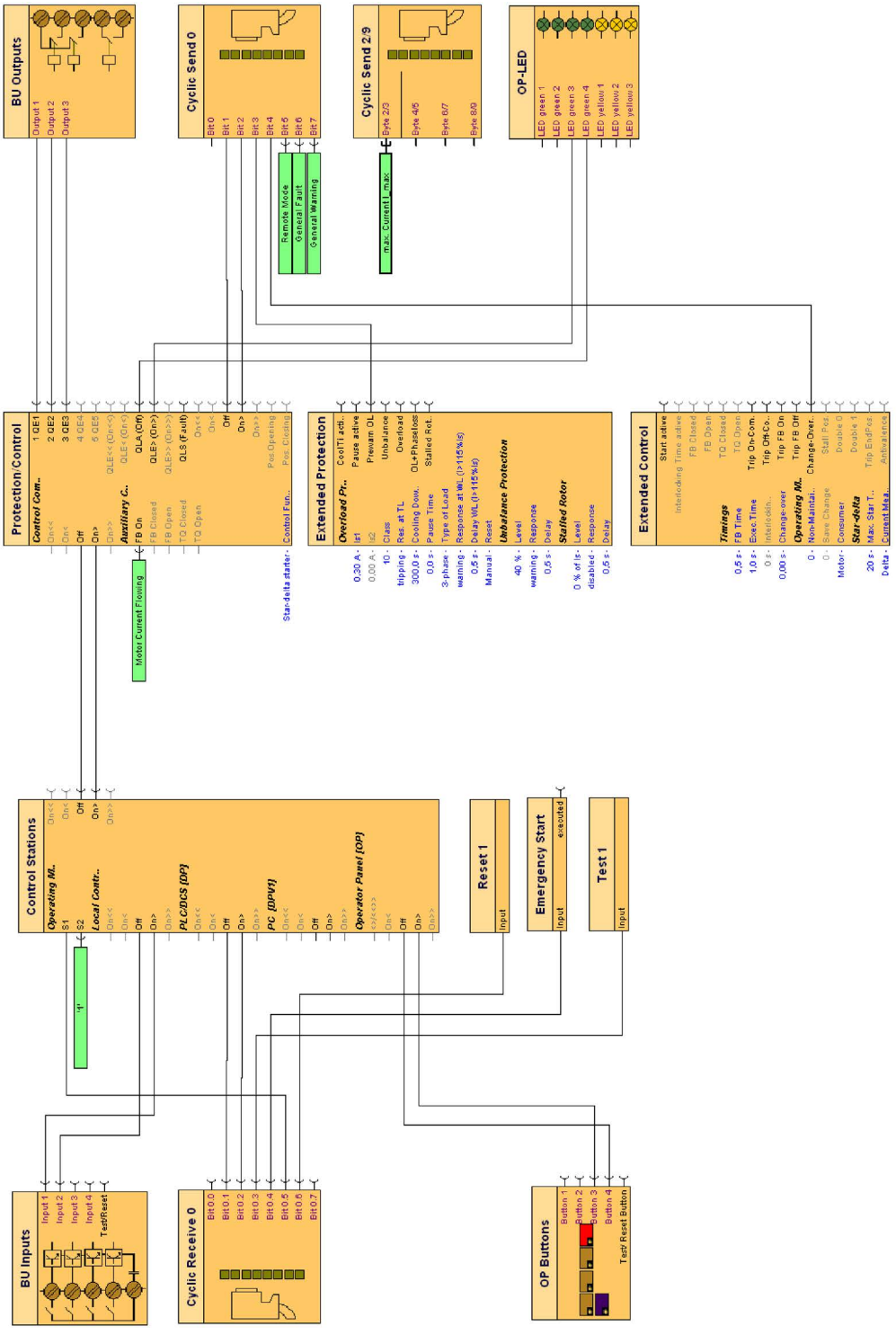


Figure 20-10 "Star-delta starter" function circuit diagram (current measuring in delta)

20.6.3 "Star-delta starter" circuit diagram (current measuring in supply cable)

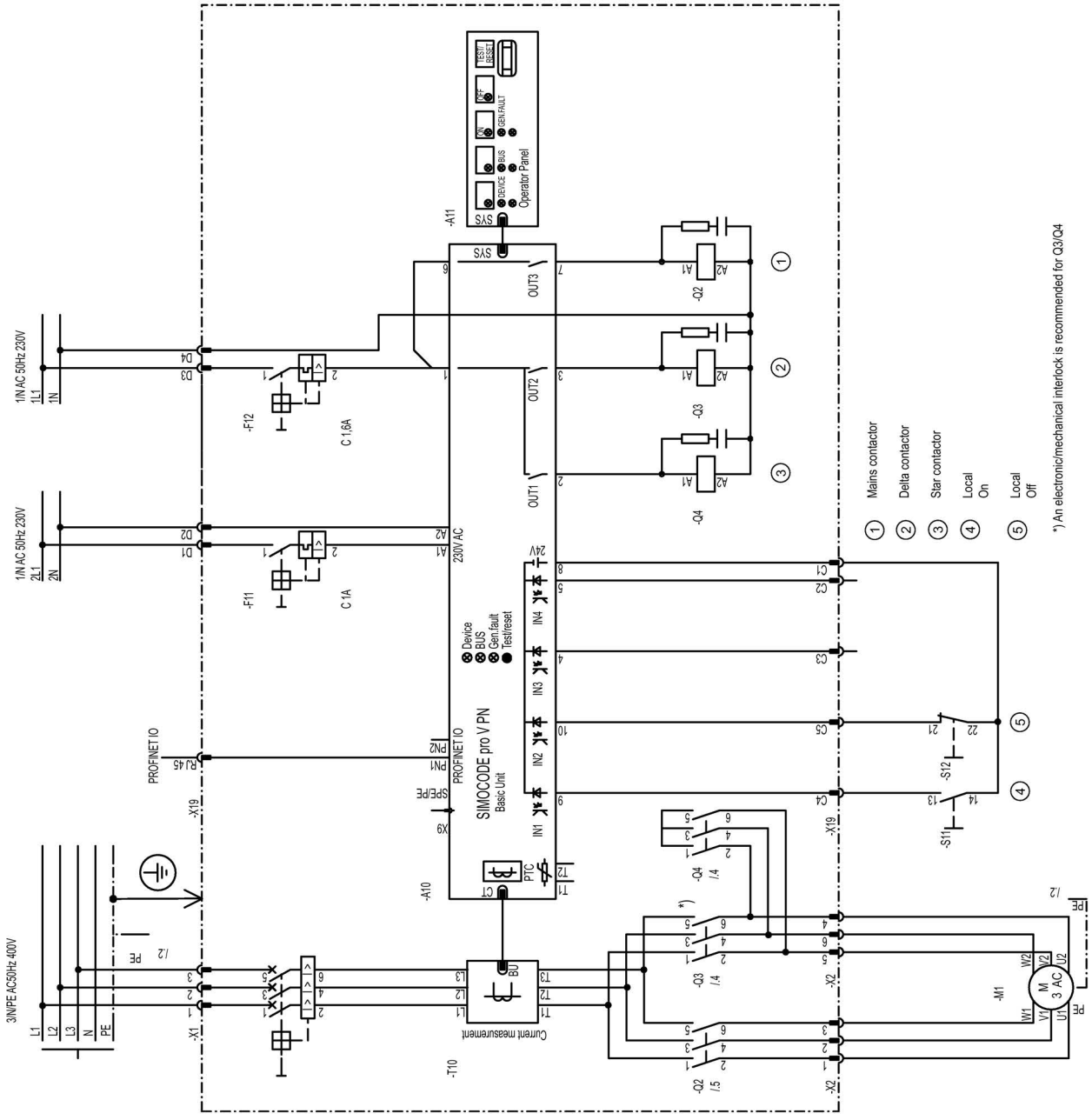


Figure 20-11 "Star-delta starter" circuit diagram (current measuring in supply cable)

20.6.4 "Star-delta starter" function circuit diagram (current measuring in supply cable)

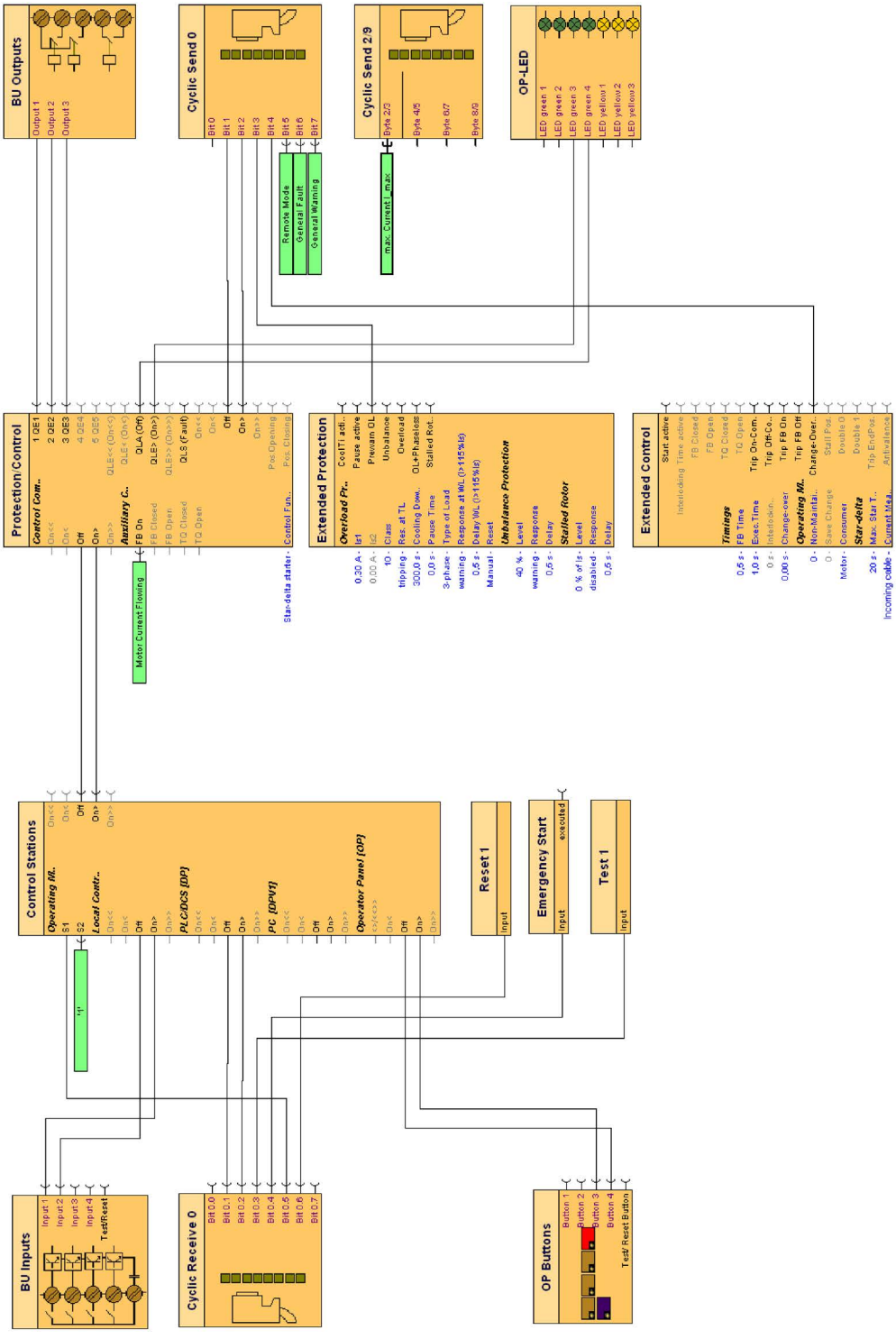


Figure 20-12 "Star-delta starter" function circuit diagram (current measuring in supply cable)

20.7 "Star-delta reversing starter" circuit example

20.7.1 "Star delta reversing starter" circuit diagram

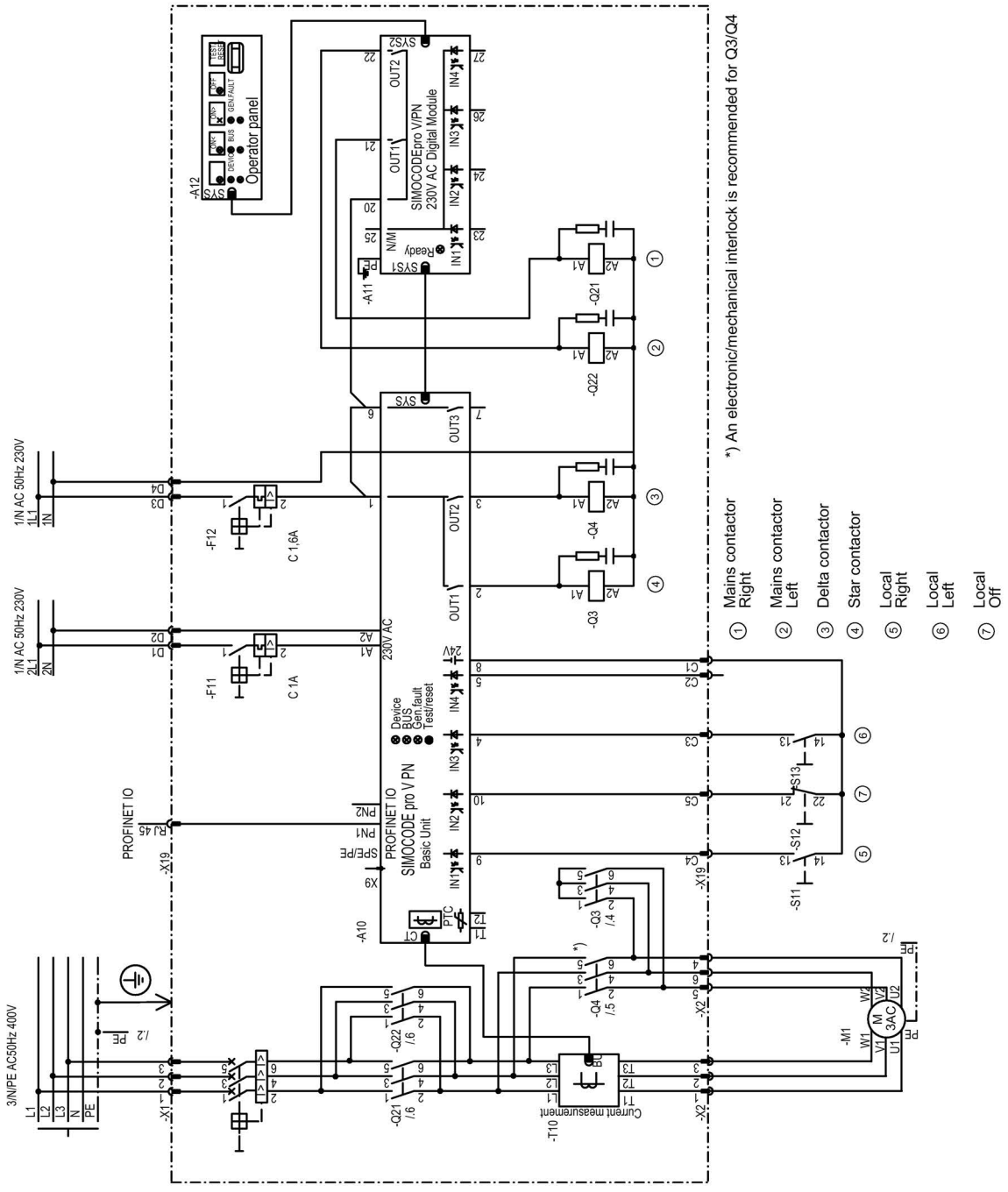


Figure 20-13 "Star delta reversing starter" circuit diagram

20.7.2 "Star-delta reversing starter" function circuit diagram

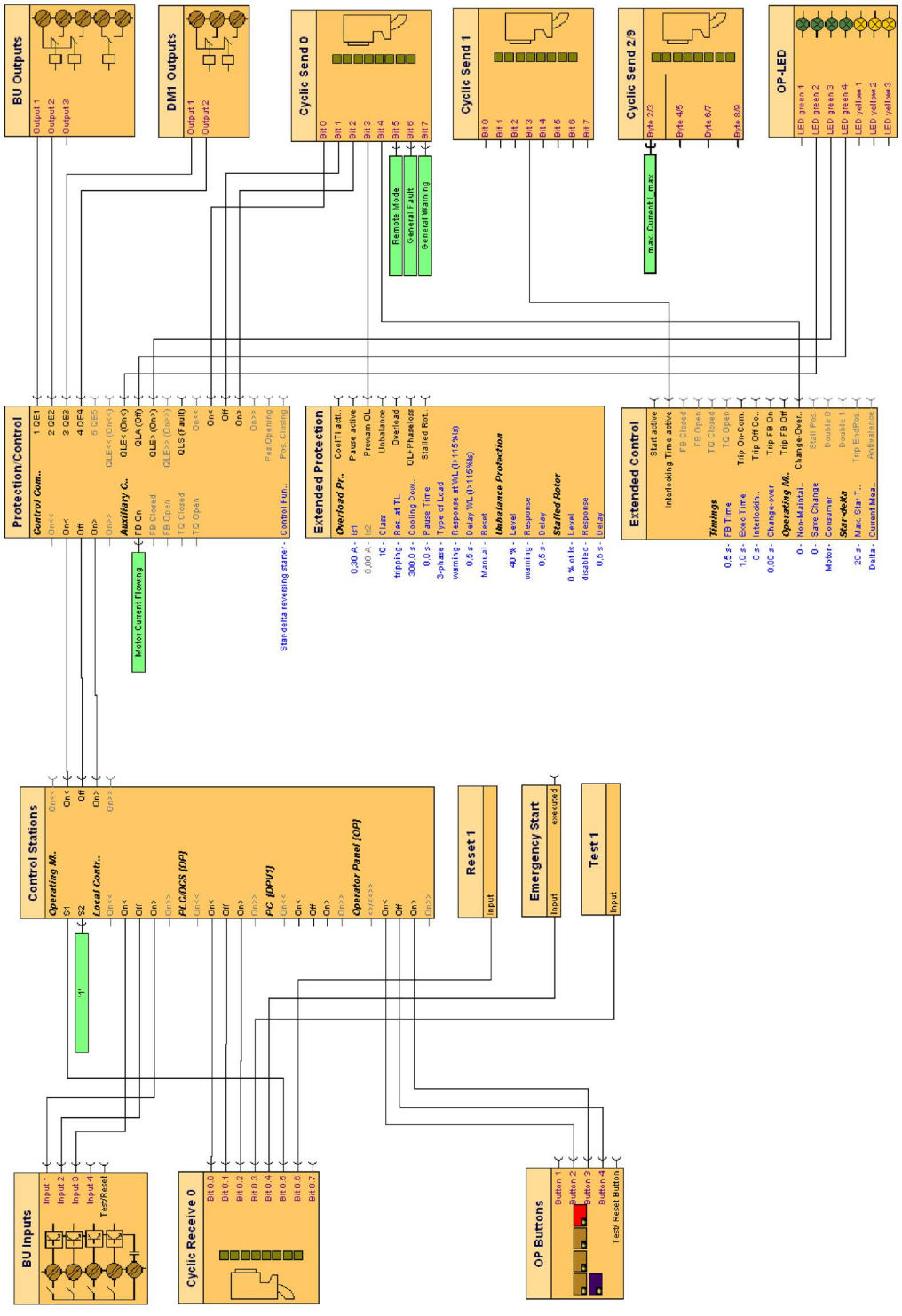


Figure 20-14 "Star-delta reversing starter" function circuit diagram

20.8 "Dahlander" circuit diagram

20.8.1 "Dahlander" circuit diagram

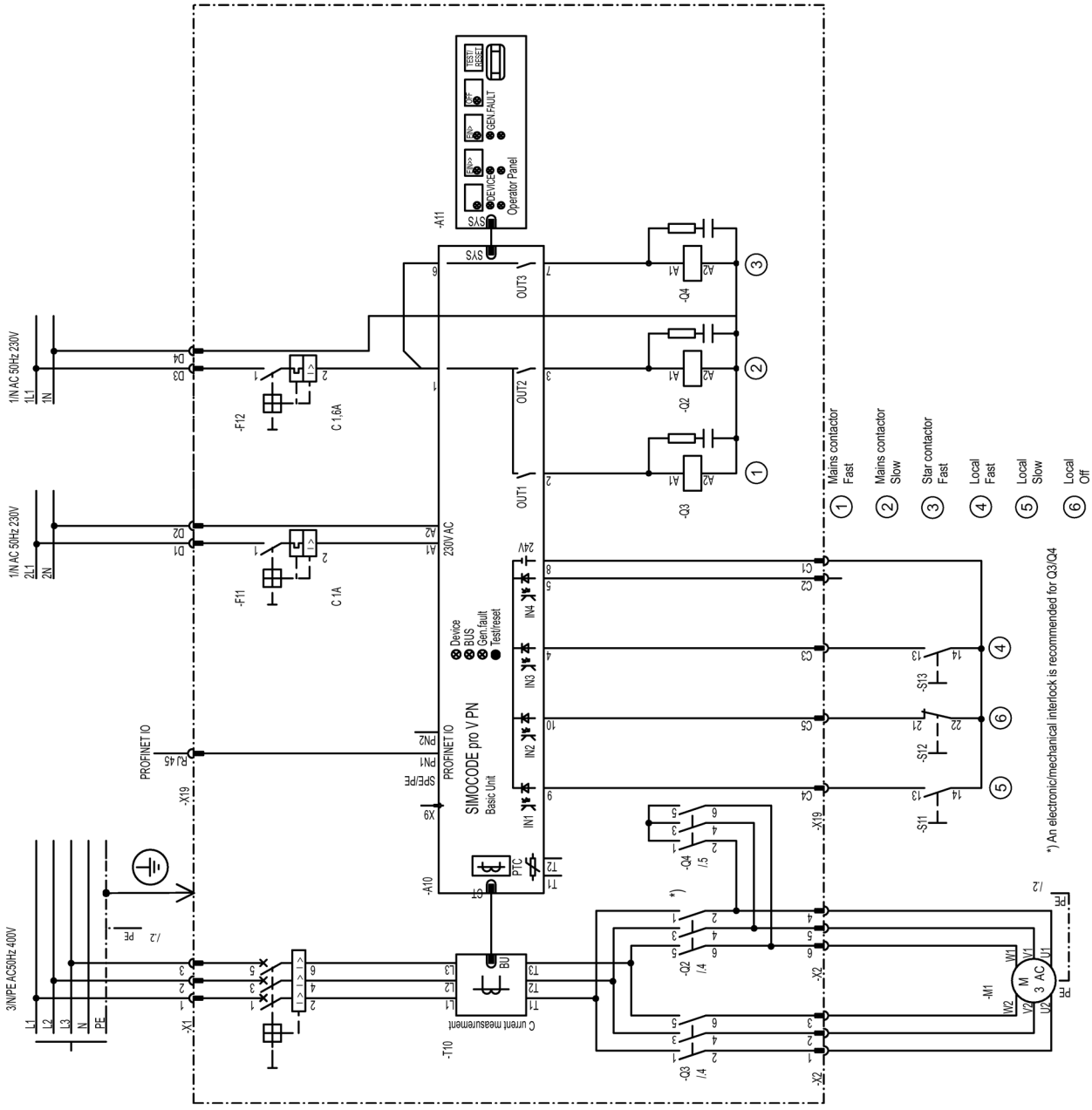


Figure 20-15 "Dahlander" circuit diagram

20.8.2 "Dahlander" function circuit diagram

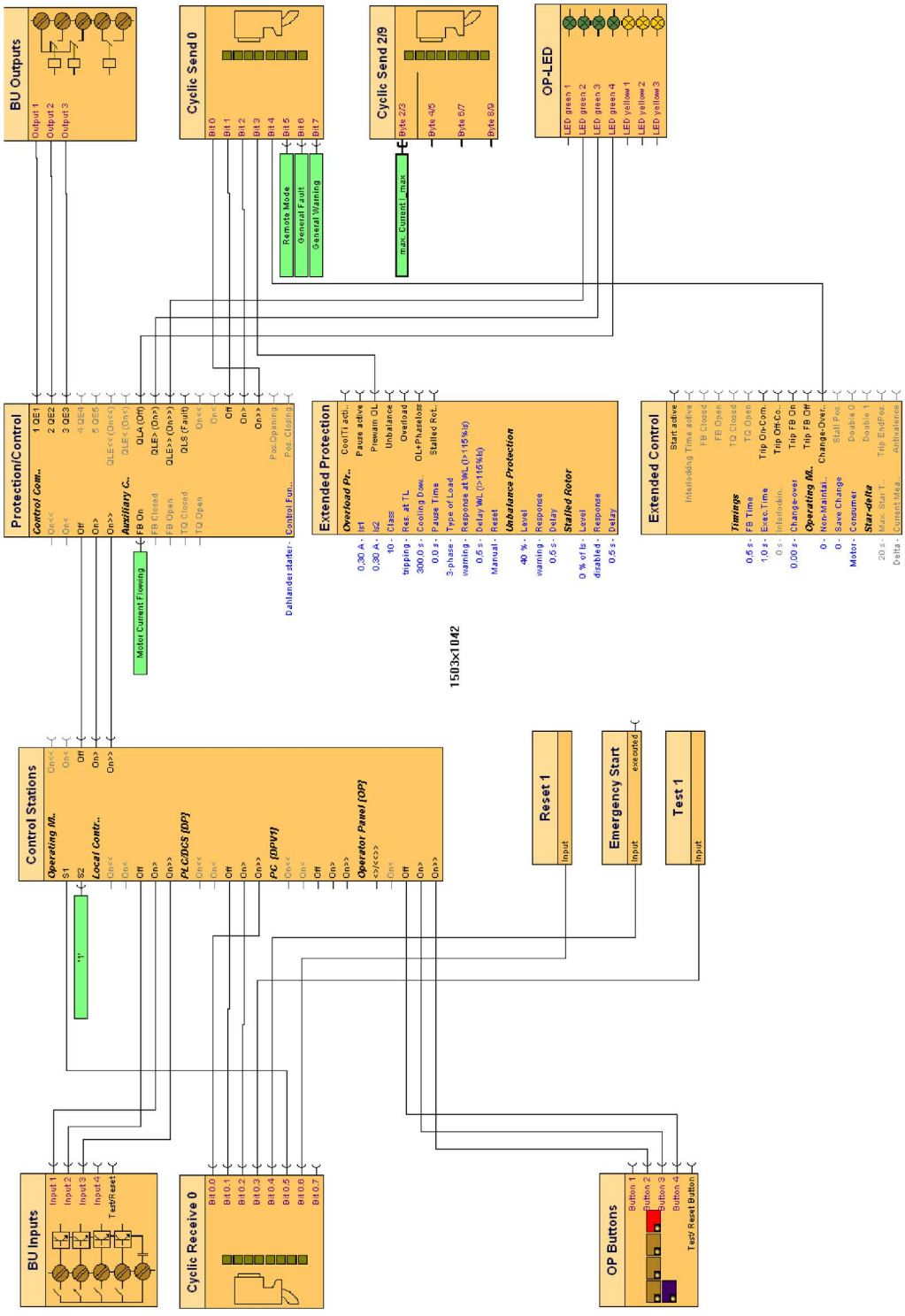


Figure 20-16 "Dahlander" function circuit diagram

20.9 "Dahlander reversing starter" circuit diagram

20.9.1 "Dahlander reversing starter" circuit diagram

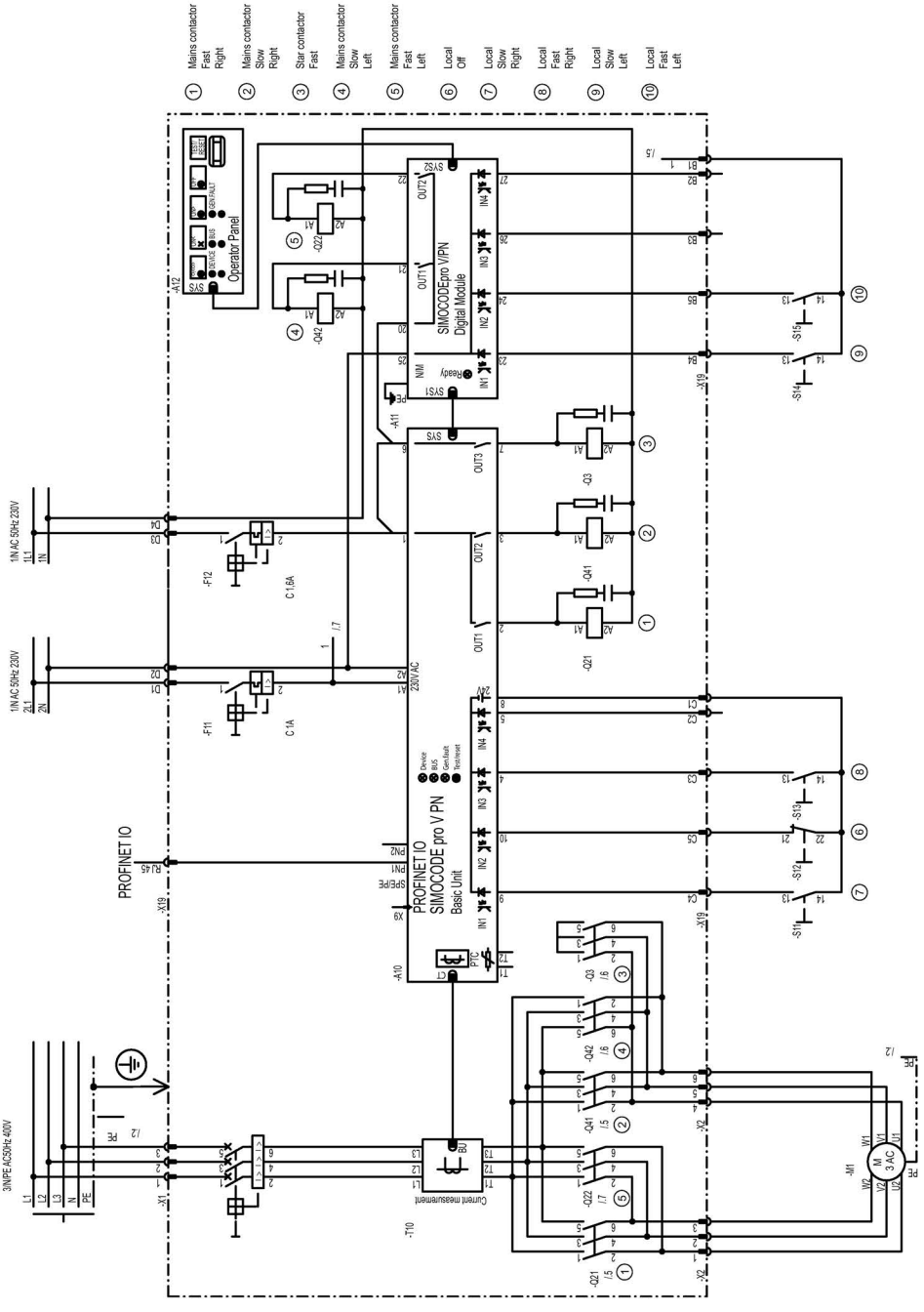


Figure 20-17 "Dahlander reversing starter" circuit diagram

20.9.2 "Dahlander reversing starter" function circuit diagram

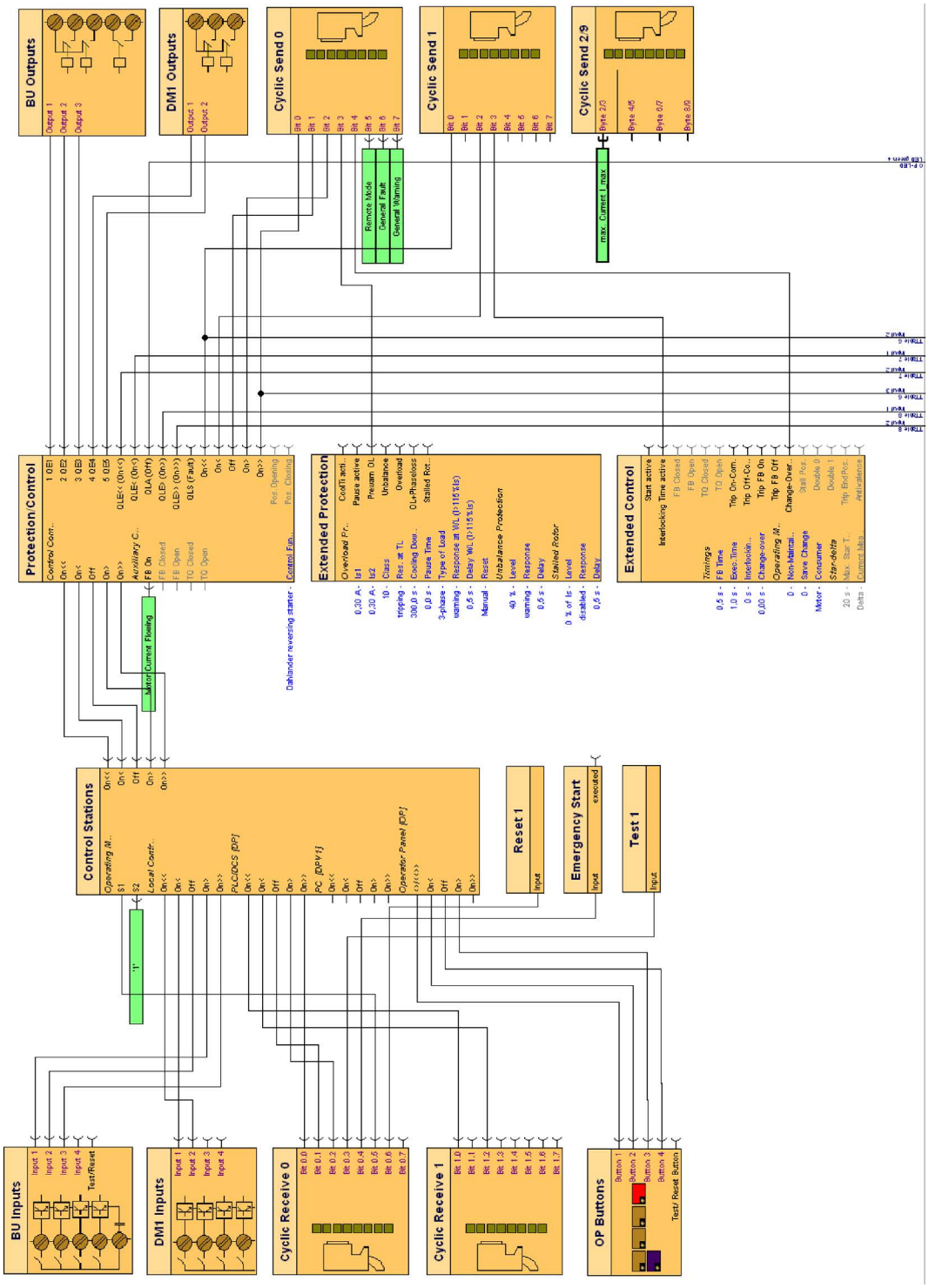


Figure 20-18 "Dahlander reversing starter" function circuit diagram (1/2)

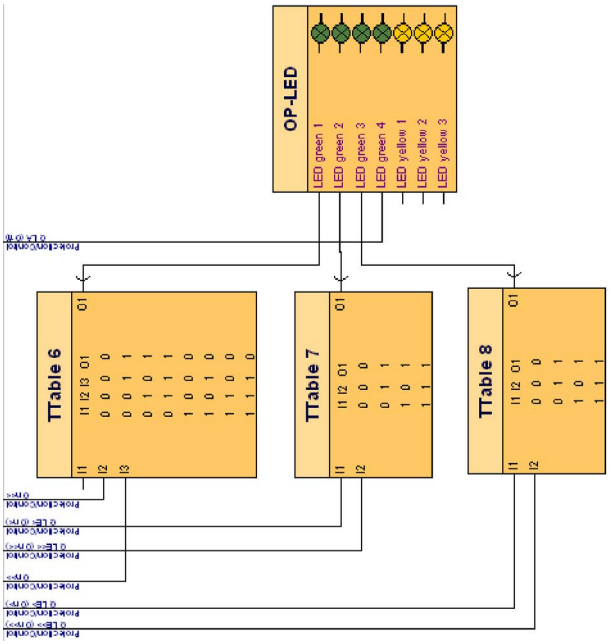


Figure 20-19 "Dahlander reversing starter" function circuit diagram (2/2)

20.10 "Pole-changing starter" example circuit

20.10.1 "Pole-changing starter" circuit diagram

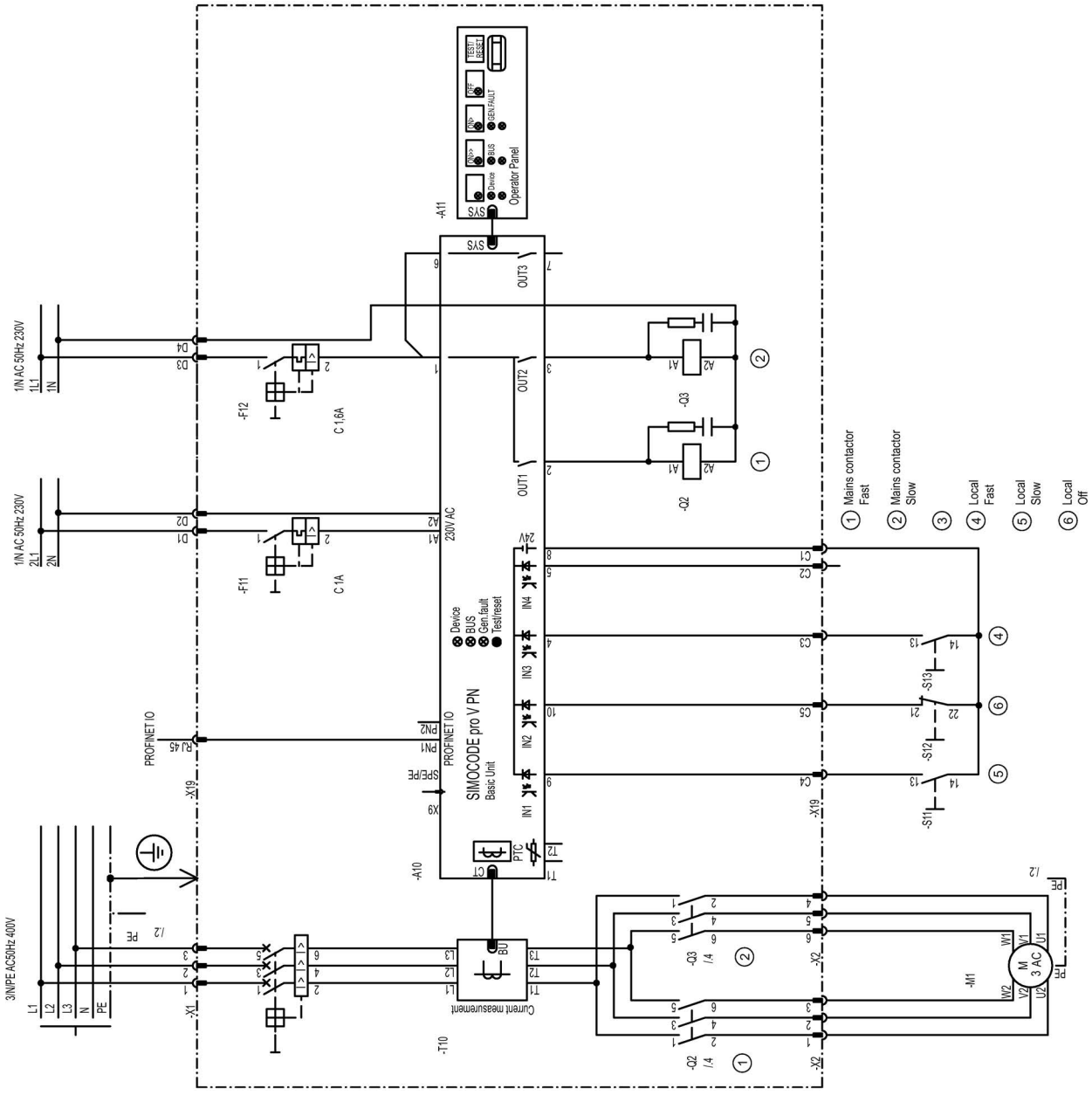


Figure 20-20 "Pole-changing starter" circuit diagram

20.10.2 "Pole-changing starter" function circuit diagram

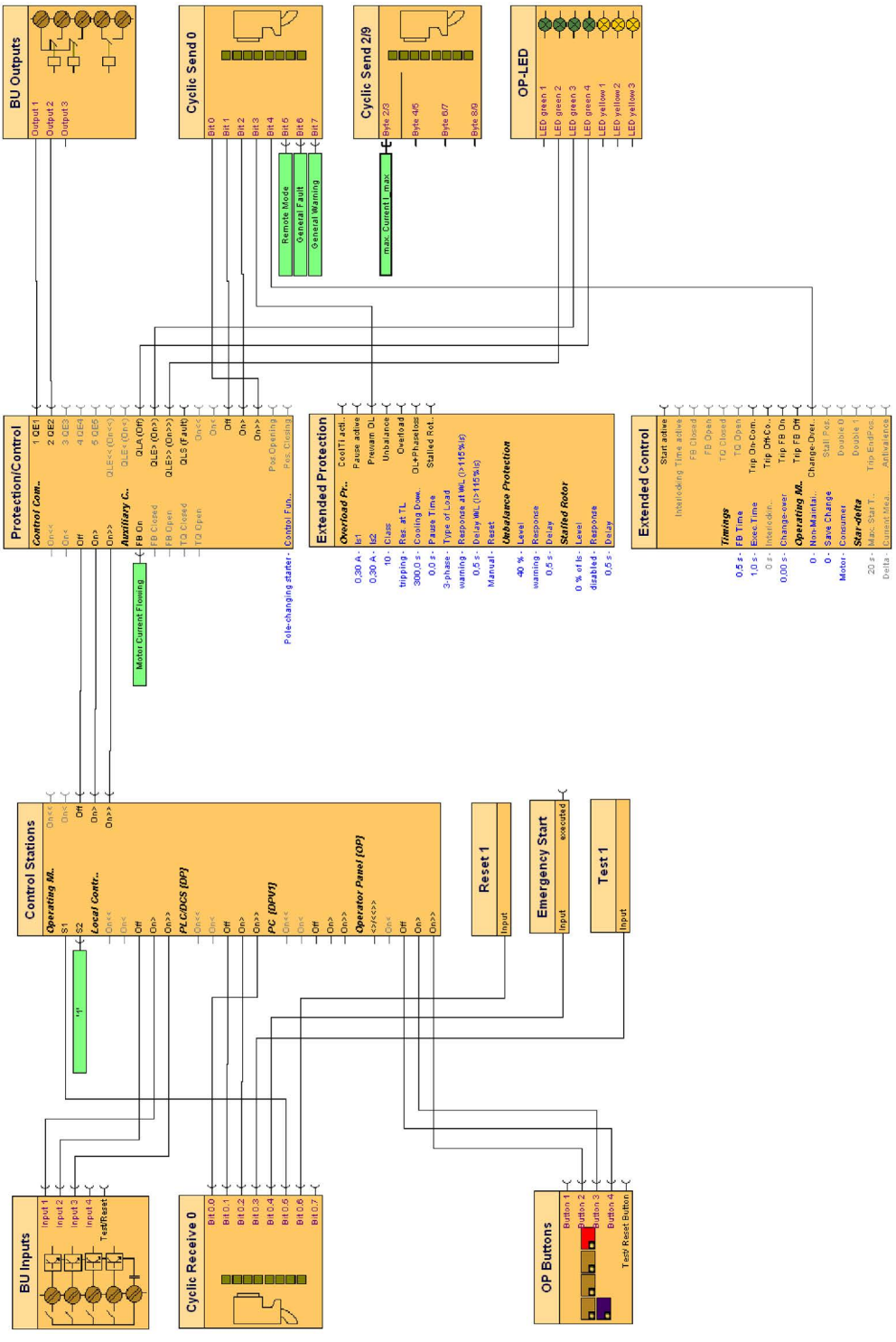


Figure 20-21 "Pole-changing starter" function circuit diagram

20.11 "Pole-changing reversing starter" circuit example

20.11.1 "Pole-changing reversing starter" circuit diagram

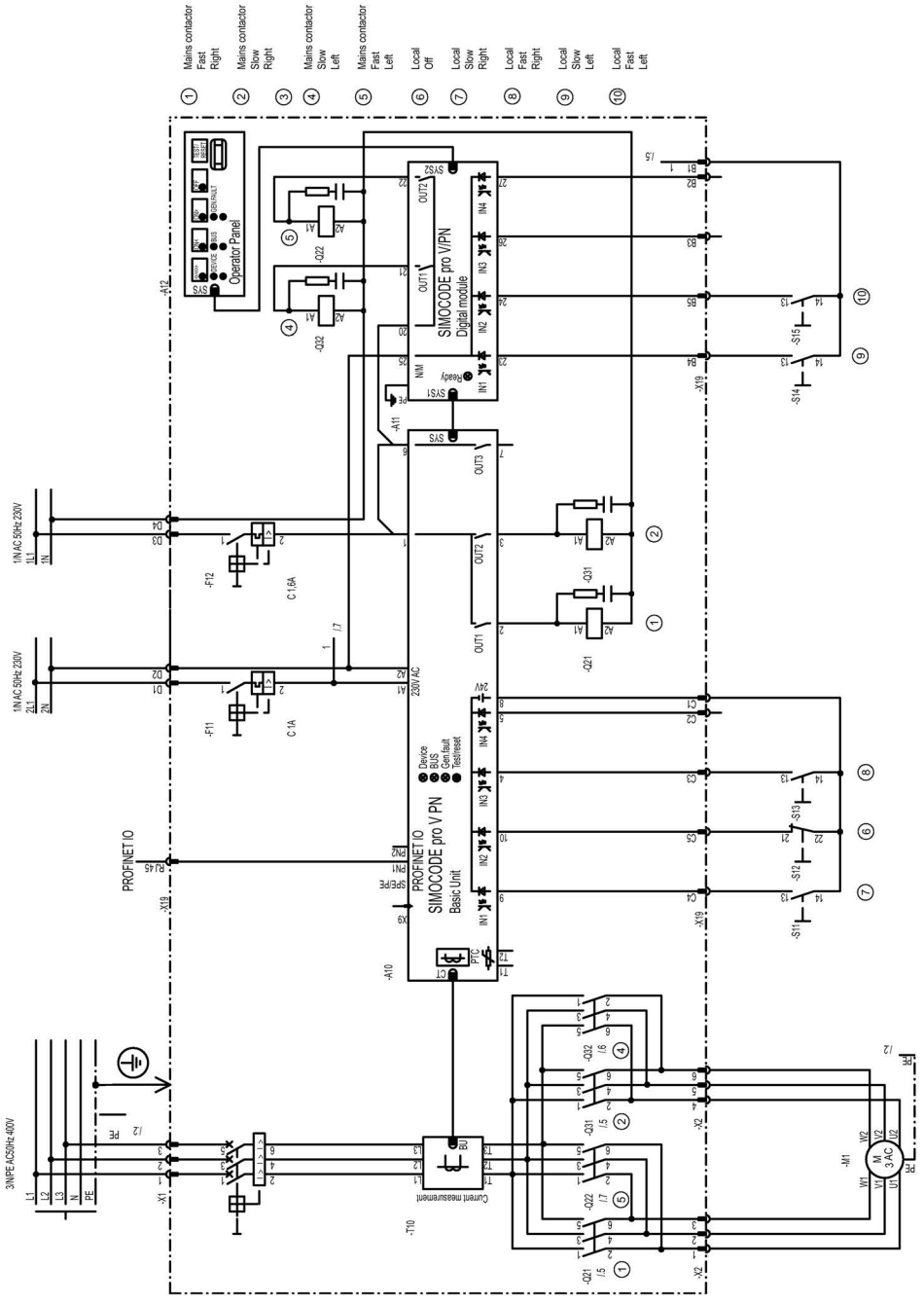


Figure 20-22 "Pole-changing reversing starter" circuit diagram

20.11.2 "Pole-changing reversing starter" function circuit diagram

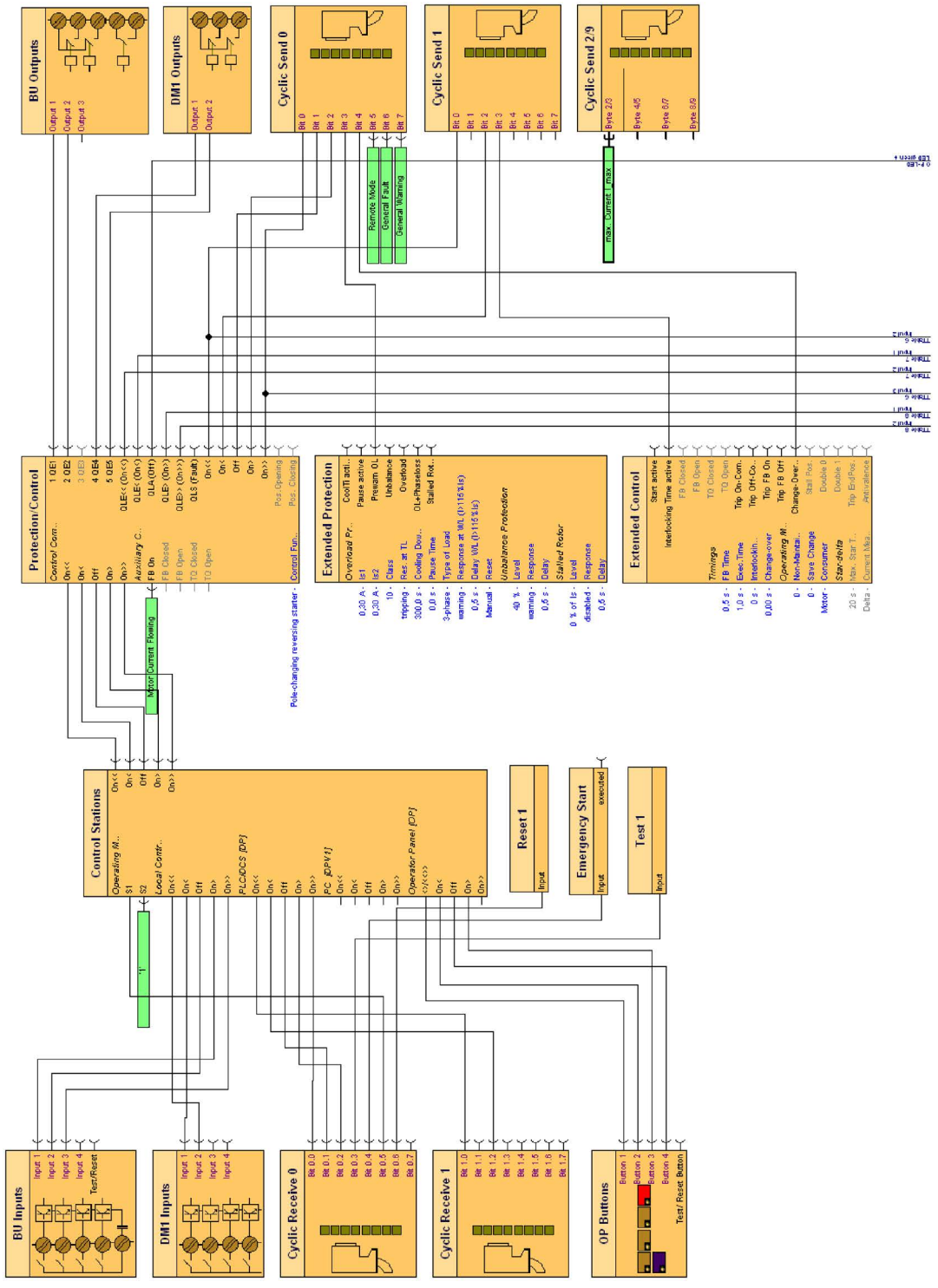


Figure 20-23 "Pole-changing reversing starter" function circuit diagram (1/2)

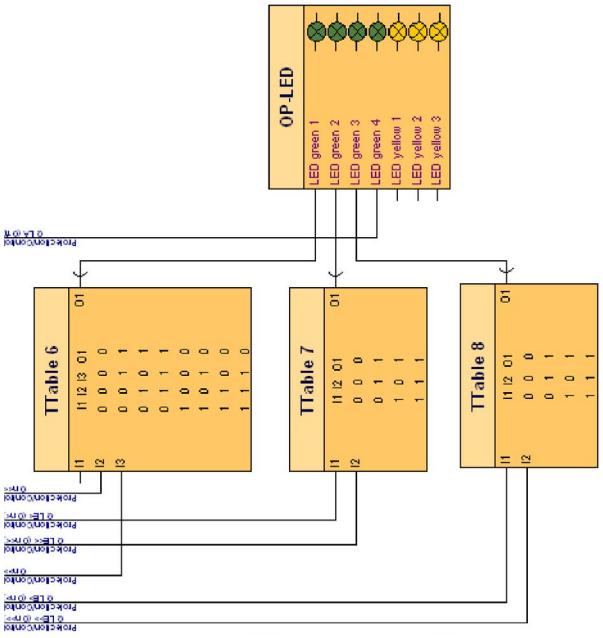


Figure 20-24 "Pole-changing reversing starter" function circuit diagram (2/2)

20.12 "Solenoid valve" example circuit

20.12.1 "Solenoid valve" circuit diagram

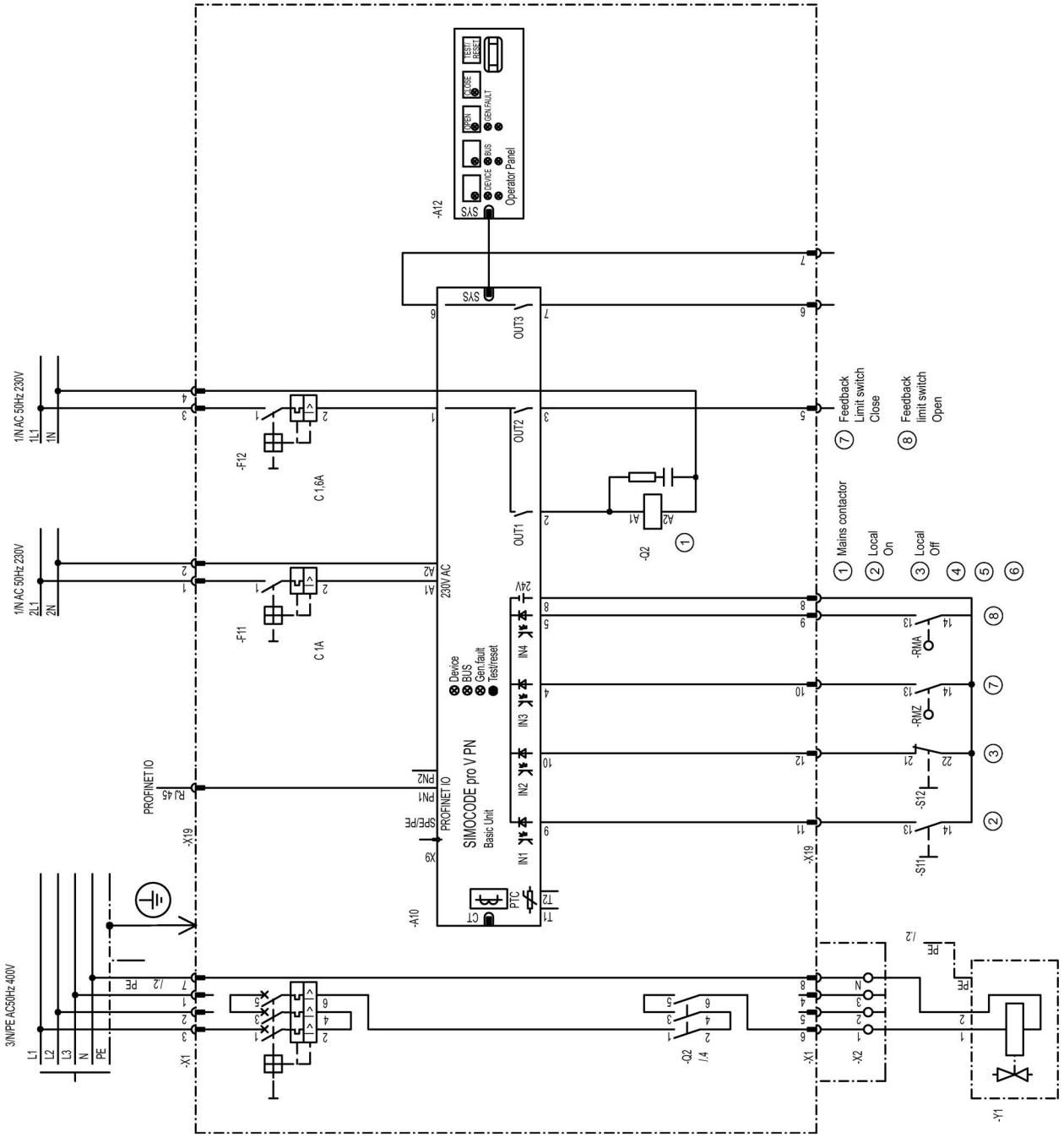


Figure 20-25 "Solenoid valve" circuit diagram

20.12.2 "Solenoid valve" function circuit diagram

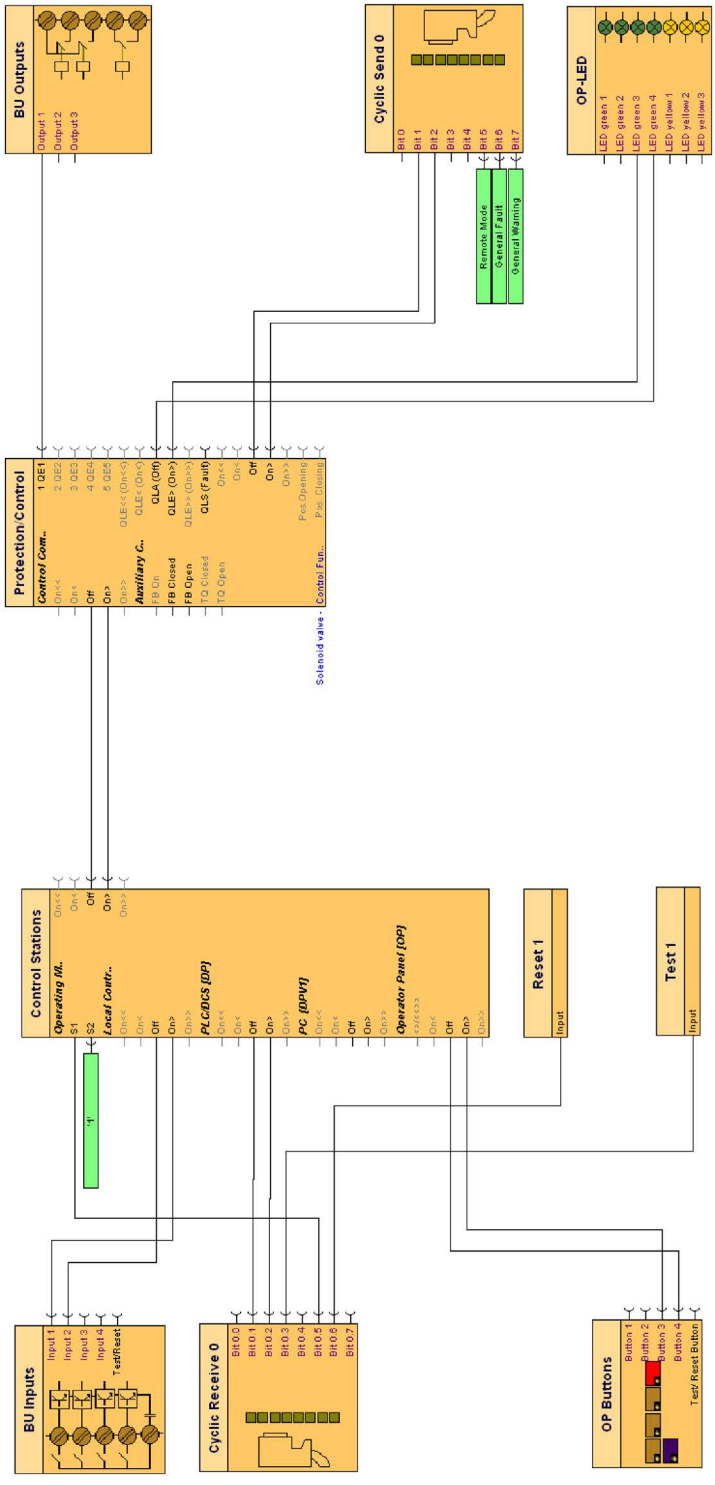


Figure 20-26 "Solenoid valve" function circuit diagram

20.13 "Positioner" example circuit

20.13.1 "Positioner 1" circuit diagram

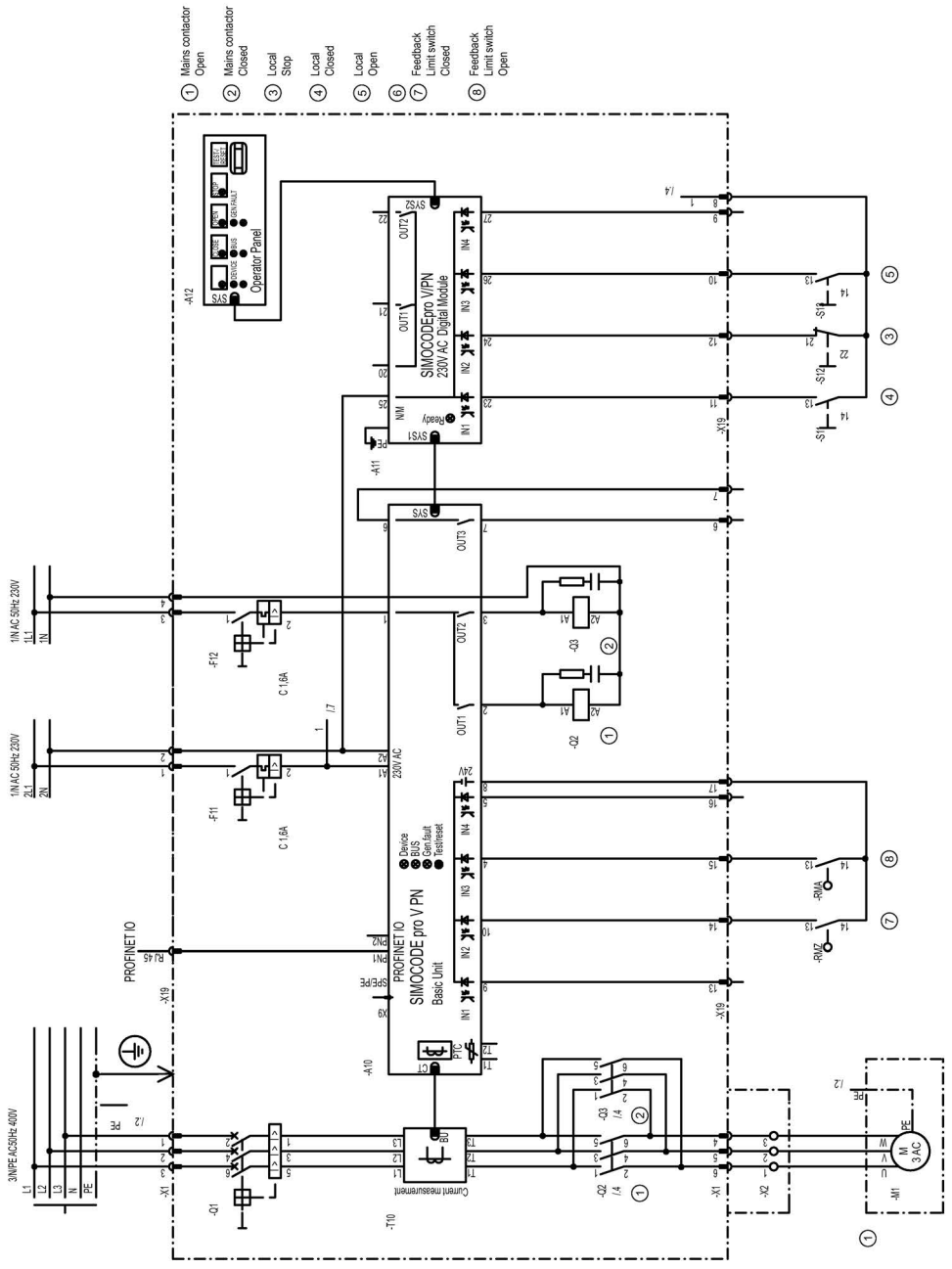


Figure 20-27 "Positioner 1" circuit diagram

20.13.2 "Positioner 1" function circuit diagram

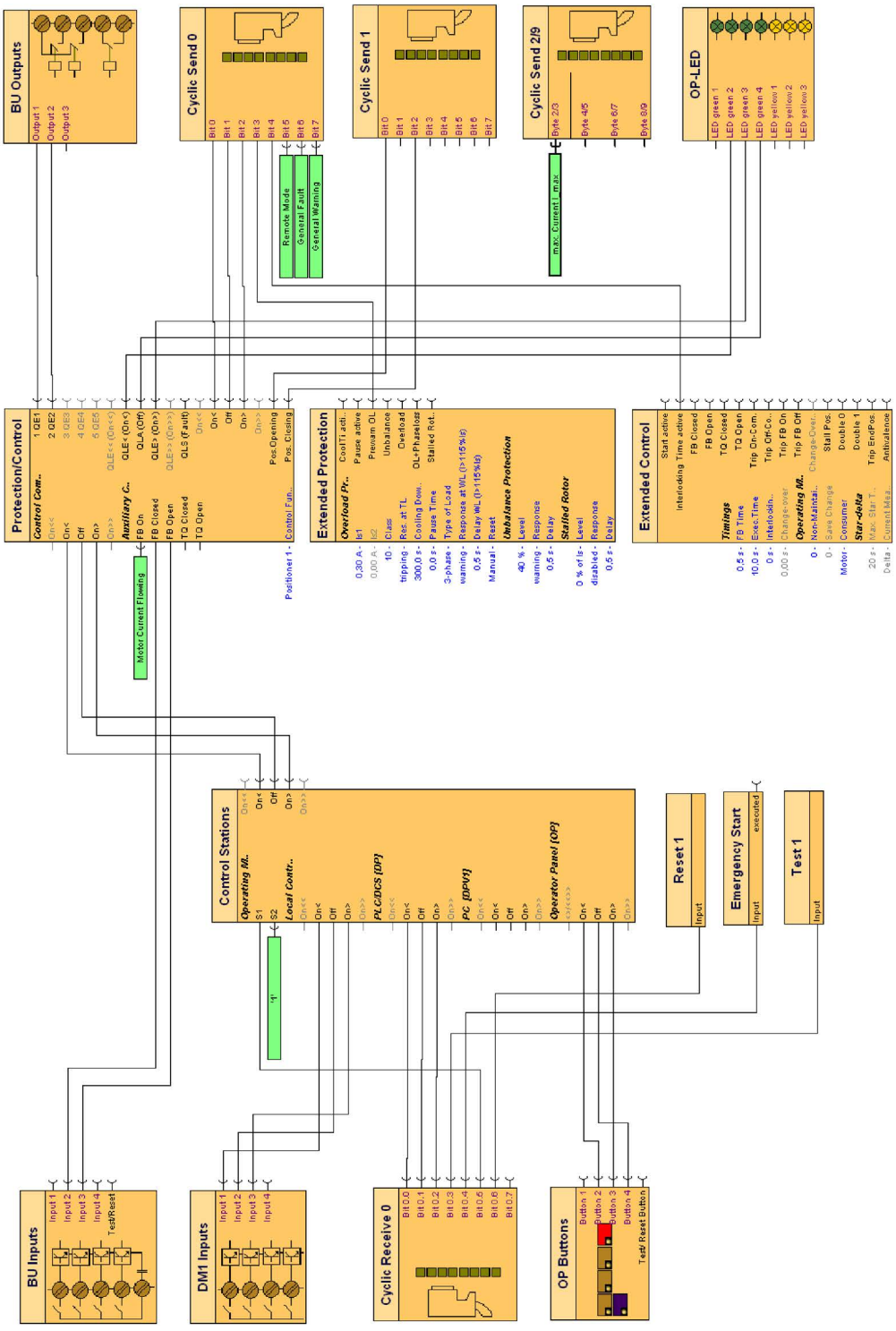


Figure 20-28 "Positioner 1" function circuit diagram

20.13.3 "Positioner 2" circuit diagram

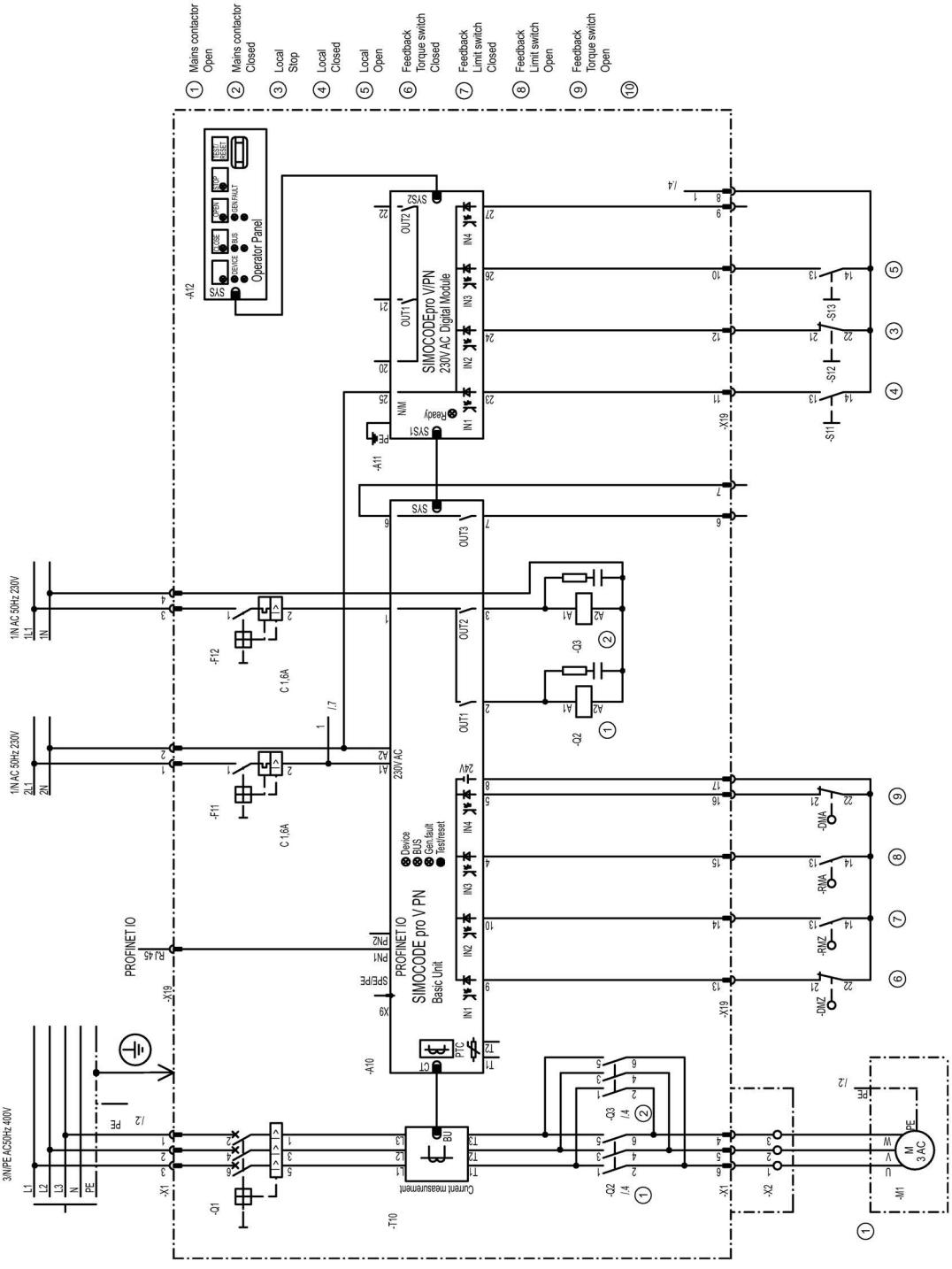


Figure 20-29 "Positioner 2" circuit diagram

20.13.4 "Positioner 2" function circuit diagram

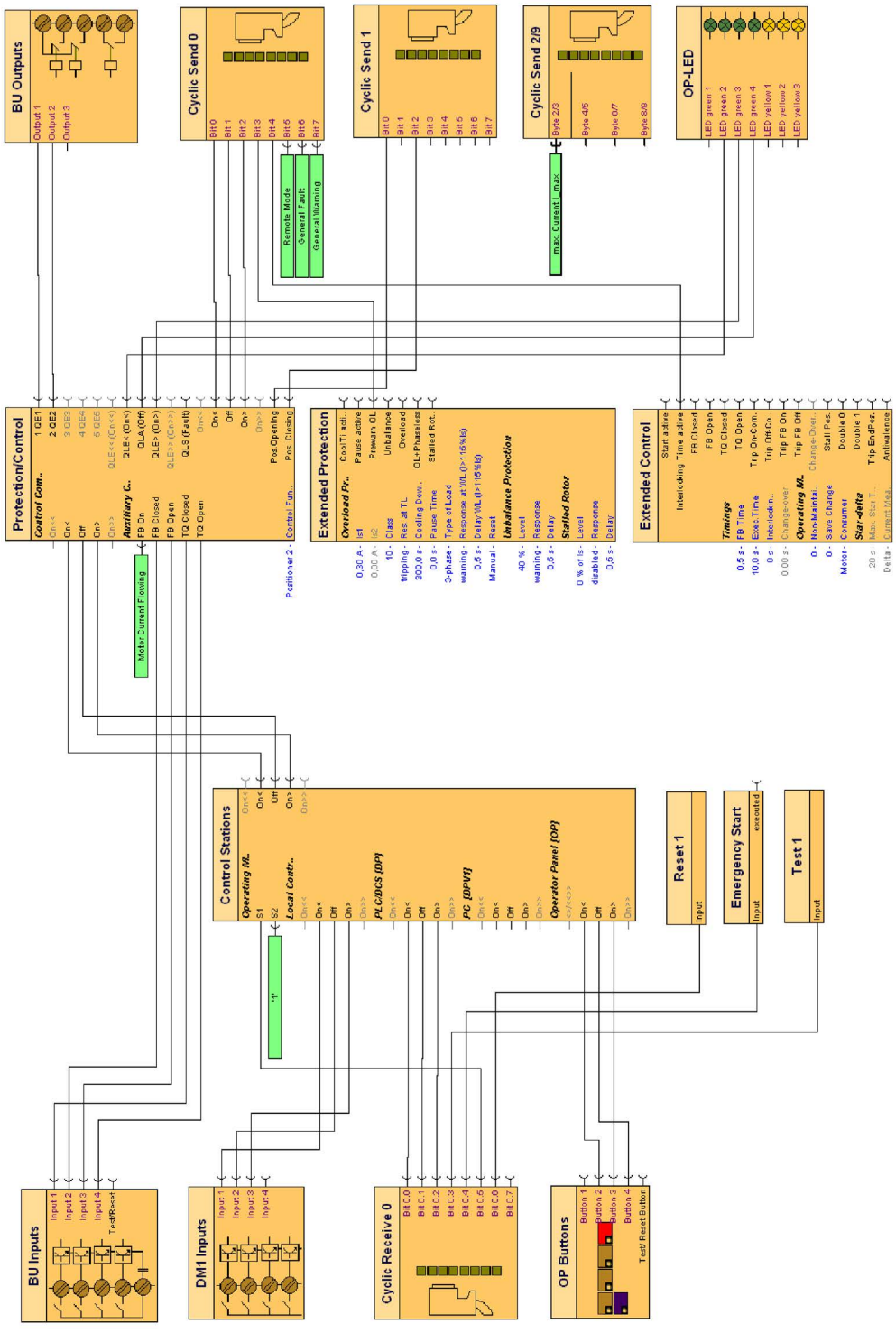


Figure 20-30 "Positioner 2" function circuit diagram

20.13.5 "Positioner 3" circuit diagram

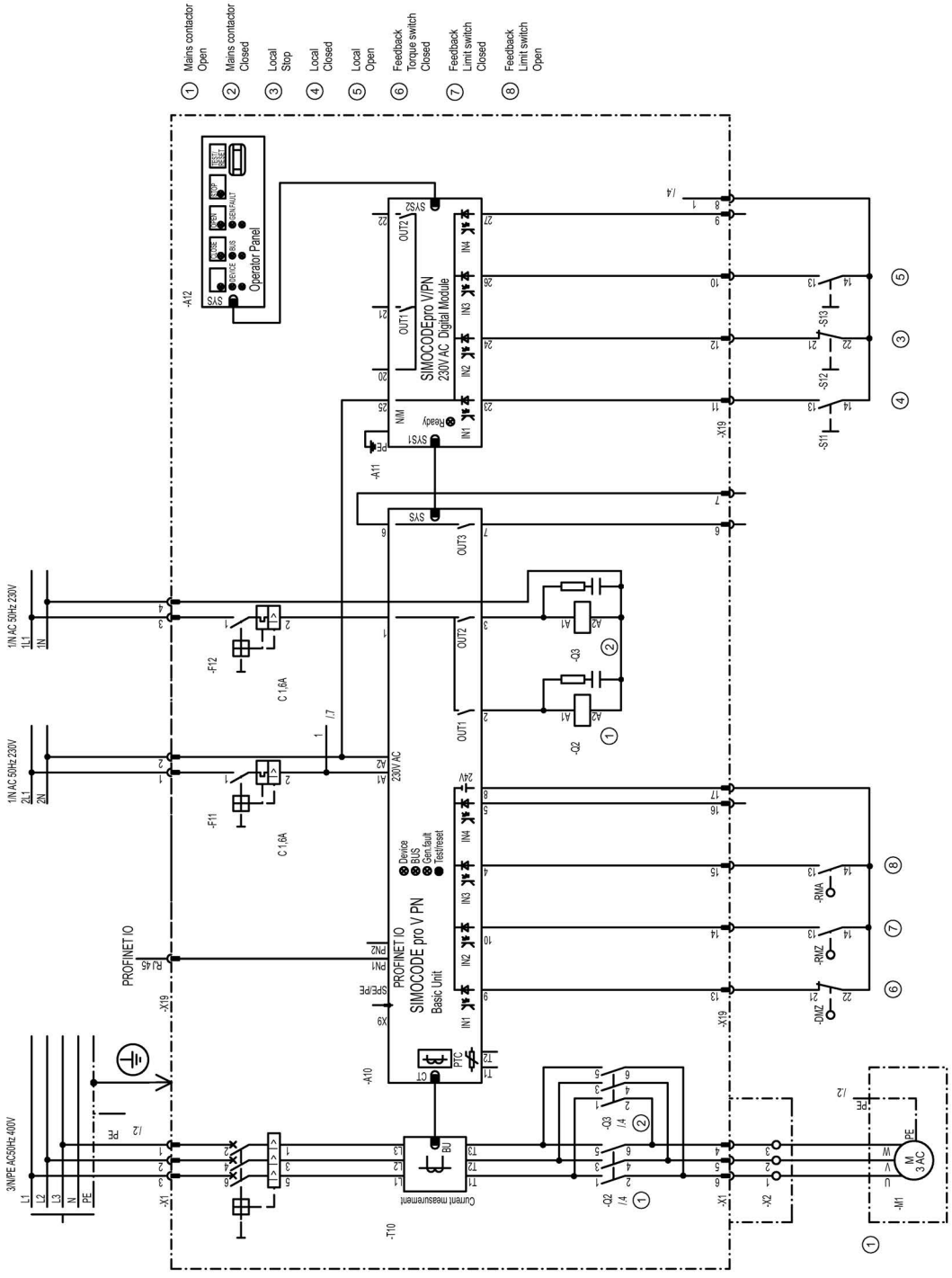


Figure 20-31 "Positioner 3" circuit diagram

20.13.6 "Positioner 3" function circuit diagram

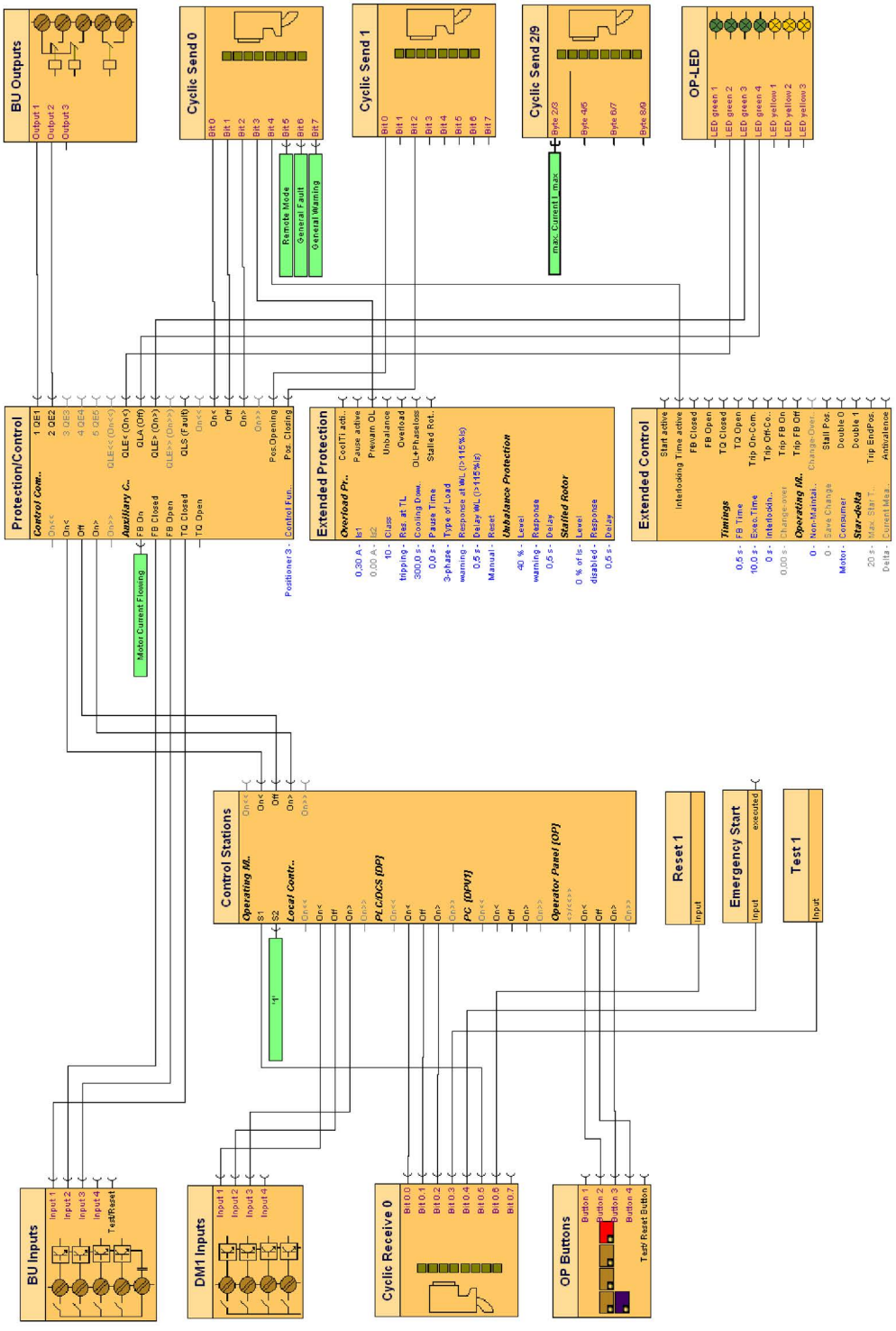


Figure 20-32 "Positioner 3" function circuit diagram

20.13.7 "Positioner 4" circuit diagram

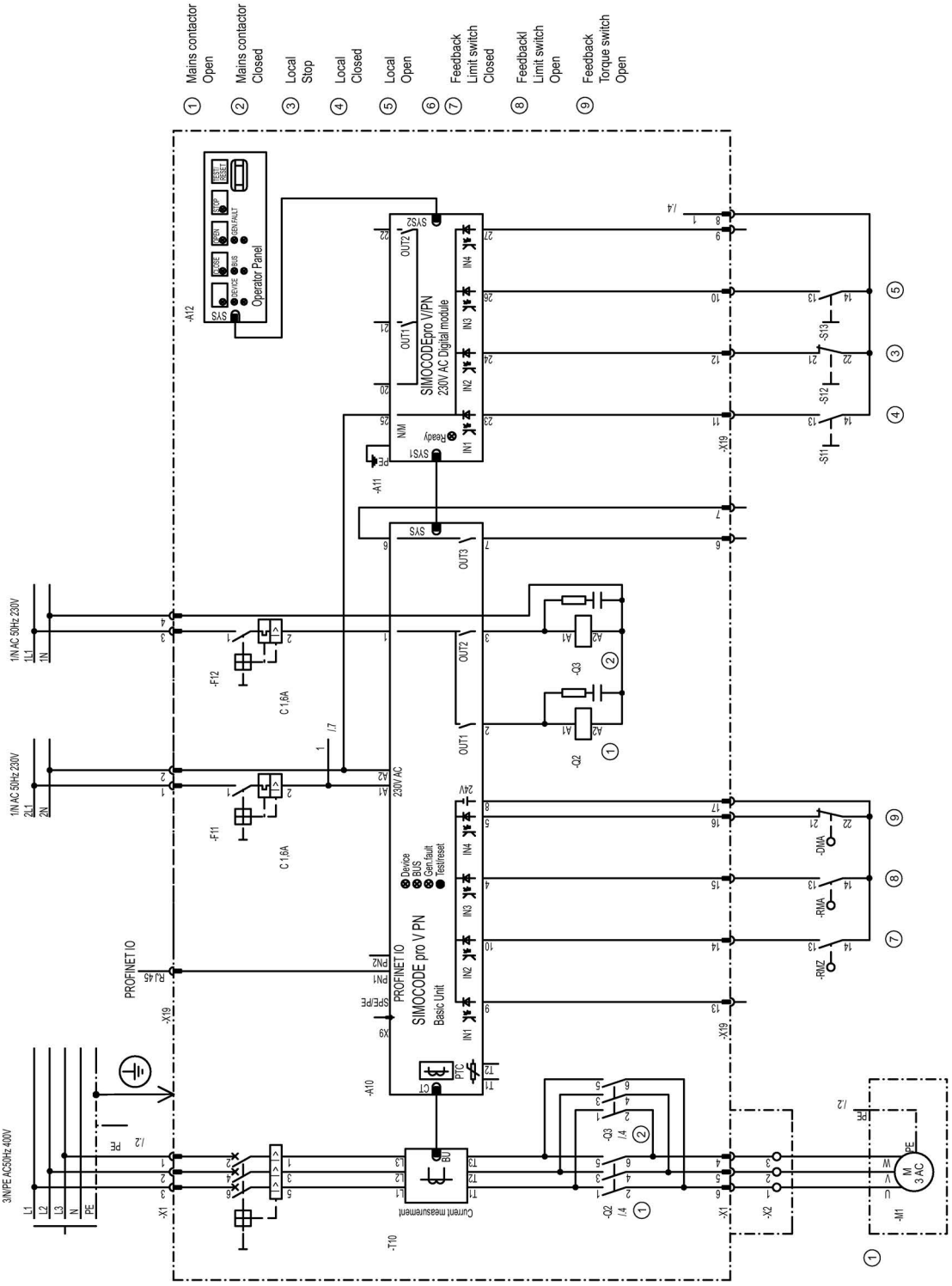


Figure 20-33 "Positioner 4" circuit diagram

20.13.8 "Positioner 4" function circuit diagram

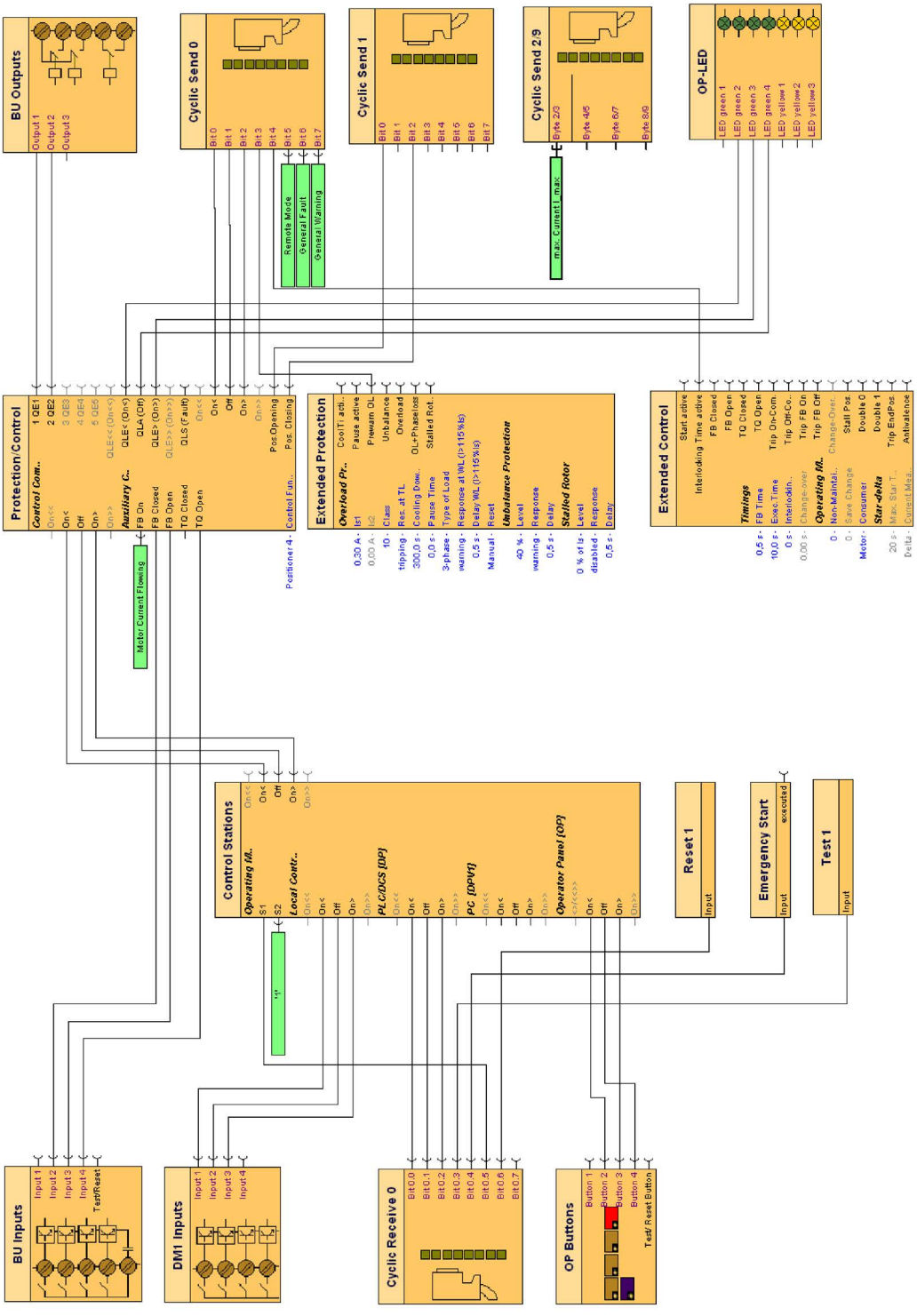


Figure 20-34 "Positioner 4" function circuit diagram

20.13.9 "Positioner 5" circuit diagram

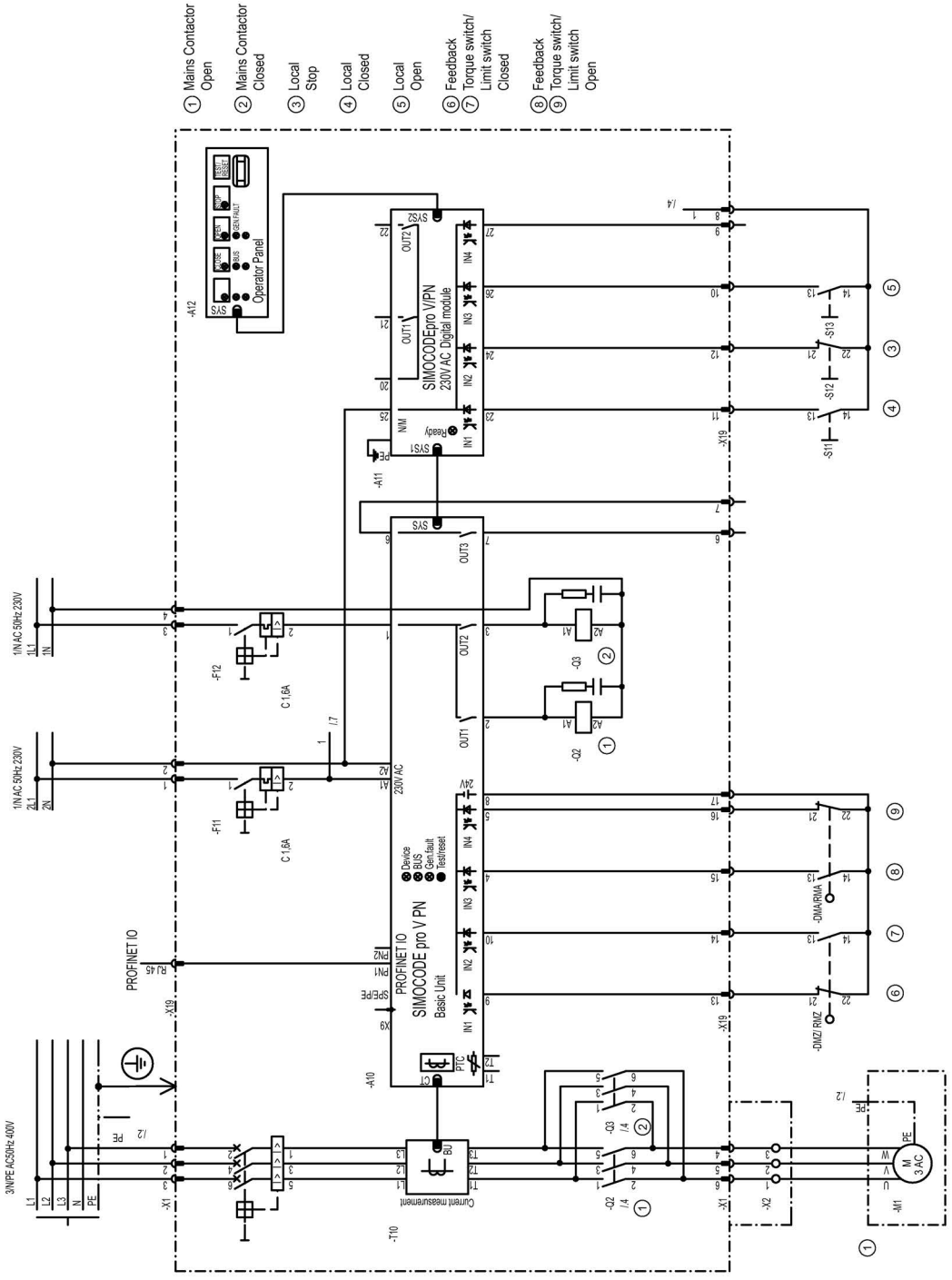


Figure 20-35 "Positioner 5" circuit diagram

20.13.10 "Positioner 5" function circuit diagram

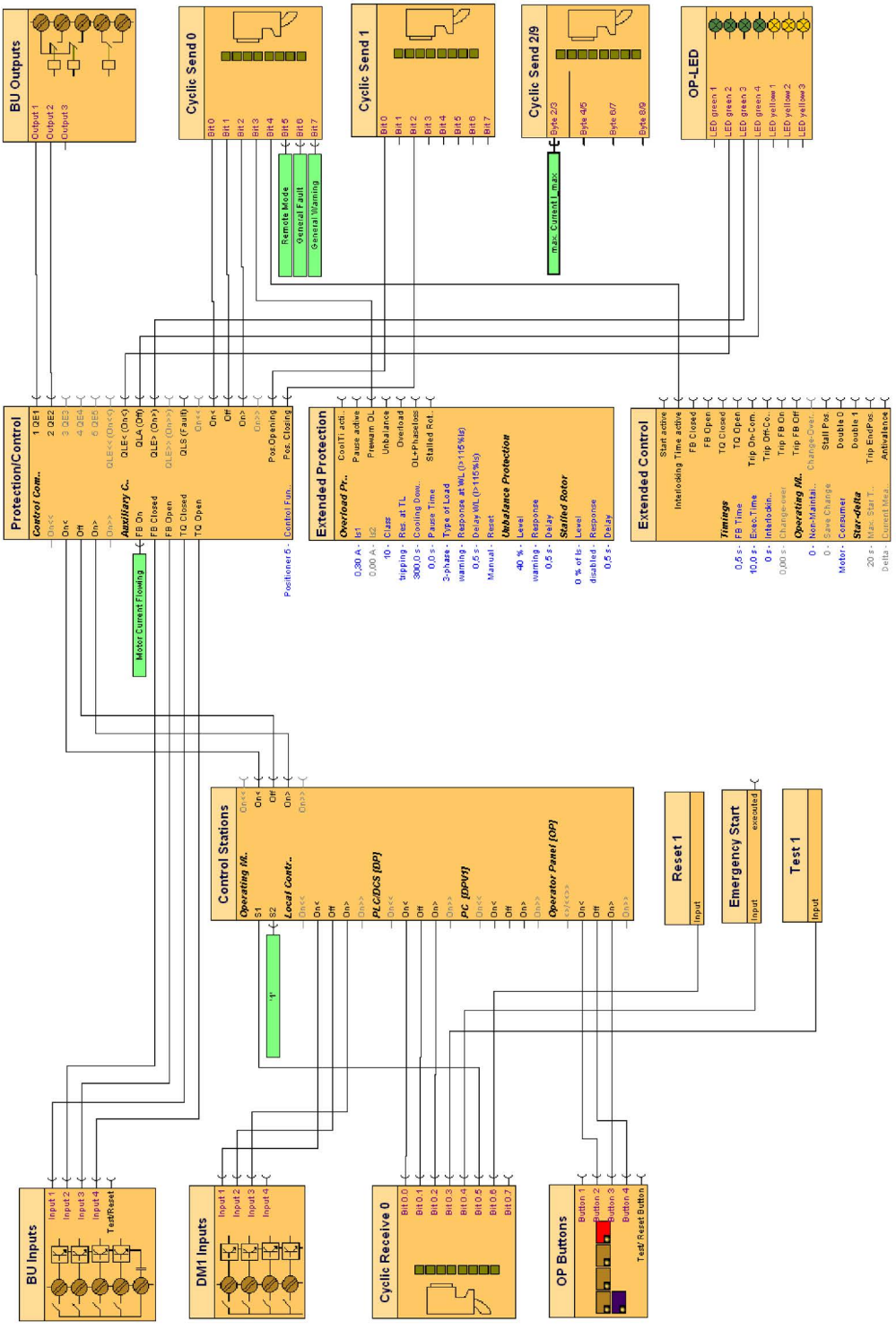


Figure 20-36 "Positioner 5" function circuit diagram

20.14 "Soft starter" (3RW402, 3RW403, 3RW404) example circuit

20.14.1 Circuit diagram "Soft starter" (example 3RW402, 3RW403, 3RW404)

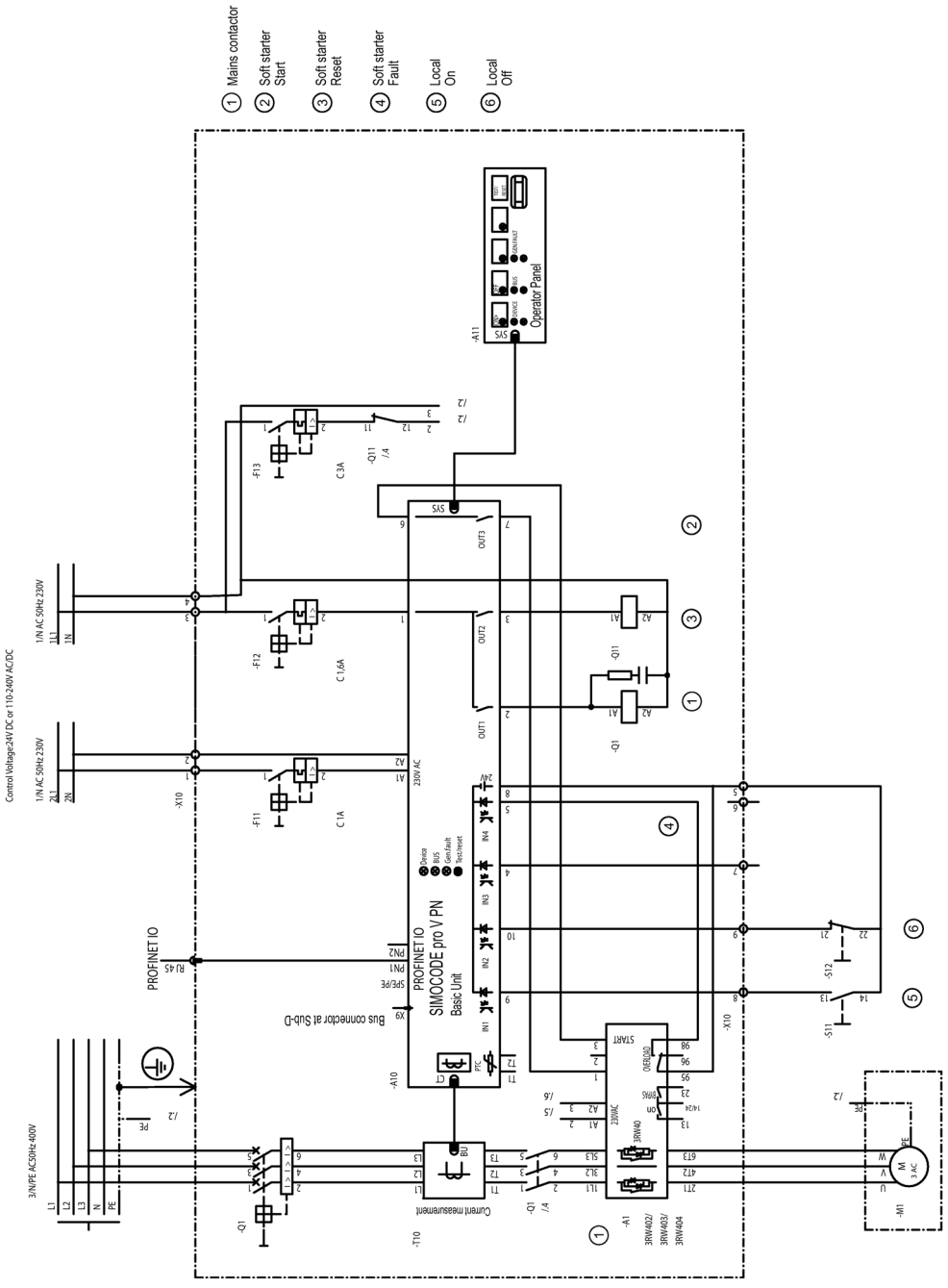


Figure 20-37 Circuit diagram "Soft starter" (example 3RW402, 3RW403, 3RW404)

20.14.2 Function circuit diagram "Soft starter" (example 3RW402, 3RW403, 3RW404)

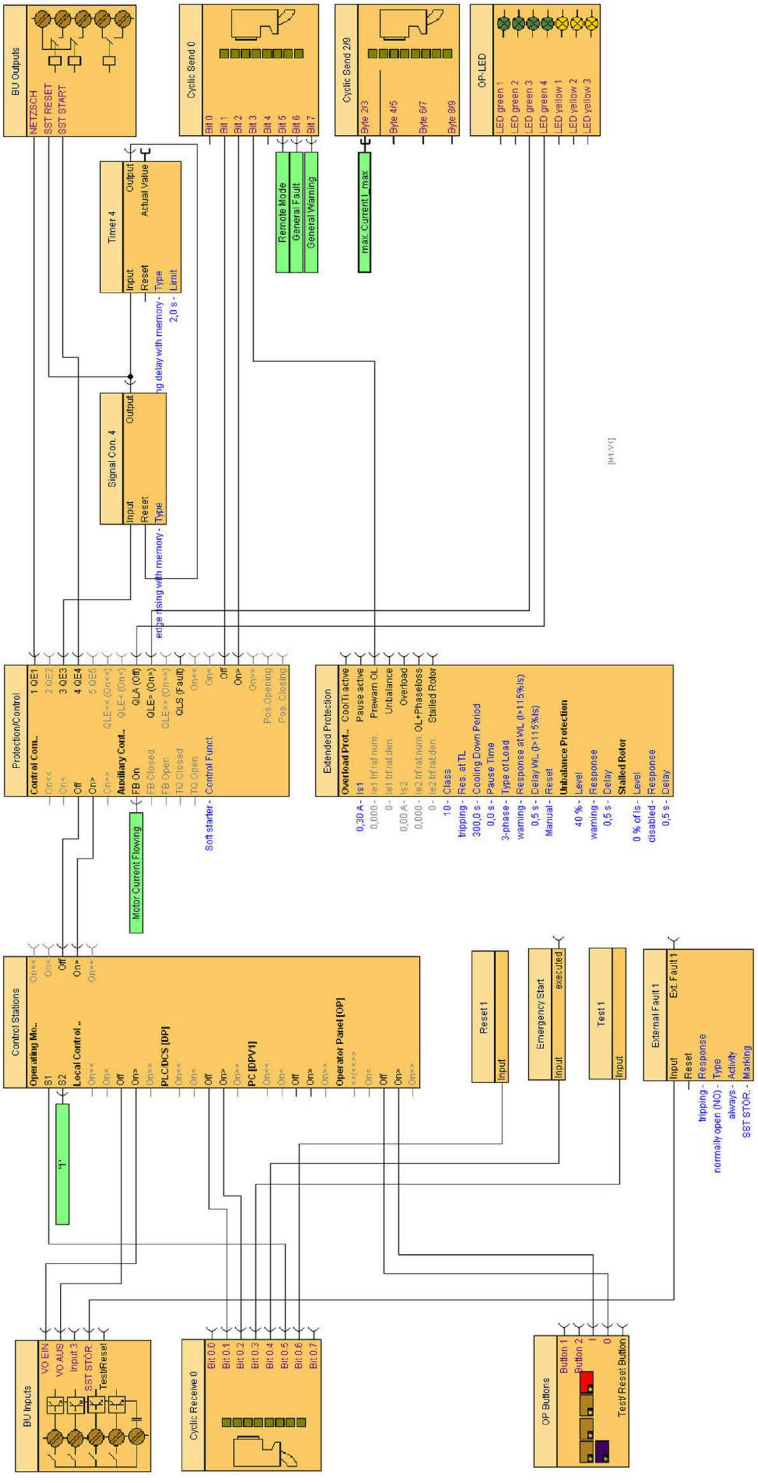


Figure 20-38 Function circuit diagram "Soft starter" (example 3RW402, 3RW403, 3RW404)

20.15 "Soft starter" (3RW405, 3RW407) example circuit

20.15.1 Circuit diagram "Soft starter" (example 3RW405, 3RW407)

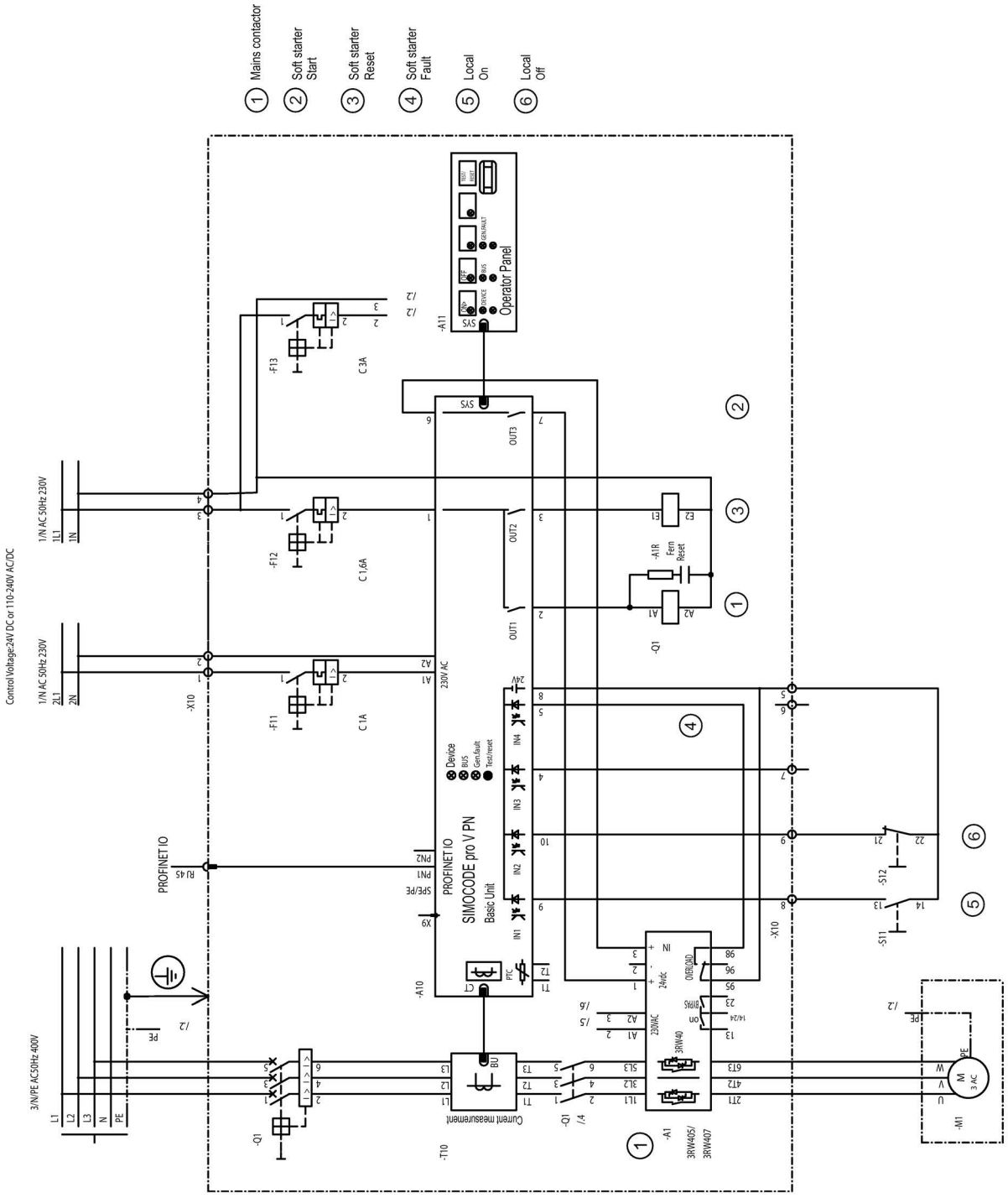


Figure 20-39 Circuit diagram "Soft starter" (example 3RW405, 3RW407)

20.15.2 Function circuit diagram "Soft starter" (example 3RW405, 3RW407)

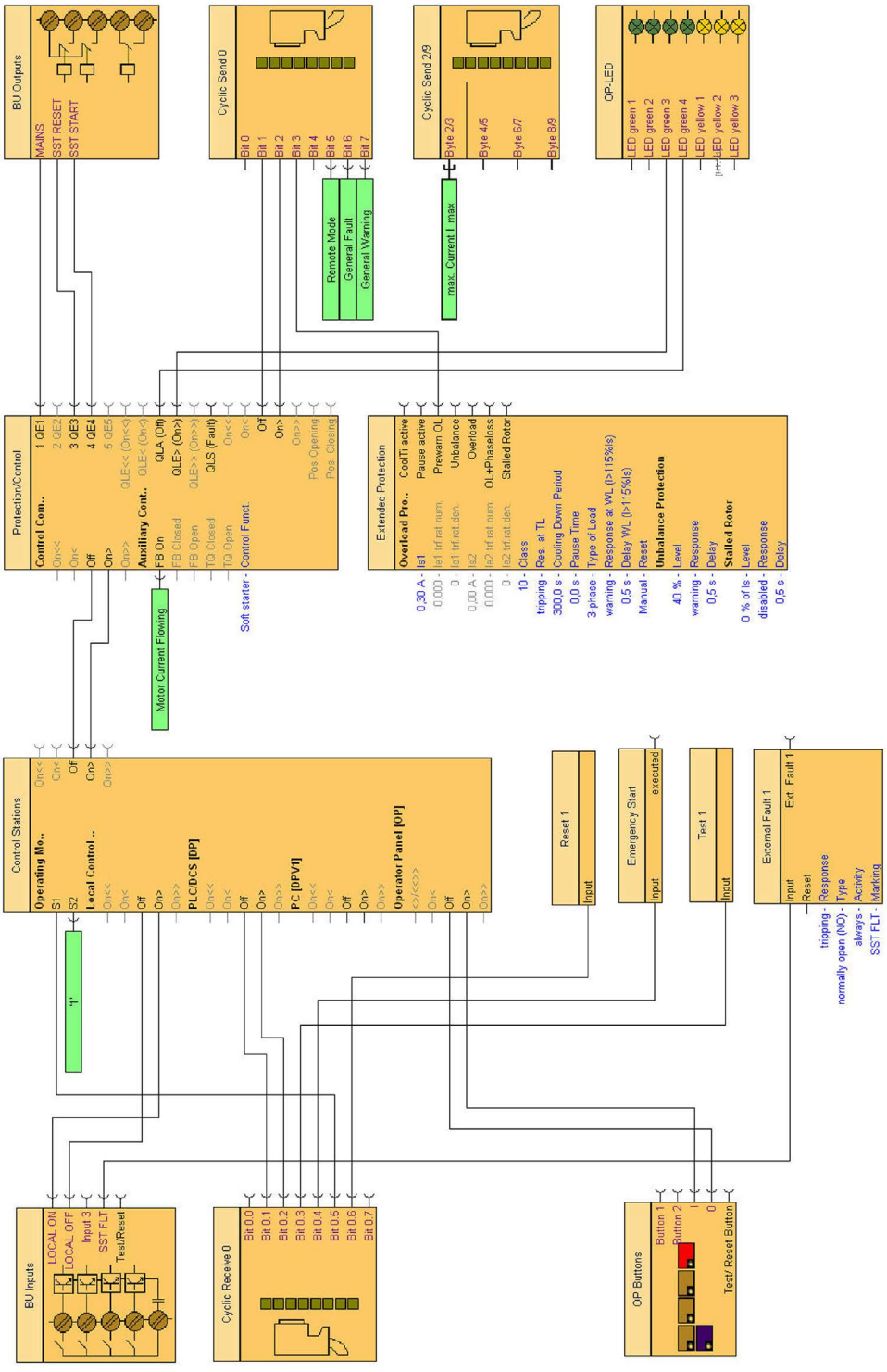


Figure 20-40 Function circuit diagram "Soft starter" (example 3RW405, 3RW407)

20.16 Circuit diagram "Soft starter with reversing contactor" (3RW402, 3RW403, 3RW404)

20.16.1 Circuit diagram "Soft starter with reversing contactor" (3RW402, 3RW403, 3RW404)

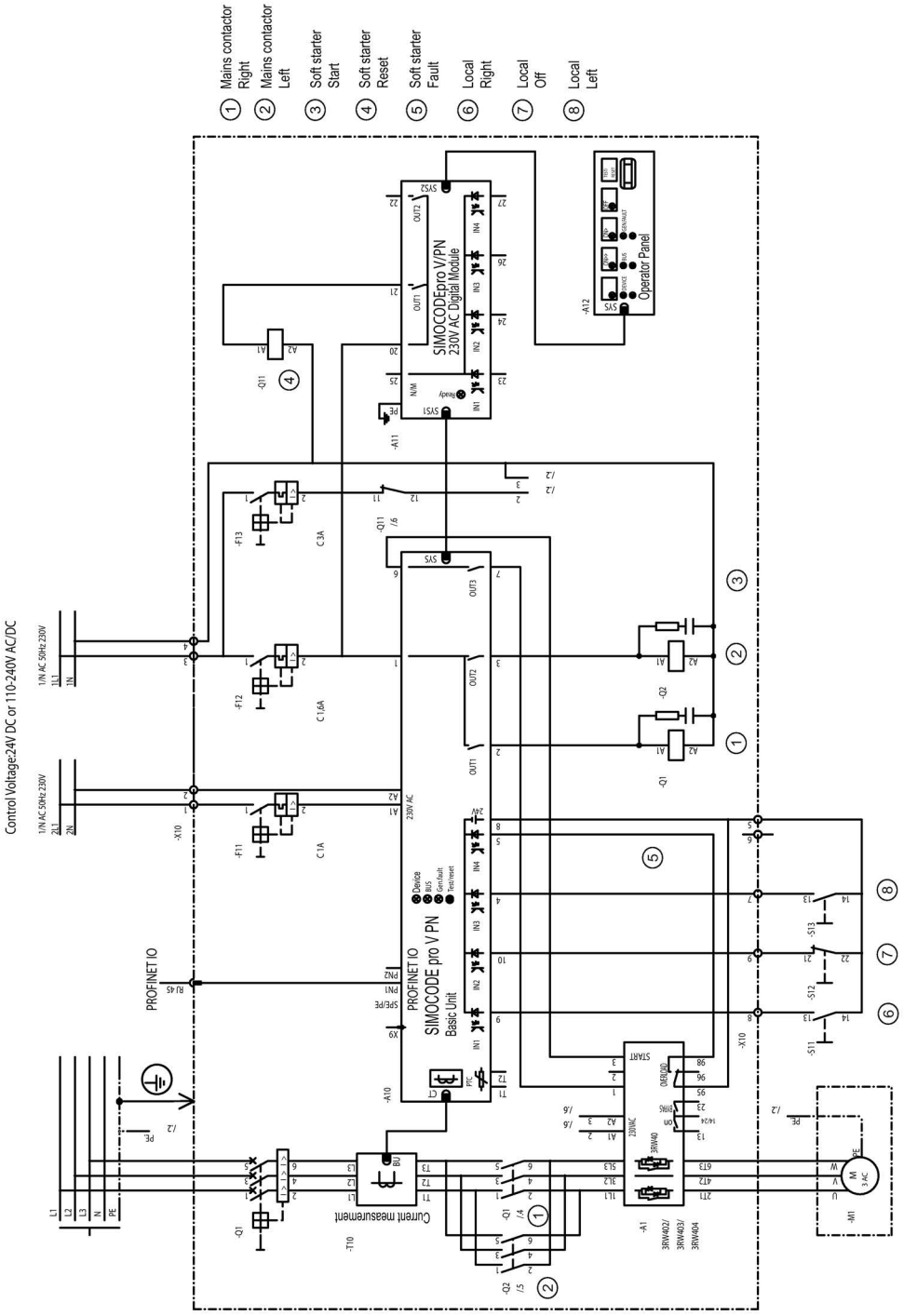


Figure 20-41 Circuit diagram "Soft starter with reversing contactor" (3RW402, 3RW403, 3RW404)

20.16.2 Function circuit diagram of "Soft starter with reversing contactor" (3RW402, 3RW403, 3RW404)

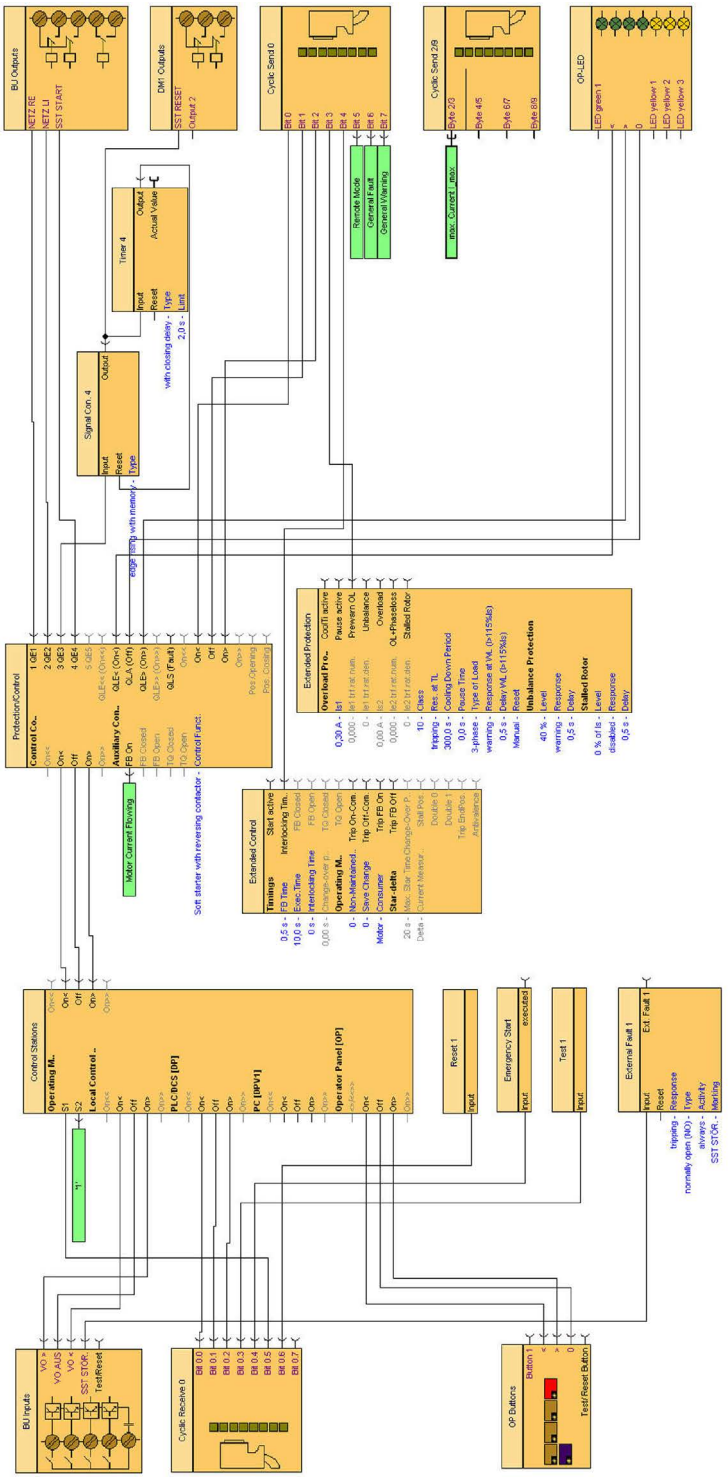


Figure 20-42 Function circuit diagram of "Soft starter with reversing contactor" (3RW402, 3RW403, 3RW404)

20.17 Example circuit "Soft starter with reversing contactor" (3RW405, 3RW407)

20.17.1 Circuit diagram "Soft starter with reversing contactor" (3RW405, 3RW407)

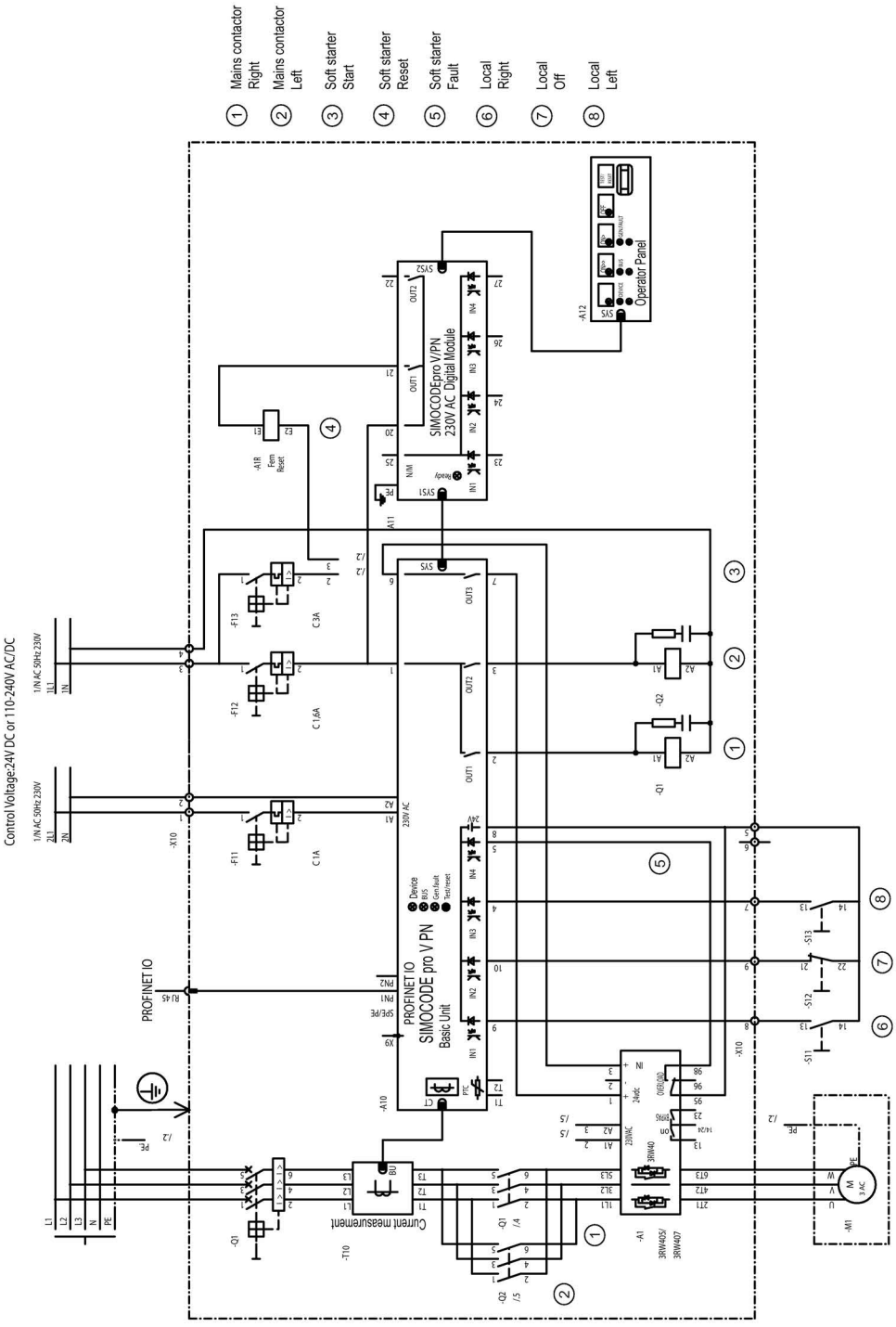


Figure 20-43 Circuit diagram "Soft starter with reversing contactor" (3RW405, 3RW407)

20.17.2 Function circuit diagram "Soft starter with reversing contactor" (3RW405, 3RW407)

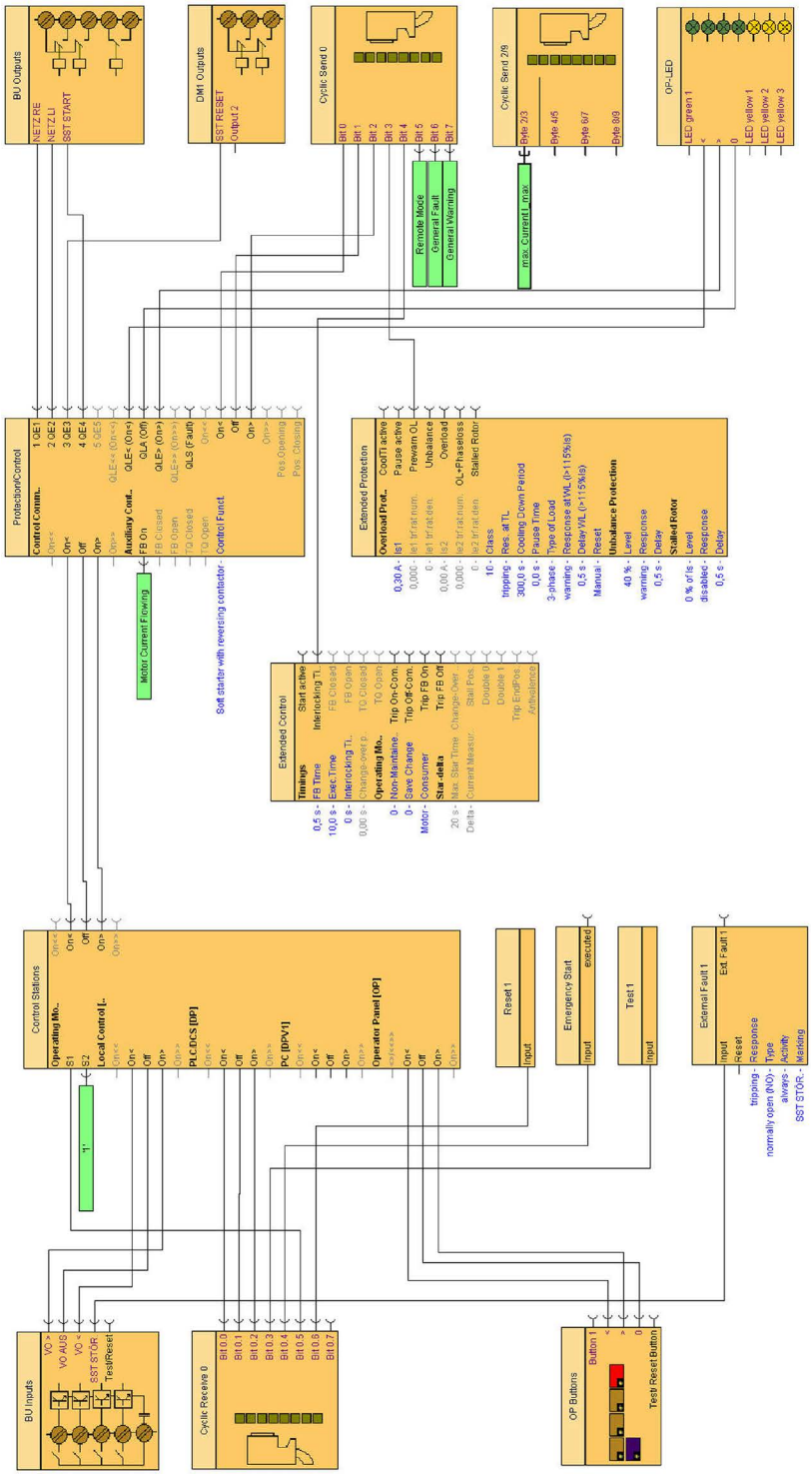


Figure 20-44 Function circuit diagram "Soft starter with reversing contactor" (3RW405, 3RW407)

20.18 Example circuit "Direct-on-line starter for 1-phase loads"

20.18.1 Circuit diagram "Direct-on-line starter for 1-phase loads"

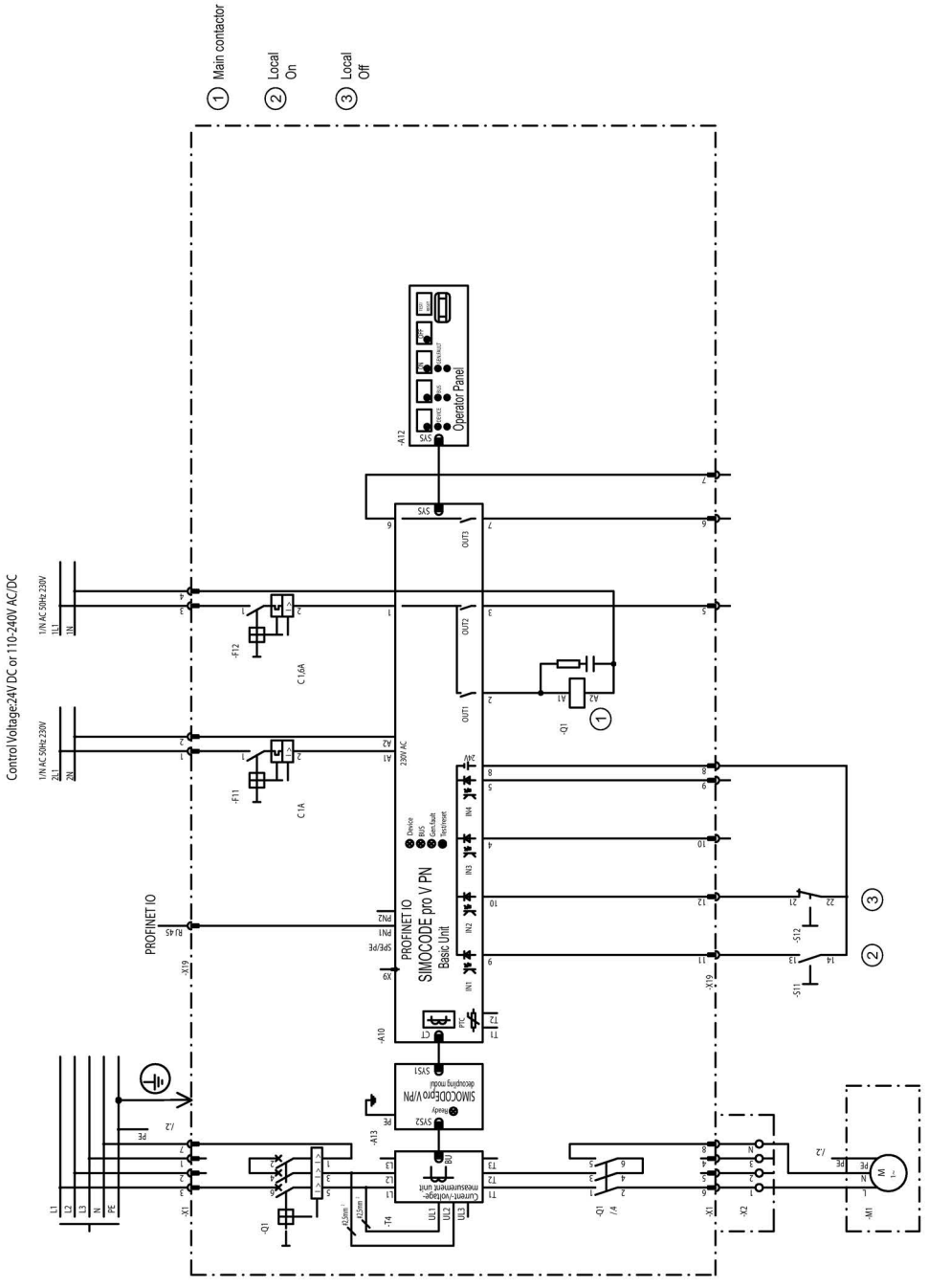


Figure 20-45 Circuit diagram "Direct-on-line starter for 1-phase loads"

20.18.2 Function circuit diagram "Direct-on-line starter for 1-phase loads"

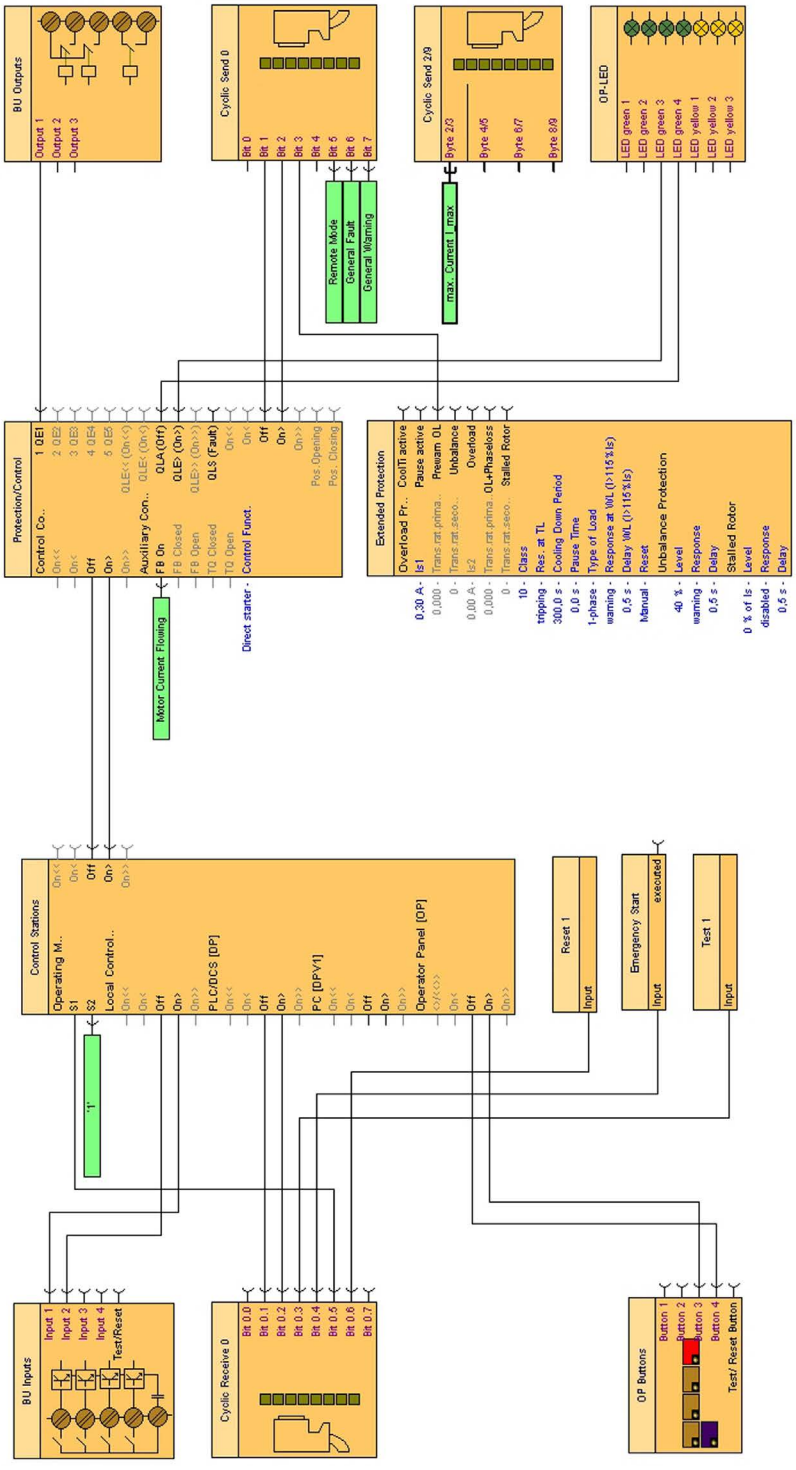


Figure 20-46 "Direct starter for 1-phase loads" function circuit diagram

Safety and commissioning information for EEx areas 21

In this chapter

In this chapter you will find safety and commissioning information for hazardous areas. It is imperative that you observe this information for the protection of any motors in hazardous areas.

Target groups

This chapter addresses the following target groups:

- Planners and configuring engineers
- Commissioning engineers
- Service and maintenance personnel

Required knowledge

You will require the following knowledge:

- Explosion protection
- **IEC 60079-14 / EN 60079-14 / DIN VDE 0165-1** Electrical equipment for locations with explosive gas atmosphere - Electrical installations in hazardous areas (except mines)
- **IEC 60079-17/EN 60079-17/DIN VDE 0165-10-1** Electrical equipment for locations with explosive gas atmosphere - Testing and maintenance of electrical installations in hazardous areas (except mines)
- **IEC 61241-14/DIN VDE 0165-2** Electrical equipment for use in the presence of combustible dust - Selection and installation
- **IEC 61241-17/DIN VDE 0165-10-2** Electrical equipment for use in the presence of combustible dust - Inspection and maintenance of electrical installations in hazardous areas (other than mines)
- **VDE 0118** Erection of electrical installations in mines
- **Betriebssicherheitsverordnung - BetrSichV (German Ordinance on Industrial Safety and Health)**

21.1 Information and standards

Information and standards

Type of protection EEx e and EEx d:

The overload protection and the thermistor motor protection of the SIMOCODE pro system comply with the requirements for overload protection of explosion-proof motors of the following types of protection:

- **EEx d "explosion-proof enclosure," e.g. according to DIN EN 50018 or DIN EN 60079**
- **EEx e "increased safety," e.g. according to DIN EN 50019 or DIN EN 60079-7.**

Increased danger in hazardous areas means it is necessary to carefully observe the following notes and standards:

- **IEC 60079-14 / EN 60079-14 / DIN VDE 0165-1** Electrical equipment for locations with explosive gas atmosphere - Electrical installations in hazardous areas (except mines)
- **IEC 60079-17/EN 60079-17/DIN VDE 0165-10-1** Electrical equipment for locations with explosive gas atmosphere - Testing and maintenance of electrical installations in hazardous areas (except mines)
- **IEC 61241-14/DIN VDE 0165-2** Electrical equipment for use in the presence of combustible dust - Selection and installation
- **IEC 61241-17/DIN VDE 0165-10-2** Electrical equipment for use in the presence of combustible dust - Inspection and maintenance of electrical installations in hazardous areas (other than mines)
- **VDE 0118** Erection of electrical installations in mines
- **German Ordinance on Industrial Safety and Health - BetrSichV.**

All 3UF7 devices are approved under Device Group I, Category "M2" (mining) and Device Group II, Category 2 in the area "GD" (areas in which explosive gas, steam, fog, air mixtures and inflammable dust are present):

- **BVS 06 ATEX F 001 Ex I (M2)** *)
- **BVS 06 ATEX F 001 Ex II (2) GD** *).

*)

Note

This safety and commissioning information is also valid for devices with certificate numbers BVS 04 ATEX F 003.

The devices are suitable for protecting motors in potentially explosive areas in accordance with the above standards.

Tests other than those legally stipulated (Ordinance on Industrial Safety and Health) are not required.

⚠ WARNING

Qualified personnel required

All work involved in connecting, commissioning and maintenance must be carried out by **qualified, responsible** personnel.

Improper handling may result in **serious personal injury and considerable material damage**.

21.2 Set-up and commissioning

21.2.1 Set-up and commissioning

Note

Please observe the following SIMOCODE pro operating instructions (enclosed with the devices):

Device	Order No.
Basic unit	3ZX1012-0UF70-3AA1
Digital module	3ZX1012-0UF73-1AA1
DM-F Local fail-safe digital module	3ZX1012-0UF73-1BA1
DM-F PROFIsafe fail-safe digital module	3ZX1012-0UF73-3BA1
Current measuring module	3ZX1012-0UF71-1AA1
Current / voltage measuring module	3ZX1012-0UF77-1BA1
You will also find the operating instructions for SIMOCODE pro at Manuals/operating instructions (http://www.siemens.com/sirius/manuals)	

21.2.2 Setting the rated motor current

Notes/examples

Set the 3UF7 to the rated motor current (according to the type plate or design test certificate of the motor).

Note

Pay attention to the trip class or the tripping characteristic of the 3UF7.

Choose the trip class so that the motor is thermally protected even with a blocked rotor.

The motor, cables, and contactor must be dimensioned for the selected trip class.

Note

Set the response of the overload protection to "Trip"!

Example

Motor 500 V, 50 / 60 Hz, 110 kW, 156 A, temperature class T3, time T_E = 11 s, I_A / I_s = 5.5:

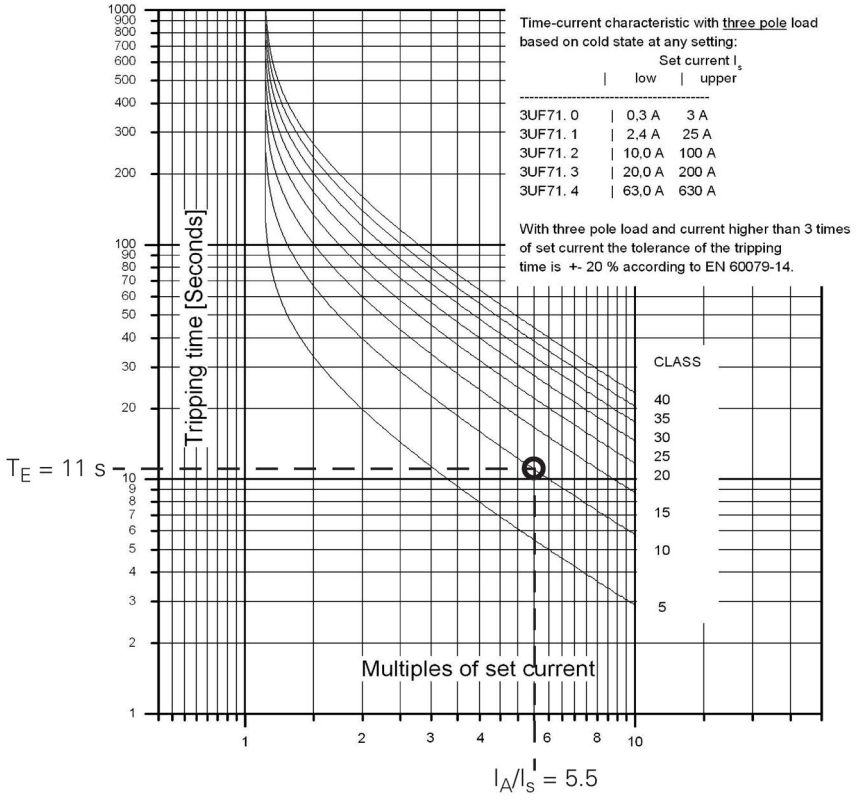


Figure 21-1 Tripping conditions of the EExe motor, selected: CLASS 10

21.2.3 SIMOCODE pro with thermistor input

On 3UF70, you can use temperature sensor type A with a characteristic according to IEC 60947-8 (DIN VDE 0660, part 303), DIN 44081 and DIN 44082.

Depending on the number of sensors, the following tripping and restart temperatures apply.

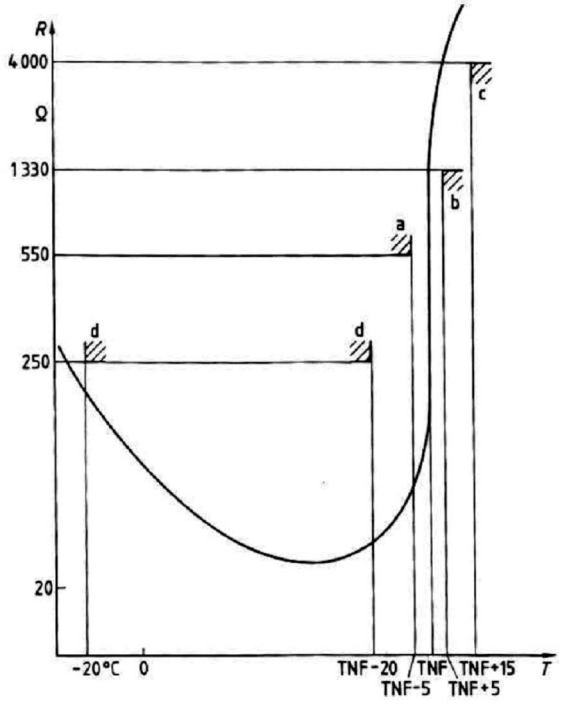


Figure 21-2 Typical characteristic curve of a type A sensor (logarithmic scale)

Depending on the number of sensors, the following tripping and restart temperatures will result based on the TNF (rated response temperature of the sensor):

Table 21- 1 Tripping and restart temperatures

	Tripping temperature	Restart temperature
3 sensors	TNF +4 K	TNF -7 K
6 sensors	TNF -5 K	TNF -20 K

The temperatures listed are limit values.

⚠ CAUTION

Response setting

Set the response for the activated thermistor to "Trip"!

21.2.4 Sensor circuit wiring

NOTICE
Installing the measuring circuit cables Lay the measuring circuit cables as separate control cables. It is not permissible to use the cores of the motor supply cable or other main supply cables. Shielded control cables should be used if extremely inductive or capacitive interference is expected as a result of power cables routed in parallel.

Maximum cable lengths of the sensor circuit cables:

Table 21- 2 Maximum cable length of the sensor circuit cables

Cable cross section	Cable lengths (single) at the thermistor input	
	Without short-circuit detection	With short-circuit detection 1)
2.5 mm^2	2800 m	250 m
1.5 mm^2	1500 m	150 m
0.5 mm^2	500 m	50 m
1) A short circuit in the sensor circuit will be detected up to these maximum cable lengths.		

Evaluating the short-circuit detection of the sensor cable is recommended.

If the short-circuit detection of the sensor cable is not evaluated, when commissioning or after modifications / maintenance work (assembly, disassembly) of the system, the sensor resistor must be measured using a suitable measuring instrument.

21.2.5 Short-circuit protection for type of coordination 2 according to IEC 60947-4-1

Short-circuit protection must be carried out by separately arranged overcurrent protection devices.

NOTICE
Fuse protection of the contactor for type of coordination 2 When combining with other contactors, observe the respective maximum fuse protection of the contactor for type of coordination 2.

21.2.6 Cable protection

NOTICE
Cable cross sections Avoid impermissibly high cable surface temperatures by correctly dimensioning the cross sections! Choose a sufficient cable cross section, especially for heavy-starting motors CLASS 20 to CLASS 40 (see Chapter Short-circuit protection with fuses for motor feeders for short-circuit currents up to 100 kA and 690 V (Page 652)).

21.2.7 Test

Testing - general information

SIMOCODE pro offers users a convenient method of checking the complete motor protection chain (incl. actuators and sensors such as contactors, circuit breakers, thermistors). This can be used, for example, for testing according to IEC 60079-17. The test encompasses a full function test. For this purpose, all three test phases are to be carried out (hardware test, current feedback, motor protection tripping, see below). The test can be carried out using the "TEST/RESET" buttons provided, or automatically via the bus. Due to existing self-test routines, tripping currents do not need to be injected in order to carry out testing.

Test phases

- Phase 1: Hardware test / lamp test (0 to 2 s):

  The hardware (e.g. the thermistor electronics) is tested, all LEDs and displays are activated, including the lamp control. Contactor controls remain unchanged.

- Phase 2: Hardware test results (2 s to 5 s):

  If there is a fault, the "HW fault basic unit" fault is triggered.

  If there is no fault:

  – The "GEN. FAULT" LED flashes when no main current is flowing.

  – The "GEN. FAULT" LED flickers if main current is flowing in all three phases (exception: with a "1-phase load" in one phase).

- Phase 3: Relay test (> 5 s):

  If testing is carried out with tripping, the contactor controls are deactivated.

The following table shows the test phases performed when the "TEST/RESET" button is pressed for the required length of time:

Table 21- 3 States of the status LEDs / contactor controls during testing

Test phase	State	Without main current		With main current	
		OK	Fault *)	OK	Fault
Hardware test / lamp test					
< 2 s	"DEVICE" LED	● orange	● green	● orange	● green
	"GEN.FAULT" LED	●	●	●	●
	Contactor control	Unchanged	Unchanged	Unchanged	Unchanged
	Show QL *)	●	●	●	●
Results of the hardware test / lamp test					
2 - 5 s	"DEVICE" LED	● green	● red	● green	● red
	"GEN.FAULT" LED	◑	●	⊗	●
	Contactor control	Unchanged	Deactivated	Unchanged	Deactivated
Relay test					
> 5 s	"DEVICE" LED	● green	● red	● green	● red
	"GEN.FAULT" LED	●	●	●	●
	Contactor control	Deactivated	Deactivated	Deactivated	Deactivated

● LED illuminated/switched on

◑ LED flashing

⊗ LED flickering

○ LED off

*) "Fault" only displayed after 2 s

21.2.8 Further safety guidelines

⚠ WARNING

Safety information for DM-F Local and DM-F PROFIsafe fail-safe digital modules

Pay attention to the safety notes in manual "Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852).

⚠ CAUTION

Using relay outputs for the protection function

For the protection function, only the relay outputs of the 3UF70 basic unit, of a monostable 3UF730 digital module or of a fail-safe 3UF732 / 3UF733 expansion module may be used!

⚠ WARNING

The 3UF7 is not suitable for installation in hazardous areas

The device may only be installed in a control cabinet with the minimum degree of protection of IP 4x.

If installed in hazardous areas, there must be no ignition hazard from the 3UF7. Appropriate measures must be taken (e.g. encapsulation).

⚠ WARNING

Electrical isolation required

When using SIMOCODE pro devices with a 24 V DC control voltage, electrical separation must be ensured using a battery or a safety transformer according to DIN EN 61558-2-6.

Note

The 3UF7 is not suitable for load-side operation on frequency converters.

21.2.9 Ambient conditions

Permissible ambient temperature range:

- Storage / transportation: -40 °C to +80 °C
- Operation: -25 °C to +60 °C; OPD: 0 °C to +60 °C.

21.2.10 Safety data

- SIL (IEC 61508): SIL 1
- PFDavg (IEC 61508) < 3.0 * 10^{-2}
- Repeat test: DIN EN 60079-17, Section 4.4

21.3 Maintenance and repairs

These devices are maintenance-free.

⚠ WARNING

Repairs

Repairs to the device may only be carried out by the manufacturer.

21.4 Warranty

Note

To meet the conditions of the warranty, you must observe the safety and commissioning instructions from the following operating instructions.

You will also find the operating instructions for SIMOCODE pro at Manuals/operating instructions (http://www.siemens.com/sirius/manuals)

Device	Order No.
Basic unit	3ZX1012-0UF70-3AA1
Operator panel	3ZX1012-0UF72-1AA1
Operator panel adapter	3ZX1012-0UF78-2BA1
Operator panel with display	3ZX3012-0UF72-2AA1
Digital module	3ZX1012-0UF73-1AA1
DM-F Local fail-safe digital module	3ZX1012-0UF73-1BA1
DM-F PROFIsafe fail-safe digital module	3ZX1012-0UF73-3BA1
Expansion modules	3ZX1012-0UF75-1BA1
Current measuring module	3ZX1012-0UF71-1AA1
Current / voltage measuring module	3ZX1012-0UF77-1BA1
Door adapter	3ZX1012-0UF78-1AA1
Decoupling module	3ZX1012-0UF71-5BA1
Initialization module	3ZX1012-0UF70-2AA1

21.5 Further information

You will find further information on the Internet:

- Internet (http://www.siemens.com/simocode)
- Information and Download Center (http://www.siemens.com/sirius/infomaterial)
- Product Information System (ProdIS) (http://www.siemens.com/sirius/support)
- Service and support (http://www.siemens.com/sirius/technical-assistance)
- ATEX (http://www.siemens.com/sirius/atex)
- Certificates (http://www.siemens.com/sirius/approvals)

See also

SIMOCODE pro operating instructions (http://www.siemens.com/sirius/manuals)

"Failsafe Digital Modules SIMOCODE pro Safety" manual (http://support.automation.siemens.com/WW/view/en/50564852)

Compartment identification (PROFINET)

22

In this chapter

This chapter provides information about how SIMOCODE pro is operated with an initialization module that is permanently installed in the switchgear.

Target groups

This chapter addresses the following target groups:

- Configuring engineers
- Commissioning engineers
- Technicians
- Service and maintenance personnel

Required knowledge

You will require the following knowledge:

- Basic general knowledge about SIMOCODE pro
- Knowledge about the "SIMOCODE ES" software

22.1 Introduction to compartment identification

Applications and advantages of compartment identification

The compartment identification described in this chapter is mainly used in application in which SIMOCODE pro is used in a withdrawable motor control center (MCC).

In withdrawable motor control centers, all components belonging to the motor feeder are grouped together as one unit in a switchgear-specific enclosure. In this way, a complete withdrawable module can be replaced very quickly and without isolating the MCC if a component is defective.

This principle is very often used in the various branches of the process industry. That is why a SIMOCODE pro with such a design is used in very many of its applications.

With the compartment identification mechanism, programming a SIMOCODE pro device when a withdrawable module is replaced is completely automated.

The initialization module (3UF7 902-0AA00-0) permanently installed in the switchgear contains a copy of the SIMOCODE device parameters and the device addressing, which are taken over completely automatically by the new SIMOCODE device after replacement of the withdrawable module.

In the future, no special knowledge of SIMOCODE will be necessary to replace withdrawable modules and at the same time the risk of incorrect parameterization in the SIMOCODE device is also reduced.

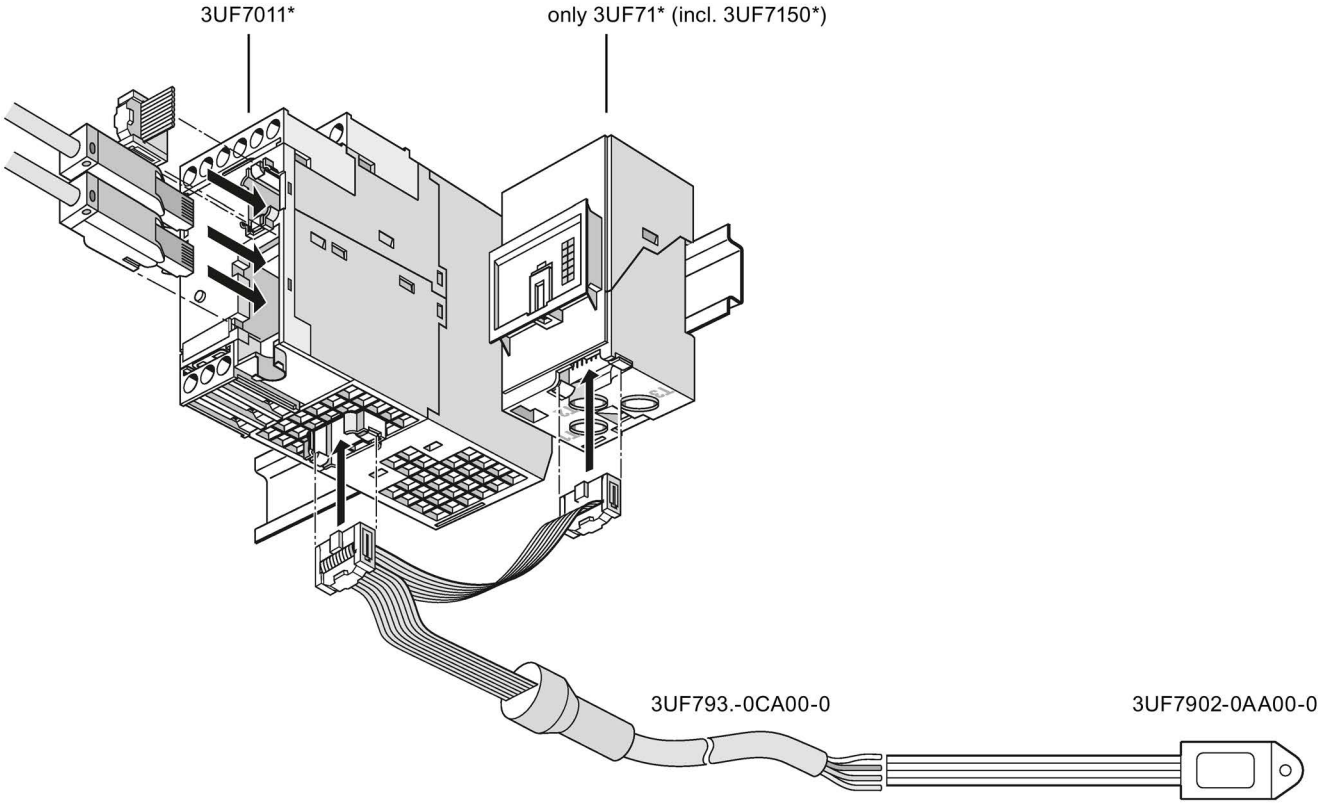


Figure 22-1 Compartment identification

A configuration such as the one shown above ensures,

- that, during device start-up of SIMOCODE pro V PN, the parameters, the device addressing, and the I&M data of the initialization module are loaded into the SIMOCODE basic unit
- when parameterizing SIMOCODE pro, the parameters, the device addressing, and I&M data are additionally also written into the initialization module.

This makes it simple for a user to change a withdrawable module without having to deal with further details of parameterization or address assignment.

The advantages of operation with a permanently installed initialization module in the switchgear:

- Device parameters and device addressing are automatically stored in the initialization module in the motor control center and loaded form this initialization module (initialized).
- It is possible to replace an MCC motor feeder without special knowledge of SIMOCODE pro.
- Manual addressing and parameterization are no longer necessary. The simplifies operation of the switchgear.

22.2 Hardware and software requirements for compartment identification

Basis unit versions

The "compartment identification" function is supported by the SIMOCODE pro V PN basic unit as from product version E01, firmware version V1.0.

NOTICE
Current measuring module required To operate SIMOCODE pro with an initialization module, a current measuring module or current/voltage measuring module must be connected to the basic unit.

Version of the operator panel with display

The "compartment identification" function is supported by operator panels with display as from product version *E07*.

SIMOCODE ES version

The "compartment identification" function is supported as from version "SIMOCODE ES 2007+SP4."

22.3 Operating compartment identification

Safety information

Note

Start-up with an initialization module

During device start-up with an initialization module, there must be no memory module in the system interface of the SIMOCODE basic unit.

If there is a memory module in the system interface of the SIMOCODE pro basic unit,

- the "Fault - parameterization" fault message will be output
- the "Gen.Fault" LED will flash red.

Note

Contacting of the initialization module

The initialization module must be contacted before or together with the voltage supply of the basic unit.

Loading parameters from the initialization module

As soon as contact has been established with the initialization module and the supply voltage of the basic unit has been switched on, the parameters of the initialization module are loaded into the basic unit. The previous parameterization of the basic unit is overwritten and the compartment identification is activated (see also the following topic "Autoactivation of compartment identification").

You can also track successful read-in of the parameters from the initialization module with the "initialization module read in" event in the SIMOCODE ES online functions.

Note

Connection of a SIMOCODE pro V PN basic unit with an empty initialization module

Because a SIMOCODE basic unit does not find any valid parameters on start-up with an empty initialization module, "Trip - Parameterization" is signaled. The "General Fault" LED of the basic unit flashes red.

Reparameterization of the device, e.g. with SIMOCODE ES, writes valid parameters to the basic unit and the initialization module again.

You can then acknowledge the fault message.

Saving parameters onto the initialization module

If an initialization module is connected to a SIMOCODE pro V PN basic unit, all parameters that are saved to the SIMOCODE pro V PN basic unit, e.g. SIMOCODE ES, are automatically copied into the initialization module.

You can also track successful writing of the parameters into the initialization module with the "initialization module programmed" event in the SIMOCODE ES online functions.

Parameter settings in the "SIMOCODE ES" software.

Technologically, the initialization module is handled like an extension module of SIMOCODE pro V PN.

To use the mechanism of compartment identification, choose the "initialization module" option in the "Device configuration" dialog box in the "SIMOCODE ES" software.

Autoactivation of compartment identification

If a SIMOCODE pro V PN basic unit detects a connected initialization module during device start-up, it will automatically load the parameters stored in it and will start with these parameters.

At the same time, the "Initialization module" parameter of the device configuration in the SIMOCODE pro V PN basic unit is activated so that on each new device start-up an initialization module is expected.

Note

Device start-up when the "initialization module" parameter is activated

If no initialization module is detected during device start-up, SIMOCODE pro will signal "Trip - Configuration fault." The "General Fault" LED of the basic unit flashes.

The basic unit can only be reset when the configuration error has been remedied by connecting an initialization module or when a configuration has been loaded into the device without an initialization module.

Deactivation of the compartment identification

To prevent SIMOCODE pro V PN from expecting an initialization module during device start-up, you clear the "Initialization module" check mark in the "Device configuration" dialog box. In this case, no initialization module must be connected to the SIMOCODE pro V PN when this configuration is downloaded into a SIMOCODE pro V PN basic unit.

A further way of deactivating the compartment identification is to reset the SIMOCODE pro V PN basic unit to the factory settings. Resetting is performed in the "Commands" dialog box. The parameter settings can then also be reloaded into the SIMOCODE pro V PN basic unit.

Commands

"Initialization module write protection on" command:

All contents of the initialization module are write-protected. This prevents any inadvertent changes to the contents of the initialization module and any parameter changes for the connected SIMOCODE pro V PN basic unit. An inadvertent change of parameters for a motor feeder is prevented. SIMOCODE pro signals successful execution of the command with the "initialization module write-protected" event.

"Initialization module write protection off" command:

With this command, you can remove the write protection of the initialization module.

"Initialization module write protection identification data on" command:

The device addressing stored in the initialization module and the I&M data (identification & maintenance) are write-protected. With this command, you can

- prevent inadvertent changes to the PROFINET parameters (e.g., device names) and the I&M data for the motor feeder.
- continue to make parameter changes in the initialization module as well as in the SIMOCODE pro V PN basic unit if the address data and I&M data are identical to the data already contained in the device when parameters are downloaded

SIMOCODE pro signals the successful execution of the command with the "initialization module identification data write-protected" event.

"Initialization module write protection identification data off" command:

With this command, you can remove the write protection of the identification data of the initialization module.

"Delete initialization module data" command:

With this command

- all contents of the initialization module are deleted
- The initialization module is reset to the as-delivered state.

SIMOCODE pro signals the successful deletion with the "Initialization module cleared" event.

On start-up with an empty initialization module, the basic unit signals "Fault - Parameterization". The "General Fault" LED of the basic unit flashes red.

Reparameterization of the device, e.g., with SIMOCODE ES, writes valid parameters to the basic unit and the initialization module again. You can then acknowledge the fault message.

Events

You can check the states of the initialization module by the following events (in the "Faults/warnings/events" dialog box of the "SIMOCODE ES" software):

- Initialization module write-protected
- Initialization module write-protected, parameter changes not allowed
- Initialization module identification data write-protected
- Initialization module read in
- Initialization module programmed
- Initialization module cleared.

See Chapter Alarm, fault, and system events for compartment identification (Page 730) or Chapter Alarm, fault, and system events (Page 501)).

22.4 Mounting, wiring, interfaces, compartment identification

Mounting the initialization module in the switchgear

Mounting the initialization module with the mounting lugs in the switchgear

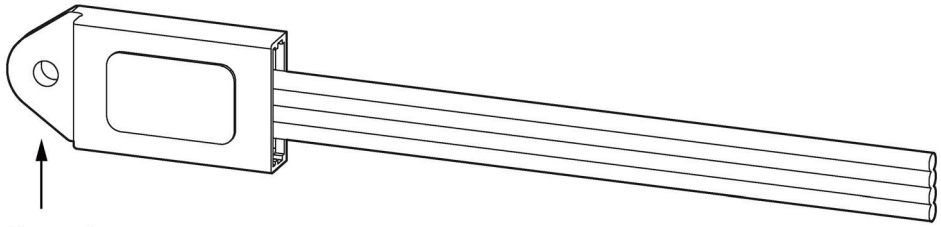


Figure 22-2 Mounting the initialization module

Wiring the initialization module

Unlike the other expansion components of the system, the initialization module does not have a connector. It is intended for installation in the fixed part of the switchgear. Connect the initialization module to the control connector of a motor control center on the switchgear side using the four connecting wires.

On the mating side, there is a withdrawable module to whose control connectors the corresponding four connecting wires of the Y connecting cable are connected (see figure).

Connect each of the wires that are of the same color on the initialization module and the Y connecting cable.

NOTICE
Note the correct colors!
Incorrect wiring can destroy the initialization module.

Note

Cable routing

When wiring the initialization module make sure the individual conductors are routed as close together as possible (ribbon cable).

The entire length of the connecting cable, including the wiring to the initialization module, must be exceed 3 m.

NOTICE
Maximum length of connecting cables
The total length of all connecting cables must not exceed 3 m on either of the system interfaces of the basic unit!

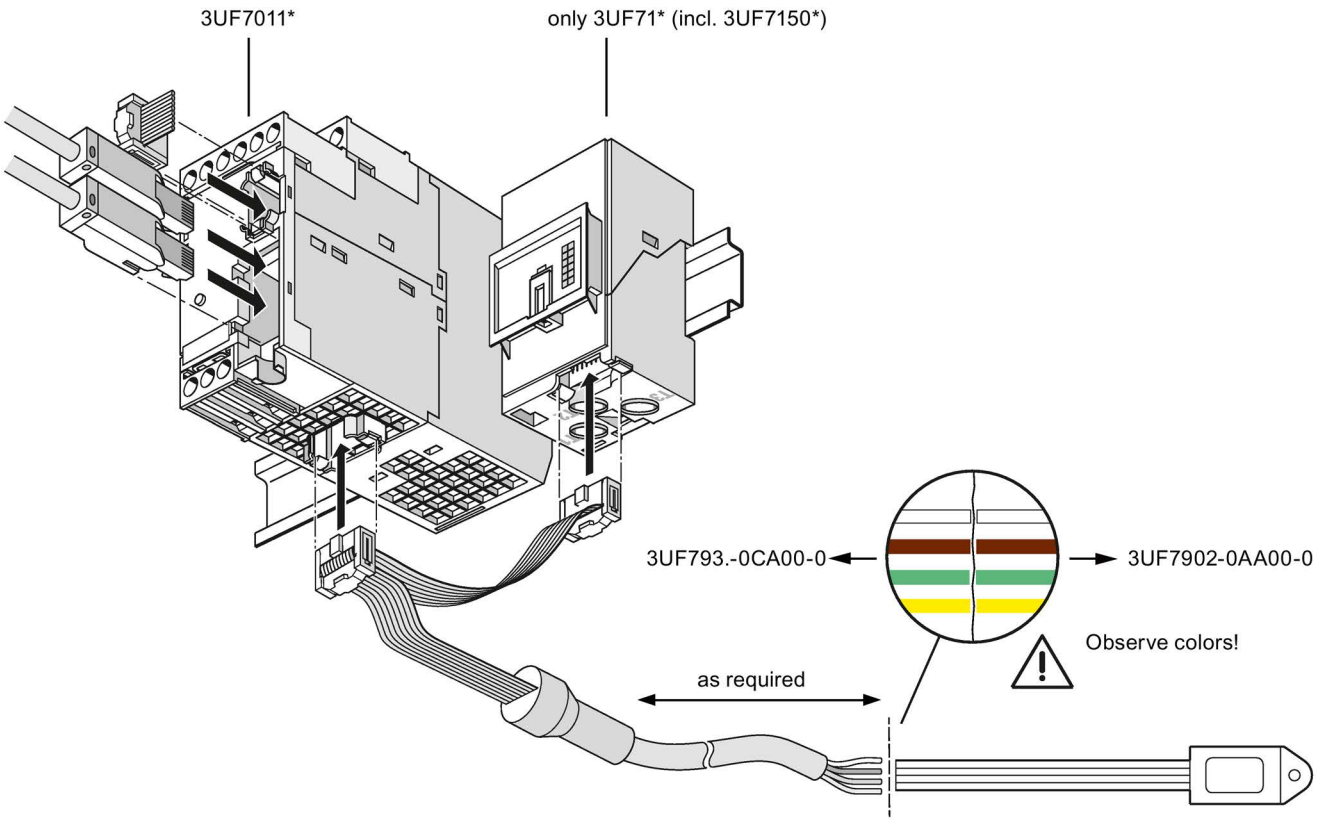


Figure 22-3 Wiring the initialization module

Connecting the Y connecting cable to the basic unit and to the current measuring module or to the current / voltage measuring module

- Connect the connector in the middle of the Y connecting cable (1) on the basic unit
- Connect the connector at the end of the Y connecting cable (2) to a current measuring module or current / voltage measuring module
- If you are using a decoupling module:
  - Connect the connector at the end of the initialization cable (2) on the decoupling module
  - Connect the decoupling module with a system interface connecting cable to the current measuring module or current / voltage measuring module

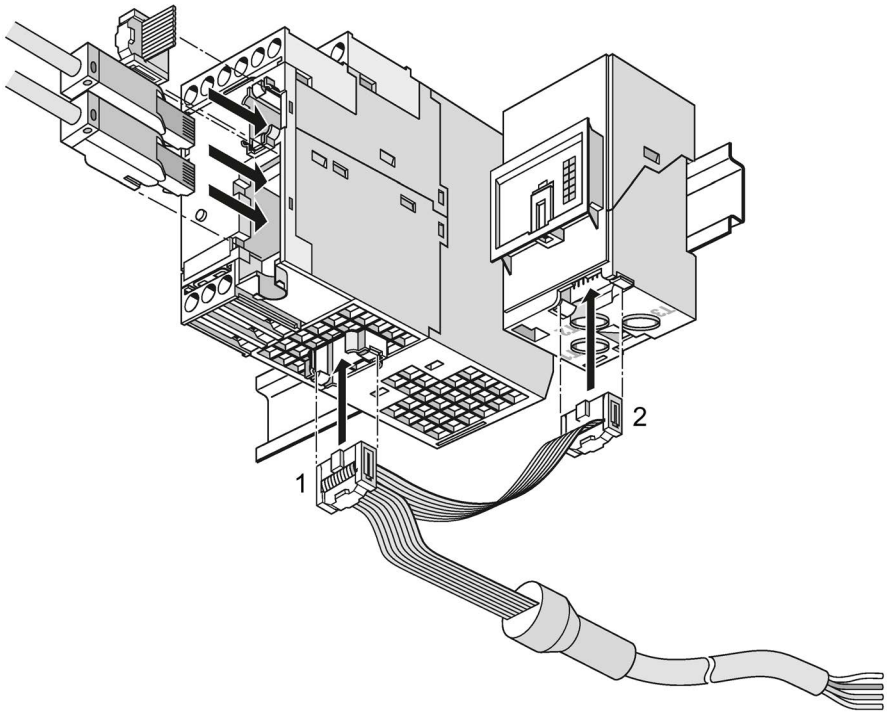


Figure 22-4 Connecting the Y connecting cable to the basic unit and to the current measuring module or to the current / voltage measuring module

22.5 Commissioning and service compartment identification

General safety information

Note

Operating instructions

During commissioning and service work, also heed the relevant "Initialization module" operating instructions!

You will find the operating instructions for SIMOCODE pro at Manuals/operating instructions (http://www.siemens.com/industrial-controls/manuals)

Commissioning the initialization module

Sequence for initial start-up of a new SIMOCODE pro basic unit and a new initialization module

Step	Description
1	Connect the SIMOCODE pro V PN basic unit to the planned expansion modules and to the initialization module.
2	Switch on the power supply. The following LED states result: • The "DEVICE" LED lights up green • The "BUS" LED lights up or flashes green when the bus is connected • The "GEN.FAULT" LED flashes red. At the same time, the "Fault - Parameterization" fault message is output.
3	Parameterize SIMOCODE pro with a PC with the SIMOCODE ES software installed. For this, connect the PC / PG to the system interface with the PC cable (see the figure below) or to the basic unit via "PROFINET."
4	Acknowledge the pending fault either locally on the device or via the SIMOCODE ES software by means of the "TEST/RESET button".

Sequence for initial start-up of a new SIMOCODE pro V PN basic unit and a new initialization module

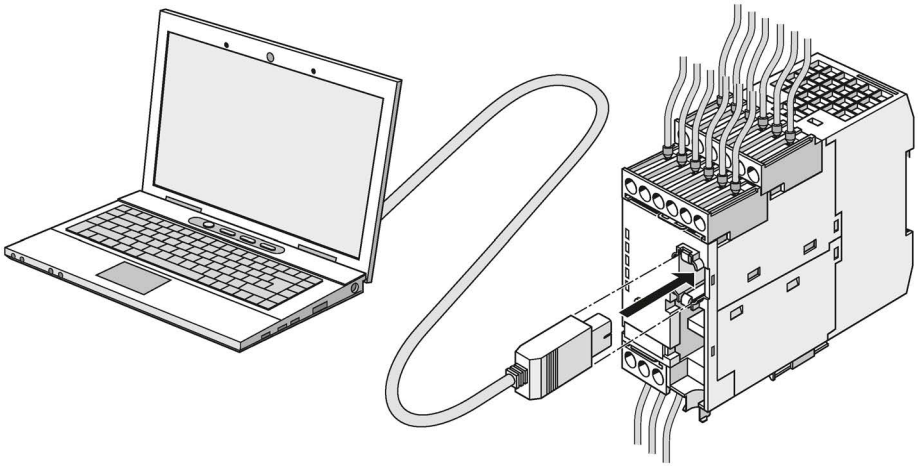


Figure 22-5 Connecting a PC to the SIMOCODE pro V PN basic unit

22.6 Alarm, fault, and system events for compartment identification

Events

Table 22- 1 Alarm, fault, and system events

Event	Description	Troubleshooting
Initialization module write-protected	The initialization module is completely write-protected.	Deactivate write protection of the initialization module
Initialization module write-protected, parameter changes not allowed	The initialization module is completely or partially write-protected. Reparameterization of SIMOCODE pro is denied because the initialization module is write-protected.	Deactivate write protection of the initialization module
Initialization module identification data write-protected	The device addressing and the I&M data in the initialization module are write-protected. Parameterization will only be accepted by SIMOCODE if the new parameter set is identical to the data stored in the initialization module at that time.	• Select a parameterization with identical addressing and I&M data • Deactivate the partial write protection of the initialization module
Initialization module read in	The parameters of the initialization module were read into SIMOCODE.	-
Initialization module programmed	The reparameterization was accepted in the initialization module.	-
Initialization module cleared	The initialization module was cleared and is now back in the as-delivered state.	-

22.7 Dimension drawings compartment identification

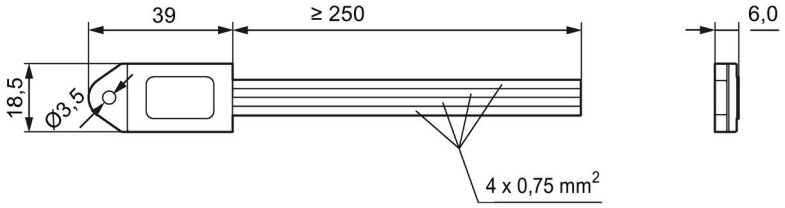


Figure 22-6 Dimension drawing initialization module

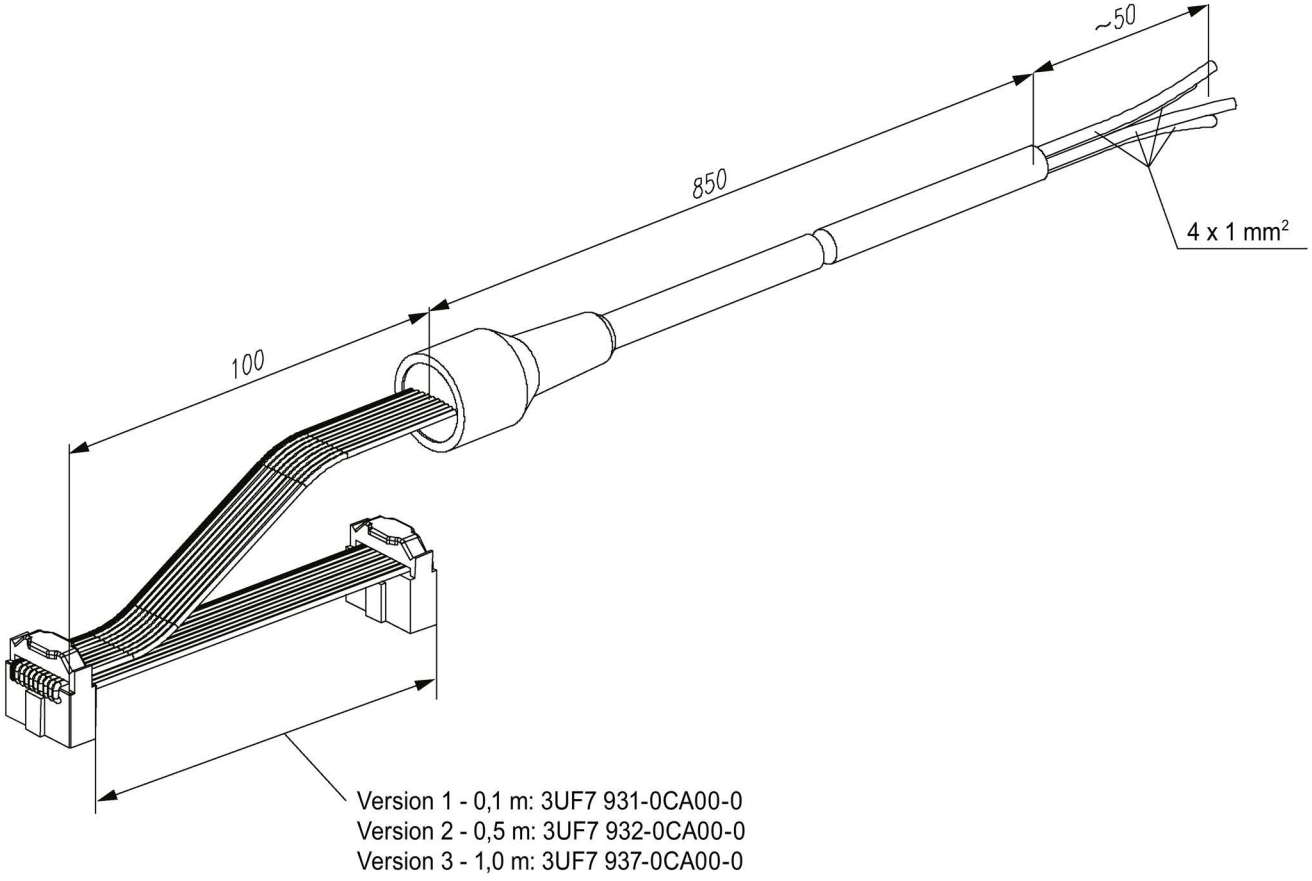


Figure 22-7 Dimension drawing Y connecting cable

List of abbreviations

A

A.1 List of abbreviations

Overview

Table A- 1 Guide to the abbreviations

Abbreviation	Term
AM	Analog module
API	Application Process Identifier
AS	Alarm switch
ATEX	"Atmosphère explosible" according to ATEX Directive 94/9/EC
AWG	American Wire Gauge
Acycl.	Acyclic
OP	Operator panel
OPD	Operator Panel with Display for SIMOCODE pro
OPO	Operational protection OFF
CP	Communications Processor
CPU	Central Processing Unit
DCM	Decoupling module
DIP	Dual In-Line Package
DM	Digital module
DM-F	Fail-safe digital module (DM-FL or DM-FP)
DM-FL	DM-F Local fail-safe digital module (F Local digital module)
DM-FP	DM-F PROFIsafe fail-safe digital module (F-PROFIsafe digital module)
TO	Torque open
TC	Torque closed
DP	Distributed peripherals
DS	Data record
DTM	Device Type Manager
EEx	European Norm EXplosion-proof: Specifies the protection classes for categorizing motors for use in hazardous areas.
ex	Explosion-proof
EM	Ground-fault module
EMF	Electromotive force
EMC	Electromagnetic compatibility
F-CPU	Fail-safe CPU (controller)
FMS	Fieldbus Message Specification
BU	Basic unit

Abbreviation	Term
GSD	Generic station description files
HMI	Human-Machine Interface
AUXS	Auxiliary switch
I&M	Identification and Maintenance
InM	Initialization module
IT	Isolation-Terre (isolation ground)
IM	Current measuring module
MAC	Media Access Control
MLFB	Machine-readable product designation
MRP	Media Redundancy Protocol
NTC	Negative temperature coefficient (resistance dependent on temperature)
NTP	Network Time Protocol
OB	Organization block
OSSD	Part of the electro-sensitive protective equipment (ESPE) that is connected to the machine control system and that switches to the OFF state if the sensor part is tripped during operation for the intended purpose.
PCS	Process Control System
PDM	Process Device Manager
PELV	Protective Extra Low Voltage
PFD	Probability of failure of demand: Probability of dangerous failure of a safety function on demand
PFDavg	Mean probability of dangerous failure of a safety function on demand
PFHD	Probability of dangerous failure per hour: Average probability of hazardous failure occurring each hour
PG	Programming device
PL	Performance Level
PCS	Process Control System
PROFINET	Process Field Network
PTC	Positive temperature coefficient (resistance dependent on temperature)
PZ	Pozidriv
FB	Feedback
FO	Feedback open
TPF	Test position feedback
FC	Feedback closed
SELV	Safety Extra Low Voltage
GF	General fault, control function
SIL	Safety Integrity Level
SFB	System function block
SFC	System function
SNMP	Simple Network Management Protocol
PLC	Programmable logic controller
Th	Thermistor
TM	Temperature module
T_{OFDT}	Total one fault delay time (maximum response time when error is present)

Abbreviation	Term
T_{WCDT}	Total worst case delay time (maximum response time in error-free state)
UA	Unified Architecture
UM	Current / voltage measuring module
UVO	Undervoltage off
USI	User Structure Identifier
LC	Local control
Cycl.	Cyclic

Glossary

Analog module (AM)

The analog module provides a way of optionally extending the basic unit with analog inputs and outputs (0/4 mA - 20 mA). This makes it possible to measure and monitor any arbitrary process variables which can be mapped onto a 0/4 mA to 20 mA signal. The automation system has free access to the measured process variables.

ATEX

French abbreviation for "atmosphère explosible" (explosive atmosphere).

ATEX is used as a synonym for the two directives of the European Communities covering explosion protection, i.e. the ATEX product directive 94/9/EC and the ATEX workplace directive 1999/92/EC.

Basic unit (BU)

The basic unit is the fundamental component of the SIMOCODE pro system. It is always necessary when SIMOCODE pro is used. It has an enclosure width of 45 mm and detachable terminals

It contains all functions and requirements for motor protection, motor control, diagnostics, and monitoring.

Baud rate

The baud rate is the speed at which data is transferred and indicates the number of transmitted bits per second (baud rate = bit rate).

Bus

A common transmission path with which all stations are connected. It has two defined ends.

Cascade input

Safe, 1-channel input of a safety relay, e.g. DM-F LOCAL and DM-F PROFIsafe. Internally, this input is evaluated like a sensor signal. If no voltage is present, the safety relay trips the enabling circuits (outputs) in a safety-related way.

Class

Unit for the trip class. Indicates the maximum tripping time in which SIMOCODE must trip at a current that is 7.2 times the value of the set current Is in a cold state (motor protection according to IEC 60947). If Class 10 is set for SIMOCODE pro, for example, it is ensured that the (cold) motor will switch off after 10 seconds if a current occurs that is 7.2 times the set current. The trip class can be set to 8 different settings ranging from Class 5 to Class 40.

Connecting cable

Connecting cables are necessary for connecting the individual basic units with their current measuring modules and, if required, with their expansion modules or operator panels. They are available in various versions and lengths (ribbon cable 0.025 m, 0.1 m, 0.3 m, 0.5 m; round cable 0.5 m, 1.0 m, 2.5 m).

Notice

Maximum length of connecting cables

The total length of all connecting cables must not exceed 3 m per system!

Contactor

Electromagnetically operated low-voltage switch with only one position of rest; it cannot be manually operated. Contactors can connect, carry, and disconnect currents in a circuit under normal operating conditions, including operational overload. The contact system consists of main and auxiliary contacts (NC, NO). Depending on the size of the contactor, the main contacts can switch several hundred amps while the auxiliary contacts are only rated for control currents of a few amps.

Control functions

Control functions (e.g. direct starters, reversing starters) are used for controlling load feeders. They are characterized by the following important features:

- Monitoring the switch-on / switch-off process (no current flows in the main circuit without the ON command)
- Monitoring the OFF state (no current flows in the main circuit without the ON command)
- Monitoring the ON status
- Tripping if a fault occurs.

Control stations

Control stations are places from which control commands are issued to the motor. The "Control Stations" function block is used for administration, switching and prioritization of these different control stations. SIMOCODE pro allows parallel administration of up to four different control stations. Dependent on the control function, up to five different control commands can be transmitted from every control station to SIMOCODE pro.

- Local control, in the direct vicinity of the motor. Control commands via pushbuttons.
- PLC/PCS, switching commands are issued by the automation system (remote).
- PC, control commands are issued via an operator control station or via PROFINET with the SIMOCODE ES software.
- Operator panel / operator panel with display, control commands are issued via the buttons of the operator panel / operator panel with display in the control cabinet door.

Cos phi monitoring

Cos phi monitoring monitors the load condition of inductive loads. The main field of application is for asynchronous motors in 1-phase or 3-phase networks with loads that fluctuate significantly. The measuring principle for the power factor (cos phi) is based on the evaluation of the phase displacement between voltage and current in one phase.

Current / voltage measuring module (UM)

It allows a current / voltage measuring module to be used instead of a current measuring module. In addition to measuring the motor current, current / voltage measuring modules also enable:

- Monitoring voltages up to 690 V
- Calculation and monitoring of power and cos phi
- Monitoring of the phase sequence.

Current limit monitoring

Current limit monitoring is used for process monitoring. This enables incipient anomalies in the system to be detected in good time. If a current limit is exceeded but is still below the overload limit, it can, for example, indicate a dirty filter on a pump, or an increasingly sluggish motor bearing. If the current limit is undershot, it can be the first sign of a worn-out drive motor belt.

Current measuring module (IM)

Current measuring modules are used together with the basic unit. The current measuring module must be selected according to the set current to be monitored (rated operating current of the motor). The current measuring modules cover current ranges between 0.3 A and 630 A, with intermediate transformers up to 820 A.

Decoupling module

A module for connection in series upstream from a current / voltage measuring module at the system interface when voltage and power measurements are implemented in non-grounded networks.

Device name

Before an IO device can be addressed by an IO controller, it must have a device name because the IP address is permanently assigned to the device name. In the case of PROFINET, this method was chosen because names are easier to handle than complex IP addresses.

Assignment of a device name for a specific IO device is comparable to setting the PROFIBUS address on a DP slave.

An IO device does not have a device name when it is delivered. It can only be addressed by an IO controller once a device name has been assigned to it, e.g. for transmission of the configuration data (including the IP address) during startup or for exchanging useful data in cyclic operation.

Digital module (DM)

Digital modules offer the possibility of increasing the type and number of binary inputs and outputs on the basic unit to meet requirements. Up to two digital modules can be connected to a basic unit. All versions can be combined with each other. In this way, SIMOCODE pro V PN can be expanded to a maximum of twelve binary inputs and seven binary outputs.

DIP switch

Small switch used to make certain basic settings. The abbreviation stands for Dual In-line Package, in other words a device package with two parallel rows of electrical connecting pins.

DM-F Local and DM-F PROFIsafe digital modules

The DM-F Local and DM-F PROFIsafe fail-safe digital modules are used as safety relays in EMERGENCY STOP devices in accordance with EN 418 and in safety circuits in accordance with EN 60204 (11.98):

DM-F Local digital module:

For applications that require local safety-related tripping with EMERGENCY OFF buttons.

DM-F PROFIsafe digital module:

For applications that require decentralized safety-related tripping with EMERGENCY OFF buttons. A fail-safe SIMATIC controller applies the logical connection between the EMERGENCY OFF button and DM-F PROFIsafe digital module.

Door adapter

The door adaptor is necessary for making the system interface of a basic unit available at an easily accessible location (e.g. front panel), thus enabling fast parameterization.

Emergency start

Emergency start deletes the thermal memory from SIMOCODE pro each time it is activated. This allows the motor to be immediately restarted after an overload trip. This function can be used to:

- Enable an immediate restart/reset after an overload trip
- Influence the thermal memory (motor model) during operation, if required.

Since the emergency start is edge-triggered, this function cannot permanently affect the thermal motor model.

EMERGENCY STOP

Shutdown in case of an emergency according to EN 418 (ISO 13850).

An action in an emergency that is intended to stop a process or motion that would result in a hazard.

EMERGENCY STOP command device

Contact block ("EMERGENCY STOP" mushroom pushbutton according to EN EN 418 (ISO 13850), cable-operated switch with positive opening contacts according to EN 60204-1) that causes the process, machine or plant to be stopped when actuated in hazardous situations. This must have positive-opening contacts, be easy to reach and be tamper-proof.

EMERGENCY STOP device

Protective device that is operated in response to an emergency according to EN 418 (ISO 13850), EN 60204-1.

Enabling circuit

An enabling circuit is used to generate a safety-related output signal. From an external viewpoint, enabling circuits act as NO contacts (however, in terms of functionality, safety-related opening is always the most important aspect). A single enabling circuit that is internally redundantly configured in the safety relay (two-channel) can be used for Category 3/4 according to EN 954-1 (ISO 13849-1).

European norm EXplosion safe (EEx)

Specifies the protection classes for categorizing motors for use in hazardous areas.

Expansion modules

Expansion modules serve as optional additions for the SIMOCODE pro V PN device series. The following expansion modules are available:

- Digital module (DM)
- Analog module (AM)
- Ground-fault module (EM)
- Temperature module (TM).

All expansion modules have the same design with an enclosure width of 22.5 mm. They are equipped with 2 system interfaces (incoming/outgoing) and removable terminals.

F_WD_Time

Monitoring time in the fail-safe PROFIsafe option. A valid, current safety message frame must be received from the F-CPU within this monitoring time. Otherwise, the PROFIsafe option goes to the safe state.

Factory settings

The factory settings are used to reset all parameters of a device to the default settings to which they were set at the factory. The factory settings can be restored using the "TEST / RESET" button on the basic unit or via the SIMOCODE ES software.

Feedback circuit

A feedback circuit is used to monitor controlled actuators (e.g., relays or contactors with positively driven contacts). The evaluation unit can only be activated if the feedback circuit is closed.

Note:

The NC contacts of the relays to be monitored are connected in series and integrated into the feedback circuit of the safety relay. If a contact in the enabling current path is welded, the safety relay can no longer be activated because the feedback circuit remains in the open position.

Field/field level

The field or field level of an automation system contains the individual sensors and actuators, as opposed to the control level, which is located above it in the hierarchy.

Fieldbus

Industrial communication system that connects a large number of field devices such as probes (sensors), actuators and drives to a control device.

Function block

Defined group of functions that can be freely parameterized by the user and connected to other function blocks in order to create a complete feeder-specific logic system. This means conventional wired control circuits containing auxiliary relays, time relays, etc. can be completely replaced.

Ground-fault module (EM)

The ground-fault module enables implementation of a powerful external ground fault monitoring system in conjunction with the 3UL22 (for 3UF7 500-1AA00-0) and 3UL23 (for 3UF7 510-1AA00-0) residual current transformers. In addition to the internal ground-fault monitoring function which is supported by both device series, SIMOCODE pro V N can be extended by an additional and more precise external ground-fault monitoring system.

Ground-fault monitoring

See "Ground-fault monitoring."

SIMOCODE pro acquires and monitors all three phase currents. By evaluating the summation current of the three current values, the motor feeder can be monitored for a possible fault current or ground fault. There is a difference between internal and external ground-fault monitoring:

Internal ground-fault monitoring:

Internal ground-fault monitoring via current measuring modules or current / voltage measuring modules is only possible for motors with a 3-phase connection in power systems that are either grounded solidly or with low impedance. The basic unit uses the total current to detect a possible residual current / ground-fault current.

External ground-fault monitoring with SIMOCODE pro V PN:

The external ground-fault monitoring using residual current transformer and ground-fault module is normally used for power systems that are grounded with high impedance, or in cases, in which precise detection of the ground-fault current is necessary, for example, for condition monitoring. The ground-fault module (EM) evaluates rated residual currents using an externally connected residual current transformer (e.g. 3UL23).

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GSD file

The properties of a PROFINET device are described in a GSD (General Station Description) file that contains all the necessary information for configuration. You can use a GSD file to integrate a PROFINET device in exactly the same way as a PROFIBUS device into an automation system (SIMATIC S7 environment or any DP standard master system).

In the case of PROFINET IO, the GSD file is in XML format. The structure of the GSD file conforms to ISO 15734, the worldwide standard for device descriptions.

I&M data

Identification and maintenance data.

Information stored in a module that help you to check the plant configuration, to located hardware modifications in a plant, or to remedy errors in a plant. I&M data can be used to identify modules uniquely on the network.

I/O

The term I/O devices is used in automation engineering to refer to peripheral devices, for example, devices that are connected to centralized controls.

Independent operation

SIMOCODE pro V PN protects and controls the motor feeder, independently of the automation system. Even if the automation system (PLC) fails, or if communication is disrupted, the motor feeder remains fully protected and controllable. SIMOCODE pro can be used without a connection to the PROFINET. This can easily be connected later, if required.

Initialization module

Memory module permanently installed in the switchgear or the motor control center in which the device parameters of intelligent switching devices are stored.

The initialization module is used in motor control centers with a withdrawable design in which all functions concerning the motor feeder are fitted in an exchangeable withdrawable module.

The initialization module can be permanently installed in the switchgear and enable backup of all parameters of a system and completely automatic transmission to a new system, e.g. device replacement.

IP address

To enable a PROFINET device to be addressed as a node on Industrial Ethernet, this device also requires an IP address that is unique within the network. The IP address is made up of 4 decimal numbers with a range of values from 0 through 255. The decimal numbers are separated by a decimal point.

The IP address is made up of

- The address of the (sub)net and
- The address of the node (generally called the host or network node)

IT system

The IT system (FR Isolé Terre) is a specific type of ground connection for increased fail-safe protection in case of insulation faults.

Logic modules

Logical operations, time relay functions and counter functions are implemented using logic modules.

Low voltage

All voltage levels used for the distribution of electricity that are within a range whose upper limit in AC systems is generally 1000 V.

MAC address

Each PROFINET device is assigned a globally unique device identifier at the factory. This 6-byte long device identifier is the MAC address.

The MAC address is divided up as follows:

- 3 bytes manufacturer's ID and
- 3 bytes device identifier (consecutive number).

The MAC address can generally be read from the front on the device, e.g.: 08-00-06-6B-80-C0.

Media redundancy

SIMOCODE pro V PN supports media redundancy according to the Media Redundancy Protocol (MRP). This function is configured using the configuration tool of the automation system, e.g. with STEP 7 HW Config.

Memory module

The memory module is plugged into the system interface and is used for fast reading in or out of the entire SIMOCODE pro parameterization, e.g. if a unit is exchanged.

Note

Memory module variant

For the SIMOCODE pro V PN basic unit, a PC cable serial 3UF7940-0AA00-0 as from product version *E02* or a PC cable USB 3UF7941-0AA00-0 can be used.

Monitoring 0/4 A - 20 mA

SIMOCODE pro supports two-level monitoring of the analog signals of a transducer (standardized 0/4 - 20 mA output signal). The analog signals are fed to the "0/4 - 20 mA" function block via the analog module.

Monitoring functions

The following monitoring functions

- Ground-fault monitoring
- Current limit monitoring
- Voltage monitoring
- Cos phi monitoring
- Active power monitoring
- Monitoring 0/4 A - 20 mA
- Operation monitoring
- Temperature monitoring (analog)

Operate "in the background" in the same way as motor protection and motor control. They can be active or not, according to the control function selected.

Motor protection

The basic unit has several protection mechanisms for current-dependent motor protection:

- Overload protection
- Unbalance protection
- Stalled rotor protection
- Thermistor protection

Network time protocol

Implementation of a TCP/IP protocol for time synchronization in networks. The NTP procedure uses hierarchical time synchronization, that is, an external clock (e.g. SICLOCK TM or a PC in the network) is used for synchronization.

Number of starts monitoring

Monitoring the number of starts can protect system parts (motors and switching devices such as soft starters and converters) from too many start processes within a parameterizable time frame and thus prevent damage. This is particularly useful for commissioning or manual control.

OPC UA server

The OPC server provides the OPC client with a wide range of functions with which it can communicate via industrial networks. SIMOCODE pro V PN provides extensive process data via OPC UA.

OPC Unified Architecture (UA)

OPC Unified Architecture (UA) is the next generation technology of the OPC Foundation for secure and reliable data transfer and defines access to industrial communication networks.

OPC UA client

An OPC UA client is a user program that accesses process data via the OPC UA interface. Access to the process data is made possible by the OPC UA server.

Operating hours monitoring

The motor operating hours monitoring function enables the operating hours (service life) of a motor to be recorded so that motor maintenance prompts can be generated in good time as applicable.

Operation monitoring

SIMOCODE pro can monitor the operating hours and stop times of a motor and restrict the number of start-ups in a defined time frame in order to avoid plant downtimes due to failed motors caused by running or being stopped for too long.

Operational Protection OFF (OPO)

The "Operational Protection OFF (OPO)" function block puts the positioner into a safe position and switches the motor off.

Operator panel (OP)

The operator panel controls the motor feeder from the control cabinet. It contains all the status LEDs which are on the basic units, the "TEST / RESET" button and the external system interface.

Operator panel with display (OPD)

The operator panel with display can be used as an alternative to the standard operator panel (OP). It displays the actual measured values, operating and diagnostic data, status information for the motor feeder at the control cabinet and the device-internal error log. It also contains all the status LEDs that are present on the basic unit and facilitates access to the system interface from outside the control cabinet. Its keys can be used to control the motor and to navigate the display menu.

For use with the SIMOCODE pro V PN basic unit, an operator panel with display version *E07* is required.

Organization block

Organization blocks form the interface between the CPU operating system and the user program. The order that the user program is processed in is specified in the organization blocks.

Overload protection

SIMOCODE pro protects three-phase or AC motors in accordance with IEC 60947-4-1 requirements. The trip class can be set to eight different settings ranging from CLASS 5 to CLASS 40.

Pause time

The pause time is the specified time for the cooling down response of the motor when tripped under normal operating conditions (not in the case of an overload trip). After this interval, the thermal memory in SIMOCODE pro is deleted and a new cold start is possible. This means that many startups can be performed in a short space of time.

PC cable

The PC cable is used to connect the serial interface of the PC to the system interface of a basic unit for device parameterization.

Note

PC cable variant

For SIMOCODE pro V PN, a PC cable serial 3UF7940-0AA00-0 as from product version *E02* or a PC cable USB 3UF7941-0AA00-0 can be used.

Performance Level (PL)

Defined by standard EN ISO 13849-1 as "a discrete level specifying the ability of safety-related control parts to execute a safety function under anticipated conditions." Five Performance Levels are specified (a to e) with defined ranges of the probability of a dangerous failure per hour. PL "e" corresponds to SIL 3 and is specified as the highest level.

Pozidriv (PZ)

Type of fixing screws and cross-tip screwdrivers.

Process Automation (PA)

Automation of continuous production processes. For instance, it controls production processes in the chemical industry or in water supply systems.

PROFIenergy

Profile for power management in production plants.

PROFIenergy uses the PROFINET communication protocol. It controls the power consumption of automation equipment in production via a PROFINET network.

PROFINET

PROFINET (Process Field Network) is the open Industrial Ethernet Standard from Profibus & Profinet International (PI) for automation.

Within the context of Totally Integrated Automation (TIA), PROFINET is the systematic development of the following systems:

- PROFIBUS DP, the established fieldbus
- Industrial Ethernet, the communications bus for the cell level.

Experiences from both systems have been and are being integrated in PROFINET.

PROFINET IO device

Distributed field device assigned to one of the IO controllers.

PROFINET IO Supervisor

PG/PC for commissioning and diagnostics.

PROFINET IO controller

Device via which the connected IO devices are addressed. This means the IO controller exchanges input and output signals with assigned field devices. The IO controller is often the controller on which the automation program runs.

PROFIsafe

The PROFIBUS safety profile specifies communication between fail-safe I/O devices and fail-safe controllers. It is based on the standards for safety-related applications as well as on the experience of PLC users and manufacturers who are members of PROFIBUS International (PI). The PROFIBUS safety profile has TÜV and BIA (Institute for Occupational Safety and Health of the German Social Accident Insurance) certification. The newest version of the PROFIsafe specification is the Profile for Safety Technology V1.11, published in 07/2001.

Programmable logic controller (PLC)

Electronic module used for open-loop and closed-loop control tasks in an automation system. It is basically a control unit with specialized input and output interfaces for sensors and actuators. A PLC can consequently control, monitor, and influence processes.

Programming device

A compact and transportable PC, suitable for industrial purposes. Its distinguishing feature is the special hardware and software for SIMATIC programmable logic controllers.

Protection functions

The protection functions

- Overload protection
- Unbalance protection
- Stalled rotor protection
- Thermistor protection

operate alongside motor control "at a higher level in the background." They can be active or not, according to the control function selected.

Protective Extra Low Voltage (PELV)

Protective measure against electric shock (formerly referred to as "protective extra low voltage with safe isolation").

In contrast to an SELV circuit, live parts and exposed conductive parts of the equipment may be grounded and connected to the protective conductor. Safe isolation means that the primary circuit of the transformer must be separated from the secondary circuit by double or reinforced insulation. PELV is used whenever operational reasons dictate that live conductors of the low voltage or bodies of the equipment must be grounded. This is the case, for instance, if equipotential bonding is necessary to prevent sparking in containers or hazardous areas. However, owing to the chassis ground, dangerous leakage currents can flow through the body regardless of the low voltage if a fault occurs in the higher-level power system.

RT communication

As a motor management system, SIMOCODE pro V PN does not have any time-critical communication functions itself but it does support the PROFINET hardware RT used. The integrated 2-port switch is therefore used to forward RT data.

SELV

Safety extra low voltage Low electric voltage that offers significant protection against electric shock due to its low value and insulation. For certain requirements, the highest voltage may be defined below 50 V AC or 120 V smoothed DC, especially if direct contact with live parts is permissible. At a rated voltage of 120 V, the highest peak value in a smoothed DC system is 140 V, and at a rated voltage of 60 V it is 70 C.

Use of power supply units according to IEC 60536, protection class III (SELV or PELV):

See Chapters "Safety-related tripping", "Fail-safe digital modules (DM-F)", and "DM-F Local and DM-F PROFIsafe digital modules."

SFB

System function block A block integrated in the S7 CPU operating system that can be called like a function block (FB) in the user program if required.

SFC

System function:

A function integrated in the S7 CPU operating system that can be called like a function (FC) in the user program if required.

Shared device

Shared device is the function with which an IO device is used simultaneously by two or more IO controllers.

Use of this function depends on whether the automation system supports the function. It is configured using the configuration tool of the automation system, e.g. with STEP 7 HW Config.

SIL (Safety Integrity Level)

Measure defined in IEC 61508 for the safety-related performance of an electrical or electronic control device.

The IEC standard defines four SIL levels SIL1 to SIL4, which are defined as the safety implementations of electrical and electronic equipment. The SIL value describes the specified safety function in the event of a fault.

SIMATIC

Name of products and systems for industrial automation from Siemens AG.

SIMATIC PDM

You can also configure SIMOCODE pro using the SIMATIC PDM (Process Device Manager) software. The following options exist:

- SIMATIC PDM as a standalone program
- PDM integrated in STEP 7

SIMOCODE ES

Standard parameterization software for SIMOCODE pro, which can be run on a PC / PG under Windows XP or Windows 7 Ultimate and Professional.

SIMOCODE pro S7 slave

The SIMOCODE pro S7 slave is a special slave with the following characteristics:

- It supports the S7 model (diagnostic interrupts, process interrupts)
- It can be parameterized

SIMOCODE pro Object Manager (OM)

Part of SIMOCODE ES. When SIMOCODE ES and SIMOCODE pro Object Manager are installed on a PC/PG, SIMOCODE ES can be called directly from STEP 7 HW Config. This enables simple and universal SIMATIC S7 configuration.

Simple Network Management Protocol (SNMP)

Network protocol for monitoring and controlling network elements (e.g. switches).

Stalled rotor protection

If the motor current rises above an adjustable stalled rotor protection level (current threshold), a defined and delayable response can be configured for SIMOCODE pro. In this case, for example, the motor can be shut down independently of the overload protection. The stalled rotor protection is only active after the parameterized class time has elapsed, e.g. for Class 10 after 10 seconds, and prevents unnecessarily high thermal and mechanical loads as well as premature aging of the motor.

Standard function

Standard functions are typical motor functions that can be activated according to need and, as applicable, individually set for each motor feeder. They are already available, work independently of the selected control function and can be used/activated as optional additions.

Station

A device which can send, receive or amplify data via the bus, e.g. master, slave.

Statistical data

SIMOCODE pro makes statistical data available which can be read out with SIMOCODE ES under Target System > Service Data / Statistical Data (for example).

STEP7

The basic STEP 7 software is the standard tool for the SIMATIC S7, SIMATIC C7 and SIMATIC WinAC automation systems.

Stop category 0

Non-controlled shutdown by immediately switching off the power to the machine's drive elements.

Stop time monitoring

SIMOCODE pro can monitor the stop times of a motor to avoid plant downtimes due to failed motors caused by either running too long (wearing out) or being stopped for too long.

System interface cover IP54

Cover to protect the system interface on the door adaptor or on the operator panel/operator panel with display from soiling or to seal it.

Temperature module (TM)

The temperature module offers the option of expanding SIMOCODE pro V PN with an analog temperature monitoring system. With this, up to three analog sensor measuring circuits (two-wire or three-wire systems) can be connected. The temperatures recorded can be fully integrated and monitored in the process and are also available for a higher-level automation system. You can, for example, implement analog temperature monitoring of the motor windings, bearings, coolant or gearbox oil. SIMOCODE pro V PN supports various sensor types (NTC, KTY83/84, PT100, and PT1000) for use with hard, fluid or gaseous media.

Temperature monitoring

See temperature module (TM).

Terminal block

Insulating part comprised of one or more terminals, insulated from one another, for mounting on a strip.

Test position feedback (TPF)

If the motor feeder is in the test position, its main circuit is isolated from the network. However, the control voltage is connected.

The "cold run" function test is performed with the feeder in this state. This means the motor feeder is tested without a current in the main circuit.

Thermistor protection

The basic unit provides the option of connecting thermistor sensors (binary PTC) for monitoring the motor temperature.

TN-C system

In a TN-C system (FR Terre Neutre Combiné) 1 wire is used simultaneously as a protective earth (SPE) and neutral wire (N).

TN-S system

In a TN-S system (FR Terre Neutre Séparé) the neutral wire and the protective earth are led separately from the transformer up to the appliance.

Trip class

See "Class".

Unbalance protection

The extent of the phase unbalance can be monitored and transmitted to the control system. A definable and delayable response can be tripped when an adjustable limit has been overshot. If the phase unbalance is more than 50%, the tripping time is also automatically reduced in accordance with the overload characteristic since the heat generation of the motors increases in asymmetrical conditions.

Universal Current (UC)

Universal current. Property of devices that can be operated with both AC and DC.

USB PC cable

The USB PC cable is used to connect the USB interface of the PC to the system interface of a basic unit for device parameterization.

Voltage monitoring

See monitoring voltage

SIMOCODE pro supports two-phase undervoltage monitoring of either a three-phase network or a single-phase network for freely selectable limits, direction of rotation (for AC) or readiness to start. The response of SIMOCODE pro on reaching a prewarning level or trip level can be freely parameterized and delayed. Voltage measuring is carried out using current / voltage measuring modules.

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Y connecting cable

Connecting cable with which a connection can be made via the system interface from a SIMOCODE pro basic unit to both an initialization module and a current measuring module.

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