

# SmartWire-DT® modules



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### **Original operating manual**

The German-language edition of this document is the original operating manual.

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## **Danger!** **Dangerous electrical voltage!**

---

### **Before commencing the installation**

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally retriggered
- Verify isolation from the supply
- Ground and short-circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions (IL) of the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 part 100) may work on this device/ system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE, PES) must be connected to the protective earth (PE) or to the potential equalizing. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 V supply. Only use power supply units complying with IEC 60364-4-41 or HD 384.4.41 S2 (VDE 0100 part 410).
- Deviations of the mains voltage from the nominal value must not exceed the tolerance limits given in the technical data, otherwise this may cause malfunction and dangerous operation.
- Emergency-Stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency switching off devices must not cause restart.
- Built-in devices for enclosures or cabinets must only be run and operated in an installed state, desk-top devices or portable devices only when the housing is closed.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency switching off devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks, etc.).



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## 0 About this manual

### 0.1 List of revisions

The following significant amendments have been introduced since previous issues:

<b>Edition</b>	<b>page</b>	<b>Keyword</b>	<b>New</b>	<b>Modifi- cation</b>	<b>Deleted</b>
07/2013	205	Chapter "SL4-SWD and SL7-SWD base modules for signal towers"	✓		
	51	EU5E-SWD-4PT-2 added to section "EU5E-SWD-4PT/...4PT-2"		✓	
	255	„Maximum current consumption of Smart-Wire-DT modules on U <sub>SWD</sub> ", „SL4-SWD", „SL7-SWD" added to table „EU5E-SWD-4PT-2"			
	256	„Power-/current consumption of the SWD stations on U <sub>AUX</sub> ", „SL4-SWD", „SL7-SWD" added to table „EU5E-SWD-4PT-2"		✓	
	258	Chapter "Data requirement (bytes) Smart-Wire-DT modules", „SL4-SWD", „SL7-SWD" added to „EU5E-SWD-4PT-2"		✓	
	269	„SL4-SWD", „SL7-SWD" added to „EU5E-SWD-4PT-2" added to table 14.6.3, „Analog module"			✓
	280	Chapter "M22-SWD connections"	✓		
11/2013	133	Chapter "PKE-SWD-CP Connection for circuit-breaker PKE"	✓		
	151	Chapter "Electronic motor starter EMS-...-SWD-ADP"	✓		
04/2014	215	Chapter "Interface module MCB-HK-SWD"	✓		
05/2015	19	Corrections in Chapter "Input/output modules EU5E-SWD..."		✓	
	167	Chapter "Pilot devices M22-SWD..." restructured		✓	
	171	Chapter "M22-SWD-R potentiometers"	✓		
	172	Chapter "Encoder M22-SWD-INC"	✓		
08/2015	51,56	EU5E-SWD-4PT-2 temp.range value corr.		✓	

### 0.2 Overview System SmartWire-DT®

The SmartWire-DT connection system is an intelligent bus system and makes possible the reliable and easy connection of switching devices, pilot devices and I/O components with overriding bus systems. The components that are connected with the SmartWire-DT system are linked, e.g. to PROFIBUS-DP or CANopen communication networks via gateways.

## 0 About this manual

### 0.3 Planning and diagnostics software SWD-Assist

tors, PKE motor-protective circuit-breakers and motor starters, DS7 soft starters, field bus modules, and NZM circuit-breakers, as well as SmartWire-DT I/O modules, SmartWire-DT RMQ modules, and base modules for signal towers.

The electrical connection is effected via a special 8 pole connecting cable and the relevant plugs.

### 0.3 Planning and diagnostics software SWD-Assist

The SWD-Assist program provides valuable support in the engineering of your SmartWire-DT topology. SWD-Assist is software that runs on Windows XP, Windows Vista (32-bit), Windows 7 or Windows 8 and relieves you of the planning work required for an SWD topology. The software is available free of charge at:

<http://www.eaton.eu/software>

### 0.4 Further manuals for this device

Further information concerning the SmartWire-DT topic can be found in:

- MN05013002Z SmartWire-DT Gateways
- MN05006002Z SmartWire-DT The system
- MN05002002Z signal modules (chapter „Diagnostics of the Profibus-DP slaves“)

The manuals are available for download on the Internet as PDF files. They can be quickly located at

<http://www.eaton.eu/documentation>

by entering the document number as the search term.

### 0.5 Target group

This manual is intended for automation technicians and engineers. Detailed knowledge of the field bus used is presumed. In addition you should be familiar with the handling of the SmartWire-DT system.

## 0.6 Writing conventions

Symbols used in this manual have the following meanings:

- ▶ Indicates instructions to be followed.

### 0.6.1 Hazard warnings of material damages

#### **NOTICE**

Warns about the possibility of material damage.

### 0.6.2 Hazard warnings of personal injury



#### **CAUTION**

Warns of the possibility of hazardous situations that may possibly cause slight injury.



#### **WARNING**

Warns of the possibility of hazardous situations that could result in serious injury or even death.



#### **DANGER**

Warns of hazardous situations that result in serious injury or death.

### 0.6.3 Tips



Indicates useful tips.

0 About this manual  
0.6 Writing conventions



# 1 EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules

## 1.1 Introduction

The SmartWire-DT power modules EU5C-SWD-PF1-1 and EU5C-SWD-PF2-1 are for the purpose of looping back the module power supply in the SmartWire-DT network.

## 1.2 EU5C-SWD-PF1-1

### 1.2.1 Surface mounting

#### Connections/power supply

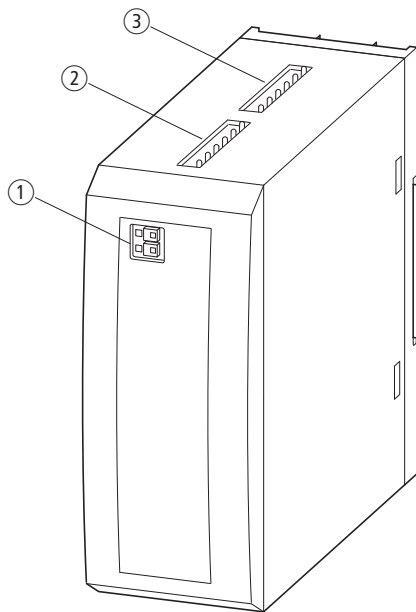


Figure 1: Connections of the EU5C-SWD-PF1-1 module

- ① Contactors power supply AUX
- ② SWD In
- ③ SWD Out

The SmartWire-DT power module EU5C-SWD-PF1 loops the 24 V DC contactor voltage back into the SmartWire-DT cable.

The looped back 24 V DC voltage is not electrically isolated from the 24 V DC supply voltage (AUX) of the module. There is voltage reversal and EMC protection.

Voltage dips are not buffered.

## 1 EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules

### 1.2 EU5C-SWD-PF1-1

The subassembly does not need a diagnostics LED and no diagnostics information of its own is sent on the SmartWire-DT network. A fault in the 24 V supply voltage is therefore ascertainable only via the missing voltage of the downstream contactors.

#### 1.2.2 Projection

##### 1.2.3 Area of application of the SmartWire-DT® power module EU5C-SWD-PF1-1

- The supply for the contactors installed in the SmartWire-DT network is no longer sufficient (power consumption of the contactors > 72 W / 3 A).
- A selective emergency shutdown of individual contactor groups or motor starter groups is required (→ Chapter 3, "Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors", Page 66).



With a SmartWire-DT power module a second incoming unit for the contactor coil control voltage can be made at another position in the SmartWire-DT network.

#### 1.2.4 Installation

The SmartWire-DT power module EU5C-SWD-PF1 is envisaged for mounting on a top-hat rail.

- ▶ Mount the module on the top hat rail.
- ▶ Connect the 24 V DC voltage to the terminals AUX on the front of the module.
- ▶ Connect the 8 pole SmartWire-DT cable to the SWD In socket. The continuation to the next SmartWire-DT module is from the SWD Out socket.



For detailed instructions on how to connect the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pin SmartWire-DT ribbon cable, refer to the "Installing SWD4-8SF2-5 external device plugs" section in manual MN05006002Z-EN (previously AWB2723-1617de).

The connection terminals are suitable for cables AWG24 to AWG16 and flexible conductors with a cross section of 0.5 to 1.5 mm<sup>2</sup>.

## 1 EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules

### 1.2 EU5C-SWD-PF1-1

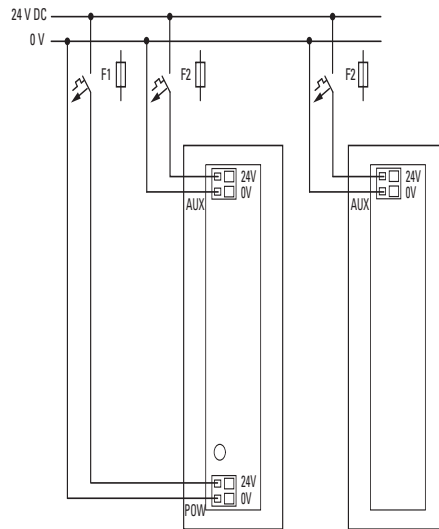


Figure 2: Terminal capacity

- flexible, cross-section 0.25 mm<sup>2</sup> to 1.5 mm<sup>2</sup>, with the ferrule (minimum length 8 mm)
- solid: 0.14 to 1.5 mm<sup>2</sup>



Information on the cable protection is provided on Page 18

### 1.2.5 Diagnostics

The device does not report a diagnosis

## 1 EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules

### 1.3 EU5C-SWD-PF2-1

#### 1.3 EU5C-SWD-PF2-1

##### 1.3.1 Surface mounting

###### Connections/power supply

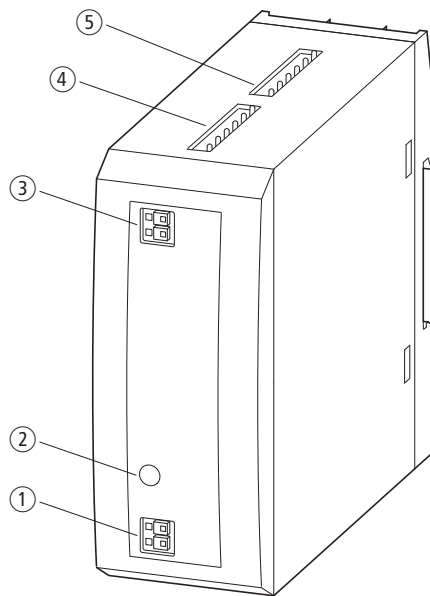


Figure 3: Connections of the EU5C-SWD-PF2-1 module

- ① SmartWire-DT module supply
- ② POW slave supply display
- ③ Contactors power supply AUX
- ④ SWD In
- ⑤ SWD Out

The SmartWire-DT power module EU5C-SWD-PF2 loops the 24 V DC contactor voltage and the 15 V module supply back into the SmartWire-DT cable.

The SmartWire-DT cable is looped from the SmartWire-DT in-connection through to the SmartWire-DT out-connection. Only the 24 V DC contactor voltage and the 15 V DC module supply are isolated and looped back in via the SmartWire-DT out-connection.

The 24 V DC contactor supply is not electrically isolated from the 24 V DC supply of the power module, i.e. the 24 V DC voltage is looped back in. There is voltage reversal and EMC protection.. Voltage dips are not buffered.

The 15 V DC module supply is electrically isolated from the 24 V DC contactor voltage. Voltage dips are buffered up to at least 10 ms. There is voltage reversal and EMC protection.

The subassembly contains an LED for indication of the 15 V DC slave supply.

The 24 V DC contactor voltage that is looped back in is not electrically isolated from the 24 V D supply voltage (AUX) of the module. There is voltage reversal and EMC protection.

## 1.3.2 Projection

### 1.3.2.1 Area of application of the SmartWire-DT power module EU5C-SWD-PF2-1

- The supply for the modules installed in the SmartWire-DT network is no longer sufficient (power consumption > 0.7 A).
- The supply for the contactors installed in the SmartWire-DT network is no longer sufficient (power consumption of the contactors > 72 W / 3 A).
- A selective emergency shutdown of individual contactor groups or motor starter groups is required (→ Chapter 3, "Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors", Page 62).



With a SmartWire-DT power module a second incoming unit for the contactor coil control voltage can be made at another position in the SmartWire-DT network.

## 1.3.3 Installation

The SmartWire-DT power module EU5C-SWD-PF2 is envisaged for mounting on a top-hat rail.

- ▶ Mount the module on the top hat rail.
- ▶ Connect the 24 V DC voltage to the terminals POW on the front of the module.
- ▶ If necessary, reconnect the 24 V DC voltage for the contactor coils to the terminals AUX.
- ▶ Connect the 8 pole SmartWire-DT cable to the SWD In socket. The continuation to the next SmartWire-DT module is from the SWD Out socket.

The connection terminals are suitable for cables AWG24 to AWG16 and flexible conductors with a cross section of 0.5 to 1.5 mm<sup>2</sup>.

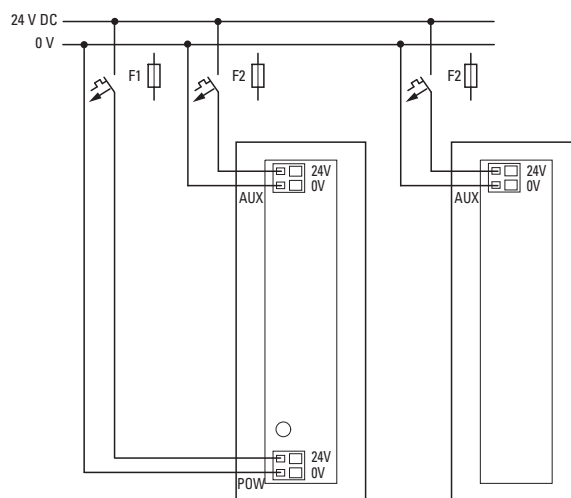


Figure 4: Terminal capacity

- flexible, cross-section 0.25 mm<sup>2</sup> to 1.5 mm<sup>2</sup>, with the ferrule (minimum length 8 mm)

## 1 EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules

### 1.3 EU5C-SWD-PF2-1

- solid: 0.14 to 1.5 mm<sup>2</sup>

#### 1.3.4 Cable protection

- ▶ On the SmartWire-DT gateway connect the POW and AUX supply voltages via separate miniature circuit-breakers or fuses:
- Miniature circuit-breaker 24 V DC for POW
  - Cable protection in accordance with DIN VDE 0641 Part 11, IEC/EN 60898:
  - Miniature circuit-breaker 24 V DC rated operational current 3 A; trip type C or
  - Fuse 3 A, utilization category gL/gG
  - Cable protection for cable AWG 24 in accordance with UL 508 and CSA-22.2 no. 14:
  - Miniature circuit-breaker 24 V DC rated operational current 2 A; tripping characteristics C or
  - Fuse 2 A
- Miniature circuit-breaker 24 V DC for AUX
  - Cable protection in accordance with DIN VDE 0641 Part 11, IEC/EN 60898:
  - Miniature circuit-breaker 24 V DC rated operational current 3 A; trip type Z or
  - Fuse 3 A, utilization category gL/gG
  - Cable protection for cable AWG 24 in accordance with UL 508 and CSA-22.2 no. 14:
  - Miniature circuit-breaker 24 V DC rated operational current 2 A; tripping characteristics Z or
  - Fuse 2 A

#### 1.3.5 Diagnostics

The device does not report a diagnosis

## 2 Input/output modules EU5E-SWD...

### 2.1 Introduction

The SmartWire-DT input/output modules (I/O modules) are used for connecting of other sensor and actuator devices. These can include, auxiliary contacts of additional switchgear without built-in SmartWire-DT technology. To reduce wiring, the modules are placed immediately next to the sensors/actuators.

A range of modules with digital or analog inputs and outputs are available.

Following is a description of the I/O modules' general characteristics and information on their use. For further information about specific modules, see the module descriptions that follow this section.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.5, „SWD module interoperability requirements“, page 261.

### 2.2 Surface mounting

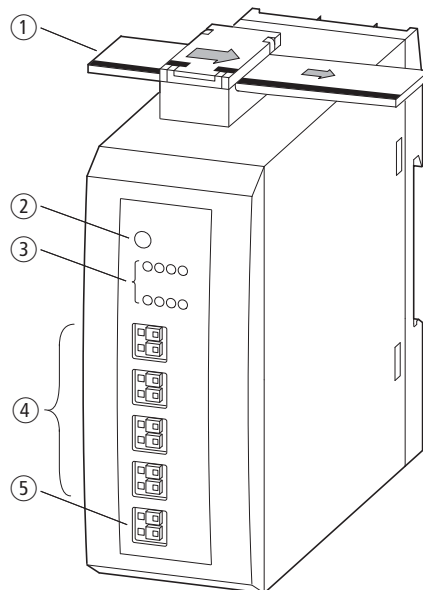


Figure 5: Connections of a SmartWire-DT I/O module

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT diagnostics LED
- ③ Input/output status displays (optional)
- ④ Input/output terminals
- ⑤ External supply (optional)

## 2 Input/output modules EU5E-SWD...

### 2.3 Engineering

#### 2.3 Engineering

The SmartWire-DT I/O modules are meant for connecting additional sensors and actuators that do not feature integrated SmartWire-DT capabilities. When installed, these modules are placed in the immediate vicinity of the corresponding sensors or actuators, which significantly reduces the remaining wiring. The signal and supply cables are connected to the SmartWire-DT ribbon cable through SmartWire-DT device plug SWD4-8SF2-5. The connection to the inputs and outputs and the optional power supply is implemented with push-in terminals.

The push-in terminals are suitable for AWG24 to AWG16 cables and cables with a cross section from 0.25 to 1.5 mm<sup>2</sup>.



The I/O modules draw their energy for communication electronics, activation of the LEDs and of the I/O modules from the SmartWire-DT network supply. Observe the total power consumption of your SmartWire-DT network and, if necessary, plan for an additional feeder module EU5C-SWD-PF2-1.



For the I/O module's power consumption, see the table in the appendix on 255.

#### 2.4 Programming, setting the parameters

For information on programming, including the scope and structure of the corresponding data, please refer to the relevant detailed descriptions.

The SmartWire-DT I/O modules can be configured flexibly, with the available configuration options depending on the specific part no. being used. The type of parameter configuration will vary depending on the selected SmartWire-DT coordinator (gateway, PLC, etc.). For special instructions for the CANopen and EtherCAT protocols, please refer to the I/O module descriptions. When using these protocols, the modules need to be configured by entering the appropriate parameter values.



The individual sections describe the structure behind the parameter data and explain how to figure out what the correct parameter data should be. For additional information, please refer to "Fieldbus-specific characteristics" in the "Parameter configuration" section for each individual module. For general information on the EtherCAT fieldbus system, please refer to → Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.



## 2.5 .Installation

The SmartWire-DT input/output modules are envisaged for top hat mounting. The mounting position is vertical.

- ▶ Mount the module on the top hat rail.

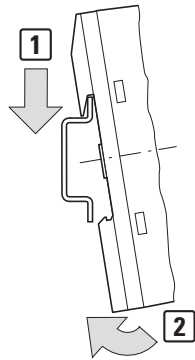


Figure 6: Mounting on top-hat rail

- ▶ Connect the 8-pole SmartWire-DT cable to the SmartWire-DT socket on the device top.



For detailed instructions on how to connect the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pin SmartWire-DT ribbon cable, refer to the "Installing SWD4-8SF2-5 external device plugs" section in manual "SmartWire-DT, System" MN05006002Z-EN (previously AWB2723-1617en).

### 2.5.1 Connecting signal and supply cables

Connect the inputs/outputs and, if applicable, the supply cables to the push-in terminals, observing the permissible cable cross-sections.

### 2.5.2 Terminal capacity

- flexible: cross-section 0.25 mm<sup>2</sup> to 1.5 mm<sup>2</sup>, with the ferrule (minimum length 8 mm)
- solid: 0.25 to 1.5 mm<sup>2</sup>
- AWG24 to AWG16

### 2.5.3 Wiring analog sensors and actuators

- ▶ Only use shielded cables for connection.
- ▶ Route the cables separately from power leads or signal cables that carry differential voltages.
- ▶ Depending on the prevailing electromagnetic environment, one or both ends of the shielding should be earthed.
- ▶ Connect the shielding with the module's 0 V supply.
- ▶ Lay the AC supply voltage cables in separate cable ducts to those used for signal or data cables.

## 2 Input/output modules EU5E-SWD...

### 2.5 .Installation

- Lay signal and data cables as close as possible to the earthed surfaces of the switchgear cabinet.

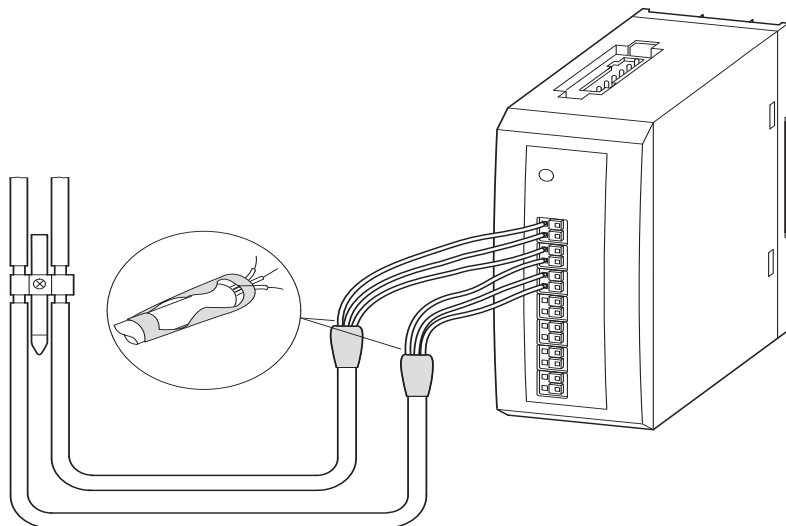


Figure 7: Wiring analog sensors and actuators

### 2.5.4 commissioning

Having connected all SmartWire-DT modules to the SmartWire-DT network, press the configuration button on the gateway, which then automatically assigns addresses to the modules.

During address assignment, the modules' SmartWire-DT diagnostics LED flashes. After address assignment, the LED is continuous lit green.

### 2.5.5 Exchange of modules

#### **NOTICE**

Replacement of the SmartWire-DT input/output modules is not permitted until the entire SmartWire-DT system has been switched off.

After replacement of the modules and connection of the voltage the configuration button must be pressed. When this is done, the new module will be assigned an address.

#### **NOTICE**

The order of the SmartWire-DT units must not be altered.

## 2.5.6 Device status

The individual SmartWire-DT modules indicate their device status with the aid of a diagnosis LED.

Table 1: Diagnostic messages of the SmartWire-DT status LED

designation	Colour	Status	Message
SmartWire-DT	green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	<ul style="list-style-type: none"> <li>• addressing process in progress                             <ul style="list-style-type: none"> <li>• after gateway power On</li> <li>• after actuation of the configuration button on the gateway</li> </ul> </li> <li>• Module not in current configuration</li> <li>• invalid type</li> </ul>
		flashing (3 Hz)	Device reports a diagnosis. (see section "Programming", subsection "Diagnostics").

## 2.5.7 Detailed descriptions

The following sections contain detailed descriptions of each I/O module:

- EU5E-SWD-8DX → Page 23
- EU5E-SWD-4DX → Page 26
- EU5E-SWD-4D4D → Page 30
- EU5E-SWD-4D2R → Page 34
- EU5E-SWD-X8D → Page 38
- EU5E-SWD-4AX → Page 41
- EU5E-SWD-2A2A → Page 46
- EU5E-SWD-4PT / EU5E-SWD-4PT-2 → Page 51

## 2.6 EU5E-SWD-8DX

### 2.6.1 Introduction

SmartWire\_DT I/O module EU5E-SWD-8DX provides eight digital inputs, with which various sensors can be integrated into the SmartWire-DT network. The inputs' status is indicated with the help of LEDs. The network status of the module is signalled via the SmartWire-DT diagnostics LED.

## 2 Input/output modules EU5E-SWD...

### 2.6 EU5E-SWD-8DX

#### 2.6.2 Surface mounting

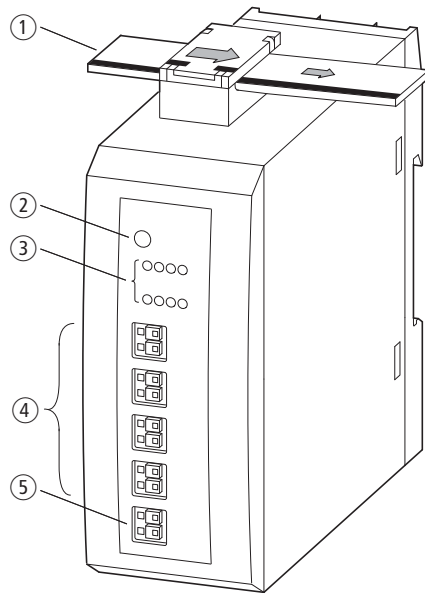


Figure 8: Connections of the modules EU5E-SWD-8DX

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT diagnostics LED
- ③ Status LEDs of the inputs
- ④ I0 – I7 (inputs)
- ⑤ 0-V connection

#### 2.6.3 Engineering

There are no specific engineering notes for this device model.

#### 2.6.4 Installation

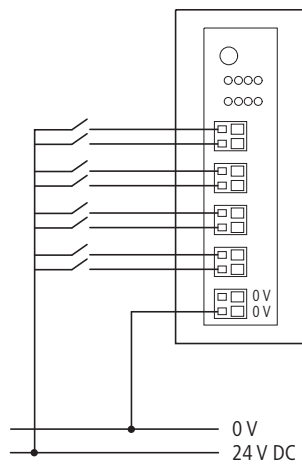


Figure 9: Connecting inputs and reference potential

- ▶ Connect the sensors to the corresponding inputs I0 to I7.

- ▶ Connect the reference potential 0 V DC to connection 0V.

### 2.6.5 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

### 2.6.6 Fieldbus-specific characteristics

#### Field bus Ethercat

Please note the general information for configuring parameters → Chapter 13 “Using SmartWire-DT modules with the EtherCAT field bus”, page 249.

### 2.6.7 Programming

The module has two input bytes at its disposal.

#### 2.6.7.1 Inputs

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
SUBS T	PRSN T	–	DIAG	–	–	–	–

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

## 2 Input/output modules EU5E-SWD...

### 2.7 EU5E-SWD-4DX

Byte 1:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
I7	I6	I5	I4	I3	I2	I1	I0

<b>Bit</b>	<b>designation</b>	<b>Meaning</b>
0	I0	Status input I0
1	I1	Status input I1
2	I2	Status input I2
3	I3	Status input I3
4	I4	Status input I4
5	I5	Status input I5
6	I6	Status input I6
7	I7	Status input I7

#### 2.6.7.2 Diagnostics

The module does not report a diagnosis.

### 2.7 EU5E-SWD-4DX

#### 2.7.1 Introduction

SmartWire-DT I/O module EU5E-SWD-4DX provides four three-wire digital inputs I0 to I3 as well as the 24 V supply.

The input states are indicated by LEDs. The network status of the module is signalled via the SmartWire-DT diagnostics LED.

### 2.7.2 Surface mounting

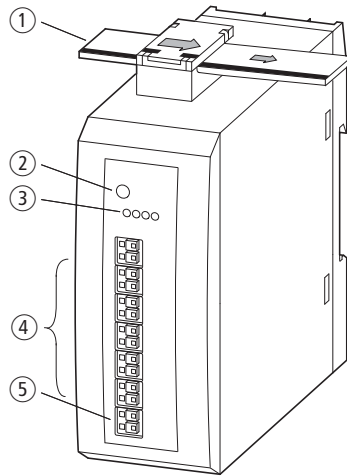


Figure 10: Layout of module EU5E-SWD-4DX

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT diagnostics LED
- ③ Status LEDs of the inputs
- ④ I0 – I3, (I, I+, I-) -inputs
- ⑤ 0-V-24-V connection

### 2.7.3 Engineering

The four inputs use a three-wire connection configuration.

input	Meaning
$I_x$	Input signal $I_x$
$I_{x-}$	0-V-supply voltage input $I_x$
$I_{x+}$	24-V-supply voltage input $I_x$
$x$	0, 1, 2, 3

A 24 V supply voltage is available for each input. The maximum current draw for each input is 0.5 A. The supply is short-circuit proof.

On short circuit the SmartWire-DT diagnostics LED flashes and the diagnostic bit is set in the user program. When the short circuit is removed, the supply voltage is automatically applied again.



All 0 V connections ( $I_{x-}$ ;  $x = 0, 1, 2, 3$ ) are connected with each other and with the module's 0 V supply.

## 2 Input/output modules EU5E-SWD...

### 2.7 EU5E-SWD-4DX

#### 2.7.4 Installation

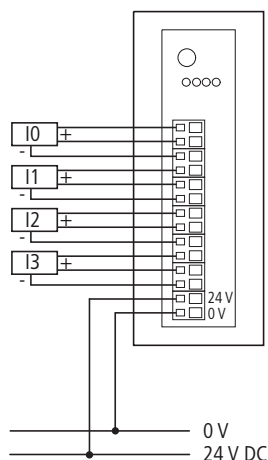


Figure 11: Connecting inputs and power supply

- ▶ Connect the sensors to the corresponding inputs I0 to I3. For the respective power supply, use terminals I- (0 V) and I+ (24 V).
- ▶ For a two-wire connection, connect the sensors to the corresponding inputs I0 to I3 and I- (0 V).
- ▶ Connect the 24 V power supply for all modules.

#### 2.7.5 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

#### 2.7.6 Fieldbus-specific characteristics

##### Field bus Ethercat

Please note the general information for configuring parameters  
→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.

#### 2.7.7 Programming

The module has two input bytes at its disposal.

##### 2.7.7.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	–	–



Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module M22-SWD-NOP(C) present

Byte 1:

7	6	5	4	3	2	1	0
–	–	–	–	I3	I2	I1	I0

Bit	designation	Meaning
0	I0	Status input I0
1	I1	Status input I1
2	I2	Status input I2
3	I3	Status input I3
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

### 2.7.7.2 Diagnostics

In case of diagnosis the module reports the following error cause (bit 4 in input byte 0 is set):

Value	Meaning
0x13)	Short-circuit/overload at supply voltage

## 2 Input/output modules EU5E-SWD...

### 2.8 EU5E-SWD-4D4D

## 2.8 EU5E-SWD-4D4D

### 2.8.1 Introduction

The SmartWire-DT I/O module EU5E-SWD-4D4D provides four digital inputs I0 to I3 and four digital outputs Q0 to Q3. Diverse sensors can be integrated into the SmartWire-DT network via the inputs. The short-circuit proof outputs are used to drive actuators.

The status of the inputs and outputs is indicated with the help of LEDs. The network status of the module is signalled via the SmartWire-DT diagnostics LED.

### 2.8.2 Surface mounting

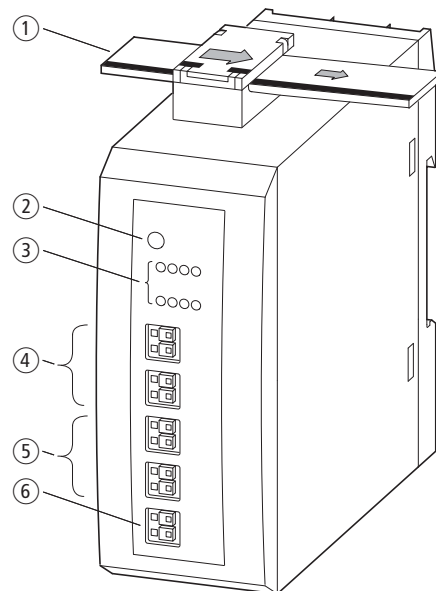


Figure 12: Connections of the modules EU5E-SWD-4D4D

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT diagnostics LED
- ③ Status LEDs of the inputs and outputs
- ④ I0 – I3 (inputs)
- ⑤ Q0 – Q3 (outputs)
- ⑥ 0-V-24-V connection

### 2.8.3 Engineering

The maximum current draw for each output is 0.5 A. The outputs are short-circuit proof. On short circuit the SmartWire-DT diagnostics LED flashes and the diagnostic bit is set in the user program. When the short circuit is removed, the supply voltage is automatically applied again.

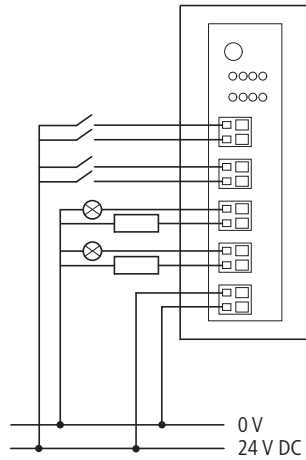


Figure 13: Connecting inputs/outputs and power supply

## 2.8.4 Installation

- ▶ Connect the sensors to the corresponding inputs I0 to I3.
- ▶ Connect the reference potential 0 V DC to connection 0V.
- ▶ Connect the actuators to the corresponding output Q0 to Q3.
- ▶ Connect the 24 V DC supply voltage for the outputs to the 24 V connection terminal

## 2.8.5 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

## 2.8.6 Fieldbus-specific characteristics

### Field bus Ethercat

Please note the general information for configuring parameters  
→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.

## 2.8.7 Programming

The module has two input bytes and one output byte at its disposal.

### 2.8.7.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	–	–

## 2 Input/output modules EU5E-SWD...

### 2.8 EU5E-SWD-4D4D

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module M22-SWD-NOP(C) present

Byte 1:

7	6	5	4	3	2	1	0
–	–	–	–	I3	I2	I1	I0

Bit	designation	Meaning
0	I0	Status input I0
1	I1	Status input I1
2	I2	Status input I2
3	I3	Status input I3
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

### 2.8.7.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	Q3	Q2	Q1	Q0

Bit	designation	Meaning
0	Q0	Actuation output Q0
1	Q1	Actuation output Q1
2	Q2	Actuation output Q2
3	Q3	Actuation output Q3
4	Not used	–

Bit	designation	Meaning
5	Not used	–
6	Not used	–
7	Not used	–

### 2.8.7.3 Diagnostics

In case of diagnosis the module reports the following error cause (bit 4 in input byte 0 is set):

Value	Meaning
0x13)	Short-circuit/overload on at least one output

## 2 Input/output modules EU5E-SWD...

### 2.9 EU5E-SWD-4D2R

## 2.9 EU5E-SWD-4D2R

### 2.9.1 Introduction

The SmartWire-DT I/O module EU5E-SWD-4D2R provides four digital inputs and two digital relay outputs. Diverse sensors can be integrated via the four inputs. Both digital relay outputs Q0 and Q1 can be used in the actuation of actuators up to a rated operational current of 3 A, AC-15 at 250 V. The status of the inputs and outputs is indicated with the help of LEDs. The network status of the module is signalled via the SmartWire-DT diagnostics LED.

### 2.9.2 Surface mounting

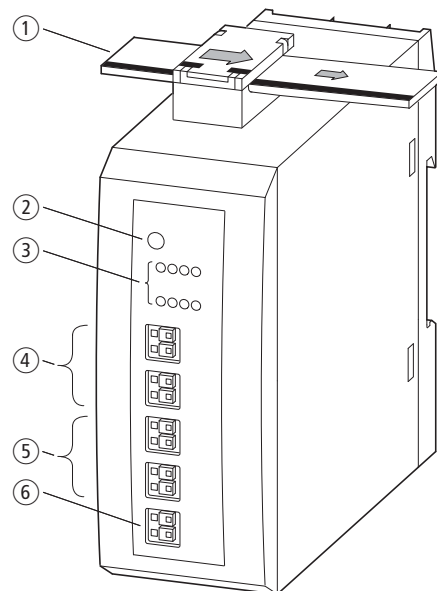


Figure 14: Connections of the modules EU5E-SWD-4D2R

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT diagnostics LED
- ③ Status LEDs of the inputs and outputs
- ④ I0 – I3 (inputs)
- ⑤ Q0, Q1 (outputs)
- ⑥ 0-V connection

### 2.9.3 Engineering

Module EU5E-SWD-4D2R can be used for directly actuating AC or DC contactors with larger pull-in power. The relay outputs must be fuse-protected against overload and short-circuits.

## 2.9.4 Installation

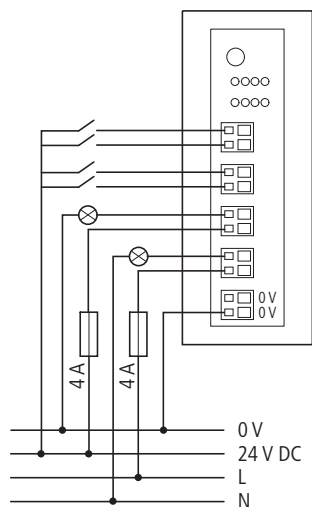


Figure 15: Connecting the inputs/outputs of module EU5E-SWD-4D2R

- ▶ Connect the sensors to the corresponding inputs I0 to I3.
- ▶ Connect the reference potential 0 V DC to connection 0V.
- ▶ Wire the first relay output to Q1 and the second to Q2.

### **NOTICE**

The relays Q1 and Q2 can be subjected to a rated operational current of up to AC3, -15 A at 250 V. They must be protected with a 4 A fuse.

## 2.9.5 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

## 2.9.6 Fieldbus-specific characteristics

### **Field bus Ethercat**

Please note the general information for configuring parameters

→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.

## 2.9.7 Programming

The module has two input bytes and one output byte at its disposal.

### 2.9.7.1 Inputs

Byte 0:

## 2 Input/output modules EU5E-SWD...

### 2.9 EU5E-SWD-4D2R

7	6	5	4	3	2	1	0
SUBST	PRSN T	–	DIAG	–	–	–	–

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module M22-SWD-NOP(C) present

Byte 1:

7	6	5	4	3	2	1	0
–	–	–	–	I3	I2	I1	I0

Bit	designation	Meaning
0	I0	Status input I0
1	I1	Status input I1
2	I2	Status input I2
3	I3	Status input I3
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

#### 2.9.7.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	Q1	Q0



Bit	designation	Meaning
0	Q0	Actuation output Q0
1	Q 1	Actuation output Q1
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

### 2.9.7.3 Diagnostics

The module does not report a diagnosis.

## 2 Input/output modules EU5E-SWD...

### 2.10 EU5E-SWD-X8D

## 2.10 EU5E-SWD-X8D

### 2.10.1 Introduction

SmartWire-DT I/O module EU5E-SWD-X8D provides eight digital outputs Q0 to Q7. The outputs are used to operate actuators. The output states are indicated by LEDs. The module's network status is indicated by the SmartWire-DT diagnostics LED.

### 2.10.2 Surface mounting

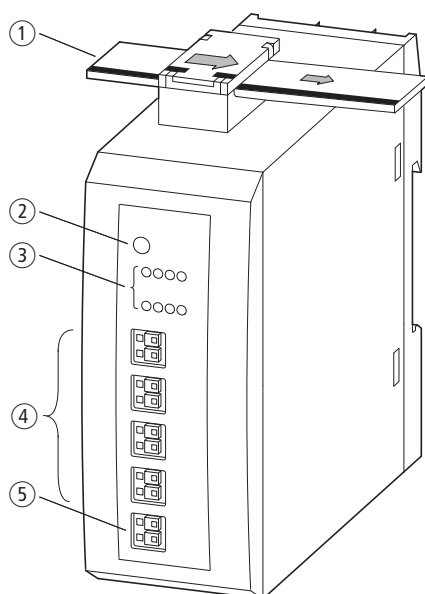


Figure 16: Layout of module EU5E-SWD-X8D

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT diagnostics LED
- ③ Status LEDs of the outputs
- ④ Q0 – Q7 (outputs)
- ⑤ 0-V-24-V connection

### 2.10.3 Engineering

The maximum current draw for each output is 0.5 A. The outputs are short-circuit proof. On short circuit the SmartWire-DT diagnostics LED flashes and the diagnostic bit is set in the user program. When the short circuit is removed, the supply voltage is automatically applied again.

## 2.10.4 Installation

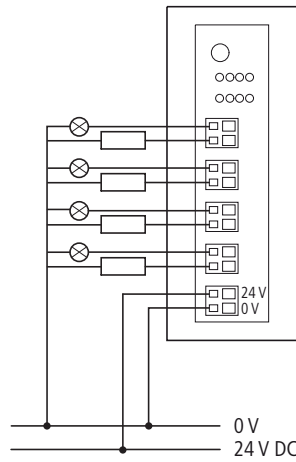


Figure 17: Connecting outputs and supply

- ▶ Connect the actuators to the corresponding outputs Q0 to Q7.
- ▶ Connect the 24 V power supply for the card.

## 2.10.5 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

## 2.10.6 Fieldbus-specific characteristics

### Field bus Ethercat

Please note the general information for configuring parameters  
→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.

## 2.10.7 Programming

The module has one input byte and one output byte.

### 2.10.7.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	–	–

## 2 Input/output modules EU5E-SWD...

### 2.10 EU5E-SWD-X8D

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module M22-SWD-NOP(C) present

#### 2.10.7.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
Q7	Q6	Q5	Q4	Q3	Q2	Q 1	Q0

Bit	designation	Meaning
0	Q0	Actuation output Q0
1	Q 1	Actuation output Q1
2	Q2	Actuation output Q2
3	Q3	Actuation output Q3
4	Q4	Actuation output Q4
5	Q5	Actuation output Q5
6	Q6	Actuation output Q6
7	Q7	Actuation output Q7

#### 2.10.7.3 Diagnostics

In case of diagnosis the module reports the following error cause (bit 4 in input byte 0 is set):

Value	Meaning
0x13)	Short-circuit/overload on at least one output

## 2.11 EU5E-SWD-4AX

### 2.11.1 Introduction

SmartWire-DT I/O module EU5E-SWD-4AX provides four analog inputs, to which voltage (0 – 10 V) or current sensors (0 – 20 mA) can be connected.

The network status of the module is signalled via the SmartWire-DT diagnostics LED.

### 2.11.2 Surface mounting

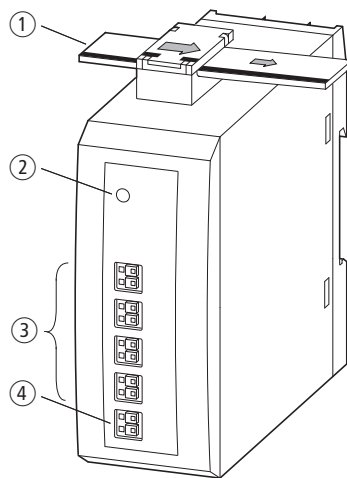


Figure 18: Layout of module EU5E-SWD-4AX

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT diagnostics LED
- ③ Inputs I0 – I3
- ④ 0-V-24-V connection supply

### 2.11.3 Engineering

The analog inputs can be connected as two-wire connections. The inputs are electrically isolated from the SmartWire-DT network but not from each other. The signal range (voltage 0–10 V, current 0–20 mA) can be separately set for each of the four analog outputs in the programming system's control configurator. The resolution is 12 Bit.



All 0 V connections ( $I_x^-$ ;  $x = 0, 1, 2, 3$ ) are connected with each other and with the module's 0 V supply.

## 2 Input/output modules EU5E-SWD...

### 2.1.1 EU5E-SWD-4AX

#### 2.11.4 Installation

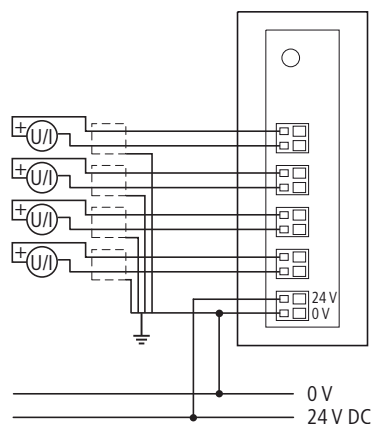


Figure 19: Connecting inputs and power supply

- ▶ Connect the analog sensors to the corresponding inputs I0 to I3.
- ▶ Connect the 24 V power supply for the card.

#### 2.11.5 Parameter definition

With the programming system's control configurator, users can define the sensor model, measured value refresh rate and averaging.

Parameter	Setting options	Default setting
Sensor type I0	Voltage (0 - 10 V), current (0 - 20 mA)	Voltage (0 - 10 V)
Sensor type I1	Voltage (0 - 10 V), current (0 - 20 mA)	Voltage (0 - 10 V)
Sensor type I2	Voltage (0 - 10 V), current (0 - 20 mA)	Voltage (0 - 10 V)
Sensor type I3	Voltage (0 - 10 V), current (0 - 20 mA)	Voltage (0 - 10 V)

Parameter	Reading update	Averaging	
		On (default)	off
Reading refresh rate	20 ms	1	—
	100 ms (default setting)	5 measurement cycles	
	200 ms	10 measurement cycles	
	500 ms	25 measurement cycles	

This setting applies for all channels.

The specified value is the refresh time to the SmartWire-DT coordinator. An averaging function, which smooths input signal fluctuations, is associated with this setting.

### 2.11.6 Fieldbus-specific characteristics

#### Field bus CANopen

The module is parameterized through its associated parameter byte in the control configurator.

For values other than the default, change these values as shown below.

Structure of parameter byte 1:

Bit	Function	Configuration
0	Sensor selection Input 1	<b>0 = Voltage</b> 1 = Current
1	Sensor selection Input 2	<b>0 = Voltage</b> 1 = Current
2	Sensor selection Input 3	<b>0 = Voltage</b> 1 = Current
3	Sensor selection Input 4	<b>0 = Voltage</b> 1 = Current
4, 5	Reading refresh rate	Bit 5 Bit 4 0 0 = 20 ms <b>0 1 = 100 ms</b> 1 0 = 200 ms 1 1 = 500 ms
6	Mean value	0 = off <b>1 = ON</b>
7	reserved	<b>0</b>

Bold values indicate the default settings.



The CANopen field bus transmits data event-controlled whenever the reading changes. Reducing the reading refresh rate, for example to 20 ms, can increase data traffic on the field bus.

#### Field bus Ethercat

Please note the general information for configuring parameters

→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249, also

→ Section , „Device options“, page 249.

Defining the sensor type and the measuring settings:

device index: sub-index 22

Parameter data length: 0x02

Structure of parameter byte 1:

## 2 Input/output modules EU5E-SWD...

### 2.11 EU5E-SWD-4AX

Bit	Function	Configuration
0	Sensor selection Input 1	<b>0 = Voltage</b> 1 = Current
1	Sensor selection Input 2	<b>0 = Voltage</b> 1 = Current
2	Sensor selection Input 3	<b>0 = Voltage</b> 1 = Current
3	Sensor selection Input 4	<b>0 = Voltage</b> 1 = Current
4, 5	Reading refresh rate	Bit 5 Bit 4 0 0 = 20 ms <b>0 1 = 100 ms</b> 1 0 = 200 ms 1 1 = 500 ms
6	Mean value	0 = off <b>1 = ON</b>
7	reserved	<b>0</b>

Bold values indicate the default settings.



## 2.11.7 Programming

The module has an input byte for SmartWire-DT status and four input words for the analog inputs.

### 2.11.7.1 Inputs

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
SUBS T	PRSN T	–	DIAG	–	–	–	–

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSENT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module M22-SWD-NOP(C) present

The input resolution is 12-bit. The analog values are transmitted as unsigned 16-bit value.

The exact addressing used for the data will depend on the selected programming system.

#### Inputs

	<b>15</b>	<b>14</b>	<b>13</b>	<b>12</b>	<b>11</b>	<b>10</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
IW0	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X
IW1	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X
IW2	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X
IW3	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X

### 2.11.7.2 Diagnostics

In fault scenario (bit 4 in input byte 0 is set) the module reports the following error cause:

0x13 overload on at least one analog current input ( $I > 23 \text{ mA}$ )

## 2 Input/output modules EU5E-SWD...

### 2.12 EU5E-SWD-2A2A

## 2.12 EU5E-SWD-2A2A

### 2.12.1 Introduction

SmartWire-DT I/O module EU5E-SWD-2A2A provides two analog inputs and two analog outputs for current. (0 – 20 mA) or voltage (0 – 10 V) sensors or actuators. The resolution is 12-bit.

The module's network status is indicated by the SmartWire-DT diagnostics LED.

### 2.12.2 Surface mounting

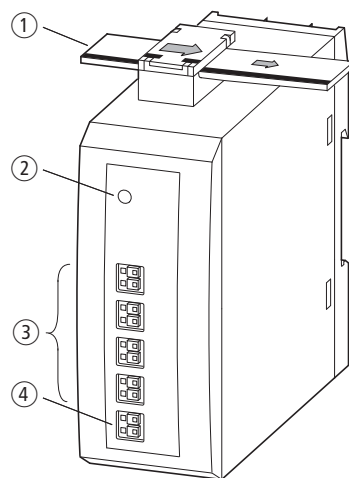


Figure 20: Layout of module EU5E-SWD-2A2A

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT diagnostics LED
- ③ Input IA0, IA1, output QA0, QA1
- ④ 0-V-24-V connection supply

### 2.12.3 Engineering

The signal range (voltage 0 – 10 V, current 0 – 20 mA) can be separately set for each input and output in the programming system's control configurator. They are electrically isolated from the SmartWire-DT network but not from each other. The resolution is 12-bit.



All 0 V connections ( $I_{x-}$ ,  $Q_{x-}$ ;  $x = 0, 1$ ) are connected with each other and with the module's 0 V supply.

### 2.12.4 Installation

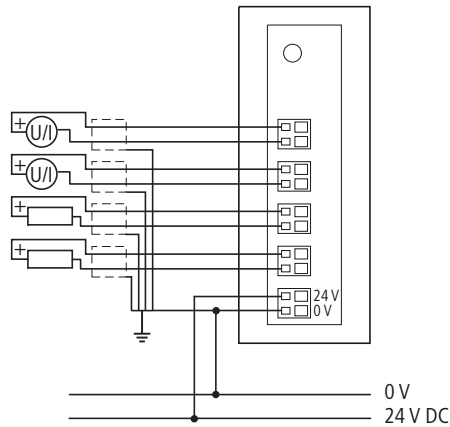


Figure 21: Connecting inputs and supply of module EU5E-SWD-2A2A

- ▶ Connect the sensors to the corresponding inputs I0 to I1.
- ▶ Connect the actuators to the corresponding outputs Q0 to Q1.
- ▶ Connect the 24 V power supply for the card.

### 2.12.5 Parameter definition

With the programming system's control configurator, users can define the sensor/actuator model, measured value refresh rate and averaging.

Parameter	Setting options	Default setting
Sensor type I0	Voltage (0 - 10 V), current (0 - 20 mA)	Voltage (0 - 10 V)
Sensor type I1	Voltage (0 - 10 V), current (0 - 20 mA)	Voltage (0 - 10 V)
Actuator model Q0	Voltage (0 - 10 V), current (0 - 20 mA)	Voltage (0 - 10 V)
Actuator model Q1	Voltage (0 - 10 V), current (0 - 20 mA)	Voltage (0 - 10 V)

Parameter	Value (reading refresh rate)	Averaging	
		On (default)	off
Reading refresh rate	20 ms	1	
	100 ms (default setting)	5 measurement cycles	
	200 ms	10 measurement cycles	
	500 ms	25 measurement cycles	

This setting applies to all analog inputs. The specified value is the refresh time for the SmartWire-DT network. An averaging function that smooths input signal fluctuations can be activated separately.

### 2.12.6 Fieldbus-specific characteristics

#### Field bus CANopen

## 2 Input/output modules EU5E-SWD...

### 2.12 EU5E-SWD-2A2A

The module is parameterized through its associated parameter byte in the control configurator.

For values other than the default, change these values as shown below.

Structure of parameter byte 1:

Bit	Function	Configuration
0	Sensor selection Input 1	<b>0 = Voltage</b> 1 = Current
1	Sensor selection Input 2	<b>0 = Voltage</b> 1 = Current
2	Sensor selection Output 1	<b>0 = Voltage</b> 1 = Current
3	Sensor selection Output 2	<b>0 = Voltage</b> 1 = Current
4, 5	Reading refresh rate	Bit 5 Bit 4 0 0 = 20 ms <b>0 1 = 100 ms</b> 1 0 = 200 ms 1 1 = 500 ms
6	Mean value	0 = off <b>1 = on</b>
7	reserved	<b>0</b>

Bold values indicate the default settings.



The CANopen field bus transmits data event-controlled whenever the reading changes. Reducing the reading refresh rate, for example to 20 ms, can increase data traffic on the field bus.

### Field bus Ethercat

Please note the general information for configuring parameters

→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249, also

→ Section , „Device options“, page 249.

Defining the sensor type and the measuring settings:

device index: sub-index 22

Parameter data length: 0x02

Structure of parameter byte 1:

Bit	Function	Configuration
0	Sensor selection Input 1	<b>0 = Voltage</b> 1 = Current
1	Sensor selection Input 2	<b>0 = Voltage</b> 1 = Current
2	Sensor selection Input 3	<b>0 = Voltage</b> 1 = Current

Bit	Function	Configuration
3	Sensor selection Input 4	<b>0 = Voltage</b> 1 = Current
4, 5	Reading refresh rate	Bit 5 Bit 4 0 0 = 20 ms <b>0 1 = 100 ms</b> 1 0 = 200 ms 1 1 = 500 ms
6	Mean value	0 = off <b>1 = ON</b>
7	reserved	<b>0</b>

Bold values indicate the default settings.

## 2.12.7 Programming

The module has an input byte for SmartWire-DT status, two words for the analog inputs and two output words for the analog outputs.

### 2.12.7.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	–	–

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSENT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module M22-SWD-NOP(C) present

The input resolution is 12-bit. The analog values are transmitted as unsigned 16-bit values.

The exact addressing used for the data will depend on the selected programming system.

## 2 Input/output modules EU5E-SWD...

### 2.12 EU5E-SWD-2A2A

#### Inputs

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IW0	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X
IW1	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X

#### Outputs

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
QW0	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X
QW1	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X

#### 2.12.7.2 Diagnostics

In fault scenario (bit 4 in input byte 0 is set) the module reports the following error cause:

- 0x13 overload or short circuit on at least one analog output
- 0x13 overload on at least one analog current input ( $I > 23 \text{ mA}$ )
- 0x14 No 24 VDC supply voltage connected

## 2.13 EU5E-SWD-4PT/...4PT-2

### 2.13.1 Introduction

SmartWire-DT I/O modules EU5E-SWD-4PT and EU5E-SWD-4PT-2 provide four analog temperature inputs. PT100, PT1000, or Ni1000 RTDs in two-wire or three-wire connection configurations can be connected to the inputs. The module's network status is indicated by the SmartWire-DT diagnostic LED.

### 2.13.2 Surface mounting

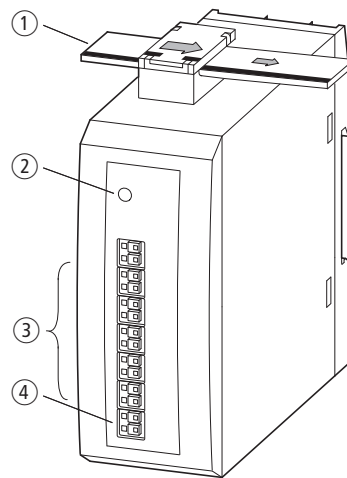


Figure 22: Layout of EU5E-SWD-4PT and EU5E-SWD-4PT-2 modules

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT diagnostics LED
- ③ Input IA0 – IA3
- ④ 0–24 V supply connection

### 2.13.3 Engineering

The RTD (Pt100, Pt1000 or Ni1000) is selected in the programming system's control configurator.

The temperature range for the EU5E-SWD-4PT and EU5E-SWD-4PT-2 I/O modules will depend on the sensor chosen.

Table 2: Temperature range EU5E-SWD-4PT and EU5E-SWD-4PT-2

Temperature range		EU5E-SWD-4PT	EU5E-SWD-4PT-2
Ni1000	°C	-50 to +150	-50 to +200
Pt100	°C	-50 to +200	-100 to +400
Pt1000	°C	-50 to +200	-100 to +400

## 2 Input/output modules EU5E-SWD...

### 2.13 EU5E-SWD-4PT/...4PT-2

If the sensor is connected as a two-wire sensor, terminals Ax-ax (x = 0, 1, 2, 3) must be connected to each other with a jumper. In the case of unused inputs, all three terminals need to be connected to each other with a jumper.

#### 2.13.4 Installation

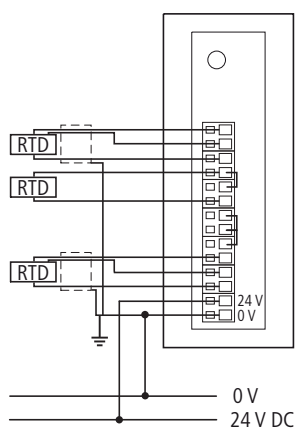


Figure 23: Connecting inputs and supply of module EU5E-SWD-4PT/...4PT-2

- ▶ Connect the sensors to the corresponding inputs I0 to I3.
- ▶ Connect the 24 V power supply for the card.

#### 2.13.5 Parameter definition

With the programming system's control configurator, users can define the sensor model, measured value refresh rate and analog input representation.

Parameter	Setting options	Default setting
Sensor type 1	Not used, PT100, PT1000, Ni1000	Not Used
Sensor type 2	Not used, PT100, PT1000, Ni1000	Not Used
Sensor type 3	Not used, PT100, PT1000, Ni1000	Not Used
Sensor type 4	Not used, PT100, PT1000, Ni1000	Not Used
Application Style	Degrees Celsius, degrees Fahrenheit, nonlinear value	Degrees Celsius

Parameter	Reading refresh rate	Averaging
Reading refresh rate/ averaging	0.25 s (default setting)	–
	1 s	4 measurement cycles
	2.5 s	10 measurement cycles
	10 s	40 measurement cycles

This setting applies for all analog inputs. The specified value is the refresh time to the SmartWire-DT network. An averaging function, which smooths input signal fluctuations, is associated with this setting.



### 2.13.6 Fieldbus-specific characteristics

#### Field bus CANopen

The module is parameterized with the control configurator using the card's two associated parameter bytes.

Select the desired model, and the reading representation and refresh rate. Unused temperature channels must remain set to "unused" according to the table.

Structure of parameter byte 1:

Bit	Function	Configuration															
0, 1	Sensor selection Input 1	<table border="0"> <tr> <td>bit1</td> <td>Bit 0</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>not used</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= PT100</td> </tr> <tr> <td>1</td> <td>0</td> <td>= PT1000</td> </tr> <tr> <td>1</td> <td>1</td> <td>= NI1000</td> </tr> </table>	bit1	Bit 0		<b>0</b>	<b>0</b>	= <b>not used</b>	0	1	= PT100	1	0	= PT1000	1	1	= NI1000
bit1	Bit 0																
<b>0</b>	<b>0</b>	= <b>not used</b>															
0	1	= PT100															
1	0	= PT1000															
1	1	= NI1000															
2, 3	Sensor selection Input 2	<table border="0"> <tr> <td>Bit3</td> <td>Bit 2</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>not used</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= PT100</td> </tr> <tr> <td>1</td> <td>0</td> <td>= PT1000</td> </tr> <tr> <td>1</td> <td>1</td> <td>= NI1000</td> </tr> </table>	Bit3	Bit 2		<b>0</b>	<b>0</b>	= <b>not used</b>	0	1	= PT100	1	0	= PT1000	1	1	= NI1000
Bit3	Bit 2																
<b>0</b>	<b>0</b>	= <b>not used</b>															
0	1	= PT100															
1	0	= PT1000															
1	1	= NI1000															
4, 5	Sensor selection Input 3	<table border="0"> <tr> <td>Bit 5</td> <td>Bit 4</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>not used</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= PT100</td> </tr> <tr> <td>1</td> <td>0</td> <td>= PT1000</td> </tr> <tr> <td>1</td> <td>1</td> <td>= NI1000</td> </tr> </table>	Bit 5	Bit 4		<b>0</b>	<b>0</b>	= <b>not used</b>	0	1	= PT100	1	0	= PT1000	1	1	= NI1000
Bit 5	Bit 4																
<b>0</b>	<b>0</b>	= <b>not used</b>															
0	1	= PT100															
1	0	= PT1000															
1	1	= NI1000															
6, 7	Sensor selection Input 4	<table border="0"> <tr> <td>Bit 7</td> <td>Bit 6</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>not used</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= PT100</td> </tr> <tr> <td>1</td> <td>0</td> <td>= PT1000</td> </tr> <tr> <td>1</td> <td>1</td> <td>= NI1000</td> </tr> </table>	Bit 7	Bit 6		<b>0</b>	<b>0</b>	= <b>not used</b>	0	1	= PT100	1	0	= PT1000	1	1	= NI1000
Bit 7	Bit 6																
<b>0</b>	<b>0</b>	= <b>not used</b>															
0	1	= PT100															
1	0	= PT1000															
1	1	= NI1000															

Bold values indicate the default settings.

Structure of parameter byte 2:

Bit	Function	Configuration															
0, 1	Measurement display	<table border="0"> <tr> <td>bit1</td> <td>Bit 0</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>degrees Celsius</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= degrees Fahrenheit</td> </tr> <tr> <td>1</td> <td>0</td> <td>= Binary value</td> </tr> </table>	bit1	Bit 0		<b>0</b>	<b>0</b>	= <b>degrees Celsius</b>	0	1	= degrees Fahrenheit	1	0	= Binary value			
bit1	Bit 0																
<b>0</b>	<b>0</b>	= <b>degrees Celsius</b>															
0	1	= degrees Fahrenheit															
1	0	= Binary value															
2, 3	Reading refresh rate	<table border="0"> <tr> <td>Bit3</td> <td>Bit 2</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>0.25 s</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= 1 s</td> </tr> <tr> <td>1</td> <td>0</td> <td>= 2.5 s</td> </tr> <tr> <td>1</td> <td>1</td> <td>= 10 s</td> </tr> </table>	Bit3	Bit 2		<b>0</b>	<b>0</b>	= <b>0.25 s</b>	0	1	= 1 s	1	0	= 2.5 s	1	1	= 10 s
Bit3	Bit 2																
<b>0</b>	<b>0</b>	= <b>0.25 s</b>															
0	1	= 1 s															
1	0	= 2.5 s															
1	1	= 10 s															
4	reserved	<b>0</b>															
5	reserved	<b>0</b>															
6	reserved	<b>0</b>															
7	reserved	<b>0</b>															

Bold values indicate the default settings.



The CANopen field bus transmits data event-controlled whenever the reading changes.

Reducing the reading refresh rate, for example to 50 ms, can increase data traffic on the field bus.

### Field bus Ethercat

Please note the general information for configuring parameters

→ Chapter 13 “Using SmartWire-DT modules with the EtherCAT field bus”, page 249, also

→ Section , „Device options”, page 249.

Defining the sensor type and the measuring settings:

device index: sub-index 22

Parameter data length: 0x03

Structure of parameter byte 1:

Bit	Function	Configuration															
0, 1	Sensor selection Input 1	<table border="0"> <tr> <td>bit1</td> <td>Bit 0</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>not used</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= PT100</td> </tr> <tr> <td>1</td> <td>0</td> <td>= PT1000</td> </tr> <tr> <td>1</td> <td>1</td> <td>= NI1000</td> </tr> </table>	bit1	Bit 0		<b>0</b>	<b>0</b>	= <b>not used</b>	0	1	= PT100	1	0	= PT1000	1	1	= NI1000
bit1	Bit 0																
<b>0</b>	<b>0</b>	= <b>not used</b>															
0	1	= PT100															
1	0	= PT1000															
1	1	= NI1000															
2, 3	Sensor selection Input 2	<table border="0"> <tr> <td>Bit3</td> <td>Bit 2</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>not used</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= PT100</td> </tr> <tr> <td>1</td> <td>0</td> <td>= PT1000</td> </tr> <tr> <td>1</td> <td>1</td> <td>= NI1000</td> </tr> </table>	Bit3	Bit 2		<b>0</b>	<b>0</b>	= <b>not used</b>	0	1	= PT100	1	0	= PT1000	1	1	= NI1000
Bit3	Bit 2																
<b>0</b>	<b>0</b>	= <b>not used</b>															
0	1	= PT100															
1	0	= PT1000															
1	1	= NI1000															
4, 5	Sensor selection Input 3	<table border="0"> <tr> <td>Bit 5</td> <td>Bit 4</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>not used</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= PT100</td> </tr> <tr> <td>1</td> <td>0</td> <td>= PT1000</td> </tr> <tr> <td>1</td> <td>1</td> <td>= NI1000</td> </tr> </table>	Bit 5	Bit 4		<b>0</b>	<b>0</b>	= <b>not used</b>	0	1	= PT100	1	0	= PT1000	1	1	= NI1000
Bit 5	Bit 4																
<b>0</b>	<b>0</b>	= <b>not used</b>															
0	1	= PT100															
1	0	= PT1000															
1	1	= NI1000															
6, 7	Sensor selection Input 4	<table border="0"> <tr> <td>Bit 7</td> <td>Bit 6</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>not used</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= PT100</td> </tr> <tr> <td>1</td> <td>0</td> <td>= PT1000</td> </tr> <tr> <td>1</td> <td>1</td> <td>= NI1000</td> </tr> </table>	Bit 7	Bit 6		<b>0</b>	<b>0</b>	= <b>not used</b>	0	1	= PT100	1	0	= PT1000	1	1	= NI1000
Bit 7	Bit 6																
<b>0</b>	<b>0</b>	= <b>not used</b>															
0	1	= PT100															
1	0	= PT1000															
1	1	= NI1000															

Bold values indicate the default settings.

Structure of parameter byte 2:

Bit	Function	Configuration															
0, 1	Measurement display	<table border="0"> <tr> <td>bit1</td> <td>Bit 0</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= degrees Celsius</td> </tr> <tr> <td>0</td> <td>1</td> <td>= degrees Fahrenheit</td> </tr> <tr> <td>1</td> <td>0</td> <td>= Binary value</td> </tr> </table>	bit1	Bit 0		<b>0</b>	<b>0</b>	= degrees Celsius	0	1	= degrees Fahrenheit	1	0	= Binary value			
bit1	Bit 0																
<b>0</b>	<b>0</b>	= degrees Celsius															
0	1	= degrees Fahrenheit															
1	0	= Binary value															
2, 3	Reading refresh rate	<table border="0"> <tr> <td>Bit3</td> <td>Bit 2</td> <td></td> </tr> <tr> <td><b>0</b></td> <td><b>0</b></td> <td>= <b>0.25 s</b></td> </tr> <tr> <td>0</td> <td>1</td> <td>= 1 s</td> </tr> <tr> <td>1</td> <td>0</td> <td>= 2.5 s</td> </tr> <tr> <td>1</td> <td>1</td> <td>= 10 s</td> </tr> </table>	Bit3	Bit 2		<b>0</b>	<b>0</b>	= <b>0.25 s</b>	0	1	= 1 s	1	0	= 2.5 s	1	1	= 10 s
Bit3	Bit 2																
<b>0</b>	<b>0</b>	= <b>0.25 s</b>															
0	1	= 1 s															
1	0	= 2.5 s															
1	1	= 10 s															
4	reserved	<b>0</b>															
5	reserved	<b>0</b>															
6	reserved	<b>0</b>															
7	reserved	<b>0</b>															

Bold values indicate the default settings.

## 2.13.7 Programming

The module has an input byte for SmartWire-DT status and four words for the temperature inputs.

### 2.13.7.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	–	–

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSN T	0: Module not available 1: Module available
7	SUBS T	0: Configured module present 1: universal module M22-SWD-NOP(C) present

## 2 Input/output modules EU5E-SWD...

### 2.13 EU5E-SWD-4PT/...4PT-2

#### Inputs

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IW0	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X
IW1	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X
IW2	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X
IW3	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X

As the table above shows, only 12 bits of each temperature input word are used. The content of inputs IW0 – IW3 will depend on how the "Format" parameter is configured.

If "°C" (degrees Celsius) or "°F" (degrees Fahrenheit) is selected as the format, the value will be represented as a signed decimal value with a resolution of 0.1 degrees. If "12Bit" is selected as the format instead, the raw value will be passed.

EU5E-SWD- ....	Representa- tion of sensor model	Temperature value in °C	Indicated value at selected representation		
			1/10 °C	1/10 °F	Nonlinear value
4PT	Pt100, Pt1000	-50 to +200	-500 to +2000	-580 – +3920	0 – 4095
	Ni1000	-50 to +150	-500 to +1500	-580 to +3020	0 – 4095
4PT-2	Pt100, Pt1000	-100 to +400	-500 to +4000	-580 to +7520	0 – 4095
	Ni1000	-50 to +200	-500 to +2000	-580 to +3920	0 – 4095

#### 2.13.7.2 Diagnostics

In fault scenario (bit 4 in input byte 0 is set) the module reports the following error cause (group information):

Value	Meaning
0x17	Out-of-range high reading on at least one temperature input
0x18	Out-of-range low reading on at least one temperature input

In this case the reading at the affected input is at the value range limit. On wire breakage the reading is at the upper value range limit.

## 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

### 3.1 Introduction

The SmartWire-DT modules DIL-SWD-32-001 and DIL-SWD-32-002 for DILM are snapped directly onto either a contactor type DILM7 to DILM38, a DILA contactor relay or an MSC motor starter. It is for the purpose of driving a contactor or a motor starter via a programmable logic controller and acquiring the feedback.

#### **NOTICE**

No additional auxiliary contact block can be snapped onto the contactor. The auxiliary switches integrated into the contactor can be used, for example, as safety locking devices.

#### **NOTICE**

In addition to the basic devices (contactors, motor starter combinations, etc.) described in the individual sections, The SmartWire Device Technology (SmartWire-DT) function elements listed in this manual can also be combined with equivalent Eaton basic devices that use the Eaton catalog number as part number.

For a reference table, see the Appendix on Page 260.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.5, „SWD module interoperability requirements“, page 261.

## 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

### 3.2 Surface mounting

#### 3.2 Surface mounting

The following diagram shows the two modules.

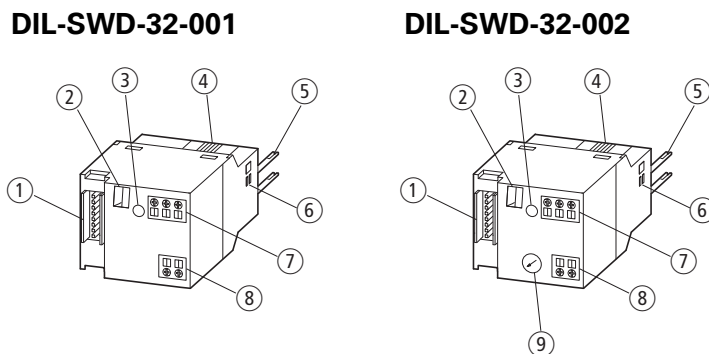


Figure 24: Structure of the SmartWire-DT modules DIL-SWD-32-001 and DIL-SWD-32-002 for DILM

- ① Connection of SmartWire-DT external device plug
- ② Mechanical switching position indicator
- ③ Diagnostics LED
- ④ Catch slider
- ⑤ Connection pins
- ⑥ Adjusting slide for contactor size
- ⑦ Terminal X0-X1-X2
- ⑧ Terminal, electrical enable X3-X4
- ⑨ Selector switch 1-0-A

The external device plug with an adapted SmartWire-DT connecting cable is connected to the contactor module DIL-SWD via connection ①.



For detailed instructions on how to connect the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pin SmartWire-DT ribbon cable, refer to the "Installing SWD4-8SF2-5 external device plugs" section in manual MN05006002Z-EN (previously AWB2723-1617de).

The communication status and switching command via the SmartWire-DT system are indicated by way of a two-color diagnostics LED ③ (→ Chapter 3 "Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors", page 74).

As well as the communication signals a 24 V DC supply for the contactor coil is also transmitted via the SmartWire-DT connection cable. The integrated electronics transfers the voltage to the connection pins ⑤ that are connected to the contactor coils.

The SmartWire-DT module for DILM is connected with the contact bridge of the contactor with the catch slider ④. Feedback on the switching status of the contactor is goes into the field bus.

In addition the status of the connected contactor can be acquired via the switch position indicator ②.

Adjustment of the SmartWire-DT module for DILM to the respective contactor size is performed via the adjusting slide for the contactor size ⑥.

### 3.3 Engineering

SmartWire-DT modules DIL-SWD-32-001 and DIL-SWD-32-002 can be combined with circuit breakers DILM7 to DILM38. This allows the use of motor starters consisting of a motor-protective circuit-breaker PKZ and a contactor DILM with the SmartWire-DT system.

With contactor combinations a SmartWire-DT module for DILM is required for each contactor.

Table 3: Combination options

Use	Number of SmartWire-DT modules for DILM
DILM contactor	1
<b>Motor starter MSC</b>	
DOL starter (PKZ and DILM)	1
Reversing starters	2
Reversing combination	2

As well as with contactors the SmartWire-DT module for DILM can also be combined with all DILA contactor relays.



Contactors with a rated operational current greater than 38 A can be integrated into the SmartWire-DT system with a DILA as a coupling relay or SmartWire-DT I/O module.

The contactor's power supply is directly supplied via the SmartWire-DT connection cable. The contactor coils have the following power consumptions with a voltage of 24 V DC:

Table 4: Power consumptions of the contactor coils with a voltage of 24 V DC

contactor	Pull-in power	Pick-up current with 24 V DC	Sealing power	Holding current with 24 V DC
	[W]	[mA]	[W]	[mA]
DILA, DILM7	3	125	3	125
DILM9 – DILM15	4.5	188	4.5	188
DILM17 – DILM38	12	500	0.5	21

### 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

#### 3.3 Engineering

#### **NOTICE**

The sum of the pull-in power of the simultaneously tripping contactors and the sum of the holding power of the tripped contactors for each SmartWire-DT network must not exceed 72 W. If required, an additional power feeder module (EU5C-SWD-PF1-1, EU5C-SWD-PF2) must be used (→ Chapter 1 “EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules”, page 13).



The DIL modules draw their energy for the communication electronics and for activation of the LEDs and of the auxiliary contacts from the SmartWire-DT network supply. Please take into consideration the total power consumption of your SmartWire-DT network and, if necessary, plan for an additional feeder module EU5C-SWD-PF2-1.



For data for the current requirement please refer to the table in the appendix on Page 255.

#### **DIL-SWD-32-001**

#### **DIL-SWD-32-002**

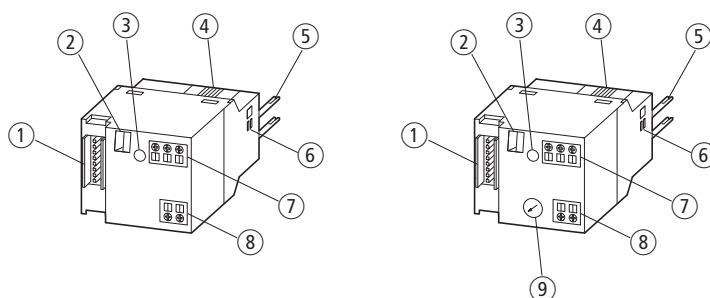


Figure 25: Connections of the SmartWire-DT module DIL-SWD-32-001 or DIL-SWD-32-002 for DILM

- ① Connection of SmartWire-DT external device plug
- ② Mechanical switching position indicator
- ③ Diagnostics LED
- ④ Catch slider
- ⑤ Connection pins
- ⑥ Adjusting slide for contactor size
- ⑦ Terminal X0-X1-X2
- ⑧ Terminal, electrical enable X3-X4
- ⑨ Selector switch 1-0-A



### 3.3.1 Direct-on-line starter

The DOL starter is assembled from a PKZM0 and a contactor DILM7 to DILM32. The SmartWire module for DILM is mounted on the contactor. The SmartWire-DT module for DILM is mounted on the contactor.

In addition to contactor control, two feedback signals can be sent to the SmartWire-DT system on each SmartWire-DT module for DILM.

#### **NOTICE**

The SmartWire-DT module for DILM drives the contactor so that terminals A1-A2 must no longer be wired.

The "Enable" ⑧ auxiliary contact is factory fitted with a link. If electrical locks are envisaged in the application, the bridge can be removed and a potential-free contact can be connected.



#### **DANGER**

The "Enable" auxiliary contact must not be used for safety-related controller parts (→ Section 3.3.3, „Safety-related applications“, page 66).

The auxiliary contacts integrated in the contactor can be used, e.g. for safety interlocks.

Two feedback inputs to the programmable logic controller are available at the three-pole terminal of connection ⑦ for the potential-free contacts. If required, potential-free auxiliary contact contacts of the protective motor switch PKZ can be connected to these two feedback inputs (e.g. NHI-E-...-PKZ0 standard auxiliary contacts, AGM2-...-PKZ0 differential trip-indicating auxiliary contact).

#### **NOTICE**

The connection cables to the potential-free auxiliary contacts at connection X0-X1-X2 ⑦ for the potential-free contacts and at connection X3-X4 ⑧ for the "Enable" auxiliary contact may have a maximum length of 2.8 m.

The connection terminals on the SmartWire-DT module for DILM are suitable for cables AWG24 to AWG16 and flexible cables with a cross-section of 0.25 mm<sup>2</sup> to 1.5 mm<sup>2</sup>.

When using ferrules it has to be ensured that the ferrule length is at least 8 mm.

A manual or electrical ON or OFF command for the contactor can take place in addition with the aid of the 1-0-A switch ⑨ in the device version DIL-SWD-32-002.

The switch positions are as follows:

### 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

#### 3.3 Engineering

- 1 - Contactor ON
- 0 - Contactor OFF
- A - Switching command via SmartWire-DT



Use of the 1-0-A switch for the electrical switching on or off of the contactor is ensured only when the SmartWire-DT module for DILM is supplied via the SmartWire-DT connecting cable.

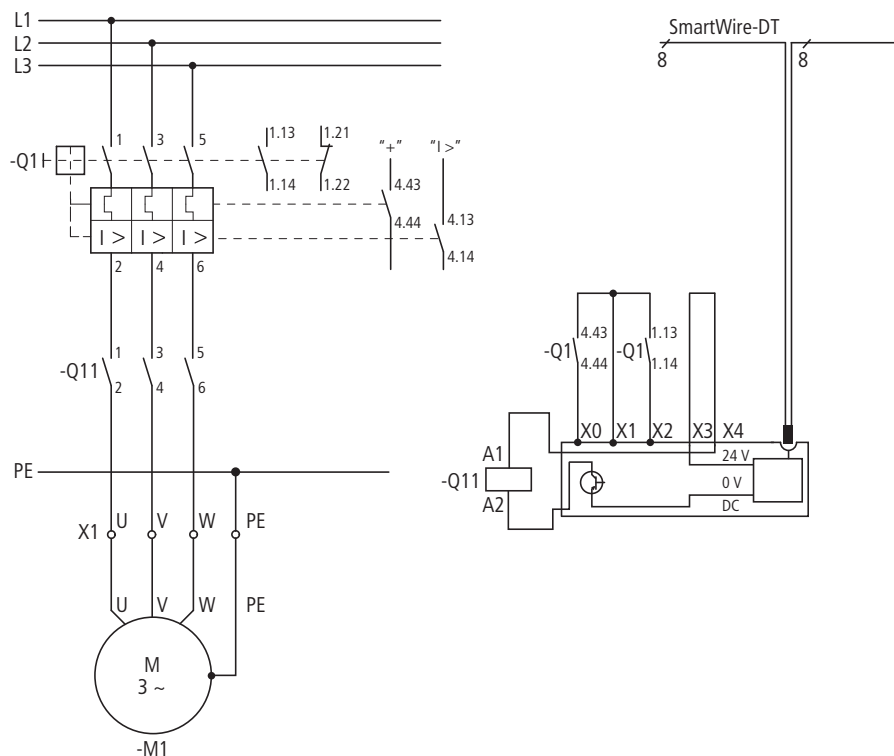


Figure 26: Circuit diagram of the direct starter

#### 3.3.2 Reversing starter

The reversing starters are made up of a PKZM0 and two contactors DILM7 to DILM32. One SmartWire-DT module each for DILM is mounted on both contactors.

In addition to contactor control, two feedback signals can be sent to the SmartWire-DT system on each SmartWire-DT module for DILM.

#### **NOTICE**

The SmartWire-DT modules for DILM drive the contactors so that the terminals A1-A2 of the contactors need no further wiring, with the exception of the DILM12-XEV link.

The "Enable" ⑧ auxiliary contact is factory fitted with a link, → Figure 28. For the electrical interlocking of the two contactors this link is removed and the auxiliary breaker (contacts 21-22) of the other contactor is linked in as a potential-free contact.



#### **DANGER**

The "Enable" ⑧ auxiliary contact must not be used for safety-related controller parts (→ Section 3.3.3, „Safety-related applications“, page 66).

The auxiliary contacts integrated in the contactor can be used, e.g. for safety interlocks.

Two feedback inputs for the programmable logic controller are available at the three-pole terminal of connection ⑦ for the potential-free contacts. If required, potential-free auxiliary contact contacts of the motor protective circuit breaker PKZ can be connected to these two feedback inputs (e.g. NHI-E-...-PKZ0 standard auxiliary contact, AGM2-...-PKZ0 differential trip-indicating auxiliary contact).

#### **NOTICE**

The connection cables to the potential-free auxiliary contacts at connection X0-X1-X2 ⑦ for the potential-free contacts and at connection X3-X4 ⑧ for the "Enable" auxiliary contact may have a maximum length of 2.8 m.

The connection terminals on the SmartWire-DT module for DILM are suitable for cables AWG24 to AWG16 and flexible cables with a cross-section of 0.25 mm<sup>2</sup> to 1.5 mm<sup>2</sup>.

When using ferrules it has to be ensured that the ferrule length is at least 8 mm.

#### **NOTICE**

The wiring sets DILM12-XRL and PKZM0-XRM12 must not be used for the assembly of the reversing starters. The A2 connections of the contactors must not be bridged.

The following jumpers can be used for wiring reversing starters.

Table 5: Links for reversing starters

	<b>DILM7 – DILM15</b>	<b>DILM17 – DILM32</b>
L1, L2 and L3 parallel	DILM12-XP2	DILM32-XRL
Phase switch L1 and L3, L2 parallel	DILM12-XR	DILM32-XRL
electrical interlock	DILM12-XEV	–

### 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

#### 3.3 Engineering

In combination with the jumpers DILM12-XEV the circuit Fig. 27 should be used. On the other hand, an electrical interlock with wire jumpers should be implemented according to the circuit Fig. 28.

A manual or electrical ON or OFF command for the contactor can take place in addition with the aid of the 1-0-A switch ⑨ in the device version DIL-SWD-32-002.

The switch positions are as follows:

- 1 - Contactor ON
- 0 - Contactor OFF
- A - Switching command via SmartWire-DT



Use of the 1-0-A switch for the electrical switching on or off of the contactor is ensured only when the SmartWire-DT module for DILM is supplied via the SmartWire-DT connecting cable.

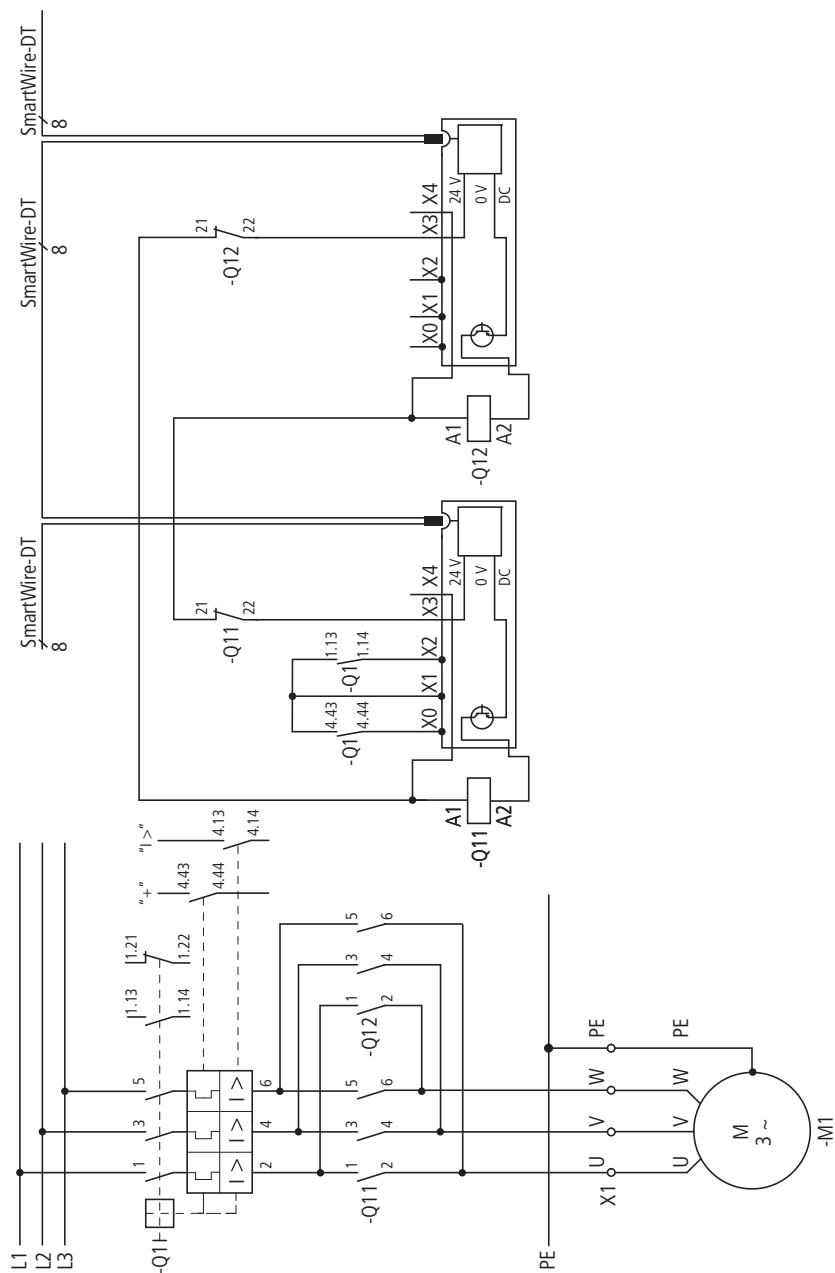


Figure 27: Circuit diagram of the reversing starter in combination with DILM12-XEV

### 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

#### 3.3 Engineering

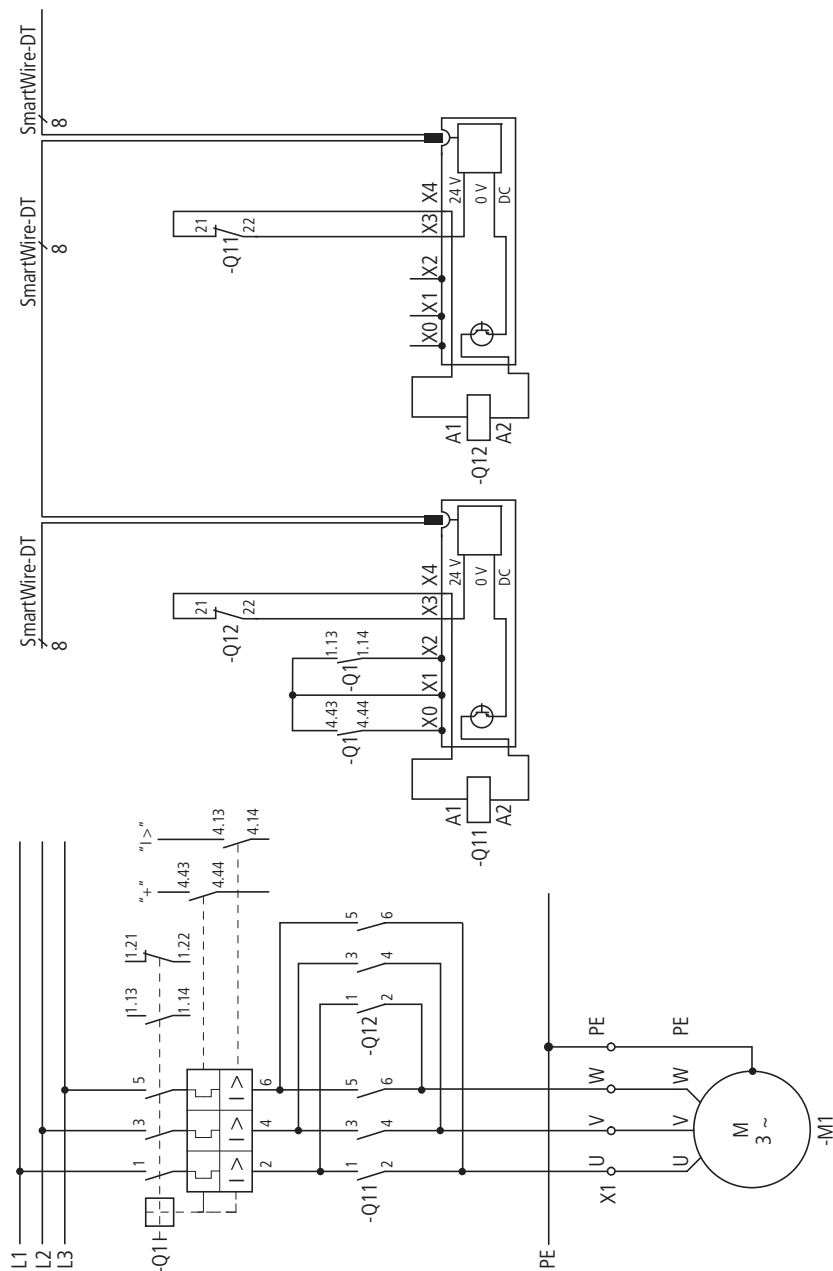


Figure 28: Circuit diagram of the reversing starter

#### 3.3.3 Safety-related applications

For most applications, disconnection in the event of an emergency or the disconnection by the opening of the protective doors is also required in addition to normal operational switching.

The SmartWire-DT system is not designed for the transfer of safety relevant signals. Using the following configuration the system SmartWire-DT can however be used for safety relevant switch-offs.

### 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

#### 3.3 Engineering



#### **DANGER**

In safety-relevant applications the power supply unit providing power to the SmartWire-DT system must feature a PELV power supply unit (protective extra low voltage).

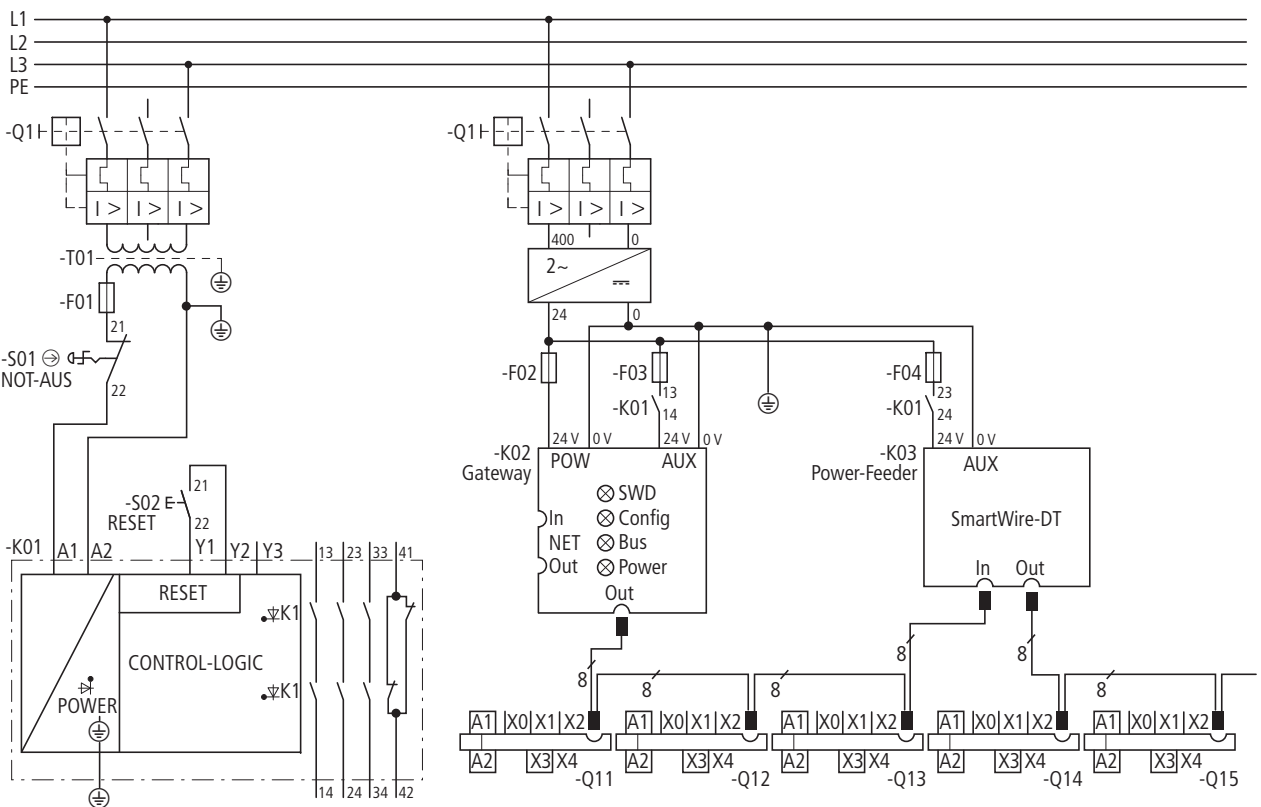


Figure 29: Actuating circuit for safety relevant switch-off

## 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

### 3.3 Engineering

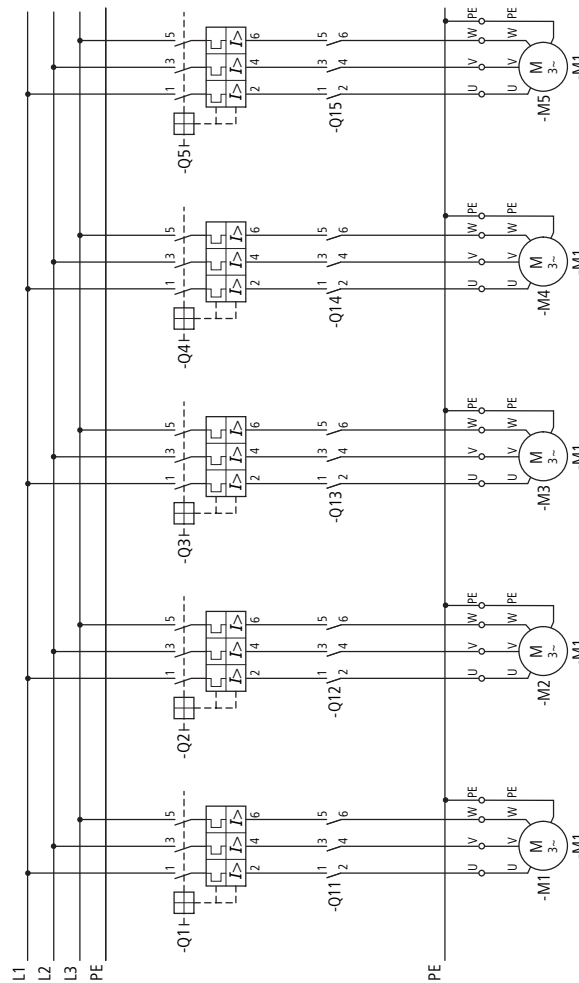


Figure 30: Main circuit for safety relevant switch-offs

In an emergency, the power for the contactor coils can be switched off using the enable circuit of the safety relay. By using additional SmartWire-DT Power modules, contactor groups are made that can be switched off together in an emergency. With this circuitry, controls can be assembled up to safety category 1 to EN 954-1. The safety relay must comply with Category 1 or higher (e.g. ESR5-NO-41-24VAC-DC) in this example.

### 3.3.4 Feedback Circuit

The auxiliary contact integrated in the contactor is a mirror contact according to IEC/EC 60947-4-1. Using this contact the state of the main contacts can be reliably signalled. The mirror contact can be included into the feedback circuit of the safety relay so that the safety relay only gives a new enable signal when the contactor is open.



### 3.3.5 Measures for higher safety categories

In many applications controls systems compliant with safety category 3 or 4 to EN 954-1 are required. Controllers of category 3 can be set up by means of an additional group contactor which is connected in series upstream of the motor junctions. In an emergency the control voltage for the motor contactors and for the group contactor are switched off via the safety relay. This redundant disconnection circuit enables the implementation of Category 3 control systems. The safety relay used must comply with Category 3 or higher (e.g. ESR5-NO-31-24VAC-DC) to attain this safety category.

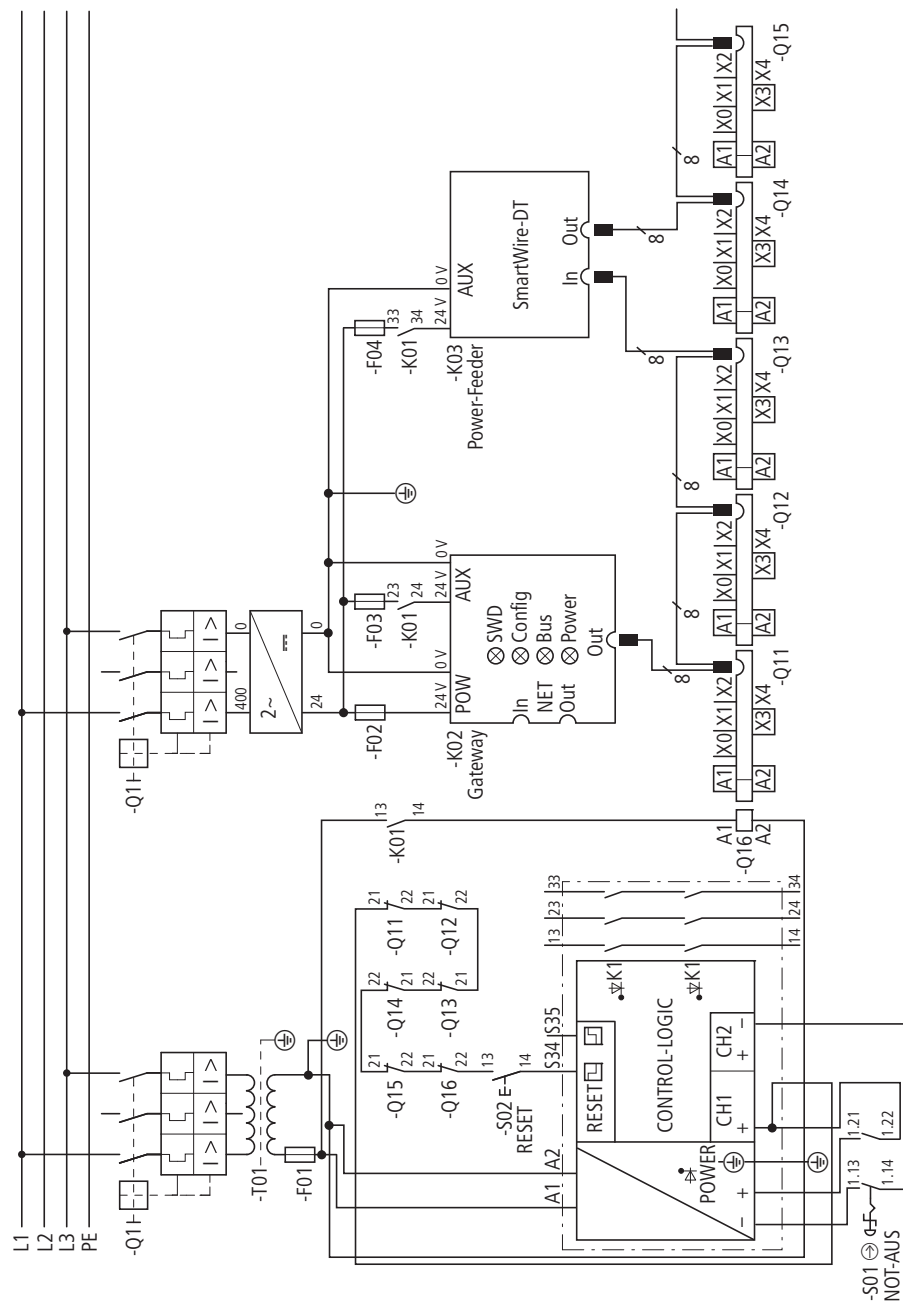


Figure 31: Actuating circuit for redundant switch-off

### 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

#### 3.3 Engineering

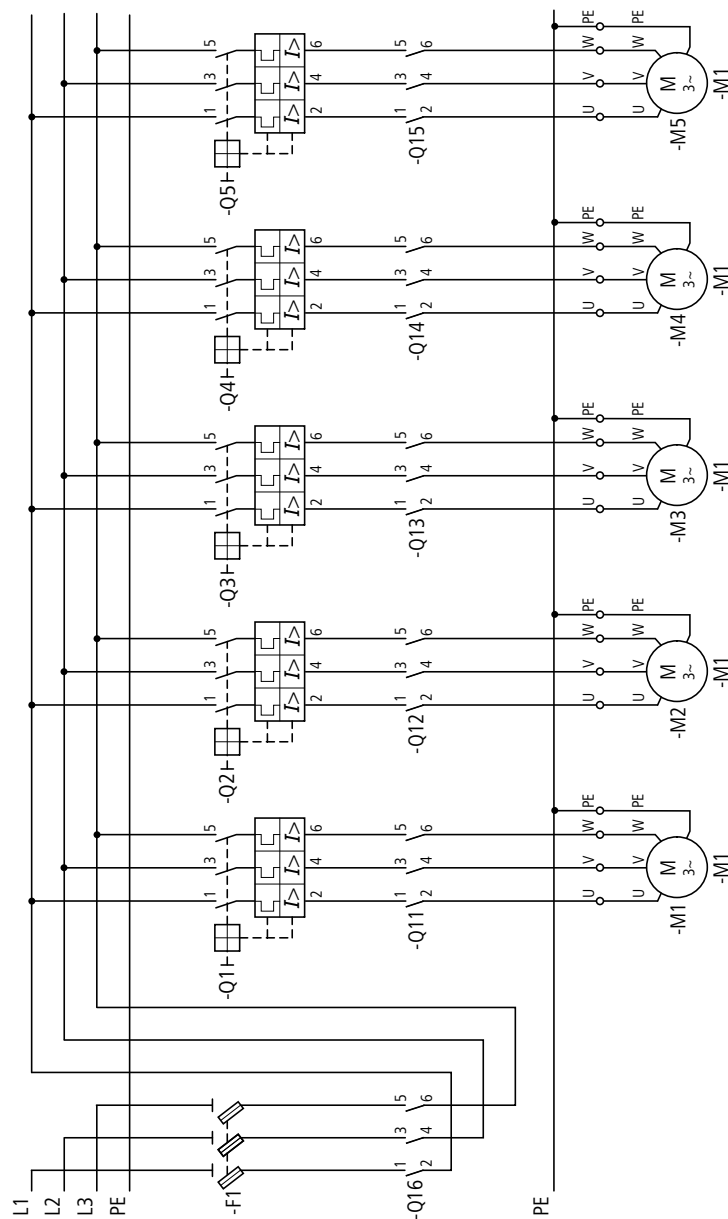


Figure 32: Mains circuit for redundant switch off.

#### 3.3.6 Application for EN ISO13849-1 and EN 62061

The SmartWire-DT system is suitable in applications up to safety category 3, PL d in accordance with EN ISO 13849-1 and SIL Cl2 in accordance with EN 62061.



#### **DANGER**

The total assembly of the safety relevant controls must correspond to the required safety category.

**DANGER**

The safety and redundancy circuit architectures for switching off drive groups described here, in terms of the safety categories that can be achieved, are approved when using the following SmartWire-DT coordinators and SmartWire-DT components:

- EU5C-SWD-CAN
- EU5C-SWD-DP
- EU5C-SWD-PF1-1
- EU5C-SWD-PF2-1

### 3.3.7 Applications in North America

For applications for the North American market special care must be taken with the approval of the individual components of the system SmartWire-DT.

#### 3.3.7.1 Current carrying capacity of the SmartWire-DT connecting cable in accordance with NFPA 79

If the SmartWire-DT connection system is used for applications in North America, the maximum current carrying capacity of the SmartWire-DT connecting cable is reduced from 3 A to 2 A.

If, due to the application, the maximum current carrying capacity of the SmartWire-DT connecting cable exceeds the value 2 A, this can be compensated by means of additional SmartWire-DT power feeder modules (→ Chapter 1 "EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules", page 13).

#### 3.3.7.2 Direct-on-line starter

With the use of DOL starters in the North American market various special features must be observed that are based on market practices and the associated Standards.



A comprehensive overview of the special North American features is provided by the publication "Special Conditions for the use of motor-protective circuit-breakers and motor starters in North America", VER1210+1280-928EN.

This publication is available as a PDF file at the following Internet address:

<http://www.moeller.net/de/company/news/publications/index.jsp>

## 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

### 3.4 Installation

#### 3.3.7.3 Reversing starter

Besides the special features described in the foregoing subsection "Direct starters", it must be taken into account that reversing starters in the North American market must be equipped in addition with a mechanical and electrical locking device. The electrical locking is realized via the connection auxiliary contact "Enable" → Figure 28, ⑧.

### 3.4 Installation

The SmartWire-DT modules DIL-SWD-32-001 and DIL-SWD-32-002 for DILM must be adapted to the corresponding contactor size prior to mounting. The adjustment required for this is performed by means of the adjusting slide of the SmartWire-DT module for DILM.

#### **NOTICE**

The SmartWire-DT module for DILM may be installed and detached only after the control voltage and supply cable have been switched off.

- ▶ Set the setting slider on the SmartWire-DT module for the corresponding contactor:
  - **Bottom** position: DILA, DILM7, DILM9, DILM12, DILM15
  - **Top** position: DILM17, DILM25, DILM32, DILM38

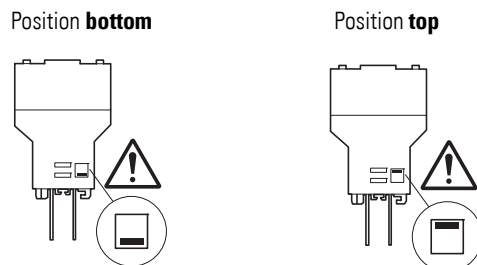


Figure 33: Adjustment of the adjusting slide on DIL-SWD-32-001 or DIL-SWD-32-002

- ▶ Place the SmartWire-DT module for DILM on the allocated contactor.

**DILA, DILM7, DILM9, DILM12, DILM17, DILM25, DILM32, DILM15**                      **DILM17, DILM25, DILM32, DILM38**

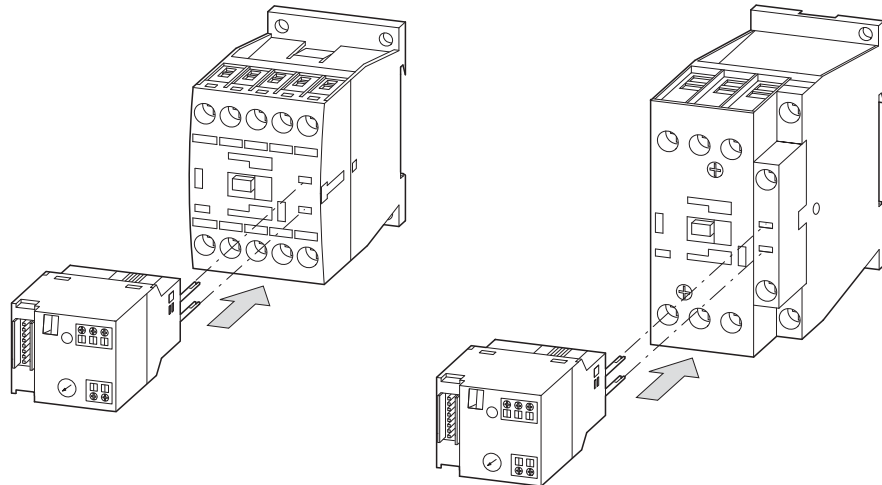


Figure 34: Placement of the DIL-SWD-32-001 or DIL-SWD-32-002 onto the contactor

- ▶ Lock the SmartWire-DT module for DILM.

**DILA, DILM7, DILM9, DILM12, DILM15**                      **DILM17, DILM25, DILM32, DILM38**

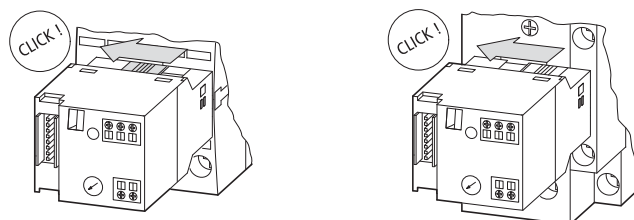


Figure 35: Locking of the DIL-SWD-32-001 or DIL-SWD-32-002

- ▶ Connect the SmartWire-DT external device plug with the adapted SmartWire-DT connecting cable.

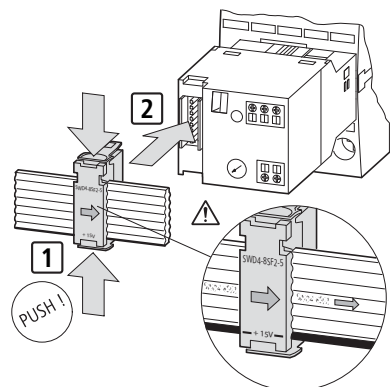


Figure 36: Connection of SmartWire-DT external device plug

## 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

### 3.5 commissioning

#### 3.5 commissioning

The automatic addressing of all modules in the SmartWire-DT network is performed via the gateway (actuation of the configuration pushbutton on the gateway) during commissioning. During the addressing process the SmartWire-DT diagnostics LED flashes. Once the addressing process is completed, the LED indicates a green continuous light.

#### 3.6 Exchange of modules



##### **DANGER**

The exchange of the SmartWire-DT module for DILM must only be carried out with the supply switched off.

After replacement of the modules and connection of the voltage the configuration button must be pressed. When this is done, the new module will be assigned an address.

##### **NOTICE**

The order of the SmartWire-DT units must not be altered.

#### 3.6.0.1 Motor starter or contactor



##### **DANGER**

The exchange of the motor starter or contactor must only be carried out after the complete system SmartWire-DT is switched off.

#### 3.7 Device status

The individual SmartWire-DT modules indicate their device status with the aid of a diagnosis LED.

Table 6: Diagnostic alarms of the SmartWire-DT module for DILM (LED indicator)

designation	Colour	Status	Message
Ready	Orange	Continuous light	Switching command for contactor via SmartWire-DT
	Green	Continuous light	Device is operating fault-free.
flashing (1 Hz)		<ul style="list-style-type: none"><li>addressing process in progress<ul style="list-style-type: none"><li>after gateway power On</li><li>after actuation of the configuration button on the gateway</li></ul></li><li>Module not in current configuration</li><li>invalid type</li></ul>	

### 3.7.1 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

### 3.7.2 Fieldbus-specific characteristics

#### Field bus Ethercat

Please note the general information for configuring parameters → Chapter 13 “Using SmartWire-DT modules with the EtherCAT field bus”, page 249.

## 3.8 Programming

### 3.8.1 DIL-SWD-32-001

The function element has one input byte and one output byte at its disposal.

#### 3.8.1.1 Inputs

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
SUBST	PRSENT	–	DIAG	–	I1 (X1-X0)	I0 (X1-X2)	Cc

Bit	designation	Meaning
0	C = Contactor	0: contactor not tripped 1: contactor tripped
1	I0 (X1-X2)	0: Auxiliary contact for X1-X2 opened 1: Auxiliary contact for X1-X2 closed The meaning depends on the auxiliary switch used.
2	I1 (X1-X0)	0: Auxiliary contact for X1-X0 opened 1: Auxiliary contact for X1-X0 closed The meaning depends on the auxiliary switch used.
3	Not used	–
4	DIAG	0: no diagnostic alarm
5	Not used	–
6	PRSENT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

#### 3.8 Programming

##### 3.8.1.2 Outputs

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
–	–	–	–	–	–	–	Q0

Bit	designation	Meaning
0	Q0	Contactor actuation
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

##### 3.8.1.3 Diagnostics

The module does not report a diagnosis.

#### 3.8.2 DIL-SWD-32-002

The function element has one input byte and one output byte at its disposal.

##### 3.8.2.1 Inputs

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
SUBS T	PRSN T	–	DIAG	M	I (X1- X0)	I0 (X1- X2)	Cc

Bit	designation	Meaning
0	C = Contactor	0: contactor not tripped 1: contactor tripped
1	I0 (X1-X2)	0: Auxiliary contact for X1-X2 opened 1: Auxiliary contact for X1-X2 closed The meaning depends on the auxiliary switch used.
2	I1 (X1-X0)	0: Auxiliary contact for X1-X0 opened 1: Auxiliary contact for X1-X0 closed The meaning depends on the auxiliary switch used.
3	M = Manual	0: Automatic 1: Manual mode
4	DIAG	0: no diagnostic alarm



Bit	designation	Meaning
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### 3.8.2.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	00

Bit	designation	Meaning
0	00	Contactors actuation
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

### 3.8.2.3 Diagnostics

The module does not report a diagnosis.

### 3 Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors

#### 3.8 Programming

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.1 Introduction

The PKE-SWD-32 SmartWire-DT module is used to enable a PLC to control a motor-starter combination based on the PKE motor protective circuit breaker, and to receive the signals of the contactor and those of the PKE motor protective circuit breaker. The PKE-SWD-32 is snap fitted directly to a DILM7 to DILM32 contactor and connected to the trip block of the PKE via a data cable.



Operation and installation of electronic motor-protective circuit-breaker PKE are described in document MN03402004Z-DE (former designation AWB1210-1631).

#### **NOTICE**

The communication connection of the PKE 12/32 is only possible when using PKE trip blocks of part no. "Advanced", i.e. PKE-XTUA-....

#### **NOTICE**

No additional auxiliary contact block can be snapped onto the contactor. The auxiliary switches integrated into the contactor can be used, for example, as safety locking devices.

#### **CAUTION**

In addition to the basic devices (contactors, motor starter combinations, etc.) described in the individual sections, The SmartWire Device Technology (SmartWire-DT) function elements listed in this manual can also be combined with equivalent Eaton basic devices that use the Eaton catalog number as part number. For a reference table, see the Appendix on Page 260.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.5, „SWD module interoperability requirements“, page 261.

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.2 Surface mounting

#### 4.2 Surface mounting

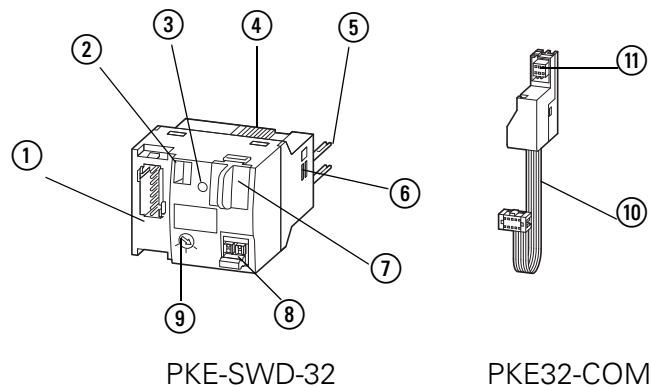


Figure 37: Connections PKE-SWD-32 and PKE32-COM-Module

- ① Connection of SmartWire-DT external device plug
- ② Mechanical switching position indicator
- ③ Diagnostics LED
- ④ Catch slider
- ⑤ Connection pins
- ⑥ Adjusting slide for contactor size
- ⑦ Data interface for PKE32-COM
- ⑧ Connection terminal, electrical enable X3-X4
- ⑨ Selector switch 1-0-A
- ⑩ Data cable with connector for PKE-SWD-32
- ⑪ Connector for PKE-XTUA- trip block...

The SmartWire-DT external device plug with an adapted SmartWire-DT connecting cable is connected to the module PKE-SWD-32 via connection ①.



For detailed instructions on how to connect the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pin SmartWire-DT ribbon cable, refer to the "Installing SWD4-8SF2-5 external device plugs" section in manual MN05006002Z-EN (previously AWB2723-1617de).

The dual-color diagnostics LED ③ shows the communication status, the status of the module and the switch command via the SmartWire-DT system (→ Section 4.7, „Device status“, page 102).

The 8-pole SmartWire-DT connection cable is used to send a 24 V DC voltage for the contactor coil as well as the communication signal. The integrated electronics transfers the voltage to the connection pins ⑤ that are connected to the contactor coils.

The PKE-SWD-32 is connected via a slide catch ④ with the contact bridge of the contactor. This slide catch is used on the one hand for the electronic monitoring of the contactor state, and on the other as a mechanical switch position indication ② on the PKE-SWD-32.

The PKE-SWD-32 is set to the respective contactor size via the slide adjuster for the contactor size ⑥. This enables the module to be set to size 1 (DILM7 to DILM15) contactors and size 2 (DILM17 to DILM32) contactors.

The PKE32-COM is used as a communication link between the PKE-SWD-32 and the PKE-XTUA-... trip block. The data is exchanged via the data interface of the PKE trip block and the data interface ⑦ on the PKE-SWD-32. The PKE32-COM module is used for transferring the signals. This connects the data interfaces of the PKE trip block and the PKE-SWD-32. The PKE-SWD-32 receives the data of the PKE trip block and makes this available on the SmartWire-DT network.

The 1-0-A ⑨ selector switch is used to manually make an electrical activation of the connected contactor as required.

### 4.3 Projection

The PKE-SWD-32 can be combined with DILM7 to DILM32 contactors in conjunction with the PKE12 and PKE32 electronic motor protective circuit breaker and the "Advanced" part no. (PKE-XTUA-...) trip blocks. The DILM7 to 32, PKE12 / PKE32 components and the PKE-XTUA-... trip block are available likewise as networkable motor starter combinations (MSC-DEA-...), and can also be combined with the PKE-SWD-32.

Each PKE-SWD-32 can be connected to a DILM7 to DILM32 contactor and a PKE12 to PKE32 with a PKE-XTUA-... trip block. With reversing starters consisting of two contactors and one PKE electronic motor protective circuit breaker, the actuation of the second contactor can be implemented with the DIL-SWD-32-001 or DIL-SWD-32-002 SmartWire-DT contactor modules (→ Chapter 3, "Switching on DIL-SWD-32-001, DIL-SWD-32-002 contactors", Page 57).

Table 7: Combination options

Use	Number of PKE-SWD-32	Number of DIL-SWD-32
Electronic motor starter MSC-DEA		
DOL starter (PKE and DILM)	1	0
Reversing starter (PKE and 2 x DILM)	1	1

The connected contactor is fed directly via the SmartWire-DT connection cable. The contactor coils have the following power consumptions at a voltage of 24 V DC:

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.3 Projection

Table 8: Wattage/ and current consumption of the contactor coils at a voltage of 24 V DC

<b>contactor</b>	<b>Pull-in power [W]</b>	<b>Pick-up current with 24 V DC [mA]</b>	<b>Holding power [W]</b>	<b>Holding current with 24 V DC [mA]</b>
DILA, DILM7	3	125	3	125
DILM9 - DILM15	4.5	188	4.5	188
DILM17 - DILM38	12	500	0.5	21

#### **NOTICE**

The sum of the pull-in power of the simultaneously tripping contactors and the sum of the holding power of the tripped contactors for each SmartWire-DT network must not exceed 72 W. If required, an additional power feeder module (EU5C-SWD-PF1-1, EU5C-SWD-PF-2) must be used (→ Section 1, „EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules“, page 13).



The PKE-SWD-32 draws its energy for the communication electronics and for controlling the LED from the SmartWire-DT network supply.

Please take into consideration the total power consumption of your SmartWire-DT network and, if necessary, plan for an additional feeder module EU5C-SWD-PF2-1.



For data for the current requirement please refer to the table in the appendix on Page 255.

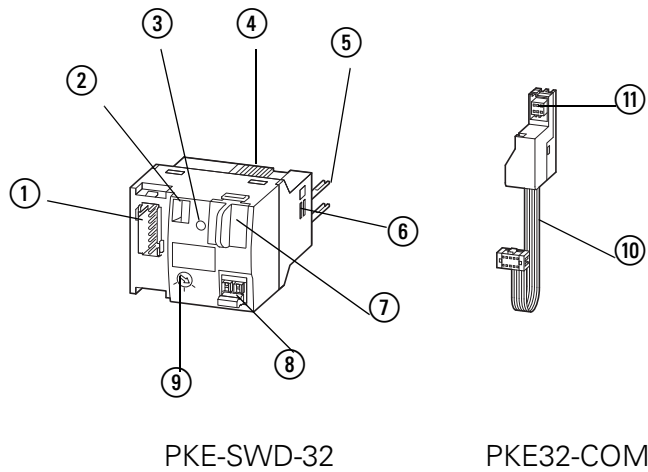


Figure 38: Connections PKE-SWD-32 and PKE32-COM-Module

- ① Connection of SmartWire-DT external device plug
- ② Mechanical switching position indicator
- ③ Diagnostics LED
- ④ Catch slider
- ⑤ Connection pins
- ⑥ Adjusting slide for contactor size
- ⑦ Data interface for PKE32-COM
- ⑧ Connection terminal, electrical enable X3-X4
- ⑨ Selector switch 1-0-A
- ⑩ Data cable with connector for PKE-SWD-32
- ⑪ Connector for PKE-XTUA- trip block...

### 4.3.1 DOL starters

The DOL starters are assembled from a PKE12/ PKE32 with the PKE-XTUA-... trip block and a DILM7 to DILM32 contactor. The PKE-SWD-32 is fitted onto the contactor.

#### **NOTICE**

The PKE-SWD32 controls the contactor so the terminals A1-A2 must not be wired.

The PKE32-COM is used as a communication link between the PKE-SWD-32 and the PKE trip block. The PKE-SWD-32 receives the data of the PKE trip block via the PKE32-COM and makes this available as input data on the SmartWire-DT network.

The PKE32-COM is mounted to the PKE basic device (PKE12 or PKE32). The connector located above the PKE32-COM ⑪ makes the contact with the data interface of the PKE trip block. The data cable with the connector for the PKE-SWD-32 ⑩ is connected via the data interface ⑦ to the PKE-SWD-32.

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.3 Projection

The auxiliary contact for the electrical enable ⑧ is connected at the factory with a link. If electrical locks are envisaged in the application, the bridge can be removed and a potential-free contact can be connected.

The auxiliary contact for the electrical enable ⑧ can be used on the PKE\_SW32 for safety-related control sections (→ Section 4.3.3, „Safety-related applications“, page 89).

The auxiliary contacts integrated in the contactor can be used, e.g. for safety interlocks.

#### **NOTICE**

The connection cables at terminal X3-X4 ⑧ for the "enable" auxiliary contact must not exceed a length of 2.8 m.

The connection terminals on the PKE-SWD-32 are suitable for AWG24 to AWG16 cables and for flexible cables with a cross-section of 0.25 mm<sup>2</sup> to 1.5 mm<sup>2</sup>.

When using ferrules it has to be ensured that the ferrule length is at least 8 mm.

A manual or electrical ON or OFF command for the contactor can also be implemented by means of the 1-0-A switch ⑨.

The switch positions are as follows:

- 1: Contactor ON
- 0: Contactor OFF
- A: switching command via SmartWire-DT



Use of the 1-0-A switch for the electrical switching on or off of the contactor is ensured only when the PKE-SWD-32 is supplied via the SmartWire-DT connecting cable.



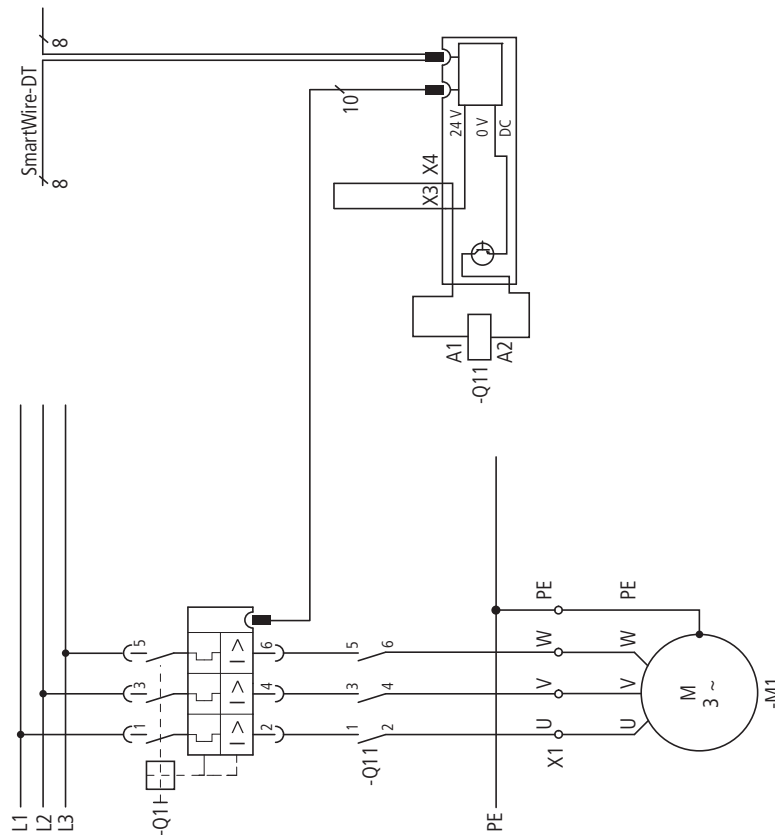


Figure 39: Circuit diagram of the direct starter

### 4.3.2 Reversing starter

The reversing starters are made up from a PKE12/PKE32 with a PKE-XTUA... trip block and two contactors DILM7 to DILM32. The PKE-SWD-32 is fitted on one of the two contactors of the reversing starter. Unlike DOL starters, the control of the second contactor for reversing starters must be implemented with a SmartWire-DT contactor module (DIL-SWD-32-...).



#### DANGER

The ZMR function must not be activated with reversing starters since this operation does not ensure the disconnection of the second contactor in the event of an overload (→ Section 4.9.2, „Overload relay function (ZMR)“, page 109).

#### NOTICE

The two SmartWire-DT modules PKE-SWD-32 and DIL-SWD-32 drive the contactors so that the terminals A1 and A2 need no further wiring, with the exception of the DILM12-XEV link.

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.3 Projection

The "Enable" ⑧ auxiliary contact is factory fitted with a link. For the electrical interlocking of the two contactors this link is removed and the auxiliary breaker (contacts 21-22) of the other contactor is linked in as a potential-free contact.

The "enable" auxiliary contact can be used on the PKE-SWD-32 for safety-related control sections (→ Section 4.3.3, „Safety-related applications“, page 89).

The auxiliary contacts integrated in the contactor can be used, e.g. for safety interlocks.

#### **NOTICE**

The connection cables at terminal X3-X4 for the "enable" ⑧ auxiliary contact must not exceed a length of 2.8 m.

The connection terminals on the PKE-SWD-32 are suitable for AWG24 to AWG16 cables and for flexible cables with a cross-section of 0.25 to 1.5 mm<sup>2</sup>.

When using ferrules it has to be ensured that the ferrule length is at least 8 mm.

#### **NOTICE**

The wiring sets DILM12-XRL and PKZM0-XRM12 must not be used for the assembly of the reversing starters.  
The A2 connections of the contactors must not be bridged.

The following jumpers can be used for wiring reversing starters:

	<b>DILM7 – DILM15</b>	<b>DILM17 – DILM32</b>
L1, L2, L3 parallel	DILM12-XP2	DILM32-XRL
Phase switch L1 and L3, L2 parallel	DILM12-XR	DILM32-XRL
electrical interlock	DILM12-XEV	–

In combination with the jumpers DILM12-XEV the circuit Figure 40 should be used. On the other hand, an electrical interlock with wire jumpers should be implemented according to the circuit Figure 41.

A manual or electrical ON or OFF command for the contactor can also be implemented by means of the 1-0-A switch ⑨.

The switch positions are as follows:

- 1: Contactor ON
- 0: Contactor OFF
- A: switching command via SmartWire-DT.



Use of the 1-0-A switch for the electrical switching on or off of the contactor is ensured only when the PKE-SWD-32 is supplied via the SmartWire-DT connecting cable.

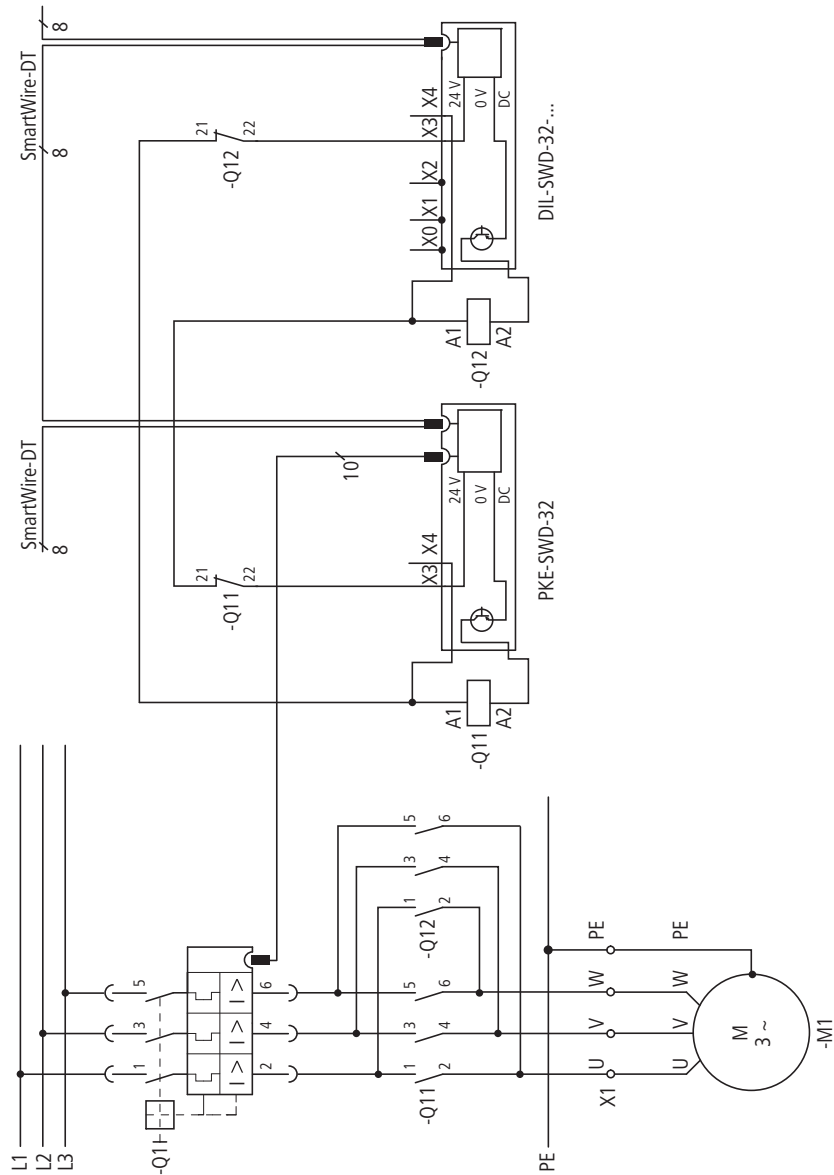


Figure 40: Circuit diagram of the reversing starter in combination with DILM12-XEV

# 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

## 4.3 Projection

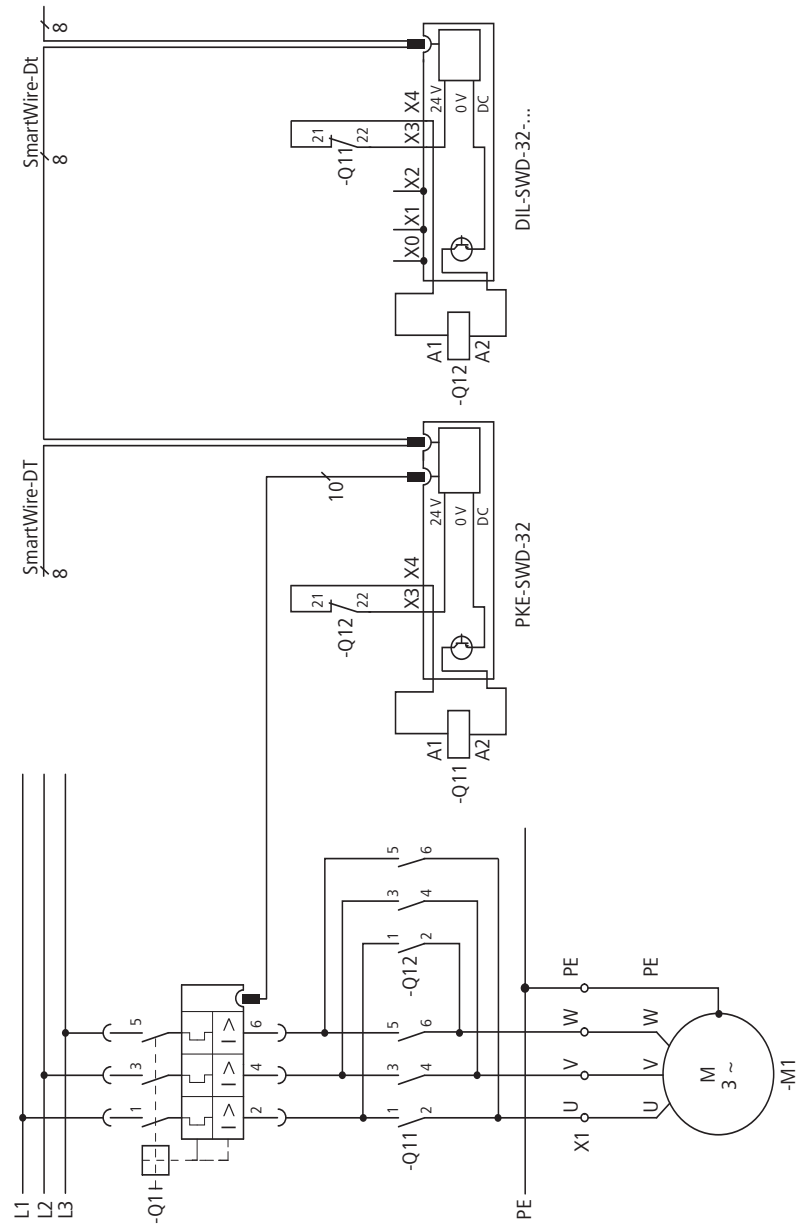


Figure 41: Circuit diagram of the reversing starter

### 4.3.3 Safety-related applications

For most applications, disconnection in the event of an emergency or the disconnection by the opening of the protective doors is also required in addition to normal operational switching.

The SmartWire-DT system is not designed for the transfer of safety relevant signals. Using the following configuration the system SmartWire-DT can however be used for safety relevant switch-offs.



#### **DANGER**

In safety-relevant applications the power supply unit providing power to the SmartWire-DT system must feature a PELV power feed module

#### **NOTICE**

The cable connection to the emergency switching off pushbutton must meet one of the following criteria in order to exclude short-circuits between the conductors (see EN ISO 13849-2, chap. D5.2):

- Cables must be laid permanently and protected against external damage (e.g. with cable duct, or hard PVC conduit).
- The cables are provided as various non-metallic-sheathed cables.
- The cables are located inside an electrical mounting area (e.g. switch cabinet).
- The cables are protected by a ground connection.

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.3 Projection

#### 4.3.3.1 Safety-related disconnection of a single drive

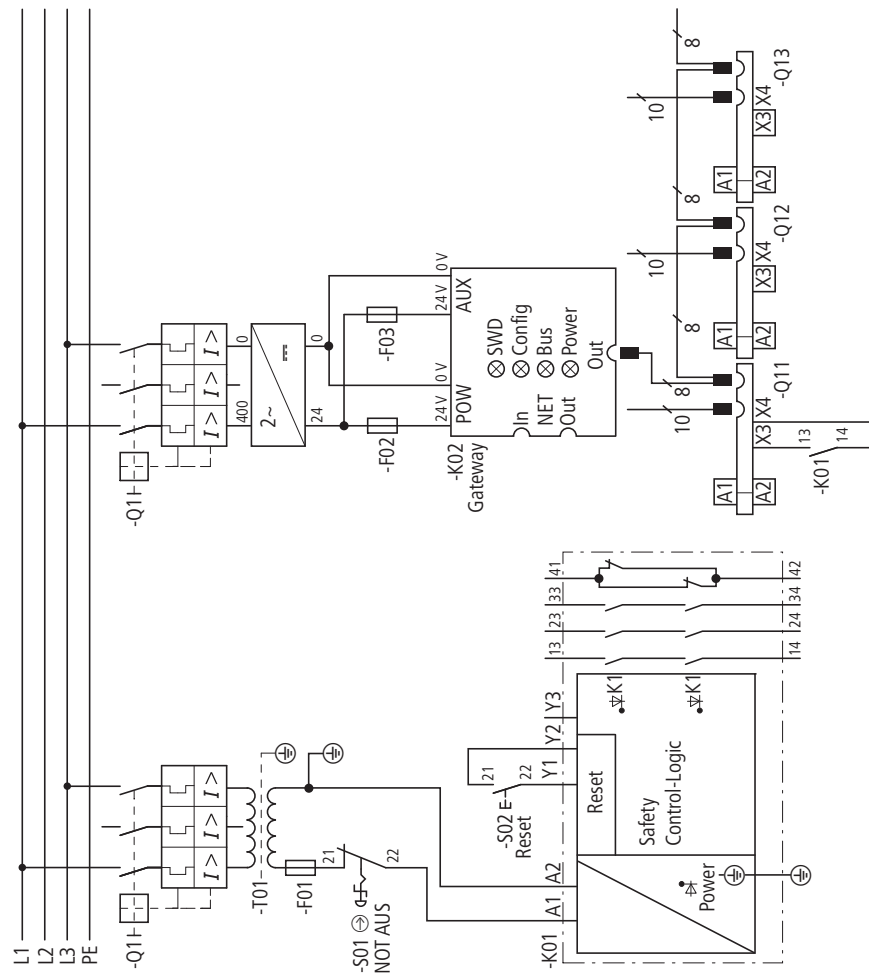


Figure 42: Actuating circuit for safety-related disconnection of a single drive

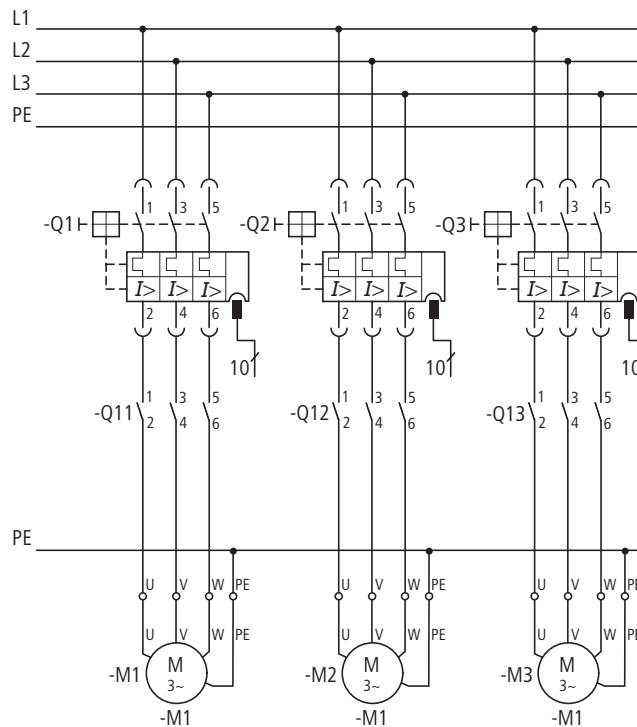


Figure 43: Mains circuit for safety-related disconnection of a single drive

With the PKE-SWD-32, safety switch-off of an individual drive can be implemented through auxiliary contact "Enable" (terminal X3-X4). Through inclusion of the enable path of a safety relay or the interlocked opposing N/C contact of an emergency switching off switch, the contactor's control voltage is interrupted in an emergency. With this circuitry, controls can be assembled up to safety category 1 to EN 954-1.

The safety relay must comply with Category 1 or higher (e.g. ESR5-NO-41-24VAC-DC) in this example.

### 4.3.3.2 Safety-related disconnection of drive groups

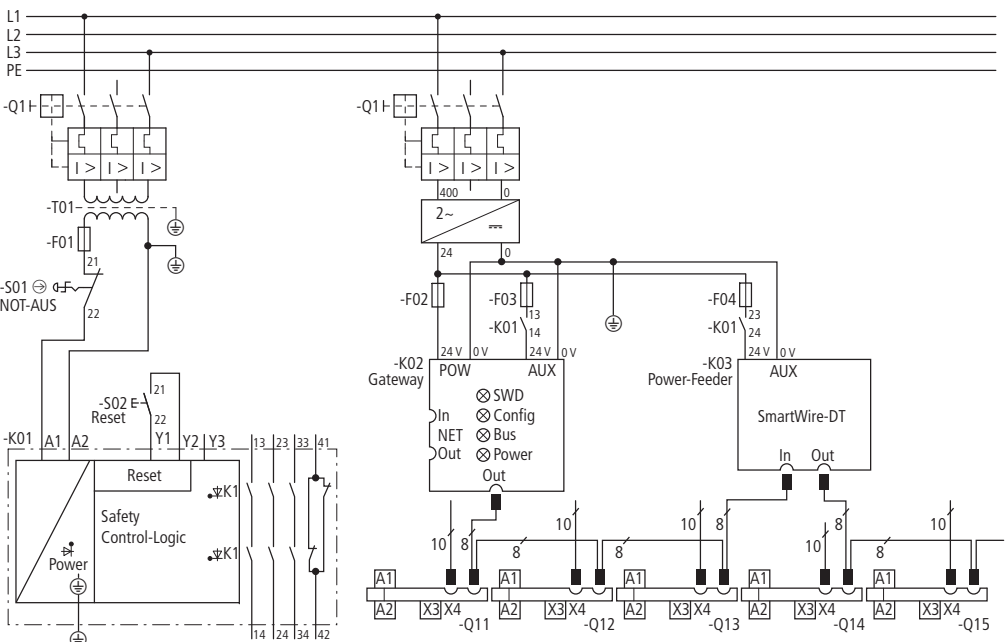


Figure 44: Actuating circuit for safety-related disconnection of drive groups



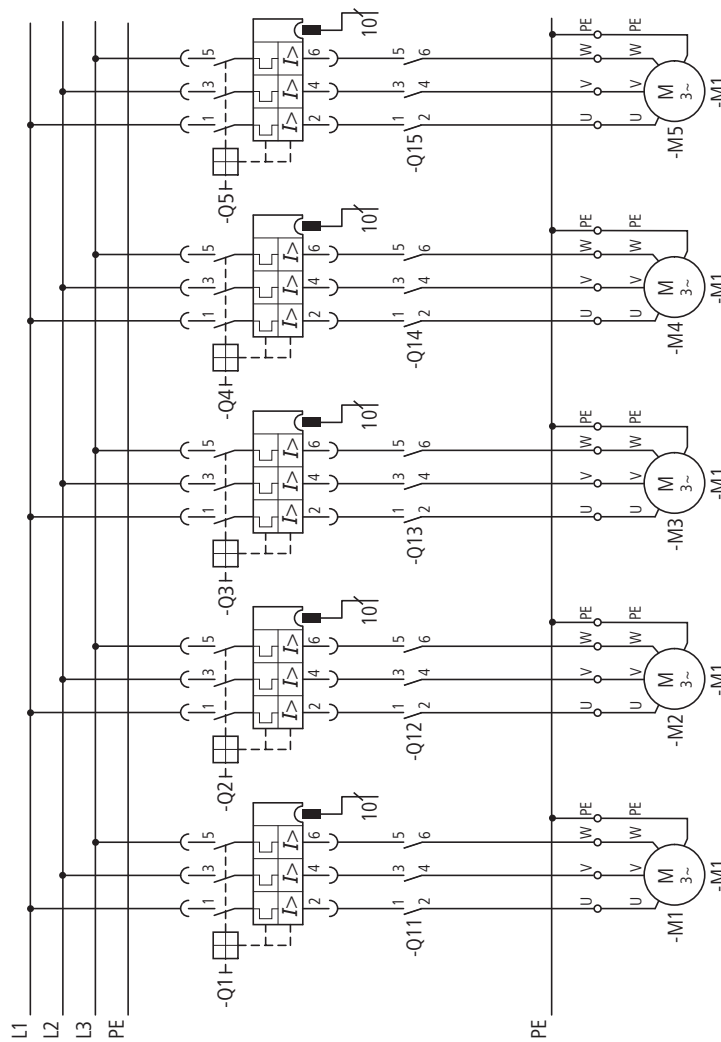


Figure 45: Main circuit for safety-related disconnection of drive groups

In an emergency, the power for the contactor coils can be switched off using the enable circuit of the safety relay. By using additional SmartWire-DT Power modules, contactor groups are made that can be switched off together in an emergency. With this circuitry, controls can be assembled up to Safety Category 1 to EN 954-1. The safety relay must comply with Category 1 or higher (e.g. ESR5-NO-41-24VAC-DC) in this example.

### 4.3.4 Feedback Circuit

The auxiliary contact integrated in the contactor is a mirror contact according to IEC/EC 60947-4-1. Using this contact the state of the main contacts can be reliably signalled. The mirror contact can be included into the feedback circuit of the safety relay so that the safety relay only gives a new enable signal when the contactor is open.

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.3 Projection

#### 4.3.5 Measures for higher safety categories

In many applications control systems compliant with safety category 3 or 4 to EN 954-1 are required. Category 3 control systems can be set up by means of an additional contactor which is connected in series upstream of the motor feeder or motor feeders. The control voltage for the contactor and the control voltage for the motor contactors are switched off in an emergency via the safety relay. This redundant disconnection circuit enables the implementation of Category 3 control systems. The safety relay used must comply with Category 3 or higher (e.g. ESR5-NO-41-24VAC-DC) to attain this safety category.

Main circuit for redundant disconnection of a single drive

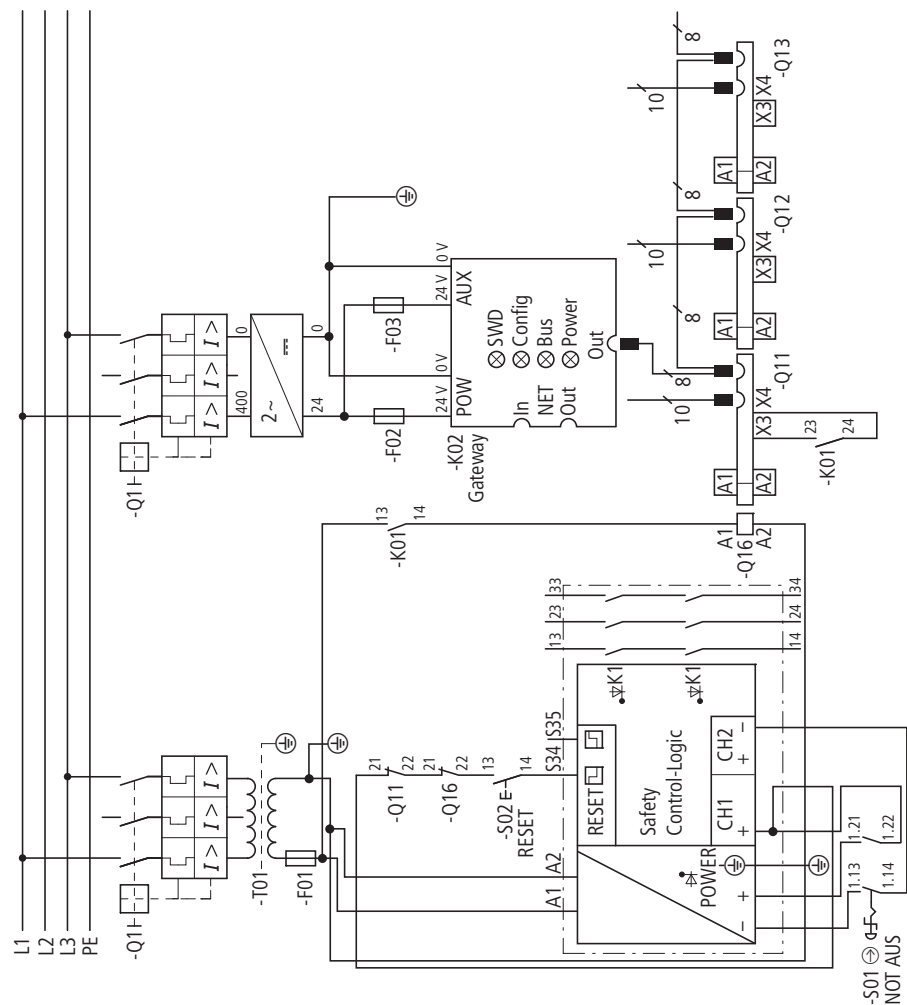


Figure 46: Actuating circuit for redundant disconnection of a single drive

4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32  
 4.3 Projection

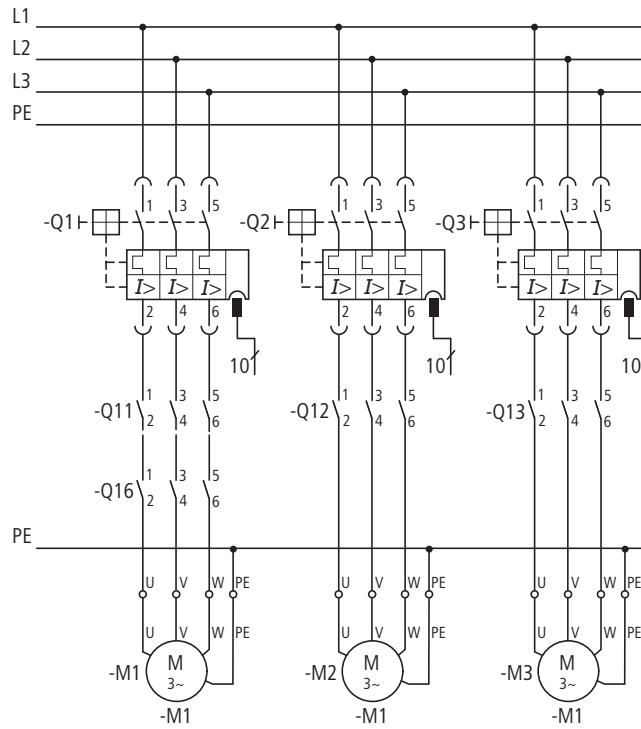


Figure 47: Main circuit for redundant disconnection of a single drive

### 4.3.5.1 Redundant disconnection of drive groups

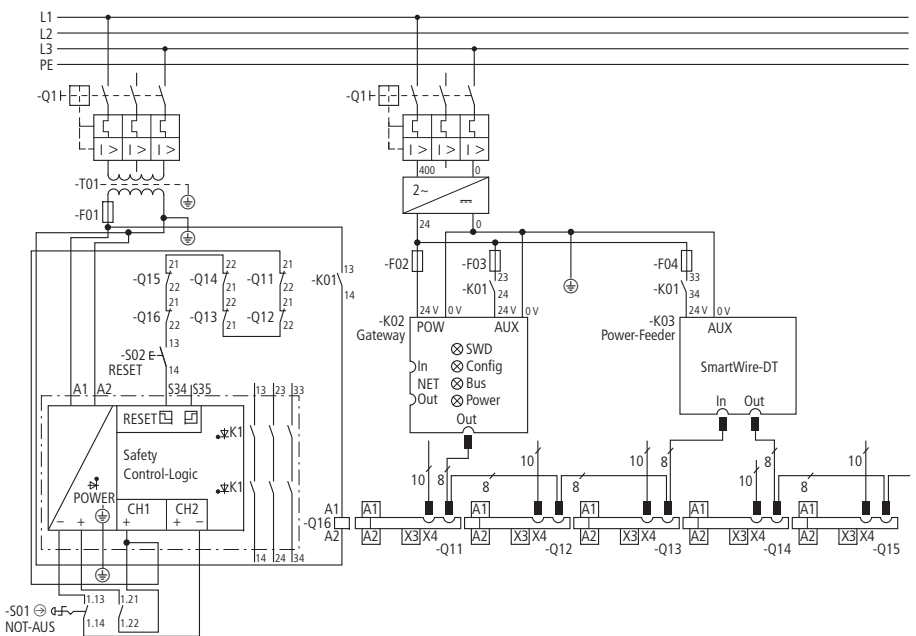


Figure 48: Actuating circuit for redundant disconnection of drive groups

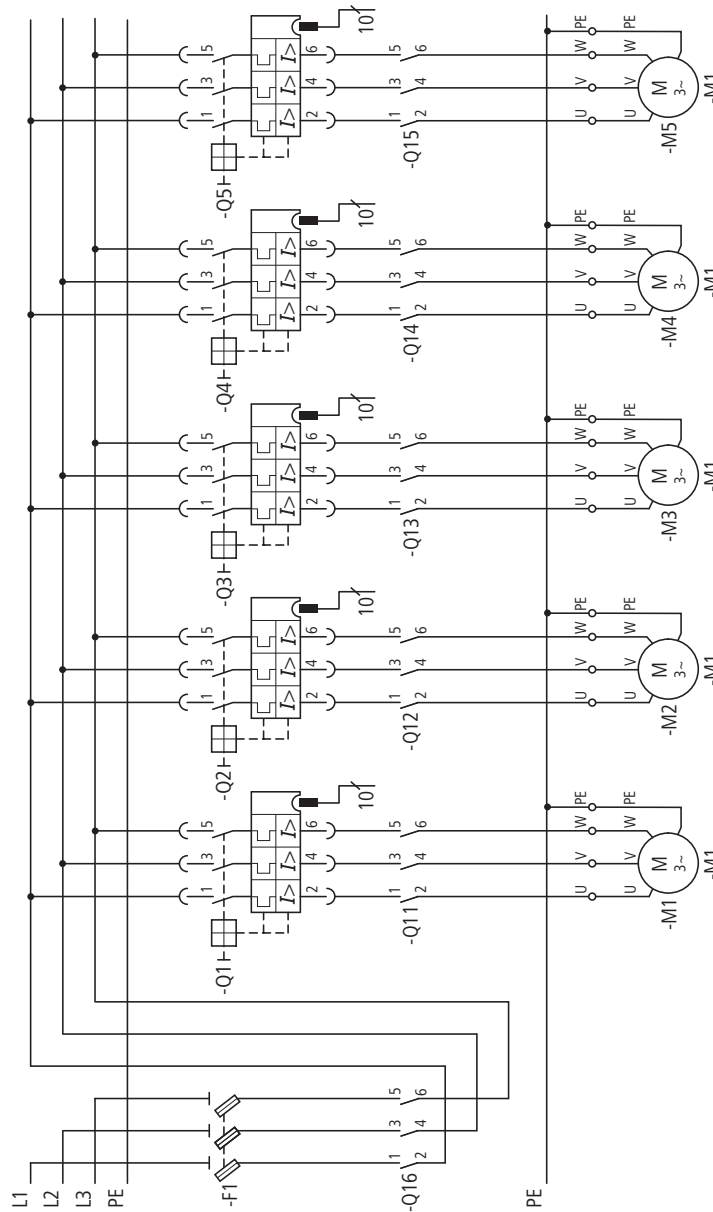


Figure 49: Main circuit for redundant disconnection of drive groups

### 4.3.6 Application for EN ISO 13849-1 and EN 62061

The SmartWire-DT system is suitable in applications up to safety category 3, PL d in accordance with EN ISO 13849-1 and SIL Cl2 in accordance with EN 62061.



#### DANGER

The total assembly of the safety relevant controls must correspond to the required safety category.



#### **DANGER**

The safety and redundancy circuit architectures for switching off drive groups described here, in terms of the safety categories that can be achieved, are approved when using the following SmartWire-DT coordinators and SmartWire-DT components:

- EU5C-SWD-CAN
- EU5C-SWD-DP
- EU5C-SWD-PF1-1
- EU5C-SWD-PF2-1

### **4.3.7 Applications in North America**

For applications for the North American market special care must be taken with the approval of the individual components of the system SmartWire-DT.

#### **4.3.7.1 Current carrying capacity of the SmartWire-DT connecting cable in accordance with NFPA 79**

If the SmartWire-DT connection system is used for applications in North America, the maximum current carrying capacity of the SmartWire-DT connecting cable is reduced from 3 A to 2 A.

If, due to the application, the maximum current carrying capacity of the SmartWire-DT connecting cable exceeds the value 2 A, this can be compensated by means of additional SmartWire-DT power feeder modules (→ Chapter 1, "EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules", Page 13).

#### **4.3.7.2 DOL starter**

With the use of DOL starters in the North American market various special features must be observed that are based on market practices and the associated Standards.

#### **4.3.7.3 Reversing starter**

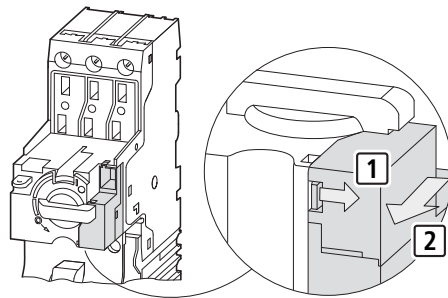
Apart from the special features described in section "DOL starter" it must be taken into account that reversing starters in the North American market must be fitted additionally with a mechanical and electrical interlock. The electrical locking is realized via the connection "Enable" ⑧ auxiliary contact.

## 4.4 Installation

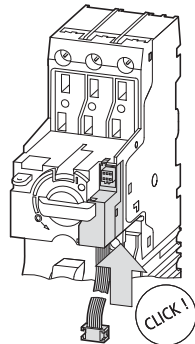
The installation of the PKE communication connection an SmartWire-DT is only possible with a DILM contactor or a part no. MSC-DEA-... electronic motor-starter combination. When using individual components (PKE and contactor separately on the top-hat rail) observe the maximum distance between the PKE and contactor. The maximum distance for a separately assembled motor starter combination is limited by the cable length of the flat cable located on the PKE32-COM.

### 4.4.1 Mounting PKE32-COM

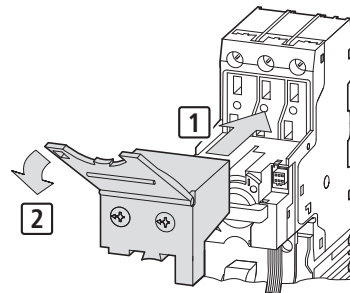
- ▶ Remove the empty module on the PKE basic device.



- ▶ Connect the PKE32-COM on the PKE basic device.



- ▶ Fit the "Advanced" part no. of PKE trip block (PKE-XTUA-...).



## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.4 Installation

#### 4.4.2 Mounting PKE-SWD-32

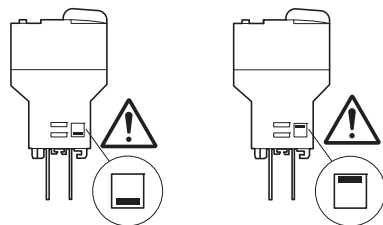
The PKE-SWD-32 must be adapted to the relevant contactor size before it is fitted. The necessary settings are made via the slide adjuster of the PKE-SWD-32.

#### **NOTICE**

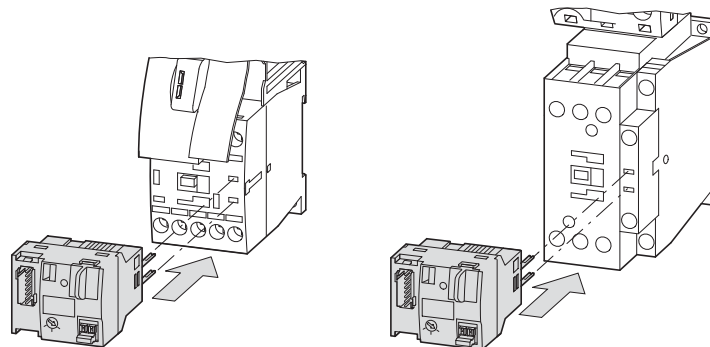
The PKE-SWD-32 may be installed and detached only after the control voltage and supply cable have been switched off.

► Set the slide adjuster of the PKE-SWD-32 for the appropriate contactor. The settings of the slide adjuster have the following settings for different contactor sizes:

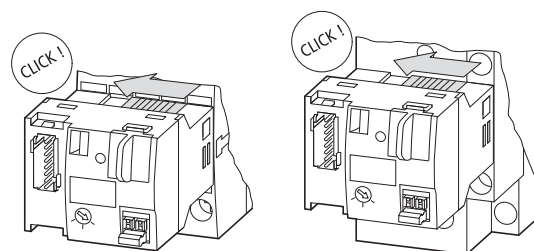
- Position **bottom**: DILM7, DILM9, DILM12, DILM15 (state of delivery)
- Position **top**: DILM17, DILM25 and DILM32



► Set the PKE-SWD-32 for the appropriate contactor.



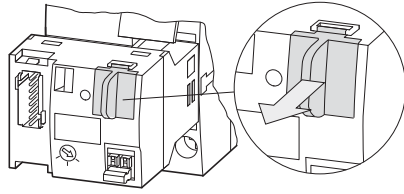
► Interlock the PKE-SWD-32.



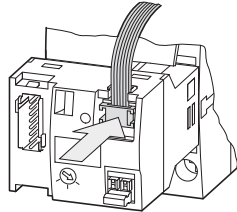
► Remove the cover of the communication interface.



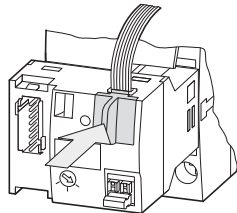
4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32  
4.5 commissioning



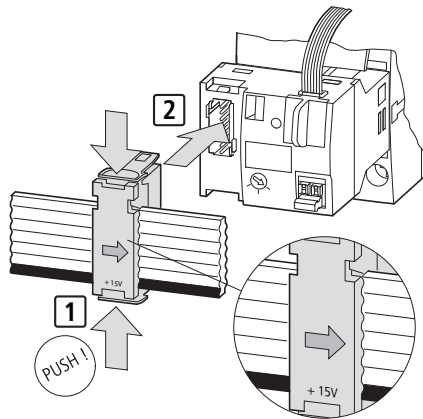
- ▶ Connect the PKE32-COM.



- ▶ Fit the cover of the communication interface.



- ▶ Connect the SmartWire-DT external device plug with the adapted SmartWire-DT connecting cable.



## 4.5 commissioning

The automatic addressing of all modules in the SmartWire-DT network is performed via the gateway (actuation of the configuration pushbutton on the gateway) during commissioning. During the addressing process the SmartWire-DT diagnostics LED flashes. Once the addressing process is completed, the LED indicates a green continuous light.

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.6 Exchange of modules

#### 4.6 Exchange of modules



#### **DANGER**

The exchange of the SmartWire-DT module PKE-SWD-32 must only be carried out with the supply switched off.

After replacement of the modules and connection of the voltage the configuration button must be pressed. When this is done, the new module will be assigned an address.

#### **NOTICE**

The order of the SmartWire-DT units must not be altered.



#### **DANGER**

The exchange of the motor starter or contactor must only be carried out after the complete system SmartWire-DT is switched off.

#### 4.7 Device status

The individual SmartWire-DT modules indicate their device status with the aid of a diagnosis LED. The diagnostics LED can have the following states:

Table 9: Diagnostic messages of the SmartWire-DT status LED

designation	Colour	Status	Message
Ready	Orange	Continuous light	Switching command for contactor via SmartWire-DT
		Blinking	Communication to the PKE is interrupted, switch command for contact is present via SmartWire-DT
	Green	Continuous light	Device is operating error-free.
		Flashing (1 Hz)	<ul style="list-style-type: none"><li>Addressing process in progress<ul style="list-style-type: none"><li>after gateway power On</li><li>after actuation of the configuration button on the gateway</li></ul></li><li>Module not in current configuration</li><li>invalid type</li></ul>
		Flashing (3 Hz)	<ul style="list-style-type: none"><li>Incorrect manual/automatic switch setting</li><li>Communication to PKE is interrupted</li></ul>

#### 4.8 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

## 4.9 Programming

### 4.9.1 PKE-SWD-32 cyclical data

The PKE-SWD-32 has a maximum of five input bytes and one output byte.



The number of cyclical input bytes can be adjusted by means of different data profiles of the module (→ Section 4.9.3, „Data profiles“, page 114).

#### 4.9.1.1 Inputs

Byte 0:

Status information: DILM, PKE, PKE-SWD-32

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	A2	A1	P	Cc

data bit	designation	Meaning
0	C = Contactor	Contactor state Contactor 0: contactor not tripped 1: contactor tripped
1	Stat.	PKE status 0: PKE switched of/tripped 1: PKE Powered up
2 - 3	A1, A2	Position of 1-0-A switch 00: Incorrect position for longer than 4 seconds 01: Position A (Switching command via SWD) 10: Position 0 (Contactor OFF) 11: Position 1 (Contactor ON)
4	DIAG	0: No diagnostic alarm 1: Module signals diagnostics
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

Byte 1:

Set value  $I_r$ , trip reasons, acknowledge signal

7	6	5	4	3	2	1	0
ACKR	TRIPR	TRIPR	TRIPR	$I_r$	$I_r$	$I_r$	$I_r$

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.9 Programming

data bit	designation	Meaning	Notes
0 - 3	$I_r$	Set value $I_r$	→ Section 4.9.1.4, „Set value $I_r$ “, page 105
4 - 6	TRIPR = Trip reason	Trip reason	→ Section 4.9.1.5, „Trip reason (TRIPR)“, page 106
7	ACKR = Acknowledge required	ZMR manual function acknowledgement required 0: No acknowledgement required 1: Acknowledgement of overload required	→ Section 4.9.2.1, „ZMR operating mode manual“, page 110

Byte 2:

Motor current [%]

7	6	5	4	3	2	1	0
I-REL	I-REL	I-REL	I-REL	I-REL	I-REL	I-REL	I-REL

data bit	designation	Meaning	Notes
0 - 7	I-REL	Motor current [%]	→ Section 4.9.1.6, „Motor current [%] (I-REL)“, page 107

Byte 3:

Thermal motor image [%]

7	6	5	4	3	2	1	0
TH	TH	TH	TH	TH	TH	TH	TH

data bit	designation	Meaning	Notes
0 - 7	TH	Thermal motor image [%]	→ Section 4.9.1.7, „Thermal motor image [TH]“, page 107

Byte 4:

Type of trip block, set time-lag class

7	6	5	4	3	2	1	0
–	–	CLASS	CLASS	CLASS	TYPE	TYPE	TYPE

data bit	designation	Meaning	Notes
0 - 2	TYPE	Control option part no.	→ Section 4.9.1.8, „Type of trip block (TYPE)“, page 108
3 - 5	CLASS	Set time lag	→ Section 4.9.1.9, „Time delay setting (CLASS)“, page 109
6	Not used	-	-
7	Not used	-	-

### 4.9.1.2 Outputs

Byte 0:

Contactor activation, ZMR, ZMR operating mode

7	6	5	4	3	2	1	0
–	–	–	–	ZMR H/A	ZMR	–	00

data bit	designation	Description	Notes
0	00	Contactor actuation 0: Contactor OFF 1: Contactor ON	–
2	ZMR	Activation of ZMR function 0: Deactivation of ZMR function 1: Activation of ZMR function	→ Section 4.9.2, „Overload relay function (ZMR)“, page 109
3	ZMR H/A	Operating mode ZMR-Function 0: Manual function 1: Automatic function	

### 4.9.1.3 Diagnostics

During diagnostics (input byte 0, bit 4 is set) the module signals the following causes of faults via three device-specific fieldbus diagnostics states:

Value	Meaning	Remedy	Notes
0x03	No communication between PKE-SWD-32 and PKE trip block	<ul style="list-style-type: none"> <li>Check whether the PKE trip block used is of part no. PKE-XTUA-...</li> <li>Check the terminals of the PKE32-COM and connect the PKE32-COM if necessary.</li> </ul>	During this state, the module can be still used for activating the connected contactor. The main circuits are isolated by the PKE in the event of an overload.
0x15	No unambiguous position of the 1-0-A switch for more than 4 seconds	<ul style="list-style-type: none"> <li>Move the 1-0-A switch to one of the three defined positions.</li> </ul>	In this state the connected contactor is switched off. With bit field A1, A2 the value 0x00 is reported.

### 4.9.1.4 Set value $I_r$

The overload release value set on the PKE basic device is indicated via bit field  $I_r$  (input byte 1, bit 0, ..., 3). The value of this bit field indicates the set absolute current value of the overload release that varies according to the PKE trip block selected. Bit field  $I_r$  has the following meaning for the different PKE trip blocks:

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.9 Programming

Table 10: Set  $I_r$  current value of the overload release

Field	Value	PKE-XTUA-1.2	PKE-XTUA-4	PKE-XTUA-12	PKE-XTUA-32
		$I_r$ [A]	$I_r$ [A]	$I_r$ [A]	$I_r$ [A]
$I_r$	0x0	0.30	1.00	3.00	8.00
	0x1	0.33	1.10	3.30	8.80
	0x2	0.36	1.20	3.60	9.70
	0x3	0.40	1.30	4.00	10.50
	0x4	0.43	1.42	4.30	11.50
	0x5	0.47	1.55	4.70	12.50
	0x6	0.50	1.70	5.00	13.50
	0x7	0.56	1.90	5.60	15.00
	0x8	0.63	2.10	6.30	17.00
	0x9	0.70	2.40	7.00	19.00
	0xA	0.77	2.60	7.70	20.50
	0xB	0.83	2.80	8.30	22.00
	0xC	0.90	3.00	9.00	24.00
	0xD	1.00	3.30	10.00	27.00
	0xE	1.10	3.70	11.00	29.00
	0xF	1.20	4.00	12.00	32.00

#### 4.9.1.5 Trip reason (TRIPR)

In the event of a malfunction or interruption of the main circuits due to a fault, the trip reason of the interruption is indicated via the TRIPR bit field. The following trip reasons are shown by the TRIPR bit field:

Table 11: Bit field trip reason TRIPR

Field	Value	Description	Notes
TRIPR	0x0	Not defined	–
	0x1	Overload	PKE has switched off
	0x2	Short-circuit	PKE has switched off
	0x3	Phase failure/ Phase Imbalance	Disconnection at 100 % of the thermal motor image (TH)
	0x4	Test position on PKE-XTUA	PKE has switched off
	0x5	Overload with activated ZMR function	Contacting has switched off, the value of the thermal motor image (TH) is still greater than 100 % after switch off
	0x6	Not defined	–
	0x7	Not defined	–

Apart from the trip reason 0x5 “Overload with activated ZMR function”, the transferred trip reasons are then reset if the main contacts of the PKE are reclosed and a current flow is sensed through the PKE trip block.

The trip reason 0x5 "Overload with activated ZMR function" is reset if the thermal motor image (TH) is below 100 %.

The message 0x3 "phase failure/phase unbalance" is set if there is a phase current difference of 50% between the highest phase current measured and phase affected. This message is reset if the phase current difference is below 25 %.

The "phase failure/phase unbalance" does not force the interruption of the main circuits. To protect the connected motor in the event of phase loss/phase unbalance, the tripping time in the event of an overcurrent is reduced to 40 % compared to when the phase load is symmetrical. The interruption of the main circuits is executed early if the thermal motor image reaches 100 %.



The Test position on the PKE trip block then causes a test trip if at least one phase current of 60 % of the minimum mark of the variable overload release on the PKE trip block flows via all three main circuits.

#### 4.9.1.6 Motor current [%] (I-REL)

The PKE-SWD-32 indicates the actual motor current via the input byte 2. The motor current is shown as a relative value in the ranges 0 % (0x00) to 255 % (0xFF). The transferred relative value is calculated from the value of the highest phase current measured in relation to the set current value of the overload release.

The accuracy of the relative current indication depends on the measured phase current in relation to the current range of the PKE trip block. In order to measure the phase current with sufficient accuracy, a phase current of at least 85% of the minimum mark of the variable overload release on the PKE trip block (e.g. trip block PKE-XTUA-4 →  $I_{\min} = 0.8 \times 1 \text{ A} = 0.8 \text{ A}$ ) must be present.

The maximum measuring accuracy of the transferred relative current value is 5 %.



The value of the thermal motor image can likewise be read as an acyclical object (→ Section 4.9.4, „acyclic data“, page 115).

#### 4.9.1.7 Thermal motor image [TH]

Depending on the current range and the actual current flow, the PKE motor-protective circuit-breaker calculates the thermal state of the motor and provides it as a data byte. The thermal load of the motor is mapped via input byte 3. The value is displayed as a relative value in the ranges 0 % (0x00) to 255 % (0xFF).

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.9 Programming

The main circuits are interrupted as a result of a motor overload if the thermal motor image is 110 %. In the event of phase failure or phase unbalance, the main circuits are interrupted at a value of 100 % of the thermal motor image. In the event of a phase unbalance and trip caused by an overload, the value of the thermal motor image is raised from 100 % to 110 %.



If the communication module PKE-SWD-32 is commissioned (i.e. by removing and replugging the SWD device connector on the PKE-SWD-32) while the thermal motor image of the PKE motor-protective circuit-breaker has the value 100 % or higher, the contactor is not operational until the value is below the 100 % mark of the thermal image.

#### 4.9.1.8 Type of trip block (TYPE)

The modular design of the PKE electronic motor-protective circuit-breaker enables several different current ranges to be covered. A different PKE trip block is inserted into the PKE basic device depending on the current range required. The following trip blocks of the type "Advanced" can be combined with the two PKE basic devices PKE12 and PKE32.

Table 12: Combination options of the PKE basic device with PKE trip block

Basic device	PKE-XTUA-1.2	PKE-XTUA-4	PKE-XTUA-12	PKE-XTUA-32
PKE12	✓	✓	✓	X
PKE32	X	X	✓	✓

The type of PKE trip block is mapped via the TYPE bit field (input byte 4, Bit 0 - 2). The values of this bit field are assigned to the following PKE trip blocks:

Table 13: Bit field Type of trip block

Field	Value	Control option part no.
TYPE	0x0	PKE-XTUA-1.2
	0x1	PKE-XTUA-4
	0x2	PKE-XTUA-12
	0x3	PKE-XTUA-32
	0x4	Not defined
	0x5	Not defined
	0x6	Not defined
	0x7	Not defined



The TYPE bit field can likewise be read as an acyclical data object (→ Section 4.9.4, „acyclic data“, page 115).



#### 4.9.1.9 Time delay setting (CLASS)

The CLASS bit field shows the value of the setting dial on the PKE trip block for the time lag class of the overload release. The setting points of the time lag class dial are assigned to the following values of the CLASS bit field.

Table 14: Bit field Time delay setting (CLASS)

Field	Value	Set time lag
CLASS	0x0	Class 5
	0x1	Class 10
	0x2	Class 15
	0x3	Class 20
	0x4	Test position
	0x5	Not defined
	0x6	Not defined
	0x7	Not defined

#### 4.9.2 Overload relay function (ZMR)

The ZMR function enables the motor to be switched off by the connected contactor in the event of an overload. To do this the PKE sends the switch off command for the contactor to the PKE-SWD-32 via the data cable of the PKE32-COM.

The ZMR function is activated using the output data of the PKE-SWD-32 (output byte 0 Bit 2).

If the ZMR function is deactivated, the connected motor is switched off in the event of an overload by the electronic PKE motor protective circuit breaker. The ZMR function cannot be deactivated in the event of an overload until the thermal motor image falls below 100 %.



#### DANGER

The ZMR function must not be activated with reversing starters since this operation does not ensure the disconnection of the second contactor in the event of an overload.



#### DANGER

Never disconnect the communication link between the PKE-SWD-32 and the PKE trip block after an overload with the ZMR function activated, as this can cause the contactor to switch on if a switch command is present.

The trip in response to a motor overload occurs if the thermal motor image of the PKE reaches 110 %. In this case, the PKE-SWD-32 sends the bit value 0x5 via the TRIPR data field (input byte 1, bits 4 - 6). This value stays set until the thermal motor image goes below the 100% mark and the contactor is once more operational.

The reclosing readiness of the contactor can be selected by the two manual and automatic operating modes of the ZMR function.



The ZMR function can only be used in position A of the 1-0-A switch.



In the event of a phase unbalance and activated ZMR function, the value of the thermal motor image is raised from 100 % to 110 % after a trip.

The switched off contactor's availability to reclose is restored when the value falls below 100 %.

#### 4.9.2.1 ZMR operating mode manual

In "manual" ZMR operating mode, the retriggering of the contactor must be acknowledged beforehand. The necessity of an acknowledgement is indicated by the ACKR bit field (input byte 1, Bit 7). The bit value "1" indicates that an overload with manual ZMR function was detected. Bit value "0" indicates that no overload is present and that an acknowledgement has already taken place. The "manual" ZMR operating mode is activated by sending the value "0" in bit field ZMR M/A (output byte 0, Bit 3).

The "manual" ZMR mode can be acknowledged in the following two ways:

- Sending the "Contactor OFF" command (output byte 0, Bit 0)
- Changing from "manual" ZMR operating mode to "automatic" ZMR mode by setting bit ZMR M/A (output byte 0, Bit 3)

The following diagrams (Fig. 50 and Fig. 51) illustrate the acknowledgement options for overloads with "manual" ZMR operating mode activated.

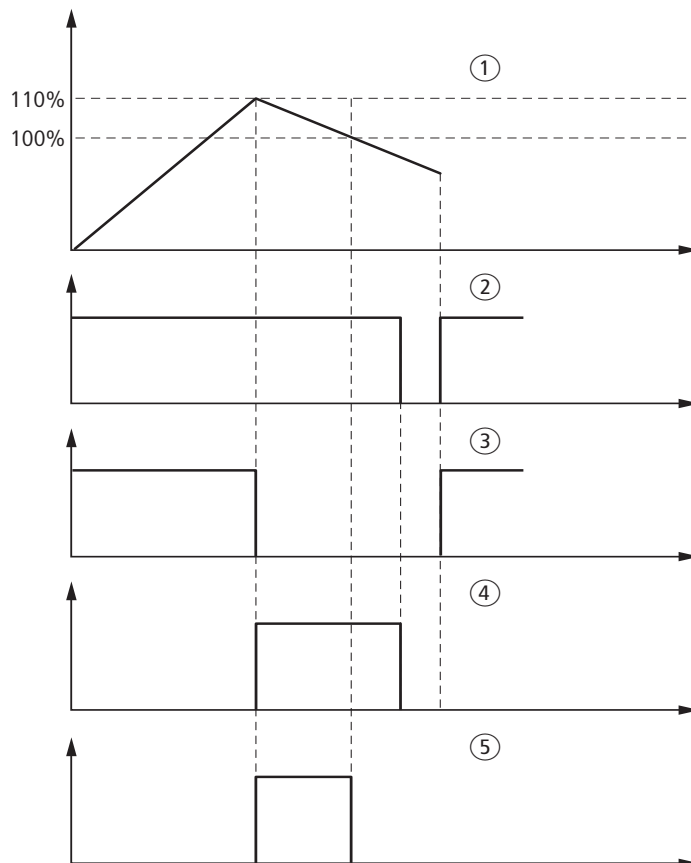


Figure 50: Acknowledgement of manual ZMR mode by "Contactor OFF" command

- ① Thermal motor image
- ② Switch command for contactor
- ③ Switch status Contactor
- ④ ACKR bit field status
- ⑤ Trip indication: Overload with activated ZMR function

4.9 Programming

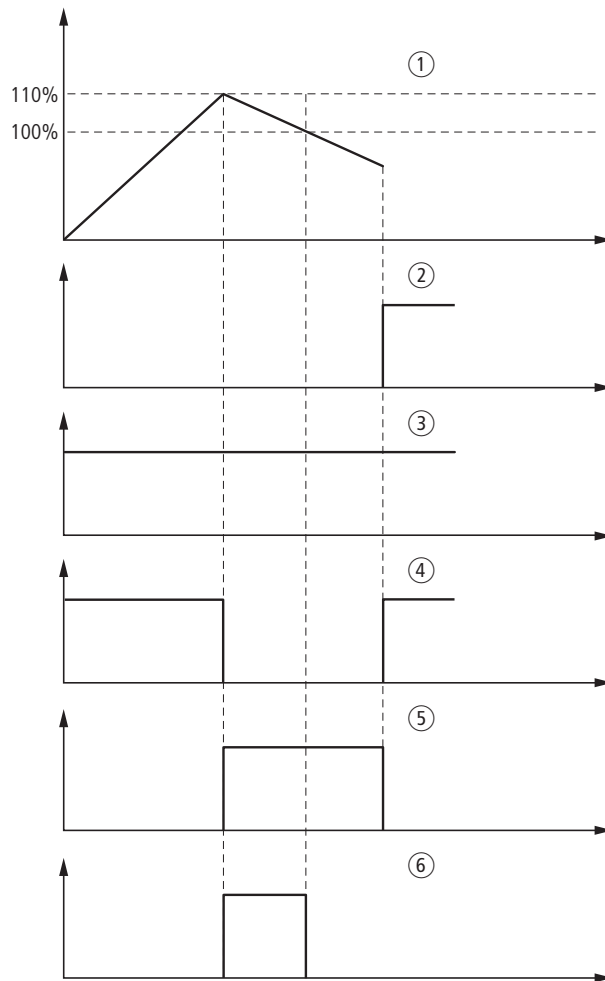


Figure 51: Acknowledgement of manual ZMR mode by changing the ZMR mode

- ① Thermal motor image
- ② ZMR M/A bit field status
- ③ Switch command for contactor
- ④ Switch status Contactor
- ⑤ ACKR bit field status
- ⑥ Trip indication: Overload with tripped ZMR function

**NOTICE**

The ZMR function cannot be deactivated until the thermal motor image falls below the 100 % mark.

### 4.9.2.2 ZMR operating mode automatic

In "automatic" ZMR operating mode, the contactor is ready to reclose immediately after the thermal image drops below 100%-mark. The "automatic" ZMR operating mode is activated by setting the ZMR M/A output bit (output byte 0, Bit 3).



#### DANGER

If the switch on command for the contactor is sent in "automatic" ZMR operating mode, the motor starts up automatically after the thermal motor image falls below the 100%-mark.

The following diagram (Fig. 52) illustrates the switching behavior of the contactor after an overload with the "automatic" ZMR operating mode active.

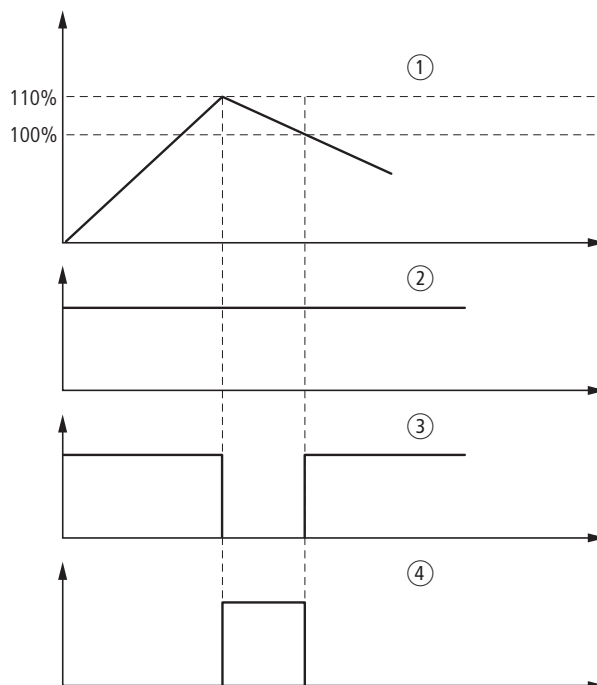


Figure 52: "Automatic" ZMR operating mode

- ① Thermal motor model
- ② Switch command for contactor
- ③ Switch status Contactor
- ④ Trip reason: Overload with activated ZMR function

### 4.9.3 Data profiles

The quantity of cyclical input data of the PKE-SWD-32 can be adapted to the application with different data profiles of the module. The data profiles are selected in the hardware configuration program/PLC configuration program.

The following three data profiles are available for the PKE-SWD-32:

Table 15: Data profile for PKE-SWD-32

Data profile	Input byte 4	Input byte 3	Input byte 2	Input byte 1	Input byte 0
PKE-SWD-32 Profile 1 (Moeller)	–	–	–	✓	✓
PKE-SWD-32 Profile 2 (Moeller)	–	✓	✓	✓	✓
PKE-SWD-32 Profile 3 (Moeller)	✓	✓	✓	✓	✓

#### 4.9.3.1 Special considerations when using the module with a CANopen field bus

When using data profile 1, 3 in conjunction with SmartWire gateway EU5C-SWD-CAN, entries in the setting range for associated service data objects (SDO) 2102subx must be changed in the PLC configuration program. With programming system CoDeSys, for example, change the default value from 0x2093 to 0x2094 to use PKE profile 3.

In programming systems with a controller configurator without automatic profile selection for SDO parameterization the corresponding SDO object 2102subx is inserted in the SDO object list and its content transferred when data profile 1 or 3 is used.

Object 2102subx (x represents the position of the PKE-SWD-32 module in the SmartWire-DT line)	contents
Profile 1	0x2091
Profile 2 (default)	0x2093
Profile 3	0x2094



Data bytes that are not transferred cyclically in certain profiles can still be read as acyclical data objects (→ Section 4.9.4, „acyclic data“, page 115).

### 4.9.4 acyclic data

The following acyclical objects can be read via the PKE-SWD-32 in addition to the cyclical input and output bytes.

The required object is addressed with parameters "ID" and "Index". The input address of the SmartWire-DT module with which communication is to be established is set with parameter "ID". Parameter "Index" addresses the object. The first object is assigned number 1, the second 2 etc. For the PKE-SWD-32, object 1 supplies current value "I-REL".

Object 1 [Index 1]:

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
I-REL	I-REL	I-REL	I-REL	I-REL	I-REL	I-REL	I-REL

Data byte	data bit	designation	Description	Notes
0	0 - 7	I-REL	Motor current [%]	→ Section 4.9.1.6, „Motor current [%] (I-REL)", page 107

Object 2 [Index 2]:

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
TH	TH	TH	TH	TH	TH	TH	TH

Data byte	data bit	designation	Description	Notes
0	0 - 7	TH	Thermal motor image [%]	→ Section 4.9.1.7, „Thermal motor image [TH]", page 107

## 4 PKE-SWD-32, interface for motor-starter combination with PKE PKE12/32

### 4.9 Programming

Object 3 [Index 3]:

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
–	–	CLASS	CLASS	CLASS	TYPE	TYPE	TYPE

Data byte	data bit	designation	Description	Notes
0	0 - 2	TYPE	Control option part no.	→ Section 4.9.1.8, „Type of trip block (TYPE)“, page 108
	3 - 5	CLASS	Set time lag	→ Section 4.9.1.9, „Time delay setting (CLASS)“, page 109
	6	Not used	–	–
	7	Not used	–	–



Further information on the subject of "acyclical data transfer" is provided in the manual MN05013002Z-EN (previous designation AWB2723-1612en).



## 5 Connection PKE-SWD for motor-protective circuit-breaker PKE12/32/65

### 5.1 Introduction

SmartWire-DT module PKE-SWD actuates motor-protective circuit-breaker PKE through a PLC and to receive data from the electronic motor-protective circuit-breaker. The PKE-SWD is connected directly to motor-protective circuit-breakers PKE12, PKE32 and PKE65.



Operation and installation of electronic motor-protective circuit-breaker PKE are described in document MN03402004Z-DE (former designation AWB1210-1631).

#### **NOTICE**

The PKE-SWD can be combined only with PKE trip blocks of type "Advanced" (PKE-XTU(W)A).

#### **NOTICE**

The PKE-SWD can not be combined with motor-starter combinations MSC-DEA up to 32A. Motor-starter combinations MSC-DEA can be connected to the SmartWire-DT system with SmartWire-DT module PKE-SWD-32.



In addition to the basic devices (contactors, motor-starter combinations, etc.) described in the individual sections, the function elements of the SmartWire-DT system listed in this manual can also be combined with equivalent Eaton basic devices that use the Eaton catalog number as part number. For a reference table, see the appendix on Page 260.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.5, „SWD module interoperability requirements“, page 261.

## 5 Connection PKE-SWD for motor-protective circuit-breaker PKE12/32/65

### 5.2 Surface mounting

#### 5.2 Surface mounting

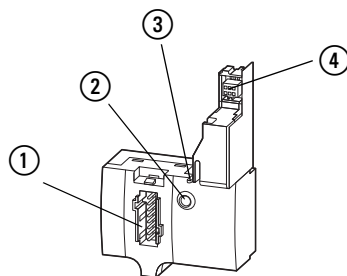


Figure 53: Figure 1: Connections PKE-SWD

- ① Connection of SmartWire-DT external device plug
- ② Diagnostics LED
- ③ Engagement hook for connecting to PKE basic device
- ④ Data interface for PKE control option "Advanced"

The SmartWire-DT external device plug with an adapted SmartWire-DT connecting cable is connected to the module PKE-SWD via connection 1.



For detailed instructions on how to connect the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pin SmartWire-DT ribbon cable, refer to the "Installing SWD4-8SF2-5 external device plugs" section in manual MN05006002Z-EN (previously AWB2723-1617de).

Diagnostic LED ② indicates the module's communication status through the SmartWire-DT system and the communication state to the PKE trip block (→ Section 5.7, „Device status“, page 122).

The PKE-SWD is fixed to the corresponding basic devices PKE with the engagement hook ③. This must be operated before the PKE-SWD is removed. When installing the PKE-SWD, the PKE basic device must not be fitted with a PKE trip block.

PKE-SWD and PKE trip block communicate through the data interface ④.

### 5.3 Engineering

The PKE-SWD can be combined with motor-protective circuit-breakers PKE12, PKE32 and PKE65. The trip blocks used that can be combined with the PKE basic devices must be of type XTUA or PKE-XTUWA. For each PKE-SWD one motor-protective circuit-breaker PKE with PKE trip block can be connected.

The following trip blocks of the type "Advanced" can be combined with the two PKE basic devices PKE12, PKE32 and PKE65.

	PKE-XTUA-1.2	PKE-XTUA-4	PKE-XTUA-12	PKE-XTUA-32	PKE-XTUWA-32	PKE-XTUA-65
PKE1 2	✓	✓	✓	X	X	X
PKE3 2	X	X	✓	✓	X	X
PKE6 5	X	X	X	X	✓	✓

Where motor-protective circuit-breakers and contactors up to DILM38 are spatially separated <sup>1)</sup> the contactor can be actuated with SmartWire-DT contactor modules DIL-SWD-32-....

If motor starters with motor-protective circuit-breaker PKE65 and contactors larger than DILM38 are used, the contactor is actuated through SmartWire-DT input/output module EU5E-SWD-4D2R. A control voltage other than 24 V DC can be selected for the circuit-breaker in this case (for example 230 V AC). Motor-starter combinations consisting of PKE65 and contactors larger than DILM38 can also be arranged together as motor starter combination on a busbar adapter(BBA4L-63) or a top-hat rail adapter plate (PKZM4-XC55/2).

Table 16: Combination options

Use	Number of PKE-SWD	Number of PKE-SWD-32	Number of DIL-SWD-32	Number of EU5E-SWD-4D2R
Electronic motor starter MSC-DEA				
DOL starter (PKE and DILM)	0	1	0	0
Reversing starter (PKE and 2 x DILM)	0	1	1	0
<b>Spatially separate arrangement <sup>1)</sup></b>				
DOL starters up to DILM38	1	0	1	0
DOL starters up to DILM38	1	0	0	1
Reversing starter up to DILM38	1	0	2	0
Reversing starter up to DILM38	1	0	0	1

1) Wiring sets PKZM0-XD(R)M12 and PKZM0-XD(R)M32 are not used

The PKE-SWD draws its energy for the communication electronics and for controlling the LED from the SmartWire-DT network supply.

Please take into consideration the total power consumption of your SmartWire-DT network and, if necessary, plan for an additional feeder module EU5C-SWD-PF2-1.



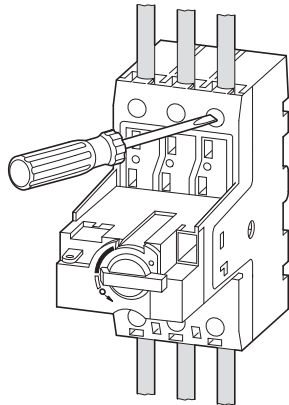
For data for the current requirement please refer to the table in the appendix on Page 255.

## 5 Connection PKE-SWD for motor-protective circuit-breaker PKE12/32/65

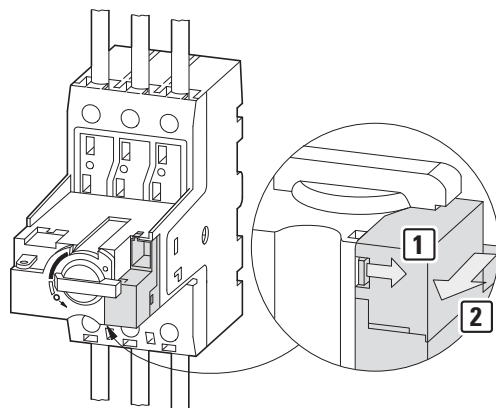
### 5.4 Installation

#### 5.4 Installation

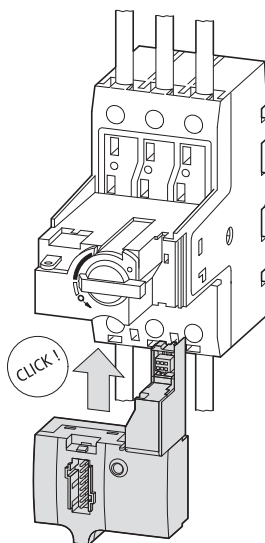
- ▶ Wire the main circuits of the PKE device.



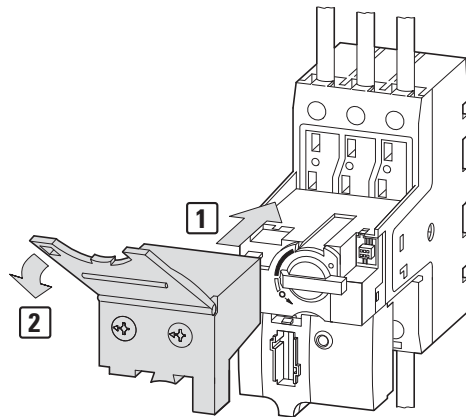
- ▶ Remove the empty module on the PKE basic device.



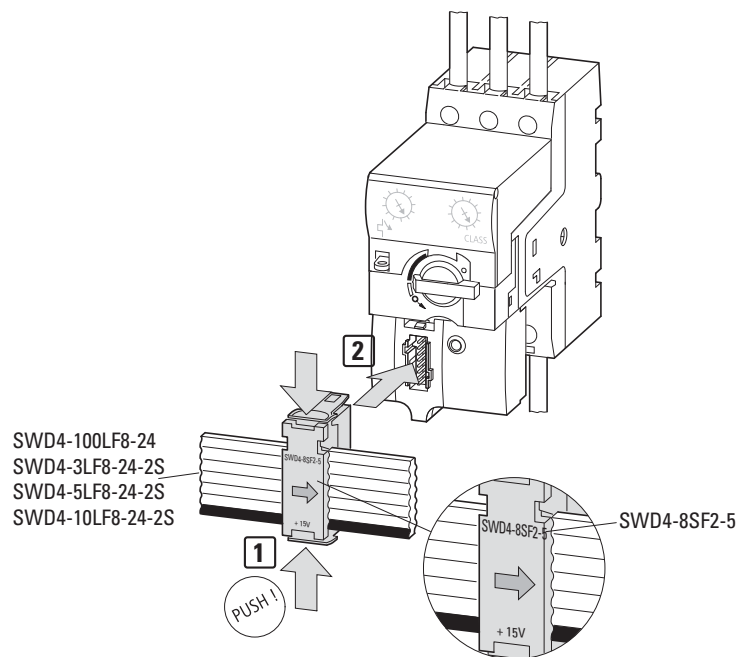
- ▶ Connect the PKE-SWD on the PKE basic device.



- ▶ Fit the "Advanced" part no. of PKE trip block (PKE-XTUA-...).



- ▶ At the PKE trip block, set the corresponding values for the overload trip or the time delay setting to overcome current peaks.
- ▶ Connect the SmartWire-DT external device plug with the adapted SmartWire-DT connecting cable.



### 5.5 commissioning

The automatic addressing of all modules in the SmartWire-DT network is performed via the gateway (actuation of the configuration pushbutton on the gateway) during commissioning. During the addressing process the SmartWire-DT diagnostics LED flashes. Once the addressing process is completed, the LED indicates a green continuous light.

## 5 Connection PKE-SWD for motor-protective circuit-breaker PKE12/32/65

### 5.6 Exchange of modules

#### 5.6 Exchange of modules

After replacement of the modules and connection of the voltage the configuration button must be pressed. When this is done, the new module will be assigned an address.

#### **NOTICE**

The order of the SmartWire-DT units must not be altered.



#### **DANGER**

The exchange of the motor starter or contactor must only be carried out after the complete system SmartWire-DT is switched off.

#### 5.7 Device status

The individual SmartWire-DT modules indicate their device status with the aid of a diagnosis LED. The diagnostics LED can have the following states:

Table 17: Diagnostic messages of the SmartWire-DT status LED

designation	Colour	Status	Message
Ready	Green	Continuous light	Device is operating error-free.
		Flashing (1 Hz)	<ul style="list-style-type: none"><li>Addressing process in progress<ul style="list-style-type: none"><li>after gateway power On</li><li>after actuation of the configuration button on the gateway</li></ul></li><li>Module not in current configuration</li><li>invalid type</li></ul>
		Flashing (3 Hz)	<ul style="list-style-type: none"><li>Communication to trip block PKE is interrupted</li></ul>

#### 5.8 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

#### 5.9 Fieldbus-specific characteristics

##### Field bus Ethercat

Please note the general information for configuring parameters  
→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.

## 5.10 Programming

### 5.10.1 PKE-SWD cyclical data

The PKE-SWD has a maximum of five input bytes and one output byte.



The number of cyclical input bytes can be adjusted by means of different data profiles of the module (→ Section 5.10.2, „Data profiles“, page 130).

#### 5.10.1.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	F	–	–	Stat.	–

data bit	designation	Meaning
0	Not used	-
1	STAT	Contacteur state PKE 0: PKE switched off 1: PKE Powered up
2	Not used	-
3	Not used	-
4	F = Failure	0: No diagnostic alarm 1: Module signals diagnostics
5	Not used	-
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

Byte 1:

7	6	5	4	3	2	1	0
–	TRIPR	TRIPR	TRIPR	I <sub>r</sub>	I <sub>r</sub>	I <sub>r</sub>	I <sub>r</sub>

data bit	designation	Meaning	Notes
0-3	I <sub>r</sub>	Set value I <sub>r</sub>	→ Section 5.10.1.4, „Set value (I <sub>r</sub> )“, page 126
4-6	TRIPR = Trip reason	Trip reason	→ Section 5.10.1.5, „Differential trip indication (TRIPR)“, page 127
7	Not used	–	–

## 5 Connection PKE-SWD for motor-protective circuit-breaker PKE12/32/65

### 5.10 Programming

Byte 2:

7	6	5	4	3	2	1	0
I-REL	I-REL	I-REL	I-REL	I-REL	I-REL	I-REL	I-REL

data bit	designation	Meaning	Notes
0-7	I-REL	Relative current value	→ Section 5.10.1.6, „Relative current value (I-REL)“, page 127

Byte 3:

7	6	5	4	3	2	1	0
TH	TH	TH	TH	TH	TH	TH	TH

data bit	designation	Meaning	Notes
0 - 7	TH	Thermal motor image [%]	→ Section 5.10.1.7, „Thermal motor image [TH]“, page 128

Byte 4:

7	6	5	4	3	2	1	0
–	–	CLASS	CLASS	CLASS	TYPE	TYPE	TYPE

data bit	designation	Meaning	Notes
0 - 2	TYPE	Control option part no.	→ Section 5.10.1.8, „Type of trip block (TYPE)“, page 128
3 - 5	CLASS	Set time lag	→ Section 5.10.1.9, „Time delay setting (CLASS)“, page 129
6	Not used	-	-
7	Not used	-	-



### 5.10.1.2 Outputs

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
–	–	–	–	–	–	R-TRIP	–

data bit	designation	Meaning	Notes
1	R-TRIP	Remote tripping, PKE basic device 0: no remote tripping 1: Remote tripping	

Remote tripping through output bit R\_TRIP causes a trip if a phase current of at least 85 percent of the minimum mark of the variable overload release on the PKE trip block flows through all three main circuits (for example PKE-XTUA-4 →  $I_{min} = 0.85 \times 1A = 0.85 A$ ).

**CAUTION.**

Signal “Remote tripping of PKE basic device” is supported by PKE trip blocks of the following or later versions:

	PKE-XTUA-1.2/4/12/32	PKE-XTUWA-32	PKE-XTUA-65
Release designation	05	01	01

### 5.10.1.3 Diagnostics

In the event of a diagnostics message (input byte 0, bit 4 is set), the module indicates the following causes of faults:

Value	Meaning	Remedy
0x03	No communication between PKE-SWD and PKE trip block	Check whether the PKE trip block used is of part no. PKE-XTU(W)A.

## 5 Connection PKE-SWD for motor-protective circuit-breaker PKE12/32/65

### 5.10 Programming

#### 5.10.1.4 Set value ( $I_r$ )

The overload release value set on the PKE basic device is indicated via bit field  $I_r$  (input byte 1, bit 0, ..., bit 3). The value of this bit field indicates the absolute current value of the overload release, which depends on the PKE trip block selected. Bit field  $I_r$  has the following meaning for the different PKE trip blocks:

Table 18: Bit array  $I_r$

Field	Value	PKE-XTUA-0.3 $I_r$ [A]	PKE-XTUA-4 $I_r$ [A]	PKE-XTUA-12 $I_r$ [A]	PKE-XTU(W)A-32 $I_r$ [A]	PKE-XTUA-65 $I_r$ [A]
$I_r$	0x0	0.30	1.00	3.00	8.00	16.00
	0x1	0.33	1.10	3.30	8.80	17.60
	0x2	0.36	1.20	3.60	9.70	19.30
	0x3	0.40	1.30	4.00	10.50	21.30
	0x4	0.43	1.42	4.30	11.50	23.00
	0x5	0.47	1.55	4.70	12.50	24.80
	0x6	0.50	1.70	5.00	13.50	26.80
	0x7	0.56	1.90	5.60	15.00	30.00
	0x8	0.63	2.10	6.30	17.00	33.60
	0x9	0.70	2.40	7.00	19.00	37.70
	0xA	0.77	2.60	7.70	20.50	40.90
	0xB	0.83	2.80	8.30	22.00	44.40
	0xC	0.90	3.00	9.00	24.00	48.10
	0xD	1.00	3.30	10.00	27.00	53.30
	0xE	1.10	3.70	11.00	29.00	58.60
	0xF	1.20	4.00	12.00	32.00	65.00

### 5.10.1.5 Differential trip indication (TRIPR)

In the event of a malfunction or interruption of the main circuits due to a fault, the trip reason of the interruption is indicated via the TRIPR bit field.

The following trip reasons are shown by the TRIPR bit array:

Table 19: Differential trip indication TRIPR

Field	Value	Description	Notes
TRIPR	0x0	Not defined	–
	0x1	Overload	PKE has switched off
	0x2	Short-circuit	PKE has switched off
	0x3	Phase failure/ Phase Imbalance	Disconnection at: 100 % of the thermal motor image (TH)
	0x4	Test position on PKE-XTU(W)A-...	PKE has switched off
	0x5	Not defined	–
	0x6	Remote tripping through output bit	PKE has switched off
	0x7	Not defined	–

The transmitted trip reasons are reset when the main contacts of the PKE are closed again and a power flow through the PKE trip block is detected.

The message 0x3 “phase failure/phase unbalance” is set if there is a phase current difference of 50% between the highest phase current measured and phase affected. This message is reset if the phase current difference is below 25 %.

The “phase failure/phase unbalance” does not force the interruption of the main circuits. To protect the connected motor in the event of phase loss/ phase unbalance, the tripping time in the event of an overcurrent is reduced to 40 % compared to when the phase load is symmetrical.

The interruption of the main circuits is executed early if the thermal motor image reaches 100 %.



The Test position on the PLE trip block and remote tripping through output bit R-TRIP cause a trip when a phase current of at least 85 percent of the minimum mark of the variable overload release on the PKE trip block flows through all three main circuits (for example PKE-XTUA-4 →  $I_{\min} = 0.85 \times 1 \text{ A} = 0.85 \text{ A}$ ).

### 5.10.1.6 Relative current value (I-REL)

The PKE-SWD indicates the actual motor current via the input byte 2. The motor current is shown as a relative value in the ranges 0 % (0x00) to 255 % (0xFF). The transferred relative value is calculated from the value of the highest phase current measured in relation to the set current value of the over-

## 5 Connection PKE-SWD for motor-protective circuit-breaker PKE12/32/65

### 5.10 Programming

load release. The accuracy of the relative current indication depends on the measured phase current in relation to the current range of the PKE trip block. In order to measure the phase current with sufficient accuracy, a phase current of at least 85% of the minimum mark of the variable overload release on the PKE trip block (e.g. trip block PKE-XTUA-4 →  $I_{\min} = 0.85 \times 1 \text{ A} = 0.85 \text{ A}$ ) must be present.

The maximum measuring accuracy of the transferred relative current value is 5 %.



The value in data field Motor Current [%] can also be read as an acyclical object  
(→ Section 5.10.3, „acyclic data“, page 130).

#### 5.10.1.7 Thermal motor image [TH]

Depending on the current range and the actual current flow, the PKE motor-protective circuit-breaker calculates the thermal state of the motor and provides it as a data byte. The motor's thermal load is represented in input byte 3. The value is displayed as a relative value in the ranges 0 % (0x00) to 255 % (0xFF).

The main circuits are interrupted as a result of a motor overload if the thermal motor image is 110 %. In the event of phase failure or phase unbalance, the main circuits are interrupted at a value of 100 % of the thermal motor image. In the event of a phase unbalance and trip caused by an overload, the value of the thermal motor image is raised from 100 % to 110 %.

#### 5.10.1.8 Type of trip block (TYPE)

The modular design of the PKE electronic motor-protective circuit-breaker enables several different current ranges to be covered. A different PKE trip block is inserted into the PKE basic device depending on the current range required.

The following trip blocks of the type “Advanced” can be combined with the two PKE basic devices PKE12, PKE32 and PKE65.

Table 20: Combination options of the PKE basic device with PKE trip block

Basic device	PKE-XTUA-1.2	PKE-XTUA-4	PKE-XTUA-12	PKE-XTUA-32	PKE-XTUWA-32	PKE-XTUA-65
PKE12	✓	✓	✓	X	X	X
PKE32	X	X	✓	✓	X	X
PKE64	X	X	X	X	✓	✓

The type of PKE trip block is mapped via the TYPE bit field (input byte 4, Bit 0 - 2). The values of this bit field are assigned to the following PKE trip blocks:

Table 21: Bit array XTUA

Field	Value	Control option part no.
XTUA	0x0	PKE-XTUA-1.2
	0x1	PKE-XTUA-4
	0x2	PKE-XTUA-12
	0x3	PKE-XTUA-32
	0x4	PKE-XTUWA-32
	0x5	PKE-XTUA-65
	0x6	Not defined
	0x7	Not defined



The TYPE bit array XTUA can be read as an acyclical data object (→ Section 5.10.3, „acyclic data“, page 130).

### 5.10.1.9 Time delay setting (CLASS)

The CLASS bit field shows the value of the setting dial on the PKE trip block for the time lag class of the overload release. The setting points of the time lag class dial are assigned to the following values of the CLASS bit field.

Table 22: Bit array CLASS

Field	Value	Set time lag
CLASS	0x0	Class 5
	0x1	Class 10
	0x2	Class 15
	0x3	Class 20
	0x4	Test position
	0x5	Not defined
	0x6	Not defined
	0x7	Not defined

### 5.10.1.10 Remote tripping, PKE basic device (R-TRIP)

Remote tripping of the PKE basic device through output bit R-TRIP causes a trip if a phase current of at least 85 percent of the minimum mark of the variable overload release on the PKE trip block flows through all three main circuits (for example PKE-XTUA-4 →  $I_{min} = 0.85 \times 1A = 0.85A$ ). The maximum duration of the tripping process from the time the PKE-SWD receives the trip signal to the actual time of tripping of the PKE basic device is 700 ms.

#### 5.10.2 Data profiles

The quantity of cyclical input data of the PKE-SWD can be adapted to the application with different data profiles of the module. The data profiles are selected in the hardware configuration program/PLC configuration program.

The following three data profiles are available for the PKE-SWD:

Table 23: Data profile for PKE-SWD

	Data byte 4	Data byte 3	Data byte 2	Data byte 1	Data byte 0
Data profile 1	X	X	X	✓	✓
Data profile 2 (default)	X	✓	✓	✓	✓
Data profile 3	✓	✓	✓	✓	✓

#### Special considerations when using the module with a CANopen field bus

When using data profile 1, 3 in conjunction with SmartWire gateway EU5C-SWD-CAN, entries in the setting range for associated service data objects (SDO) 2102subx must be changed in the PLC configuration program. With programming system CoDeSys, for example, change the default value from 0x2093 to 0x2094 to use PKE profile 3.

In programming systems with a controller configurator without automatic profile selection for SDO parameterization the corresponding SDO object 2102subx is inserted in the SDO object list and its content transferred when data profile 1 or 3 is used.

Object 2102subx (x represents the position of the PKE-SWD in the SmartWire-DT line)	contents
Profile 1	0x2091
Profile 2 (default)	0x2093
Profile 3	0x2094



Data bytes that are not transferred cyclically in certain profiles can be read as acyclical data objects (→ Section 5.10.3, „acyclic data“, page 130).

#### 5.10.3 acyclic data

The following acyclical objects can be read via the PKE-SWD in addition to the cyclical input and output bytes.

## 5 Connection PKE-SWD for motor-protective circuit-breaker PKE12/32/65

### 5.10 Programming

The required object is addressed with parameters "ID" and "Index". The input address of the SmartWire-DT module with which communication is to be established is set with parameter "ID". Parameter "Index" addresses the object. The first object is assigned number 1, the second 2 etc. For the PKE-SWD, object 1 supplies current value "I-REL".

Object 1 [Index 1]:

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
I-REL	I-REL	I-REL	I-REL	I-REL	I-REL	I-REL	I-REL

Data byte	data bit	designation	Description	Notes
0	0 - 7	I-REL	Motor current [%]	→ Section 5.10.1.6, „Relative current value (I-REL)“, page 127

Object 2 [Index 2]:

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
TH	TH	TH	TH	TH	TH	TH	TH

Data byte	data bit	designation	Description	Notes
0	0 - 7	TH	Thermal motor image [%]	→ Section 5.10.1.7, „Thermal motor image [TH]“, page 128

## 5 Connection PKE-SWD for motor-protective circuit-breaker PKE12/32/65

### 5.10 Programming

Object 3 [Index 3]:

Byte 0:

7	6	5	4	3	2	1	0
–	–	CLASS	CLASS	CLASS	TYPE	TYPE	TYPE

Data byte	data bit	designation	Description	Notes
0	0 - 2	TYPE	Control option part no.	→ Section 5.10.1.8, „Type of trip block (TYPE)“, page 128
	3 - 5	CLASS	Set time lag	→ Section 5.10.1.9, „Time delay setting (CLASS)“, page 129
	6	Not used	–	–
	7	Not used	–	–



Further information on the subject of "acyclical data transfer" is provided in the manual MN05013002Z-EN (previous designation AWB2723-1612en).



## 6 PKE-SWD-CP Connection for circuit-breaker PKE

### 6.1 Introduction

The purpose of the PKE-SWD-CP SmartWire-DT module is to control PKE motor-protective circuit-breakers, used in combination with PKE-XTU(W)ACP-... trip blocks, as communications-capable circuit-breakers via a programmable logic controller and to acquire data from PKE electronic motor-protective circuit-breakers.

The PKE-SWD-CP is connected directly to motor-protective circuit-breakers PKE32 or PKE65.

#### **NOTICE**

PKE-SWD-CP modules can only be combined with the following PKE trip blocks:

- PKE-XTUACP-36
- PKE-XTUWA-CP-36
- PKE-XTUACP-65



In addition to the basic devices (contactors, motor-starter combinations, etc.) described in the individual sections, the function elements of the SmartWire-DT system listed in this manual can also be combined with equivalent Eaton basic devices that use the Eaton catalog number as part number. For a reference table, see the Appendix Page 260.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.5, „SWD module interoperability requirements“, page 261.

## 6 PKE-SWD-CP Connection for circuit-breaker PKE

### 6.2 Surface mounting

#### 6.2 Surface mounting

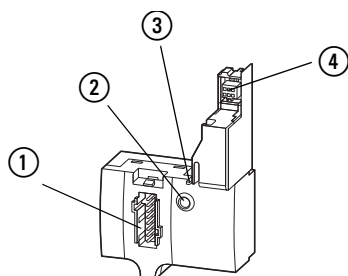


Figure 54: Connections PKE-SWD-CP

- ① Connection of SmartWire-DT external device plug
- ② Diagnostics LED
- ③ Engagement hook for connecting to PKE basic device
- ④ Data interface for PKE trip block

The SmartWire-DT external device plug with an installed SmartWire-DT ribbon cable is plugged into the PKE-SWD-CP module using connector ①.



For detailed instructions on how to connect the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pin SmartWire-DT ribbon cable, refer to the "Installing SWD4-8SF2-5 external device plugs" section in manual MN05006002Z-EN (previously called AWB2723-1617en).

Diagnostic LED ② indicates the module's communication status to the SmartWire-DT system and the communication state to the PKE trip block (→ Section 6.7, „Device status“, page 138).

The PKE-SWD-CP is fixed to the corresponding basic devices PKE with the engagement hook ③. This must be operated before the PKE-SWD-CP is removed. When installing the PKE-SWD-CP, the PKE basic device must not be fitted with a PKE trip block.

PKE-SWD-CP and PKE trip block communicate through the data interface ④.

## 6.3 Projection

The following trip blocks of the type PKE-XTU(W)ACP-... can be combined with the two PKE basic devices PKE32 and PKE65.

	PKE-XTUACP-32	PKE-XTUWACP-36	PKE-XTUACP-65
PKE32	✓	X	X
PKE65	X	✓	✓

The PKE-SWD-CP module takes the power it uses for its communications electronics and for driving its LEDs from the SmartWire-DT system's  $U_{SWD}$  15-V supply voltage.

Take the total power consumption of your SmartWire-DT system into account. If necessary, add an additional EU5C-SWD-PF2-1 power supply module to your configuration.



For data for the current consumption please refer to the table in → Chapter 14 "Appendix", page 255.

## 6 PKE-SWD-CP Connection for circuit-breaker PKE

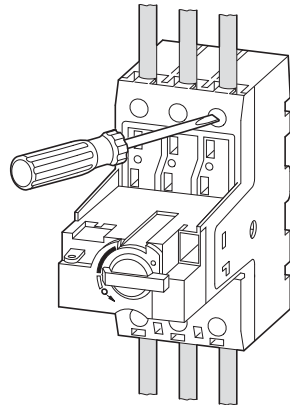
### 6.4 Installation

#### 6.4 Installation

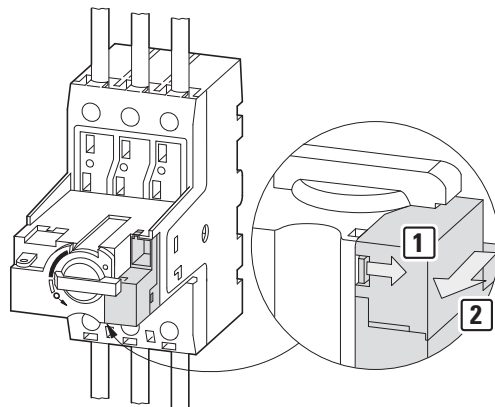


When installing the module, the PKE basic device must not have a PKE trip block installed on it.

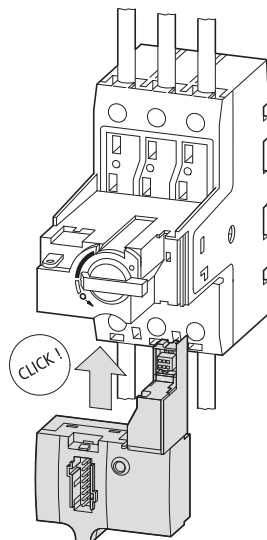
- ▶ Wire the main circuits of the PKE device.



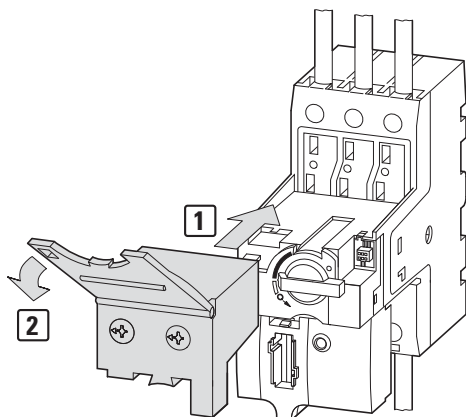
- ▶ Remove the empty module on the PKE basic device.



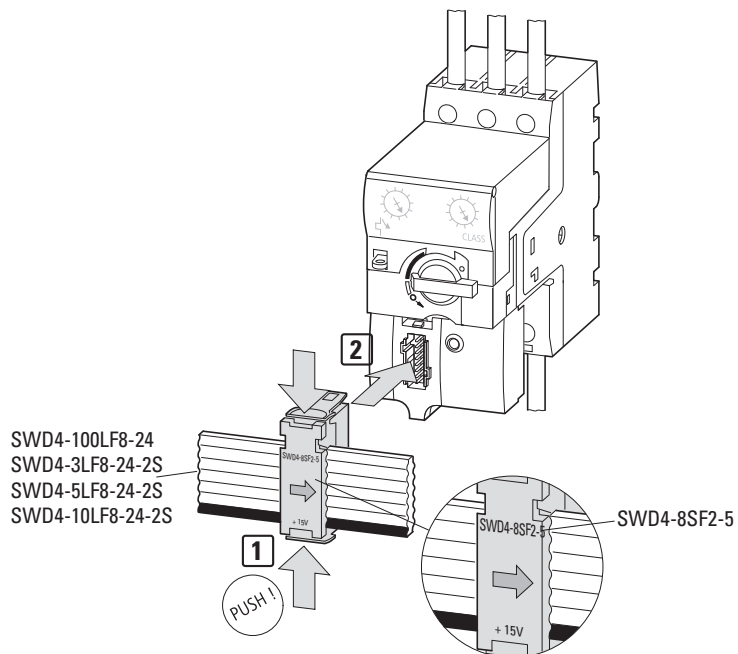
- ▶ Connect the PKE-SWD-CP on the PKE basic device.



- ▶ Fit the PKE trip block of the part no. PKE-XTU(W)ACP-...



- ▶ Set the appropriate overload release or short-circuit release values, as the case may be, on the PKE trip block.
- ▶ Plug the SmartWire-DT external device plug, with the SmartWire-DT ribbon cable in place already, into the device.



## 6.5 Commissioning

During commissioning, all modules on SmartWire-DT will be automatically assigned addresses via the gateway. To start this process, press the configuration button on front of the gateway. The SmartWire-DT diagnostics LED will flash while addresses are being assigned. Once all addresses have been assigned, the diagnostics LED will light up with a solid green light.

## 6 PKE-SWD-CP Connection for circuit-breaker PKE

### 6.6 Exchange of modules

#### 6.6 Exchange of modules

After replacing the modules and turning on the voltage, you will have to press the configuration button. When this is done, the new module will be assigned an address.

#### **NOTICE**

The order of the SmartWire-DT units must not be altered.



#### **DANGER**

The SmartWire-DT module must not be swapped unless the entire SmartWire-DT system has been switched off first.

#### 6.7 Device status

The individual SmartWire-DT modules indicate their device status with the aid of a diagnosis LED. The diagnostics LED can have the following states:

Table 24: Diagnostic messages of the SmartWire-DT status LED

designation	Colour	Status	Message
Ready	Green	Continuous light	Device is operating error-free.
		Flashing (1 Hz)	<ul style="list-style-type: none"><li>Addressing process in progress<ul style="list-style-type: none"><li>After the coordinator is powered on</li><li>after actuation of the configuration button on the coordinator</li></ul></li><li>Module not in current configuration</li><li>invalid type</li></ul>
		Flashing (3 Hz)	<ul style="list-style-type: none"><li>Communication to trip block PKE is interrupted</li><li>The trip block is not of part no. PKE-XTU(W)ACP-...</li></ul>

#### 6.8 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

#### 6.9 Fieldbus-specific characteristics

##### Field bus Ethercat

Please note the general information for configuring parameters  
→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.

## 6.10 Programming

### 6.10.1 PKE-SWD-CP cyclic data

The PKE-SWD-CP has a maximum of eight input bytes and one output byte.



The number of cyclical input bytes can be adjusted by means of different data profiles of the module (→ Section 6.10.2, „Data profiles“, page 146).

#### 6.10.1.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	F	–	–	Stat.	–

data bit	designation	Meaning
0	Not used	-
1	STAT	Contactor state PKE 0: PKE switched off 1: PKE Powered up
2	Not used	-
3	Not used	-
4	F = Failure	0: No diagnostic alarm 1: Module signals diagnostics
5	Not used	-
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

Byte 1:

7	6	5	4	3	2	1	0
–	TRIPR	TRIPR	TRIPR	I <sub>r</sub>	I <sub>r</sub>	I <sub>r</sub>	I <sub>r</sub>

data bit	designation	Meaning	Notes
0-3	I <sub>r</sub>	Set value I <sub>r</sub>	→ Section 6.10.1.4, „Set value (I <sub>r</sub> )“, page 142
4-6	TRIPR = Trip reason	Trip reason	→ Section 6.10.1.5, „Differential trip indication (TRIPR)“, page 143
7	Not used	-	-

## 6 PKE-SWD-CP Connection for circuit-breaker PKE

### 6.10 Programming

Byte 2:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX

data bit	designation	Meaning	Notes
0-7	I-REL-MAX	Relative current value of the highest phase current	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 143

Byte 3:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
TH	TH	TH	TH	TH	TH	TH	TH

data bit	designation	Meaning	Notes
0 - 7	TH	Thermal motor image [%]	→ Section 6.10.1.7, „Thermal model (TH)“, page 144

Byte 4:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
–	–	I >	I >	I >	TYPE	TYPE	TYPE

data bit	designation	Meaning	Notes
0 - 2	TYPE	Control option part no.	→ Section 6.10.1.8, „Type of trip block (TYPE)“, page 144
3 - 5	I >	Factor for short-circuit current	→ Section 6.10.1.9, „Short-circuit release (I >) factor“, page 145
6	Not used	-	-
7	Not used	-	-

Byte 5:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1

data bit	designation	Meaning	Notes
0 - 2	I-REL-L1	Relative phase current L1	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 143



Byte 6:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2

data bit	designation	Meaning	Notes
0 - 2	I-REL-L2	Relative phase current L2	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 143

Byte 7:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3

data bit	designation	Meaning	Notes
0 - 2	I-REL-L3	Relative phase current L3	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 143

### 6.10.1.2 Outputs

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
–	–	–	–	–	–	R-TRIP	–

data bit	designation	Meaning	Notes
0	–	Not used	
1	R-TRIP	Remote tripping, PKE basic device 0: no remote tripping 1: Remote tripping	
2-7	–	Not used	

Remote tripping via the R-TRIP output bit will cause the unit to trip as soon as the actual phase current exceeds the minimum tripping current  $I_{\min}$  that can be set;

e.g., PKE-XTUACP-36 →  $I_{\min} = 15 \times 1 \text{ A} = 15 \text{ A}$ .

## 6 PKE-SWD-CP Connection for circuit-breaker PKE

### 6.10 Programming

#### 6.10.1.3 Diagnostics

In the event of a diagnostics message (input byte 0, bit 4 is set), the module indicates the following causes of faults:

Value	Meaning	Remedy	Notes
0x03	No communication between PKE-SWD and PKE trip block	Check whether the PKE trip block used is of part no. PKE-XTU(W)ACP-...	

#### 6.10.1.4 Set value ( $I_r$ )

The overload release value set on the PKE basic device is indicated via bit field  $I_r$  (input byte 1, bit 0, ..., bit 3). The value of this bit field indicates the absolute current value of the overload release, which depends on the PKE trip block selected. Bit field  $I_r$  has the following meaning for the different PKE trip blocks:

Table 25: Bit array  $I_r$

Field	Value	PKE-XTUA-36 $I_r$ [A]	PKE-XTU(W)A-32 $I_r$ [A]	PKE-XTUA-65 $I_r$ [A]
$I_r$	0x0	15.00	15.00	30.00
	0x1	16.30	16.30	32.30
	0x2	17.70	17.70	34.60
	0x3	19.00	19.00	37.00
	0x4	20.30	20.30	39.30
	0x5	21.70	21.70	41.60
	0x6	23.00	23.00	44.00
	0x7	24.30	24.30	46.30
	0x8	25.70	25.70	48.30
	0x9	27.00	27.00	51.00
	0xA	28.30	28.30	53.30
	0xB	29.70	29.70	55.60
	0xC	31.00	31.00	58.00
	0xD	32.70	32.70	60.30
	0xE	34.30	34.30	62.60
	0xF	36.00	36.00	65.00

### 6.10.1.5 Differential trip indication (TRIPR)

In the event of a malfunction or interruption of the main circuits due to a fault scenario, the trip reason of the interruption is indicated via the TRIPR bit field.

The following trip reasons are shown by the TRIPR bit array:

Table 26: Differential trip indication TRIPR

Field	Value	Description	Notes
TRIPR	0x0	Not defined	–
	0x1	Overload	PKE has switched off
	0x2	Short-circuit	PKE has switched off
	0x3	Not defined	–
	0x4	Test position on PKE-XTU(W)ACP-...	PKE has switched off
	0x5	Not defined	–
	0x6	Remote tripping through output bit	PKE has switched off
	0x7	Not defined	–

The transmitted trip reasons are reset when the main contacts of the PKE are closed again and a power flow through the PKE trip block is detected.



The Test position on the PKE trip block, as well as remote tripping via the R-TRIP output bit, will cause the unit to trip as soon as the actual phase current exceeds the minimum tripping current  $I_{\min}$  that can be set;  
z.B. PKE-XTUACP-36 →  $I_{\min} = 15 \times 1 \text{ A} = 15 \text{ A}$ .

### 6.10.1.6 Relative current value (I-REL)

The PKE-SWD-CP module uses input byte 2 to provide the maximum phase current and input bytes 5 to 7 to provide relative phase currents L1 to L3.

These currents are represented as relative values within a range of 0% to 255% (0x00 to 0xFF). The relative values transmitted are calculated using the value of the phase current relative to the value of the set overload release current. The accuracy of the relative current indication depends on the measured phase current in relation to the current range of the PKE trip block. A sufficiently accurate phase current measurement will be achieved if at least 100% of the lowest current marker is flowing.

The maximum measuring accuracy of the transferred relative current value is 5 %.

The value in data field I-REL-MAX can also be read as an acyclical object (→ Section 6.10.3, „Acyclical data PKE-SWD-CP“, page 147).

## 6 PKE-SWD-CP Connection for circuit-breaker PKE

### 6.10 Programming

#### 6.10.1.7 Thermal model (TH)

The PKE motor-protective circuit-breaker will use the selected current range and actual power flow to calculate the unit's thermal state on the basis of the implemented trip type. The PKE-SWD-CP module will provide this thermal state in the form of an input byte. It will be represented as a relative value within a range of 0% to 255% (0x00 to 0xFF).

The PKE will trip if the thermal model assumes a value of 110%.

The value in data field TH can also be read as an acyclical object (→ Section 6.10.3, „Acyclic data PKE-SWD-CP“, page 147).

#### 6.10.1.8 Type of trip block (TYPE)

The modular design of the PKE electronic motor-protective circuit-breaker enables several different current ranges to be covered. A different PKE trip block is inserted into the PKE basic device depending on the current range required.

The following trip blocks of the type PKE-XTU(W)ACP-... can be combined with the two PKE basic devices PKE32 and PKE65.

Table 27: Combination options of the PKE basic device with PKE trip block

Basic device	PKE-XTUACP-36	PKE-XTUWACP-36	PKE-XTUACP-65
PKE32	✓	X	X
PKE65	X	✓	✓

The type of PKE trip block is mapped via the TYPE bit field (input byte 4, Bit 0 - 2). The values of this bit field are assigned to the following PKE trip blocks:

Table 28: Bit array TYPE

Field	Value	Control option part no.
TYPE	0x0	Not defined
	0x1	PKE-XTUACP-36
	0x2	PKE-XTUWACP-36
	0x3	PKE-XTUACP-65
	0x4	Not defined
	0x5	Not defined
	0x6	Not defined
	0x7	Not defined



The TYPE bit field can likewise be read as an acyclical data object (→ Section 6.10.3, „Acyclic data PKE-SWD-CP“, page 147).

### 6.10.1.9 Short-circuit release (I >) factor

The I > bit field is used to represent the value for the short-circuit release factor that is set using the setting dial found on the PKE trip block. The short-circuit release value is yielded by multiplying this factor by the set rated operational current value. The I > bit field can assume the following values:

Table 29: Bit array I >

Field	Value	Short-circuit release factor
I >	0x0	5
	0x1	6.5
	0x2	8
	0x3	Test position
	0x4	Not defined
	0x5	Not defined
	0x6	Not defined
	0x7	Not defined

## 6 PKE-SWD-CP Connection for circuit-breaker PKE

### 6.10 Programming

#### 6.10.2 Data profiles

The quantity of cyclical input data of the PKE-SWD-CP can be adapted to the application with different data profiles of the module. The data profiles are selected in the hardware configuration program/PLC configuration program.

The following four data profiles are available for the PKE-SWD-CP:

Table 30: Data profile for PKE-SWD-CP

	Data byte 7	Data byte 6	Data-byte5	Data-byte4	Data byte 3	Data byte 2	Data byte 1	Data byte 0
Data profile 1	X	X	X	X	X	X	✓	✓
Data profile 2 (default)	X	X	X	X	✓	✓	✓	✓
Data profile 3	X	X	X	✓	✓	✓	✓	✓
Data profile 4	✓	✓	✓	✓	✓	✓	✓	✓

#### Special considerations when using the module with a CANopen field bus

When using data profile 1, 3 or 4 in conjunction with SmartWire-DT gateway EU5C-SWD-CAN, entries in the setting range for associated service data objects (SDO) 2102subx must be changed in the PLC configuration program. With programming system CoDeSys, for example, change the default value from 0x2093 to 0x2094 to use PKE profile 3.

In programming systems with a controller configurator without automatic profile selection for SDO parameterization the corresponding SDO object 2102subx is inserted in the SDO object list and its content transferred when data profile 1 or 3 is used.

Object 2102subx (x represents the position of the PKE-SWD in the SmartWire-DT line)	contents
Profile 1	0x2091
Profile 2 (default)	0x2093
Profile 3	0x2094
Profile 4	0x2095



Data bytes that are not transferred cyclically in certain profiles can still be read as acyclical data objects (→ Section 6.10.3, „Acyclic data PKE-SWD-CP“, page 147).

### 6.10.3 Acyclic data PKE-SWD-CP

The following acyclical objects can be read via the PKE-SWD-CP in addition to the cyclical input and output bytes.

The required object is addressed with parameters "ID" and "Index". The input address of the SmartWire-DT module with which communication is to be established is set with parameter "ID". Parameter "Index" addresses the object. The first object is assigned number 1, the second number 2 etc. For the PKE-SWD-CP, object 1 supplies current value "I-REL-MAX".

Object 1 [Index 1]:

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX	I-REL-MAX

Data byte	data bit	designation	Description	Notes
0	0 - 7	I-REL-MAX	Relative current value of the highest phase current [%]	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 143

Object 2 [Index 2]:

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
TH	TH	TH	TH	TH	TH	TH	TH

Data byte	data bit	designation	Description	Notes
0	0 - 7	TH	Thermal motor image [%]	→ Section 6.10.1.7, „Thermal model (TH)“, page 144

Object 3 [Index 3]:

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
–	–	I >	I >	I >	TYPE	TYPE	TYPE

## 6 PKE-SWD-CP Connection for circuit-breaker PKE

### 6.10 Programming

Data byte	data bit	designation	Description	Notes
0	0 - 2	TYPE	Control option part no.	→ Section 6.10.1.8, „Type of trip block (TYPE)“, page 144
	3 - 5	I >	Factor for short-circuit current	→ Section 6.10.1.9, „Short-circuit release (I >) factor“, page 145
	6-7	Not used	–	–

Object 4 [Index 4]:

Byte 0:

7	6	5	4	3	2	1	0
I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1	I-REL-L1

Data byte	data bit	designation	Description	Notes
0	0 - 7	I-REL-L1	Relative phase current L1 [%]	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 143

Object 5 [Index 5]:

Byte 0:

7	6	5	4	3	2	1	0
I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2	I-REL-L2

Data byte	data bit	designation	Description	Notes
0	0 - 7	I-REL-L2	Relative phase current L2 [%]	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 143

Object 6 [Index 6]:

Byte 0:

7	6	5	4	3	2	1	0
I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3	I-REL-L3

Data byte	data bit	designation	Description	Notes
0	0 - 7	I-REL-L3	Relative phase current L3 [%]	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 143





For more information on the subject of acyclic data transfers, consult the manuals

- SmartWire-DT gateway EU5C-SWD-DP, MN120001Z-DE,
- SmartWire-DT gateway EU5C-SWD-CAN, MN120002Z-DE,
- SmartWire-DT gateway EU5C-SWD-EIP-MODTCP, MN120003Z-DE.

## 6 PKE-SWD-CP Connection for circuit-breaker PKE

### 6.10 Programming

## 7 Electronic motor starter EMS-...-SWD-ADP

### 7.1 Introduction

EMS-...-SWD-ADP electronic motor starters can be used to drive and protect three-phase asynchronous motors.

EMS-...-SWD-ADP motor starters combine the following functions for this purpose:

- Anticlockwise motor rotation,
- Clockwise motor rotation,
- Motor protection (overload protection plus detection of phase failures and phase imbalance).

The internal interlock circuit and load wiring keep wiring complexity to a minimum. The EMS series of products includes various versions with different functions. Version EMS-...-SWD-ADP features a SmartWire-DT interface that is used to supply power and control the appropriate direction of motor rotation.



Manual MN03407009Z-EN describes how EMS electronic motor-protective circuit-breakers are operated and installed .

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.5, „SWD module interoperability requirements“, page 261.

## 7 Electronic motor starter EMS-...-SWD-ADP

### 7.2 Surface mounting

#### 7.2 Surface mounting

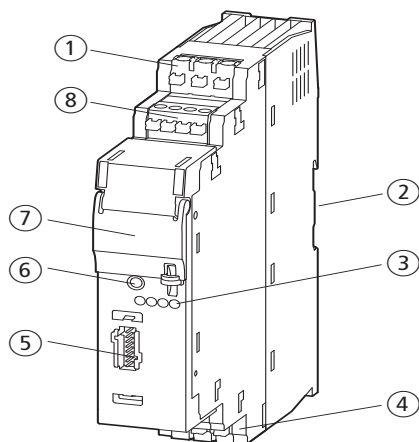


Figure 55: EMS-...-SWD-ADP electronic motor starter layout

- ① Connection of SmartWire-DT external device plug
- ② Sealable cover
- ③ 3-phase input voltage (1L1, 3L2, 5L3)
- ④ Diagnostics LED
- ⑤ Setting dial for motor current
- ⑥ Reset pushbutton
- ⑦ LED PWR: supply voltage, R: clockwise operation, L/ON: anticlockwise operation/motor starter ON (EMS-R.../EMS-D), ERR: fault
- ⑧ 3-phase output voltage

The SmartWire-DT external device plug with an installed SmartWire-DT ribbon cable is plugged into the EMS-...-SWD-ADP electronic motor starter using connector ①.



For detailed instructions on how to connect the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pin SmartWire-DT ribbon cable, refer to the "Installing SWD4-8SF2-5 external device plugs" section in manual MN05006002Z-EN (previously AWB2723-1617en).

The 8-pin SmartWire-DT ribbon cable carries not only the communication signal, but also a 24 VDC  $U_{AUX}$  voltage used to power and control the electronic motor starter.

Diagnostics LED ④ indicates the unit's communication status regarding communications with the SmartWire-DT system; → Section 7.7.1, „Diagnostics LED“, page 162.

### LED display

Electronic motor starter EMS-...-SWD-ADP uses four LEDs ⑦ to indicate its operating state. These LEDs have the following designations and colors:

Table 31: LEDs at DOL starter (EMS-...-SWD-ADP)

designation	Colour	Meaning
PWR	Green	Supply voltage available
ERR	Red	Fault scenario: overcurrent, imbalance, phase failure
L/ON	Green	Anticlockwise operation is active
R <sup>1)</sup>	Green	Clockwise rotation is active

1) for EMS-D... without function

The moment SmartWire-DT supply voltage  $U_{SWD}$  is applied, all the LEDs will light up once as part of an LED test.

The green PWR LED indicates the device's general status. External faults (process faults: overcurrent, imbalance, phase failure) will be signaled with the red ERR LED. At that point, the device will be in a safe, switched-off state. The error must be acknowledged in order to leave this state (→ section 4, "Device status and fault detection," page 19).

The green L/ON and R LEDs are used to indicate the drive's counterclockwise and clockwise operation, respectively. Since EMS-D... DOL starters only run in one direction, the R LED will not serve any purpose in them.

Use the ③ terminals, i.e., the terminals for the three-phase input voltage, to connect the unit to a three-phase supply system. If you are using an EMS reversing starter, make absolutely sure to pay attention to the terminal names for the EMS-...-SWD-ADP unit when connecting the unit to the three-phase supply system so that you will be setting the correct direction of rotation for the motor. Finally, connect the motor being driven to the h terminals ⑧, i.e., the three-phase output voltage terminals.

The motor current setting dial ⑤ is used to set the motor current. The sealable cover can be used to prevent unintended changes to this setting.

The Reset button ⑥ can be used to manually acknowledge error conditions (e.g., overload) on the electronic motor starter. Error conditions can also be acknowledged using the SmartWire-DT system.

If the electronic motor starter is in an error-free state and there is no control signal coming in via SmartWire-DT, the Reset button can be used to show the set rated operational current, in binary format, on the LEDs; → Section 7.4, "Installation EMS-...-SWD-ADP", page 159.

## 7.3 Projection

### 7.3.1 Fuse protection against short-circuits

Fuse protection against short-circuits can be added to a three-phase supply system in one of the following ways:

Table 32: Fuse protection for IEC applications

Device	Protective device	$I_q$ [kA]	Voltage [V]	Type of coordination
Electronic motor starter EMS ...	16A gG/gL	50	500	„1“
	PKMO-4	50	415	„1“
	PKMO-6.3	15	415	„1“



#### DANGER

The electronic motor starter must be replaced after a short-circuit occurs. Continuing to use the motor starter without repairs and without replacing parts is not permissible.

### 7.3.2 Motor current setting

The motor current setting dial can be used to set the motor current to one of 16 discrete current values. These values will vary depending on the model being used, as shown below:

Table 33: Setting dial positions and their corresponding current values

position	Current [A]	Current [A]
	EMS-...-2.4-SWD-ADP	EMS-...-9-SWD-ADP
0	0.18	1.5
1	0.25	2.0
2	0.41	2.5
3	0.56	3.0
4	0.71	3.5
5	0.87	4.0
6	1.02	4.5
7	1.17	5.0
8	1.33	5.5
9	1.48	6.0
10	1.63	6.5
11	1.79	7.0
12	1.94	7.5

position	Current [A]	Current [A]
	EMS-...-2.4-SWD-ADP	EMS-...-9-SWD-ADP
13	2.09	8.0
14	2.25	8.5
15	2.40	9.0

### 7.3.3 Derating curve rated operational current (EMS-...-9-SWD-ADP)

Depending on the installation situation and the maximum ambient air temperature, it may be necessary to derate the maximum rated operational current. Derating is based on the following three installation situations:

1. separate mounting
2. Connected in series with 30 mm clearance.
3. Connected in series without clearance

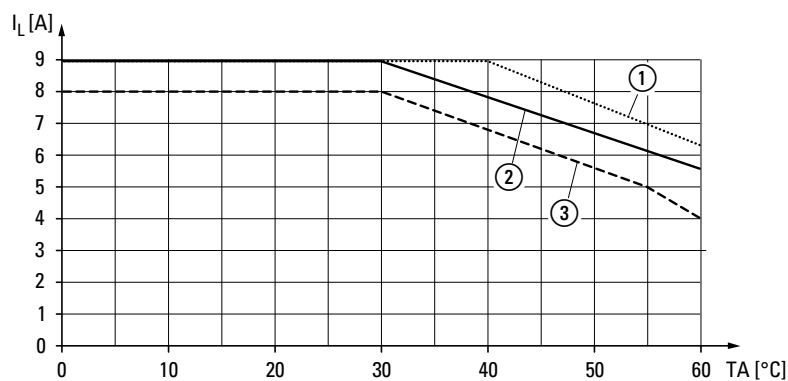


Figure 56: Derating curve rated operational current

- ① separate mounting
- ② Connected in series with 30 mm clearance
- ③ Connected in series without clearance

### 7.3.4 Determining the maximum motor current as a function of the overcurrent factor

The adjustment factors refer to EMS-...-9-SWD-ADP electronic motor starters with a maximum load current of 9 A. By using the load current, the overload factor (see the data sheet for the motor you are driving), and the derating curve for the rated operational current, you can calculate the maximum permissible rated operational current for the motor.

Table 34: Overcurrent factors and the corresponding adjustment factors

## 7 Electronic motor starter EMS-...-SWD-ADP

### 7.3 Projection

Overcurrent factor										
Overcurrent factor	1 <sup>1)</sup>	2	3	4	5	6	7	8 <sup>2)</sup>	9	10
Adjustment factor K	1	1	1	1	1	0.96	0.83	0.72	0.64	0.58

1) Utilization category AC-51

2) Utilization category AC-53a

#### Follow the steps below in order to calculate the motor's maximum permissible rated operational current:

- ▶ Calculate the maximum rated operational current for the maximum ambient air temperature at which the device will run based on the relevant installation situation for the electronic motor starter; → Figure 56.
- ▶ Determine the overcurrent factor for the motor being driven (see the data sheet for the motor)
- ▶ Take the adjustment factor corresponding to the motor's overcurrent factor.
- ▶ Multiply the adjustment factor by the maximum rated operational current you just calculated.

Table 35: Example: How to determine the maximum permissible rated operational current for a motor

	Example 1	Example 2
Motor with overcurrent factor (from motor data sheet)	$I_A/I_N = 8$	$I_A/I_N = 5$
Adjustment factor K (see table 34)	$K=0.72$	$K=1$
Maximum permissible load current $I_N$ with Max. ambient temperature $T_A$ and installation arrangement (from derating curve, EMS-...-9-SWD-ADP)	$I_N=9$ A $T_A = 40$ °C not connected in series	$I_N=4$ A $T_A = 60$ °C connected in series
Max. rated operational current of the motor	$I_N = 6.5$ A	$I_N = 4$ A



### 7.3.5 Tripping characteristic

The electronic motor starter features two different trip characteristics (class 10, class 10A) for protecting motors against thermal overloads. The characteristic curve used will depend on the device model's current range (2.4 A or 9 A), and, in the case of devices with 9 A, on the value set for the motor current. The following table shows when each trip characteristic applies:

Table 36: Applicable trip characteristic classes

Device Type	Motor current [A] set value	tripping characteristics
EMS-...-2.4-...	0.18 – 2.4	Class 10
EMS-...-9-...	1.5 – 4	Class 10
EMS-...-9-...	4.5 – 9	Class 10A

When the class 10A trip characteristic is used, the electronic motor starter will trip within 2 seconds if the load current exceeds 45 A.

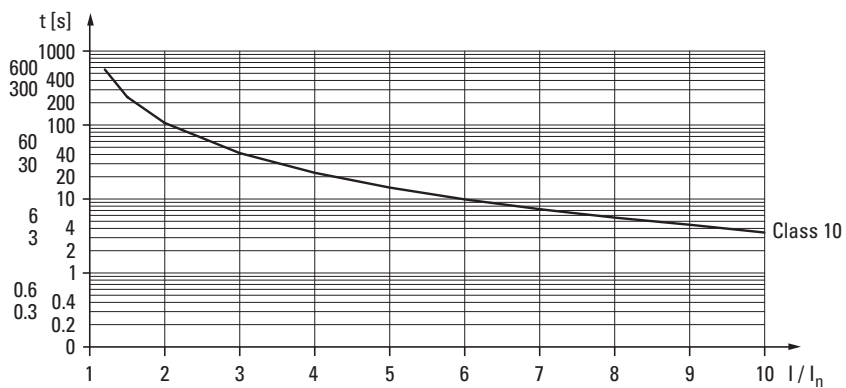


Figure 57: Tripping characteristics Class 10

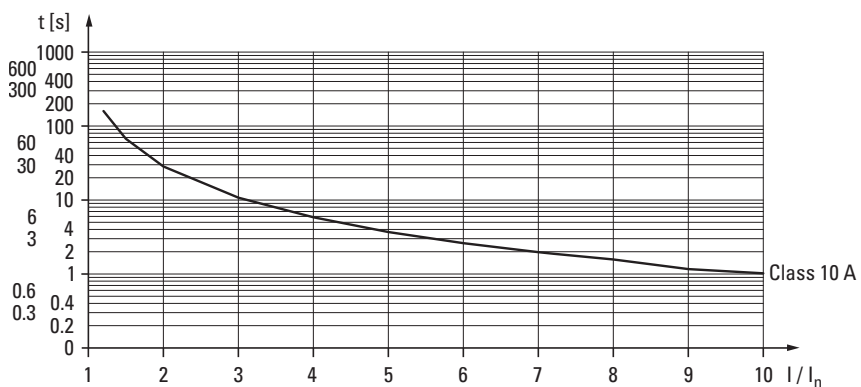


Figure 58: Tripping characteristics Class 10A

### 7.3.6 Circuit diagram DOL starter

K1 = EMS-DO-...-SWD-ADP

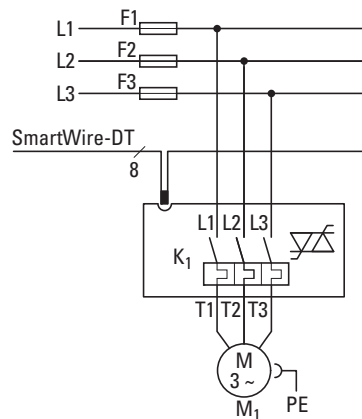


Figure 59: Circuit diagram DOL starter

### 7.3.7 Circuit diagram reversing starter

K1 = EMS-RO-...-SWD-ADP

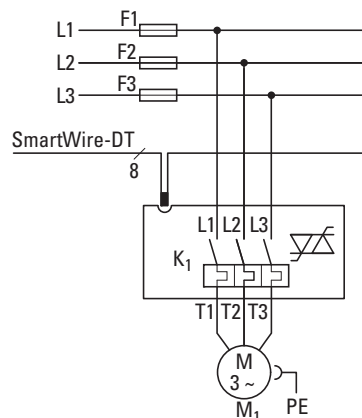


Figure 60: Circuit diagram reversing starter



For data for the current consumption refer to the table  
 → Section 14.2, „Power-/current consumption of the SWD stations on  $U_{AUX}$ “, page 256.

## 7.4 Installation EMS-...-SWD-ADP

To install the EMS-...-SWD-ADP electronic motor starter, follow the steps below:

- ▶ Mount the electronic motor starter on the top hat DIN rail.

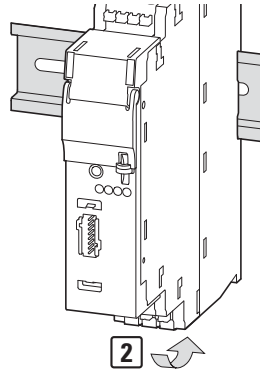


Figure 61: assembly of EMS-...-ADP

- ▶ Connect the SmartWire-DT external device plug with the SmartWire-DT ribbon cable in place already.

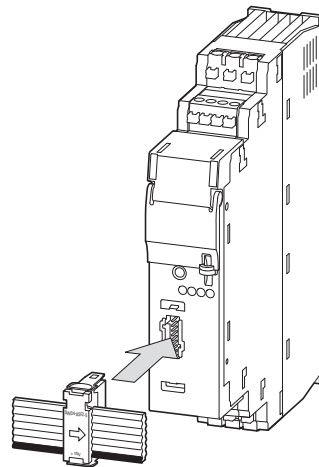


Figure 62: Plugging in the SmartWire-DT external device plug

## 7 Electronic motor starter EMS-...-SWD-ADP

### 7.5 commissioning

- ▶ Connect the cables for the three-phase input voltage and three-phase output voltage.

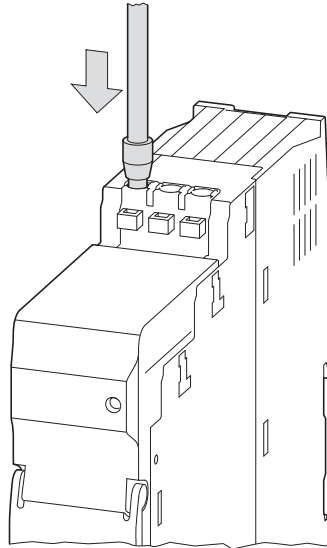


Figure 63: Connecting cables

- ▶ Use the motor current setting dial to set the motor current for the motor being driven.

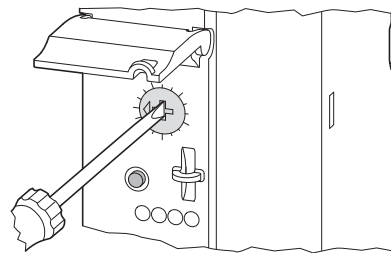


Figure 64: Adjust motor current

### 7.5 commissioning

After SmartWire-DT supply voltage  $U_{AUX}$  is switched on, the four PWR, ERR, L, R (EMS-RO-...-SWD-ADP) LEDs or three PWR, ERR, ON LEDs, as applicable, will light up once as part of an LED test. The PWR LED will then light up with a solid green light.

After the  $U_{SWD}$  SmartWire-DT supply voltage is switched on, the green SmartWire-DT diagnostic LED (Ready) will flash with 1 Hz to indicate that the electronic motor starter is ready for commissioning. During commissioning, the gateway will automatically assign addresses to all the modules on the SmartWire-DT line (when the configuration button on the gateway is

pressed). During the address assignment process, the diagnostic LED will flash. Once the address assignment process is complete, the diagnostic LED will show a solid green light.

## 7.6 Exchange of modules

After replacing the modules and turning on the voltage, you will have to press the configuration button. When this is done, the new module will be assigned an address.



### **DANGER**

The entire SmartWire-DT system must be switched off before replacing the electronic motor starter.

### **NOTICE**

The order of the SmartWire-DT units must not be altered.



In order to make it possible to replace the EMS-...-SWD-ADP electronic motor starter at a later point in time, make sure to set the "compatible device allowed" parameter to a value of 1 within the application parameters for the SmartWire-DT coordinator. These parameters can be accessed in the PLC program's controller configuration. In the case of CANopen, these parameters can be accessed using the SmartWire-DT gateway's Service Data Objects.

## 7.7 Device status

### 7.7.1 Diagnostics LED

The individual SmartWire-DT modules indicate their device status with the aid of a diagnosis LED. The diagnostics LED can have the following states:

Table 37: Diagnostics LED status messages

designation	Color]	Message
Ready	Green continuous light	Device is operating error-free.
	Green flashing (1Hz)	<ul style="list-style-type: none"> <li>Addressing process in progress</li> <li>After powering on the gateway</li> <li>After the configuration button on the gateway is pressed</li> <li>Module not in current configuration</li> <li>invalid part no.</li> </ul>

A variety of diagnostic functions enable EMS electronic motor starters to detect many peripheral internal and external faults. When a fault is detected, the device will switch to a safe, switched-off state. Internal faults cannot be reset, and will be stored in the device. If more than 14 internal faults occur, it will no longer be possible to operate the device. In the case of external errors, you will have to acknowledge the corresponding error in order to leave the safe, switched-off state.

The following table shows the various LED combinations together with their corresponding device states and error acknowledgement details. The following symbols are used throughout the table in order to represent the LEDs:

- LED off: ●
- LED with a solid light: ●/●
- LED flashing: ●/●

Table 38: LED indication on the device

LED indicators PWR R L/ ON ERR	Device status	Description	Error acknowledge
	off	no supply voltage $U_{AUX}$ available	
	Operational readiness	Power supply present	
	Drive switched on	Run Reverse	
		Run Forward	
	Internal error	Internal fault; device needs to be replaced	not possible
	External fault in the control section or peripherals (servicing required)	Bi-metal function The motor current is greater than the specified rated motor current (e.g., class 10A) Cooling-off time is running (20 minutes)!	
		An error has occurred at anticlockwise operation	automatic <sup>1)</sup>
		An error has occurred at clockwise rotation	
		After 2 minutes elapse, the L, R, or ON LED will flash: The error can be manually reset	
		An error has occurred at anticlockwise operation	Manual
		An error has occurred at clockwise rotation	Manual
		Error when attempting to establish system status: bad checksum. The bi-metal function's thermal memory will be set to the maximum value. The error must be acknowledged in automatic mode as well.	Manual
		Imbalance The motor currents differ from each other by more than 33%.	Manual
	External fault in the control section or peripherals (servicing required)	Block The maximum measurable motor current is exceeded for more than 2 seconds.	
		Stalling occurred during anticlockwise operation	Manual
		Stalling occurred during clockwise operation	Manual
	Status signal (power path remains connected)	Status signal in present control signal • Two or more phases missing • No motor connected • Motor current lower than the minimum configurable current for more than 2 seconds on at least 2 phases	
		Status signal issued during anticlockwise operation	automatic <sup>2)</sup>
		Status signal issued during clockwise operation	automatic <sup>2)</sup>

1) By means of permanently set output bit 3, Byte 0 (RES\_AUT)

2) No further action required

#### 7.7.2 Error acknowledgment

There are three ways to acknowledge a fault:

1. **Manually, using the Reset button:**

Pressing the Reset pushbutton on the front of the device will acknowledge an error/fault. If the Reset button is still being held down after approx. 2 seconds, the electronic motor starter will reassume its error condition. If the acknowledgment request is present (Reset button held down) for more than 6 seconds, an extended power output stage test will be run.

2. **Manually with a remote acknowledgment**

A remote acknowledgment control section can be implemented with the SmartWire-DT system by setting output bit 0.2 (RES\_MAN). An acknowledgment will be triggered as soon as a change in bit state from 0 to 1 is detected via SmartWire-DT. If a change in bit state from 1 to 0 is not detected after approx. 2 seconds have passed, the electronic motor starter will reassume its error condition, since tampering, or a defect in the acknowledgment circuit, cannot be ruled out.

3. **Automatically**

If output bit 0.3 (RES\_AUT) is permanently set, the electronic motor starter will automatically acknowledge faults after the bi-metal relay is actuated and the unit goes through a subsequent cool-down period (20 minutes).



#### **DANGER**

Automatic restarting may result in bodily injury and/or property damage.

There is a danger of automatic restarts occurring when the "automatic reset" operating mode (output bit 0.3 (RES\_AUT) permanently set to 1) is being used. The unit will restart automatically after the cool-down period of 20 minutes elapses.

#### 7.7.3 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

#### 7.7.4 Fieldbus-specific characteristics

##### **Field bus Ethercat**

Please note the general information for configuring parameters

→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.



## 7.8 Programming

### 7.8.1 Replacing with later versions of the EMS-...-SWD-ADP electronic motor starter

In order to make it possible to replace the EMS-...-SWD-ADP electronic motor starter at a later point in time, make sure to set the "compatible device allowed" parameter to a value of 1 within the application parameters for the SmartWire-DT coordinator. This parameter can be accessed in the PLC program's controller configuration. In the case of CANopen, this parameter can be accessed using the SmartWire-DT gateway's Service Data Objects.

### 7.8.2 Cyclic input data

Byte 0:

Status information: operating direction, error message

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	DIRL	DIR_ON /DIRR	ERR

data bit	designation	Meaning
0	ERR	0: Device can be actuated 1: Not ready for switching on Cool-down due to overload, internal device fault, pending overload case reset
1	DIR_ON/DIRR	PKE status 0: Operating direction is not activated 1: Motor running (EMS-DO-... DOL starter), 1: Motor in clockwise operation (EMS-RO... reversing starter)
2	DIRL	0: Operating direction is not activated 1: Motor in anticlockwise operation (EMS-RO... rever- sing starter)
3	–	free
4	DIAG	Diagnostic alarm not possible
5	–	
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

## 7 Electronic motor starter EMS-...-SWD-ADP

### 7.8 Programming

#### 7.8.3 Cyclical output data

Byte 0:

Control section operating direction

7	6	5	4	3	2	1	0
–	–	–	–	RES_AU T	RES_MA N	CMD_DIR L	CMD_ON/ CMD_DIR R

data bit	designation	Description
0	CMD_ON/ CMD_DIRR	0: No actuation signal for motor start (EMS-DO-... DOL starter) or clockwise operation motor start (EMS-RO-... reversing starter) 1: Motor start or clockwise operation motor start
1	CMD_DIRL	0: No actuation signal for anticlockwise operation motor start 1: Motor start anticlockwise operation
2	RES_MAN	0: No control section signal for manual overload case reset 1: Overload case activated by rising edge <sup>1)</sup>
3	RES_AUT	0: No activation signal for automatic overload case reset 1: Overload case activated by permanent signal <sup>2)</sup>

1) The electronic motor starter will be ready to receive a manual reset (RES\_MAN) command 2 minutes after an overload trip.

2) For automatic resetting, the automatic resetting command (RES\_AUT) must already be set before the overload trip. The motor will be restarted automatically (with the activated operating direction) after 20 minutes.

## 8 Pilot devices M22-SWD...

### 8.1 Introduction

The function elements M22-SWD... are combined together with front elements of the RMQ Titan system to form pilot devices that are capable of communication. The switch position indications of the control elements and activation of the indicator are implemented with the SmartWire-DT communication system. The following function elements are available.

Function element	Description
M22-SWD-K(C)11	a function element with a changeover contact
M22-SWD-K(C)22	a function element with two changeover contacts
M22-SWD-LED...	an LED function element in white (W), red (R), green (G) or blue (B)
M22-SWD-K11LED...	a function element with a changeover contact and an LED in white (W), red (R), green (G) or blue (B)
M22-SWD-K22LED...	a function element with two changeover contacts and an LED in white (W), red (R), green (G) or blue (B)

These function elements are each available in two versions for front or base fixing.

In addition to the modules listed above, the M22-SWD... range of products features a potentiometer and an encoder.

Function element	Description
M22-SWD-R	Potentiometer with digital output for values of up to 10 bits
M22-SWD-INC	Encoder designed to output relative change based on the user's rotary input

These elements are available with a front mounting configuration.

### 8.2 M22-SWD front mount

M22-SWD front function elements are used in connection with the M22-A adapter and M22 front elements for installation in consoles or control box doors.

## 8.2.1 Surface mounting

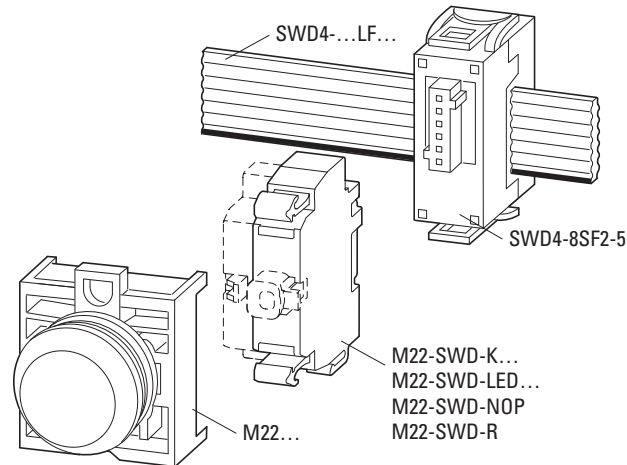


Figure 65: Layout M22-SWD front mount

## 8.2.2 Projection

The SmartWire-DT front function elements are used instead of the previous M22-K10-/K01 contact elements and the corresponding M22 LED....indicator elements. The previous elements for the control circuit function are used on the front.

One SmartWire function element is used per M22-A adapter. Mounting is always performed in the middle position. Correspondingly more efficient function elements are used for the combined functions of a luminous command device or for the realization of a multi-step switch. An illuminated push-button, which previously had to be realized as a combination of several elements, can now be realized simply by means of one combination element (LED indicator + contact element = M22-SWD-K11LED).

### 8.2.2.1 M22-SWD-K11

This function element replaces the previous contact elements M22-K10/K01. It provides a changeover contact by means of which both a breaker and maker function can be realized. The previously possible "piggy-back" combination consisting of an M22-K01 and -K10 element can also be replaced by a single M22-SWD-K11 element. The function element is used in combination with M22 (pushbutton) actuators.



Further M22-K10-/01 contact elements can be installed here in the free location of the M22-A adapter.

A possible application is, for example, conventional switching via an M22-K... contact element and the reporting of this process to the PLC via the M22-SWD-K11 function element.

### 8.2.2.2 M22-SWD-K22

This function element replaces multiple combinations of the previous contact elements M22-K10/K01. It provides two changeover contacts, by means of which control switches can be operator controlled with up to three-position indication.

### 8.2.2.3 M22-SWD-LED...(W/B/G/R)

This function element is used in combination with the indicator lights M22-L.... White, blue, green and red are available as colors.

### 8.2.2.4 M22-SWD-K11LED-(W/B/G/R)

This function element contains a changeover contact and an LED in the colours white, blue, green and red.

The function element replaces previous combinations of a contact element M22-K01 or -K10 and an M22 LED element. It is used in combination with luminous pushbuttons or selector buttons.

### 8.2.2.5 M22-SWD-K22LED...(W/B/G/R)

This function element contains two changeover contacts and an LED in the colours white, blue, green and red.

The function element replaces previous combinations consisting of several contact elements M22-K01 or -K10 and an M22 LED element. It is used in combination with luminous 3-position selector switches.



The adapter M22-SWD-A4, which can then accommodate two M22-SWD-K22 function elements, is used for 4-position contact polling (e.g. joystick M22S-WJ4) instead of the adapter M22-A4.

All combination options for M22 front elements with SmartWire-DT function elements for front mount are listed in the following table.

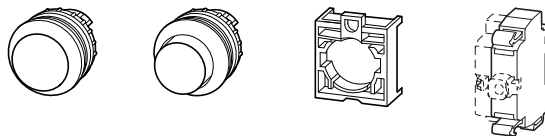


Figure 66: SmartWire-DT:Function elements

## 8 Pilot devices M22-SWD...

### 8.2 M22-SWD front mount

Table 39: Combination options for the M22 front element with SmartWire-DT function elements

Front element	component adapter	SmartWire-DT function element (front mount)
M22(S)-PV(T)	M22-A	M22-SWD-K11
M22(S)-PVL(T)	M22-A	M22-SWD-K11LED
M22(S)-DDL	M22-A	M22-SWD-K22LED
M22(S)-D(R)(H)	M22-A	M22-SWD-K11
M22(S)-D(R)P	M22-A	M22-SWD-K11
M22(S)-W(R)JK	M22-A	M22-SWD-K11
M22(S)-WKV	M22-A	M22-SWD-K11
M22(S)-W(R)K3	M22-A	M22-SWD-K22
M22(S)-W(R)S-(SA)	M22-A	M22-SWD-K11
M22(S)-W(R)S3-(SA)	M22-A	M22-SWD-K22
M22(S)-L(H)	M22-A	M22-SWD-LED
M22(S)-D(R)L(H)	M22-A	M22-SWD-K11LED
M22(S)-W(R)JK	M22-A	M22-SWD-K11LED
M22(S)-W(R)JK-3	M22-A	M22-SWD-K22LED
M22(S)-WLKV-3	M22-A	M22-SWD-K22LED
M22(S)-W...4...	M22-SWD-A4	2 x M22-SWD-K22
M22(S)-D...4...	M22-SWD-A4	2 x M22-SWD-K22
M22-WJ2...	M22-SWD-A4	2 x M22-SWD-K22

The SmartWire-DT function element always occupies the middle slot of the M22 adapter. If required, standard M22-K10/K01 contact elements can also be plugged into the free slots. The M22-SWD-A4 adapter is fitted with two M22-SWD-K22 function elements.

The following table shows what possibilities there are for this.

Table 40: Configurations of the M22-A adapter

function element	Configuration of the M22-A adapter (front mount - viewed from the rear while equipping the adapter)		
	1/4	3/6	2/5
Marking on adapter	1/4	3/6	2/5
M22-SWD-K11	0	X <sup>1)</sup>	0 <sup>2)</sup>
M22-SWD-LED	0	X	0
M22-SWD-K11LED	0	X	0
M22-SWD-K22	0	X	X
M22-SWD-K22LED	0	X	X

1) X = occupied by SWD element

2) 0 = optional for an additional M22-K10/K01 element



The function elements obtain the energy for communication electronics and driving the LED from the SmartWire-DT network supply.

Please take into consideration the total power consumption of your SmartWire network and, if necessary, plan for an additional feeder module EU5C-SWD-PF2-1. You will find information on the current consumption in the appendix on Page 255.

The software program SWD-Assist also supports you in doing this by automatically performing these calculations.

### 8.2.2.6 M22-SWD-R potentiometers

This function element has the functionality of a potentiometer. Moreover, it can be configured and has two different profiles available. With the first profile, the module will have a resolution of 8 bits, and it will be possible to represent the value either as a percentage (0-100%) or as an absolute value (0-255). With the second profile, the module will have a resolution of 10 bits, and it will be possible to represent the value either as a percentage (0-100.0%) or as an absolute value (0-1023).

Due to electrostatic reasons, the function element must first be mounted on the front element before the external device plug is used to establish a connection to the SmartWire-DT system.

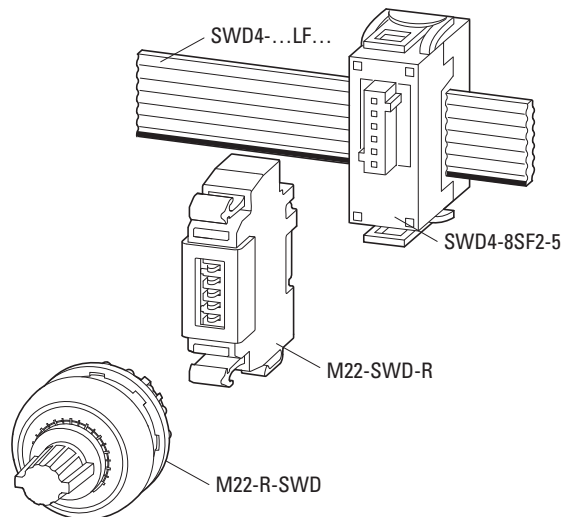


Figure 67: M22-SWD-R front mount

### 8.2.2.7 Encoder M22-SWD-INC

The function element has the functionality of a digital encoder. Moreover, the module can be configured and has two different profiles available. With the first profile, the module will return an unsigned 16-bit value; with the second one, it will return a signed 16-bit value.

The encoder also features a confirmation button. When pressed, this button will send a value to the PLC so that the value can be processed as programmed by the user. In addition, the confirmation button's behavior can be configured in such a way that a preset reset value will be applied when the button is pressed.

The module must be installed in such a way that the status LED faces upward. Moreover, due to electrostatic reasons, the function element must first be mounted on the front element before the external device plug is used to establish a connection to the SmartWire-DT system.

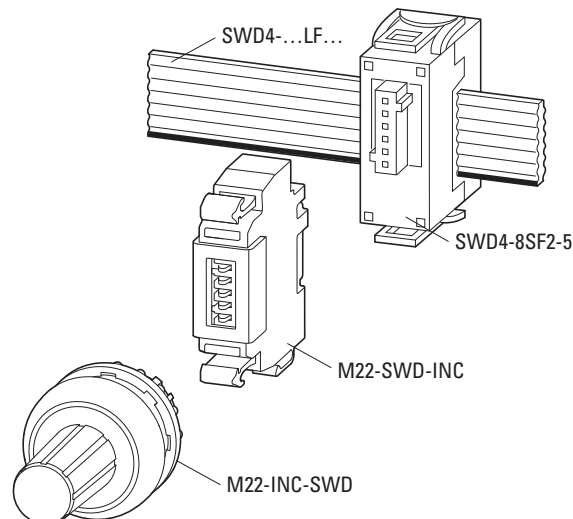


Figure 68: M22-SWD-INC front mount

### 8.2.3 Installation

The function elements are snapped onto the adapter M22-A in the middle position.

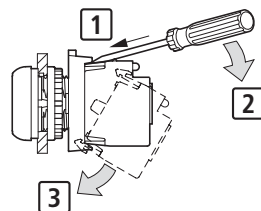


Figure 69: Connection to the adapter

The SmartWire-DT flat ribbon cable is to be connected to the SmartWire-DT network.



The external device plug SWD4-8SF2-5 is used for bonding with the M22-SWD function element. This completes installation.

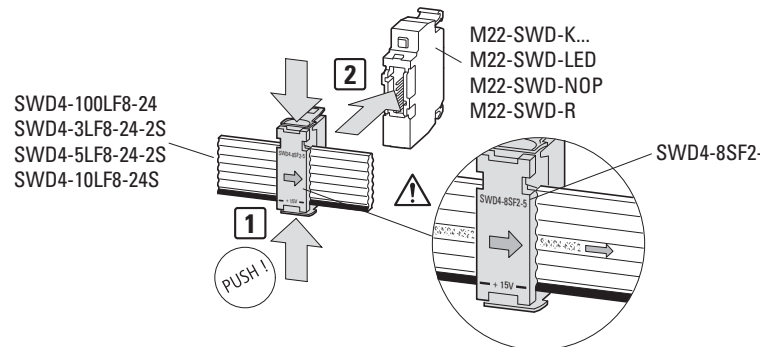


Figure 70: Connection of the function element to the SmartWire-DT flat ribbon cable

## 8.2.4 commissioning

The automatic addressing of all modules in the SmartWire-DT network is performed via the gateway (actuation of the configuration pushbutton on the gateway) during commissioning. During the addressing process the SmartWire-DT diagnosis LED on the rear side of the M22-SWD front function element flashes. Once the addressing process is completed, the LED indicates a green continuous light.

## 8.2.5 Exchange of modules

### **NOTICE**

Replacement of the SmartWire-DT function elements is not permitted until the entire SmartWire-DT system has been switched off.

After replacement of the modules and connection of the voltage the configuration button must be pressed. When this is done, the new module will be assigned an address.

### **NOTICE**

The order of the SmartWire-DT units must not be altered.

## 8.2.6 Device status

The individual SmartWire-DT modules indicate their device status with the aid of a diagnosis LED.

## 8 Pilot devices M22-SWD...

### 8.2 M22-SWD front mount

Table 41: Diagnostic messages of the SmartWire-DT status LED

designation	Colour	Status	Message
SmartWire-DT	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	<ul style="list-style-type: none"> <li>• addressing process in progress               <ul style="list-style-type: none"> <li>• after gateway power On</li> <li>• after actuation of the configuration button on the gateway</li> </ul> </li> <li>• Module not in current configuration</li> <li>• invalid type</li> </ul>
		flashing (3 Hz)	Device reports a diagnosis. (→ Section "8.3.9 Programming", sub-point "Diagnostics".)

#### 8.2.7 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

#### 8.2.8 Fieldbus-specific characteristics

##### Field bus Ethercat

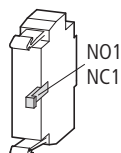
Please note the general information for configuring parameters  
→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.

#### 8.2.9 Programming

The various function elements have specific input/output information that is processed in the programming system. The meaning and scope are described in the following.

##### 8.2.9.1 M22-SWD-K11

The function element has one input byte at its disposal.



##### Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	NO1	NC1

Bit	designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: contact not actuated
1	NO1 = Normally Open	0: contact not actuated 1: contact actuated
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### Outputs

None

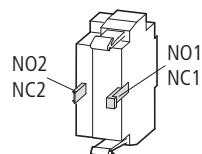
### Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

### 8.2.9.2 M22-SWD-K22

The function element has one input byte at its disposal.



### Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	NO2	NC2	NO1	NC1

## 8 Pilot devices M22-SWD...

### 8.2 M22-SWD front mount

Bit	designation	Meaning
0	NC1 = Normally Closed	0: contact 1 actuated 1: contact 1 not actuated
1	NO1 = Normally Open	0: contact 1 not actuated 1: contact 1 actuated
2	NC2 = Normally Closed	0: contact 2 actuated 1: contact 2 not actuated
3	NO2 = Normally Open	0: contact 2 not actuated 1: contact 2 actuated
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### Outputs

None

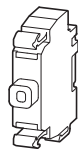
### Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

#### 8.2.9.3 M22-SWD-LED-(W/B/G/R)

The function element has one input byte and one output byte at its disposal



### Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	–	–

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	00

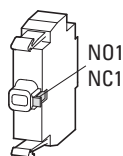
Bit	designation	Meaning
0	00	Activation of the LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

### Diagnostics

The module does not report a diagnosis.

#### 8.2.9.4 M22-SWD-K11LED-(W/B/G/R)

The function element has one input byte and one output byte at its disposal.



### Inputs

Byte 0:

## 8 Pilot devices M22-SWD...

### 8.2 M22-SWD front mount

7	6	5	4	3	2	1	0
SUBST	PRSN	–	DIAG	–	–	NO1	NC1

Bit	designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: contact not actuated
1	NO = Normally Open	0: contact not actuated 1: contact actuated
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSN	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

Bit	designation	Meaning
0	Q0	Activation of the LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

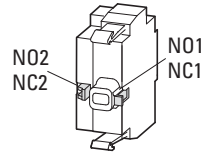
### Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

### 8.2.9.5 M22-SWD-K22LED-(W/B/G/R)

The function element has one input byte and one output byte at its disposal.



#### Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	NO2	NC2	NO1	NC1

Bit	designation	Meaning
0	NC1 = Normally Closed	0: contact 1 actuated 1: contact 1 not actuated
1	NO1 = Normally Open	0: contact 1 not actuated 1: contact 1 actuated
2	NC2 = Normally Closed	0: contact 2 actuated 1: contact 2 not actuated
3	NO2 = Normally Open	0: contact 2 not actuated 1: contact 2 actuated
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

#### Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

Bit	designation	Meaning
0	Q0	Activation of the LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–

## 8 Pilot devices M22-SWD...

### 8.2 M22-SWD front mount

Bit	designation	Meaning
5	Not used	–
6	Not used	–
7	Not used	–

#### Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

#### 8.2.9.6 M22-SWD-R potentiometers

M22-SWD potentiometers feature two data profiles that are used to define the scope of the corresponding cyclical data. Profile 1 has 2 input bytes, while profile 2 has 3 input bytes.

#### Inputs

Byte 0:

The same for both profiles.

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

Profile 1:

Byte 1: Potentiometer value; depends on whether the unit is configured to use a percentage (0 – 100%) or an absolute value (0 – 255).



Profile 2:

Bytes 1-2: Potentiometer value; depends on whether the unit is configured to use a percentage (0 – 100.0%) or an absolute value (0 – 1023).

### Outputs

none

### Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x14	Internal fault
0x2B	Front element not plugged
0x2C	Wrong front element plugged in
0x2D	Front element and/or connection defect

### Parameter definition

With the programming system's control configurator, users can define measured value refresh rate and averaging.

Parameter	Reading update	Averaging	
		On (default)	off
Reading refresh rate	20 ms	1	–
	100 ms (default setting)	5 measurement cycles	
	200 ms	10 measurement cycles	
	500 ms	25 measurement cycles	

The specified value is the refresh time to the SmartWire-DT coordinator. An averaging function, which smooths input signal fluctuations, is associated with this setting.

Structure of parameter byte 0:

Bit	Function	Configuration
0	Potentiometer data format	<b>0 = percentage value</b> 1 = absolute value
1	Averaging	0 = Off <b>1 = On</b>

Bold values indicate the default settings.

## 8 Pilot devices M22-SWD...

### 8.2 M22-SWD front mount

Bit	Function	Configuration		
2, 3	Reading refresh rate	Bit 2	Bit3	
		0	0	20 ms
		<b>0</b>	<b>1</b>	<b>100 ms</b>
		1	0	200 ms
		1	1	500 ms
4-7	Not used	0		

Bold values indicate the default settings.



The CANopen field bus transmits data event-controlled whenever the reading changes.

Reducing the reading refresh rate, for example to 50 ms, can increase data traffic on the field bus.

#### 8.2.9.7 M22-SWD-INC encoder

When used together with touchscreens, M22-SWD-INC encoders open entirely new input possibilities for industrial applications by implementing the same type of controls that are now prevalent in consumer electronics. M22-SWD-INC encoders make it possible to scroll through screen menus, adjust setpoints, and use an integrated click function to confirm and apply settings immediately with a simple hand movement.

M22-SWD-INC encoders feature two data profiles that are used to define the scope of the corresponding cyclical data. Profile 1 has 3 input bytes and 3 output bytes, while profile 2 has 3 input bytes and 1 output byte.

#### Inputs

The encoder's profiles are different from each other in terms of how input bytes 1 and 2 are interpreted. In one profile, the value is interpreted as an unsigned integer; in the other, it is interpreted as a signed integer.

Byte 0:

The same for both profiles.

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	CNS	CTRC ACK	CTRC

Bit	designation	Meaning
0	CTRC	0: Confirmation button not being pressed 1: Confirmation button being pressed; the "1" state will remain as long as the button is held down
1	CTRCACK	0: Confirmation button not being pressed 1: Confirmation button being pressed; the "1" state will remain until the PLC resets the bit to a state of "0"
2	CNS	0: Counter not reset by PLC 1: Counter set to requested value by PLC (default)
3	–	–
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	–	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

#### Explanation of CNS, bit 2

CNS / bit 2 is important whenever the user operates the encoder with activated limits, → section "Parameter definition", page 186. This bit is used to check whether the desired reset value has been successfully applied. The bit will have a value of 1 by default and will be set to 0 as soon as the module receives a valid reset value. If there are limits set in parameter bytes 1–4 and the reset value that is sent falls outside these limits, the bit will be set to 1. This makes it possible to detect instances in which the sent reset value is not applied successfully.

#### Profile 1

Bytes 1 and 2 (as a word):

Counter value as an unsigned integer (free-running counter if no limits have been defined)

Sub-index $1 \leq n \leq 254$	1 Byte								Byte 0:							
	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	m2	B1	B0
	MSB															LSB

#### Profile 2

Bytes 1 and 2 (as a word):

Counter value as a signed integer (a counter overflow may occur if no limits have been defined)

8 Pilot devices M22-SWD...  
8.2 M22-SWD front mount

Sub-index 1 ≤ n ≤ 254	<b>1 Byte</b>								<b>Byte 0:</b>							
	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	m2	B1	B0
	MSB															LSB

**Profile 1 outputs**

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
–	–	–	–	–	–	RESET	ACK CTRC

Bit	designation	Meaning
0	ACKCTRC	The confirmation button's acknowledge signal is triggered with a rising edge
1	RESET	The counter value is reset to the value defined in bytes 1 and 2 with a rising edge
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

Byte 1 and 2:

Reset value as an unsigned integer

Address Bit	<b>1 Byte</b>								<b>Byte 0:</b>							
	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	m2	B1	B0
	MSB															LSB

The reset value can be set either by the PLC with a rising edge on output byte 0, bit 1 or with the confirmation button (parameter byte 0, bit 6 must be set to 1), → table 42. If the reset value is invalid (e.g., falls outside the set limits), the value will not be applied and the existing value will be retained.

If the reset value needs to be changed, a reset must first be performed once by the PLC for confirmation purposes. This will cause the new reset value to be applied, after which the new reset value can be set with the confirmation button as well. If the PLC has not set a valid reset value by this point, the value will be set to the lower limit when the confirmation button is pressed (parameter byte 0, bit 6 must be set to 1), provided the limits are activated; otherwise, it will be set to 0, → table 42.

### Profile 2 outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	RESET	ACK CTRC

Bit	designation	Meaning
0	ACKCTRC	The confirmation button's acknowledge signal is triggered with a rising edge
1	RESET	The counter value is reset to the value defined in parameter bytes 5 and 6 with a rising edge, → section "Byte 5 and 6:", page 188
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

The reset value can be set either by the PLC with a rising edge on output byte 0, bit 1 or with the confirmation button (parameter byte 0, bit 6 must be set to 1), → table 43. The reset value can be changed by changing the value of bytes 5 and 6 in parameter byte 0.

### Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x14	Internal fault
0x2B	Front element not plugged in
0x2C	Wrong front element plugged in
0x2D	Malfunctioning front element and/or plug-in connection
0x2E	Pushbutton fault
0x2F	Parameter fault

#### Parameter definition

Users can configure the following values using the programming system's PLC configurator:

- Module counting direction: If the module is not installed as described above, the counting direction will be inverted. This problem can be fixed by changing the value for the module counting direction parameter.
- Fast scrolling: If the encoder is turned quickly for a continuous stretch of time, a "fast scroll" function will be activated and the value will change ten times more quickly as the encoder continues to be turned.
- Updating interval for the value from the module to the SmartWire-DT network.
- Scroll speed: If necessary, a prescaler can be used for particularly precise applications so that the scroll speed will be reduced by having the value change only after the configured number of rotary pulses is completed (parameter byte 0, bits 4 and 5).
- Reset with confirmation button: Defines whether the confirmation button should also be used to reset the module value to the reset value.
- Upper and lower limit: Defines the upper and lower limits for counting. If these limits are reached, the counter will not continue counting up/down. If the limits are enabled, the lower limit will always be set as the starting value when the PLC is powered up or reset. If both values are set to 0, there will not be any limits. In this case, the lower limit will be set to 0 when the PLC is powered up or reset.
- Reset value (in profile 2 only): The reset value applied when a reset is carried out (with the confirmation button (if enabled) or with the PLC).

**Profile 1**

Byte 0:

Table 42: Structure of parameter byte 0

Bit	Function	Configuration
0	Count direction	<b>0 = The count will increase when the encoder is turned clockwise</b> 1 = The count will increase when the encoder is turned counterclockwise
1	Quick scrolling	<b>0 = Off</b> 1 = On
2, 3	Reading refresh rate	Bit 2    Bit3 0        0        20 ms <b>0        1        100 ms</b> 1        0        200 ms 1        1        500 ms
4, 5	Scroll speed	Bit 4    Bit 5 <b>0        0        = Increase every detent</b> 0        1        = Increase every 2 detents 1        0        = Increase every 4 detents 1        1        = Increase every 8 detents
6	Reset with confirmation button	<b>0 = Off</b> 1 = On
7	Not used	0

Bold values indicate the default settings.

Byte 1 and 2:

Upper limit as an unsigned integer

Byte 3 and 4:

Lower limit as an unsigned integer

## Profile 2

Byte 0:

Table 43: Structure of parameter byte 0

Bit	Function	Configuration
0	Count direction	<b>0 = The count will increase when the encoder is turned clockwise</b> 1 = The count will increase when the encoder is turned counterclockwise
1	Quick scrolling	<b>0 = Off</b> 1 = On
2, 3	Reading refresh rate	Bit 2    Bit3 0        0        20 ms <b>0        1        100 ms</b> 1        0        200 ms 1        1        500 ms
4, 5	Scroll speed	Bit 4    Bit 5 <b>0        0        = Increase every detent</b> 0        1        = Increase every 2 detents 1        0        = Increase every 4 detents 1        1        = Increase every 8 detents
6	Reset with confirmation button	<b>0 = Off</b> 1 = On
7	Not used	0

Bold values indicate the default settings.

Byte 1 and 2:

Upper limit as a signed integer

Byte 3 and 4:

Lower limit as a signed integer

Byte 5 and 6:

Reset value as a signed integer



## 8.2.10 Fieldbus-specific characteristics

### Field bus CANopen

In programming systems with a controller configurator without automatic profile selection for SDO parameterization the corresponding SDO object 2102subx is inserted in the SDO object list and its content transferred when a data profile is used.

For values other than the default, change these values as shown below.

<b>Object 2102subx (x represents the position of the M22-SWD-INC in the Smart- Wire-DT line)</b>	<b>contents</b>
Profile 1(default)	0xE020D090
Profile 2	0x0020D090

The module is parameterized through its associated parameter byte in the control configurator.

For values other than the default, change these values as shown below.

Mounting see → section "Parameter definition", page 186.



The CANopen field bus transmits data event-controlled whenever the reading changes.

Reducing the reading refresh rate, for example to 50 ms, can increase data traffic on the field bus.

### Field bus Ethercat

Please note the general information for configuring parameters

→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249, also

→ section "Device options", page 249.

Parameter data length: 0x07 Device index parameter: sub-index 22

For additional information, please refer to "Fieldbus-specific characteristics" in the "Parameter configuration" section for each individual module.

### 8.3 M22-SWD base fixing

M22-SWD base function elements are used in connection with M22-I... surface mounting enclosures and M22 front elements.

#### 8.3.1 Surface mounting

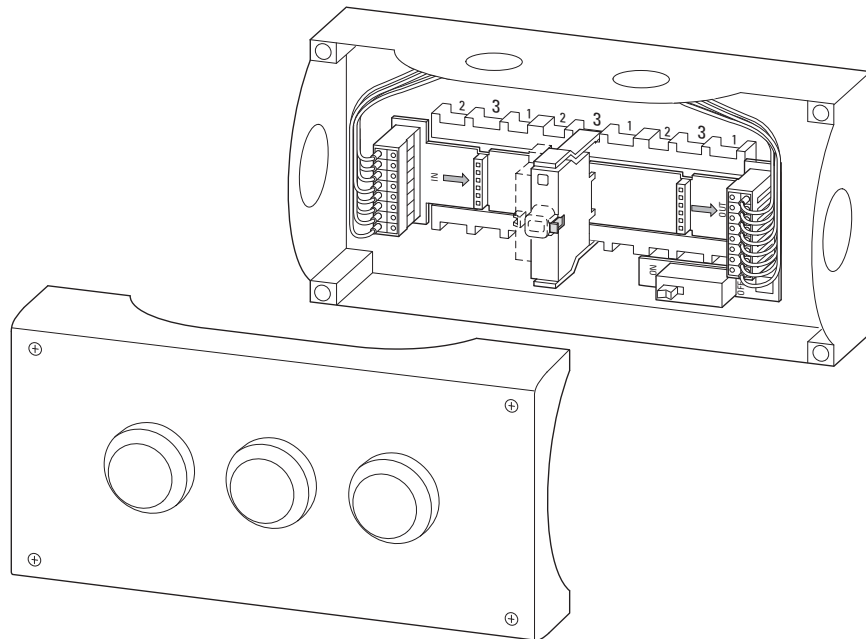


Figure 71: Base elements with enclosure

#### 8.3.2 Projection

The SmartWire-DT base function elements replace the previous M22-KC10 / KC01 contact elements and the corresponding M22 LEDC... elements. They are used in the surface mounting enclosures M22-I1 to M22-I6 in connection with the corresponding M22-SWD-ILP1-6 PCBs. Up to six operator control and indicator light functions can be realized with them. The cards create the connection with the SmartWire-DT network. The known M22 front elements for the control circuit function are used on the front.

The surface mounting enclosures are connected to the SmartWire-DT network via the SmartWire-DT round cable SWD4 50LR8-24.

The round cable can be connected directly by means of VM20 (metric cable gland) or plugged in.

8 pole enclosure bushings as plug/socket versions are used for the plug-in version.

### 8.3.2.1 Connection of the round cable to the cable gland

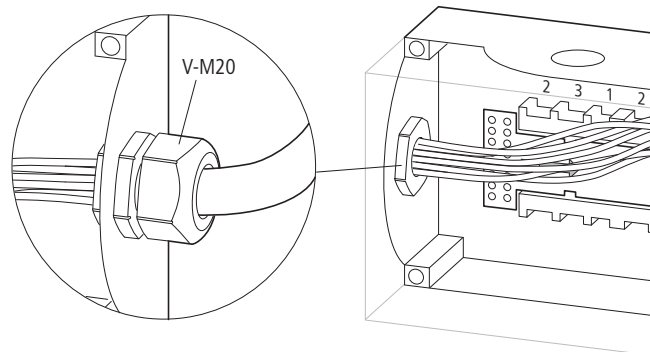


Figure 72: Connection with a cable gland

### 8.3.2.2 Connection of the round cable via a plug-in connection

The SmartWire-DT card is connected via 8 pole enclosure bushings executed as sockets or plugs.

housing bushing socket	SWD Element
Housing bushing socket for M22	SWD4-SF8-20
Housing bushing plug for M22	SWD4-SM8-20

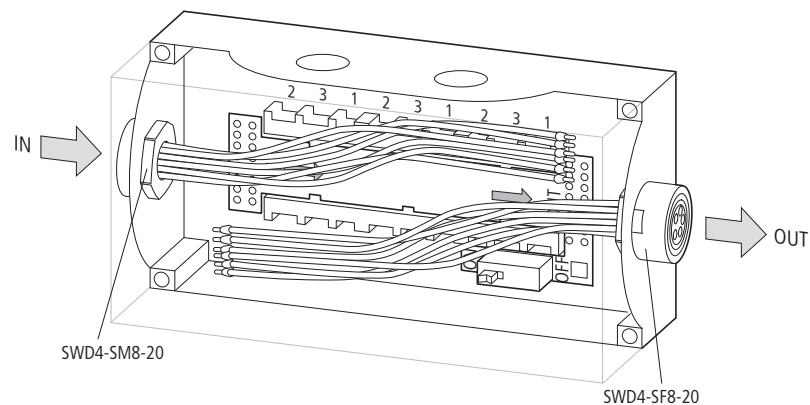


Figure 73: Plug connection

Connection to the round cable in this case is via 8 pole plugs/sockets.

housing bushing socket	SWD Element
Socket, straight, 8-pole	SWD4-SF8-67
Plug, flat, 8-pole	SWD4-SM8-67
Socket, angled at 90°, 8 pole	SWD4-SF8-67W
Plug, angled at 90°, 8 pole	SWD4-SM8-67W

## 8 Pilot devices M22-SWD...

### 8.3 M22-SWD base fixing

- ➔ Non-used slots have to be equipped with the SmartWire-DT bridge M22-SWD-SEL8-10, otherwise the SmartWire-DT network will be interrupted.
- ➔ The PCBs contain a switchable terminating resistor for the SmartWire-DT network. If the surface mounting enclosure is the last slave in the network, the terminating resistor must be switched on.
- ➔ You can also obtain information about terminating resistors and on the use of the SWD link via the software program SWD-Assist.  
<http://www.eaton.eu/software>

One SmartWire-DT function element is used per slot. Correspondingly more efficient function elements are used for the combined function of a luminous command device or for the realization of a multi-step switch.

A luminous pushbutton, which previously had to be realized as a combination of several elements, can now be realized simply by means of one combination element (LED indicator + contact element = M22-SWD-K11LEDC).

#### **M22-SWD-KC11**

This function element replaces the previous contact elements M22-KC10/KC01. It provides a changeover contact by means of which both a breaker and maker function can be realized. The function element is used in combination with M22 (pushbutton) actuators.

- ➔ Further M22-KC10/KC01 contact elements can be installed here in the free locations in the surface mounting enclosure. A possible application is, for example, conventional switching via an M22-K... contact element and the reporting of this process to the PLC via the M22-SWD-K11 function element.

#### **M22-SWD-KC22**

This function element replaces multiple combinations of the previous contact elements M22-KC10/KC01. It provides two changeover contacts, by means of which control switches can be operated with up to three-position indication.

#### **M22-SWD-LEDC...**

This function element is used in combination with the indicator lights M22-L.... White, blue, green or red are available as colours.

- ➔ Further M22-KC... contact elements can be installed here in the free locations in the surface mounting enclosure.

### M22-SWD-K11LEDC... (multiple function elements)

These functional elements contain a changeover contact and an LED element in the colours white, blue, green and red. They replace previous combinations consisting of a contact element M22-KC01 or -KC10 and an M22 LEDC... element. They are used in combination with illuminated pushbuttons or selector switch buttons.

### M22-SWD-K22LEDC... (multiple function elements)

These functional elements contain two changeover contacts and an LED element in the colours white, blue, green and red. They replace previous combinations consisting of several contact elements M22-KC01 or -KC10 and an M22-LEDC... element. They are used in combination with luminous 3-position selector switches.



There is no possibility of connecting an M22S-WJ4 joystick element.

All combination options for M22 front elements with SmartWire-DT base function elements are listed in the following table.

Table 44: combination options M22 front elements with SmartWire-DT-Function in base fixing

Front element	SWD function element (Base fixing)
M22(S)-PV(T)	M22-SWD-KC11
M22(S)-PVL(T)	M22-SWD-K11LEDC
M22(S)-DDL	M22-SWD-K22LEDC
M22(S)-D(R)(H)	M22-SWD-KC11
M22(S)-D(R)P	M22-SWD-KC11
M22(S)-W(R)K	M22-SWD-KC11
M22(S)-WKV	M22-SWD-KC11
M22(S)-W(R)K3	M22-SWD-KC22
M22(S)-W(R)S-(SA)	M22-SWD-KC11
M22(S)-W(R)S3-(SA)	M22-SWD-KC22
M22(S)-L(H)	M22-SWD-LEDC
M22(S)-D(R)L(H)	M22-SWD-K11LEDC
M22(S)-W(R)LK	M22-SWD-K11LEDC
M22(S)-W(R)LK-3	M22-SWD-K22LEDC
M22(S)-WLKV-3	M22-SWD-K22LEDC

The SmartWire-DT function element always occupies the middle slot. If required, standard M22-KC10/KC01 contact elements can also be plugged into the free slots.

The following Table45 shows what possibilities there are.

## 8 Pilot devices M22-SWD...

### 8.3 M22-SWD base fixing

Table 45: Configuration in the M22-I... enclosure

function element	M22-I... enclosure configuration (base fixing - viewed from the front while equipping the enclosure)		
	2	3	1
Location on the PCB (marking on the enclosure base)			
M22-SWD-KC11	0	X <sup>1)</sup>	0 <sup>2)</sup>
M22-SWD-LEDC	0	X	0
M22-SWD-K11LEDC	0	X	0
M22-SWD-KC22	X	X	0
M22-SWD-K22LEDC	X	X	0
M22-SWD-SEL-8-10	0	X	0

1) X = occupied by SWD element

2) 0 = optional for an additional M22-KC10/KC01 element



The function elements obtain the energy for communication electronics and driving the LEDs from the SmartWire-DT network supply.

So please take into consideration the total power consumption of your SmartWire-DT network and, if necessary, plan for an additional feeder module EU5E-SWD-PF2-1.

You can find information on the current consumption in the appendix on Page 255.

For questions about current consumption the software program SWD-Assist also supports you in doing this by automatically performing these calculations.

<http://downloadcenter.moeller.net>

### 8.3.3 Installation

The functional elements are mounted on the PCB M22-SWD-ILP... in the surface mounting enclosure M22-I....

To do so, proceed as follows:

- ▶ Insert the printed circuit board into the surface mounting enclosure. Ensure that the PCB is pointing in the correct direction. The direction of the arrow defines the arrangement of the modules. (the gateway is to the left of the IN code.)

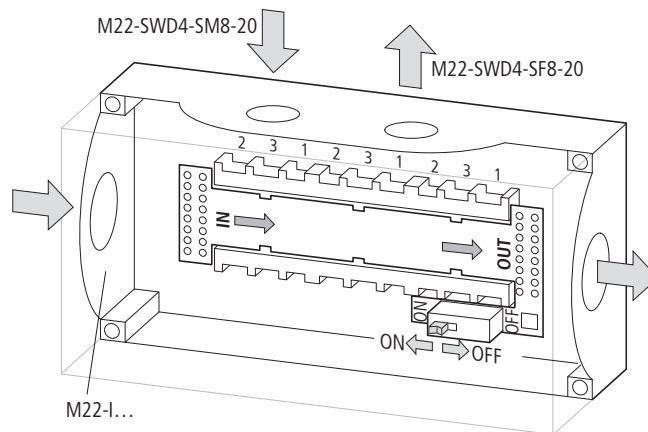


Figure 74: Surface-mounting enclosure with PCB M22-SWD-ILP...

- ▶ Fix the SmartWire-DT cables to the PCB terminals. Ensure that the color assignment is correct.
- ▶ If this is the last SmartWire-DT module, please switch on the terminating resistor.

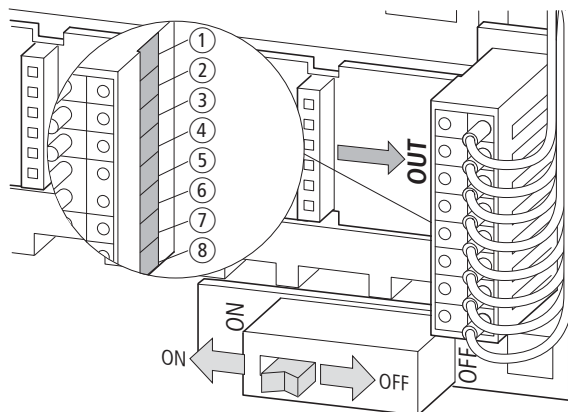


Figure 75: Bus termination resistor

- ▶ Equip the slots with the M22-SWD...C... function elements. Ensure that the mounting position is correct (status LED must be at the top). Unused slots must be equipped with the bridge M22-SWD-SEL8 10.

## 8 Pilot devices M22-SWD...

### 8.3 M22-SWD base fixing

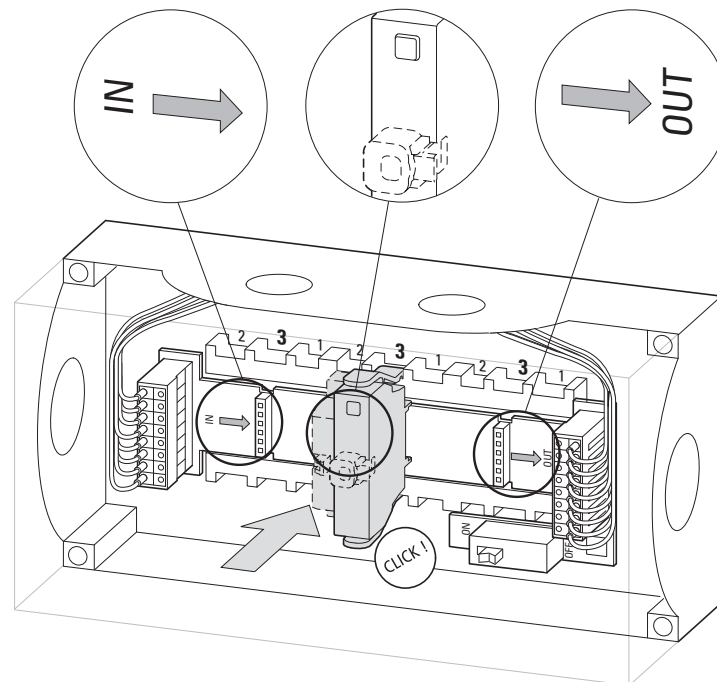


Figure 76: Equipping the enclosure slots

### 8.3.4 commissioning

The automatic addressing of all modules in the SmartWire-DT network is performed via the gateway (actuation of the configuration pushbutton on the gateway) during commissioning. During the addressing process the SmartWire-DT diagnostics LED on the top side of the M22 SmartWire-DT base function element flashes. Once the addressing process is completed, the LED indicates a green continuous light.

### 8.3.5 Exchange of modules

#### **NOTICE**

Replacement of the SmartWire-DT function elements is not permitted until the entire SmartWire-DT system has been switched off.

After replacement of the modules and connection of the voltage the configuration button must be pressed. When this is done, the new module will be assigned an address.

#### **NOTICE**

The order of the SmartWire-DT units must not be altered.



### 8.3.6 Device status

The individual SmartWire-DT modules indicate their device status with the aid of a diagnosis LED.

Table 46: Diagnostic messages of the SmartWire-DT status LED

designation	Colour	Status	Message
SmartWire-DT	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	<ul style="list-style-type: none"> <li>• addressing process in progress               <ul style="list-style-type: none"> <li>• after gateway power On</li> <li>• after actuation of the configuration button on the gateway</li> </ul> </li> <li>• Module not in current configuration</li> <li>• invalid type</li> </ul>
		flashing (3 Hz)	Device reports a diagnosis. (→ Section "8.3.9 Programming", sub-point "Diagnostics".)

### 8.3.7 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

### 8.3.8 Fieldbus-specific characteristics

#### Field bus Ethercat

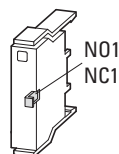
Please note the general information for configuring parameters  
→ Chapter 13 "Using SmartWire-DT modules with the EtherCAT field bus", page 249.

### 8.3.9 Programming

The various function elements have specific input/output information that is processed in the programming system. The meaning and scope are described in the following.

#### 8.3.9.1 M22-SWD-KC11

The function element has one input byte at its disposal.



## 8 Pilot devices M22-SWD...

### 8.3 M22-SWD base fixing

#### Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	NO1	NC1

Bit	designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: contact not actuated
1	NO1 = Normally Open	0: contact not actuated 1: contact actuated
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

#### Outputs

None

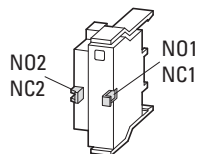
#### Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

#### 8.3.9.2 M22-SWD-KC22

The function element has one input byte at its disposal.



#### Inputs

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
SUBS T	PRSN T	–	DIAG	NO2	NC2	NO1	NC1

Bit	designation	Meaning
0	NC1 = Normally Closed	0: contact 1 actuated 1: contact 1 not actuated
1	NO1 = Normally Open	0: contact 1 not actuated 1: contact 1 actuated
2	NC2 = Normally Closed	0: contact 2 actuated 1: contact 2 not actuated
3	NO2 = Normally Open	0: contact 2 not actuated 1: contact 2 actuated
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSENT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### Outputs

None

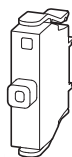
### Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

### 8.3.9.3 M22-SWD-LEDC-(W/B/G/R)

The function element has one input byte and one output byte at its disposal.



### Inputs

Byte 0:

## 8 Pilot devices M22-SWD...

### 8.3 M22-SWD base fixing

7	6	5	4	3	2	1	0
SUBST	PRSN T	–	DIAG	–	–	–	–

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm
5	Not used	–
6	PRSN T	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

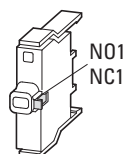
Bit	designation	Meaning
0	Q0	Activation of the LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

### Diagnostics

The module does not report a diagnosis.

#### 8.3.9.4 M22-SWD-K11LEDC-(W/B/G/R)

The function element has one input byte and one output byte at its disposal.



## Inputs

### Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	NO1	NC1

Bit	designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: contact not actuated
1	NO1 = Normally Open	0: contact not actuated 1: contact actuated
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

## Outputs

### Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

Bit	designation	Meaning
0	Q0	Activation of the LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

## Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

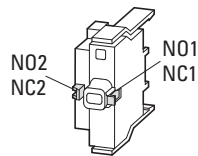
## 8 Pilot devices M22-SWD...

### 8.3 M22-SWD base fixing

Value	Meaning
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

#### 8.3.9.5 M22-SWD-K22LEDC-(W/B/G/R)

The function element has one input byte and one output byte at its disposal.



#### Inputs

##### Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	NO2	NC2	NO1	NC1

Bit	designation	Meaning
0	NC1 = Normally Closed	0: contact 1 actuated 1: contact 1 not actuated
1	NO1 = Normally Open	0: contact 1 not actuated 1: contact 1 actuated
2	NC2 = Normally Closed	0: contact 2 actuated 1: contact 2 not actuated
3	NO2 = Normally Open	0: contact 2 not actuated 1: contact 2 actuated
4	DIAG	0: no diagnostic alarm 1: Diagnosis present
5	Not used	–
6	PRSENT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

#### Outputs

##### Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	00

Bit	designation	Meaning
0	Q0	Activation of the LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

### Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

8 Pilot devices M22-SWD...

8.3 M22-SWD base fixing



## 9 SL4-SWD and SL7-SWD base modules for signal towers

### 9.1 Introduction

The SL4-SWD and SL7-SWD base modules for signal towers are mounted firmly on equipment by using a rapid mounting and wiring system. Up to 5 light or acoustic modules can be interconnected on a base module in order to form a signal tower.

A variety of light and acoustic modules are available for this purpose.

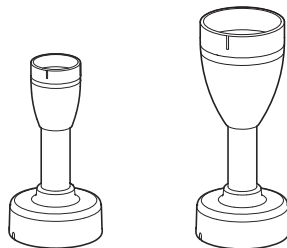
With a high IP66 degree of protection, signal towers can be used in adverse environments. Moreover, their rapid mounting and wiring system makes it easy to remove them and then mount them again after transportation.

Finally, a variety of mounting configuration options and a choice between a diameter of 40 mm or 70 mm ensures that signal towers can be easily adapted to any application.



The interoperability requirements for these SmartWire-DT modules are described in → Section 14.5, „SWD module interoperability requirements“, page 261.

### 9.2 Surface mounting



SL4

SL7

Figure 77: Lateral view of base modules

## 9 SL4-SWD and SL7-SWD base modules for signal towers

### 9.2 Surface mounting

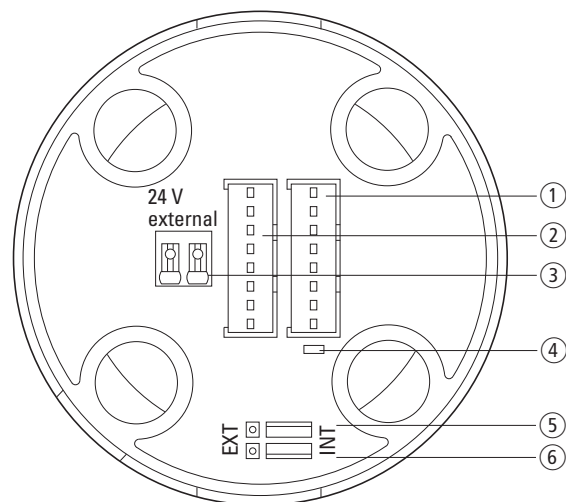


Figure 78: Bottom view of SL4-SWD and SL7-SWD base modules and corresponding connections

- ① X1 (IN) SmartWire-DT socket for input with blade terminal
- ② X2 (OUT) SmartWire-DT socket for output with blade terminal
- ③ External 24 VDC auxiliary power (optional)
- ④ SmartWire Module LED
- ⑤ Jumper for selecting external/internal power supply 24V-
- ⑥ Jumper for selecting external/internal power supply 24V+

## 9.3 Engineering

Base modules SL4-SWD and SL7-SWD require two supply voltages.

The first one - the 15-V  $U_{\text{SWD}}$  supply voltage for controlling the base modules - is provided by the SWD line.

The second one - the 24-V supply voltage for the light/acoustic modules - can be provided in one of two ways:

- The SWD line can carry the 24-V  $U_{\text{AUX}}$  supply voltage. To achieve this, either a 24 VDC supply voltage has to be fed into the AUX terminals on the SmartWire-DT coordinator or an EU5C-SWD-PF1-1 or EU5C-SWD-PF1-2 power module has to be connected to the SWD line upstream of the base module.
- An external 24 VDC power supply can be connected using the base module's push-in terminals.

Jumpers are used in order to choose which of the supply voltages provided will be supplied to the light/acoustic modules.

The signal and supply cables are connected to the SmartWire-DT ribbon cable using a SmartWire-DT SWD4-8MF2 blade terminal. The push-in terminals are designed to accommodate wires with a gauge of AWG24 to AWG16 and wires with a cross-sectional area of 0.25 to 1.5 mm<sup>2</sup>.

The current requirement is:

- $U_{\text{SWD}}$  (15 V DC): 26 mA,
- $U_{\text{AUX}}$  (24 V DC) → Page 256.



Please calculate your SmartWire-DT system's total power consumption and, if necessary, add an additional EU5C-SWD-PF2-1 power supply module. For more information, please refer to the manual „SmartWire-DT Das System“, MN05006002Z.



For data regarding the SmartWire-DT modules' current consumption, please refer to the tables in the appendix on pages 255 and 256.

## 9 SL4-SWD and SL7-SWD base modules for signal towers

### 9.4 Installation

#### 9.4 Installation

The SmartWire-DT base modules are designed for screw fixing. They can be placed in any mounting position.

#### 9.4.1 mounting

##### **NOTICE**

The specified IP66 degree of protection will only be achieved on a smooth, solid surface with the same degree of protection, and only if a signal tower is installed.

For ease of wiring, leave a clearance of at least 3 cm to the wall or adjacent devices.

To mount the SmartWire-DT base module, follow the steps below:

- ▶ At the spot where you want to mount the module, make an opening that is large enough for the SWD ribbon cables to go through. The ribbon cables have a width of 19 mm. The rapid mounting adapter's opening has a diameter of 33 mm.
- ▶ Drill 4 holes for the rapid mounting adapter using the mount drilling template found in installation instructions IL047002ZU.
- ▶ Use the M5 screws to fasten the rapid mounting adapter to the equipment.

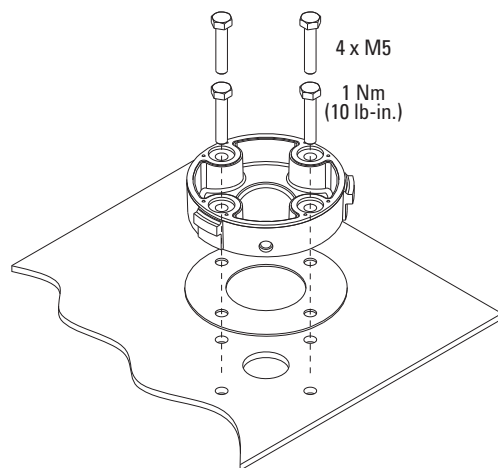


Figure 79: Installing the rapid mounting adapter

- ▶ Thread the ribbon cable coming from the SmartWire-DT coordinator, as well as the ribbon cable starting from the base module, through the rapid mounting adapter's opening.
- ▶ If necessary, connect an external auxiliary power, → Section 9.4.2, „Connecting the external supply voltage“, page 210.
- ▶ Connect the SmartWire DT → Section 9.4.3, „Connect SmartWire-DT®“, page 210.

- ▶ Slide the base module onto the rapid mounting adapter in such a way that the hole on the side of the base module is aligned with the lateral screw on the rapid mounting adapter.
- ▶ Slide the securing ring over the base module and the rapid mounting adapter ①. The position of the marking on the base module and the position of the marking on the securing ring must match ②.
- ▶ Turn the securing ring clockwise an eighth of a turn (35 degrees) ③.

The base module is now secured in place. The rapid mounting adapter's lateral screw will now be accessible.

- ▶ Lock the securing ring into position by screwing out the screw on the rapid mounting adapter ④.

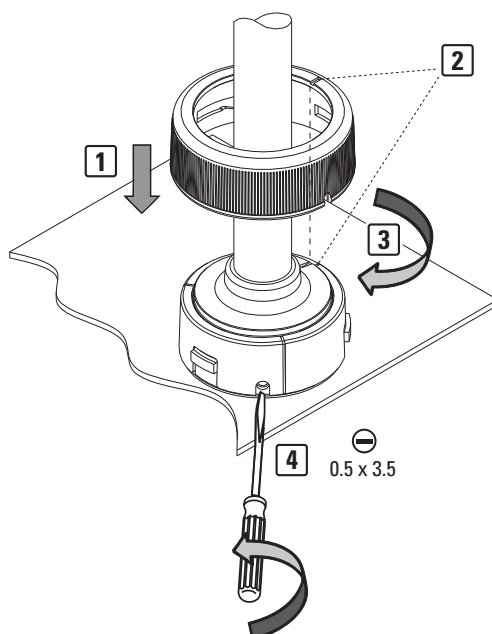


Figure 80: Attaching the base module on the rapid mounting adapter



For detailed instructions on how to connect the SWD4-8MF2 SmartWire-DT external device plug for the 8-pin SmartWire-DT ribbon cable, please refer to the "Installing the SWD4-8MF2 blade terminal" chapter in the „SmartWire-DT Das System“, MN05006002Z manual.

## 9 SL4-SWD and SL7-SWD base modules for signal towers

### 9.4 Installation

#### 9.4.2 Connecting the external supply voltage

The signal towers will be supplied with 24 VDC through the SWD line. If there is a large number of SmartWire-DT modules on a single SWD line, it may be necessary to connect an additional supply voltage to the SmartWire-DT base module.

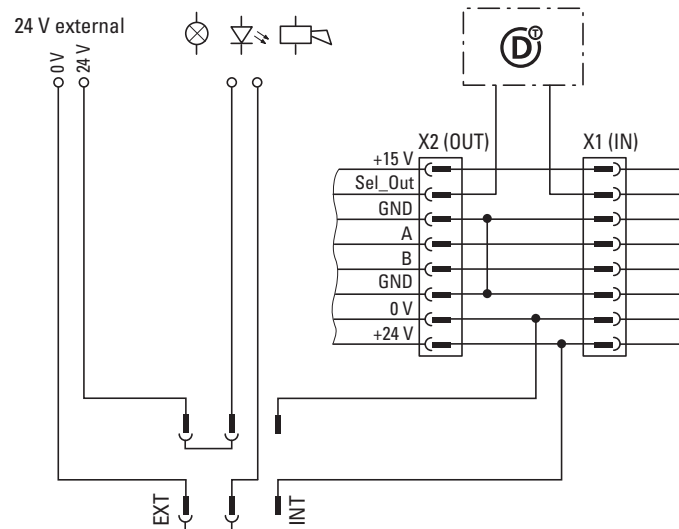


Figure 81: How the supply voltage is routed when there is an external supply and the jumpers are set accordingly

To connect an external supply voltage, follow the steps below:

- ▶ Connect the supply cables to the "24 V external" push-in terminals. Keep the permissible terminal capacities in mind, → Section 9.4.4, „Terminal capacity“, page 211.
- ▶ Set the jumpers on the pins as shown in the following table.

##### External auxiliary power

**On**                      **off**



Figure 82: Connecting the external supply voltage with jumpers

The external supply voltage is applied.

#### 9.4.3 Connect SmartWire-DT®



SWD stations may be destroyed if they are refitted in the SWD line when the power supply is on. Switch off the power supply beforehand!

Follow the steps below to connect SmartWire-DT:

- ▶ Plug the blade terminal of the SWD ribbon cable coming from the SmartWire-DT coordinator's direction into the base module's X1(IN) socket.
- ▶ Plug the blade terminal of the SWD ribbon cable going to the next module into the base module's X2(OUT) socket.
- ▶ If there are no more SmartWire-DT modules after the base module, terminate the SWD line with an SWD4-RC8-10 bus termination resistor. To do this, crimp a blade terminal onto the ends of a ribbon cable. Place the bus termination resistor on the blade terminal towards which the black arrow on the ribbon cable is pointing. Plug the blade terminal away from which the black arrow on the ribbon cable is pointing into the base module's X2 socket. Make sure to connect the ribbon cable correctly. For detailed information, refer to the „SmartWire-DT Das System“, MN05006002Z manual.

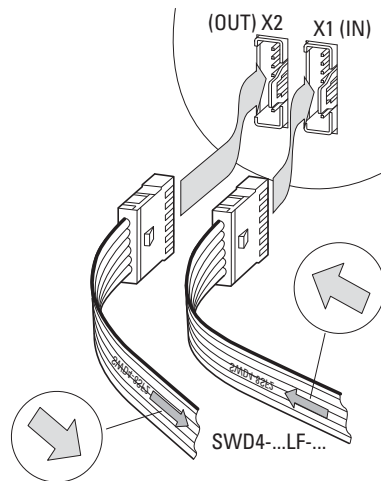
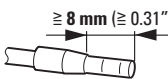



Figure 83: Plugging in the coming and going SWD ribbon cables

### 9.4.4 Terminal capacity

Table 47: External auxiliary power, 24 V DC

Figure	type	Terminal capacity
	Flexible with ferrule	0.25 - 1.5 mm <sup>2</sup> (Minimum length 8 mm)
	solid	0.25 to 1.5 mm <sup>2</sup> (AWG 24 - 16)

## 9 SL4-SWD and SL7-SWD base modules for signal towers

### 9.5 commissioning

#### 9.5 commissioning

Once all the SmartWire-DT modules are connected to the SWD line, you will need the SmartWire-DT coordinator to automatically assign addresses to all of them. To do this, press the configuration button on the front of the SmartWire-DT coordinator.

During the address assignment process, the SmartWire-DT modules' module LED will flash. If the process is completed successfully, the module LED will show a continuous green light.

#### 9.5.1 Exchange of modules

##### **NOTICE**

Switch off the entire SmartWire-DT system before replacing SmartWire-DT base modules.

After replacing the modules and turning on the voltage, you will have to press the configuration button. When this is done, the new module will be assigned an address.

##### **NOTICE**

The order of the SmartWire-DT units must not be altered.

#### 9.5.2 Device status

The individual SmartWire-DT modules indicate their device status with the help of a module LED.

Table 48: Module LED diagnostic messages

designation	Colour	Status	Message
Module-LED	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	<ul style="list-style-type: none"><li>addressing process in progress<ul style="list-style-type: none"><li>after gateway power On</li><li>after actuation of the configuration button on the gateway</li></ul></li><li>Module not in current configuration</li><li>invalid type</li></ul>
		off	no 15 V supply voltage

#### 9.6 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.



### 9.6.1 Fieldbus-specific characteristics

#### Field bus Ethercat

Please note the general information for configuring parameters

→ Chapter 13 “Using SmartWire-DT modules with the EtherCAT field bus”, page 249.

## 9.7 Programming

The module has one input byte.

### 9.7.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBS T	PRSN T	–	DIAG	–	–	–	–

Bit	designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSENT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### 9.7.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	Q4	Q3	Q2	Q 1	Q0

Bit	designation	Meaning
0	Q0	Turns on light module Q0
1	Q 1	Turns on light module Q1

## 9 SL4-SWD and SL7-SWD base modules for signal towers

### 9.7 Programming

Bit	designation	Meaning
2	Q2	Turns on light module Q2
3	Q3	Turns on light module Q3
4	Q4	Turns on light module Q4

### 9.7.3 Diagnostics

In case of diagnosis the module reports the following error cause (bit 4 in input byte 0 is set):

Value	Meaning
0x13	Short-circuit/overload on at least one output

## 10 Interface module MCB-HK-SWD

### 10.1 Introduction

MCB-HK-SWD interface modules are meant for use with miniature circuit-breakers, residual current circuit-breakers, and residual current operated circuit-breakers with overcurrent protection. These modules are designed to transmit the corresponding circuit-breaker's switch position indication (On, Off, Tripped) via SmartWire-DT communication systems.

### 10.2 Surface mounting

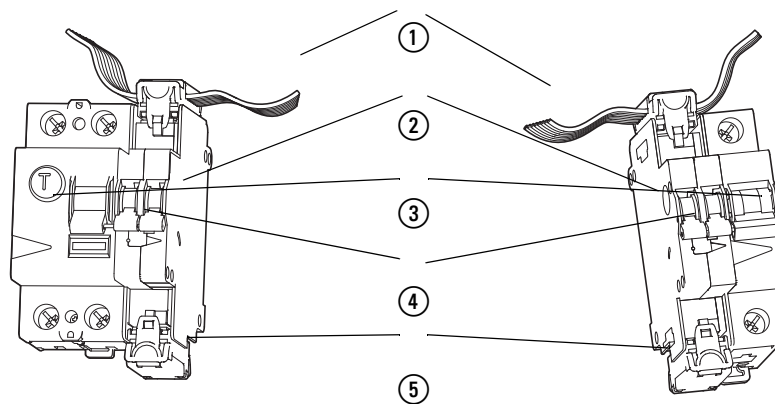


Figure 84: MCB-HK-SWD parts

- ① SmartWire-DT cable with external device plug
- ② SmartWire-DT interface module
- ③ Residual current circuit-breaker (with left stop), miniature circuit-breaker or residual current operated circuit-breaker with overcurrent protection (with right stop)
- ④ SmartWire-DT diagnostics LED
- ⑤ Covering cap

### 10.3 Engineering

MCB-HK-SWD interface modules are designed to be connected to miniature circuit-breakers, residual current circuit-breakers, or residual current operated circuit-breakers with overcurrent protection.

The connection to the SmartWire-DT ribbon cable is established using a SmartWire-DT SWD4-8SF2-5 external device plug, which can be connected either to the top or bottom of the interface module. The unused connector must be covered with the included cap.

## 10 Interface module MCB-HK-SWD

### 10.3 Engineering



The function elements obtain the energy for communication electronics and driving the LEDs from the SmartWire-DT network supply.

Please take into consideration the total power consumption of your SmartWire- network and, if necessary, plan for an additional feeder module EU5C-SWD-PF2-1.

The software programme SWD-Assist also supports you in doing this by automatically performing these calculations.

## 10.4 Installation

MCB-HK-SWD interface modules are designed for installation on DIN-rails. They must be installed in a vertical position.

### Procedure

- ▶ Push the centering pin (red) through the circuit-breaker and connect the interface module to the circuit-breaker.

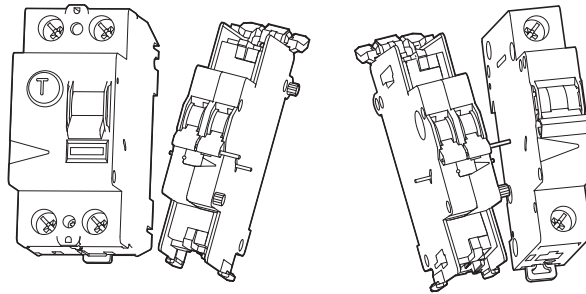


Figure 85: Connecting the interface module to the circuit-breaker

- ▶ Remove any unneeded auxiliary contact parts. Depending on whether the auxiliary contact is connected to a residual current circuit-breaker, a miniature circuit-breaker, or a residual current operated circuit-breaker with overcurrent protection, the connection pins or locking mechanisms will need to be removed from the side not connected to the circuit-breaker so that there will be a flat surface.

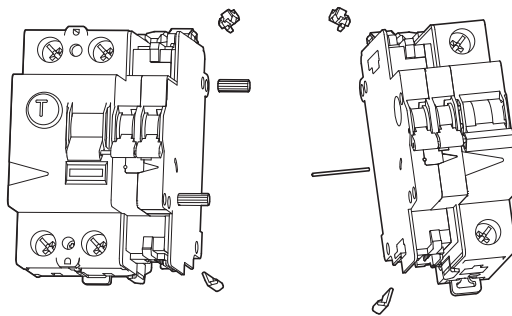


Figure 86: Removing the connection pins

- ▶ Use the SmartWire-DT socket to connect the 8-conductor SmartWire-DT cable to the top or bottom of the device. Due to EMC reasons, the SmartWire-DT socket strip that remains unused must be covered with included accessory SWD4-.... Failure to do so may result in communication problems and in SmartWire-DT modules being damaged and ruined.

## 10 Interface module MCB-HK-SWD

### 10.5 Commissioning

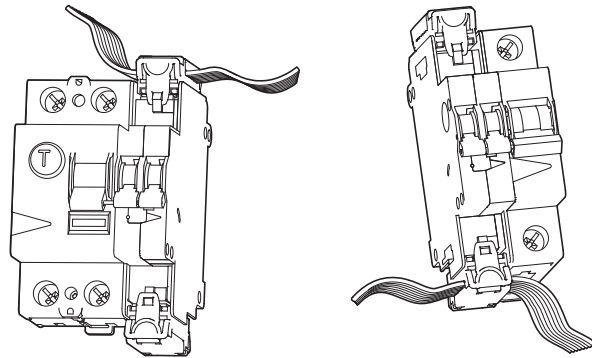


Figure 87: Connecting the SmartWire-DT cable



For detailed instructions for adapting the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pole SmartWire-DT cable, see chapter "Fitting external device plug SWD4-8SF2-5" of manual "SmartWire-DT, the System" (MN05006002Z-EN, previously AWB2723-1617en).

### 10.5 Commissioning

During address assignment, the modules' SmartWire-DT diagnostics LED flashes. After address assignment, the LED is continuous lit green.

### 10.6 Exchange of modules

Whenever you replace a module, you will need to press the configuration button after replacing the module and switching on the voltage. When this is done, the new module will be assigned an address.

### 10.7 Device status

The individual SmartWire-DT modules indicate their device status with the aid of a diagnosis LED.

Table 49: Diagnostic messages of the SmartWire-DT status LED

designation	Color	Status	Message
SmartWire-DT	Green	Continuous light	Device is operating error-free.
		flashing (1 Hz)	<ul style="list-style-type: none"><li>addressing process in progress<ul style="list-style-type: none"><li>after gateway power On</li><li>after actuation of the configuration button on the gateway</li></ul></li><li>Module not in current configuration</li><li>invalid type</li></ul>
		flashing (3 Hz)	Device reports a diagnosis. (→ Section 10.8.2, „Diagnostics“, page219)

## 10.8 Programming

The module has one input byte.

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
SUBST	PRSN T	–	DIAG	–	–	ON	TRIP

Bit	designation	Meaning
0	TRIP	0: – 1: The device has tripped due to a fault (fault current, overload, etc.)
1	ON	0: Device switched off 1: Device switched on
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSN T	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

### 10.8.1 Outputs

None

### 10.8.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Meaning
0x19	Check the connection between the SmartWire-DT auxiliary contact and the circuit-breakers and switch the circuit-breakers on and off. If the fault continues to be present, replace the SmartWire-DT auxiliary contact.

## 10 Interface module MCB-HK-SWD

### 10.8 Programming



## 11 Connection for SmartWire-DT® universal module M22-SWD-NOP(C)

### 11.1 Introduction

If functions have to be retrofitted on an installation, modifications in the hardware configuration and program extension are normally very labor-intensive.

The two universal cards M22-SWD-NOP (front-mount) and M22-SWD-NOPC (base fixing) can be fitted as replacements for cards that are configured in the installation but physically fitted only for expansion.

The aim here is to engineer and program the full extent of envisaged expansion in the PLC's user program while not (yet) installing the corresponding hardware. The user program can detect the presence of a universal module (bits 4 and 7). At a later date the universal modules can be replaced with the intended device to extend system functionality without having to alter program or hardware configuration. To facilitate this functionality, the PLC's user software and control configuration must fulfil a number of prerequisites.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.5, „SWD module interoperability requirements“, page 261.

#### 11.1.1 Procedure

- ▶ In the PLC's control configuration, program the SmartWire-DT modules that will be required at a later date in addition to the ones that will be installed and used immediately. In the hardware installation, fit a universal module in place of the software-configured SmartWire-DT module.
- ▶ In the user program scan whether the the configured SmartWire-DT station or a universal module is fitted. The program flow must be controlled according to this information.
- ▶ If a universal module is later replaced with the originally configured SmartWire-DT module, add this module to the SmartWire-DT network by pressing the "Config." button on the gateway.

### 11.2 Surface mounting

The universal modules can be both front- and base-fixed.

#### 11.2.1 Front mount

Front-fixing universal modules M22-SWD are used as placeholders for pilot devices and contactors, motor-protective circuit-breakers in consoles, control panel doors or in control panels.

## 11 Connection for SmartWire-DT® universal module M22-SWD-NOP(C)

### 11.2 Surface mounting

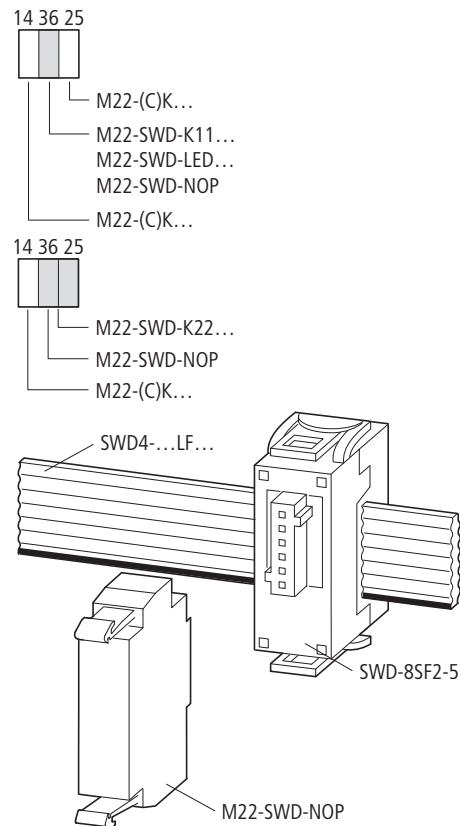


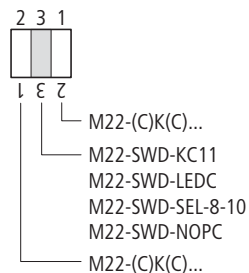
Figure 88: RMQ module as carrier element of a universal module for front mounting

#### 11.2.1.1 Advantages

- Good mechanical adaptability.
- Can be mounted directly on top-hat rail.
- Telescopic clip for height compensation, for example to the motor-starter combinations.

#### 11.2.2 Base fixing

Base-fixing universal modules M22-SWD are used as placeholders in combination with surface mounting enclosures M22-I....



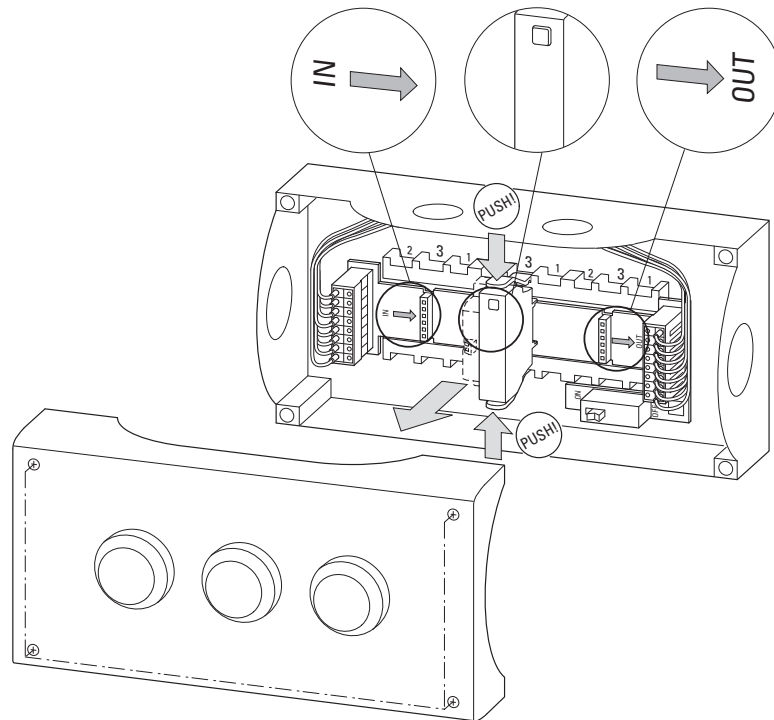


Figure 89: M22-SWD-NOPC in enclosure M22-I3

## 11.3 Projection

In the PLC's control configuration, program the SmartWire-DT modules that will be required at a later date in addition to the ones that will be installed and used immediately. For modules that are to be replaced with a universal module, parameter "Replacement by universal module" must be set to "allowed" in the Module Properties dialog in the control configuration. You can then fit a universal module in place of this SmartWire-DT module in the network.

In the user program scan whether the configured SmartWire-DT module or a universal module is fitted. Bit 7 (SUBST) in the first input byte is set if a universal module is fitted in place of the software-configured module. The program flow must be controlled according to this information.

The input data from a universal module always has a zero value. If a universal module is later replaced with the originally configured SmartWire-DT module, add this module to the SmartWire-DT network by pressing the "Config." button on the gateway.

## 11.4 Installation

The universal modules can be installed in three ways:

- Front mount with M22-A component adapter,
- Front fixing directly on top-hat rail or with telescopic adapter,
- Base fixing in surface mounting enclosure M22-I....

## 11 Connection for SmartWire-DT® universal module M22-SWD-NOP(C)

### 11.4 Installation

#### 11.4.1 Front mount

Universal module M22-SWD-NOP is snap-fitted to adapter M22-A in the middle position.

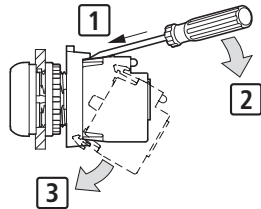


Figure 90: Connection to the adapter

The SmartWire-DT flat ribbon cable is connected to the SmartWire-DT network. The external device plug SWD4-8SF2-5 is used for bonding with the M22-SWD function element.

This completes installation.

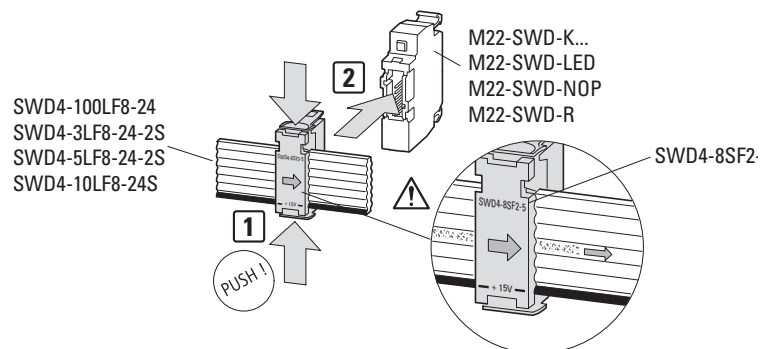


Figure 91: Connection of the universal module to the SmartWire-DT flat ribbon cable

### 11.4.2 Base fixing

Universal module M22-SWD-NOPC is fitted to card M22-SWD-ILP... in surface mounting enclosure M22-I....

To do so, proceed as follows:

- ▶ Insert the printed circuit board into the surface mounting enclosure. Ensure that the PCB is pointing in the correct direction. The direction of the arrow defines the arrangement of the modules. (the gateway is to the left of the IN code.)
- ▶ Equip the slots with the M22-SWD-NOPC universal module. Ensure that the mounting position is correct (status LED must be at the top). Unused slots must be equipped with the bridge M22-SWD-SEL8 10.

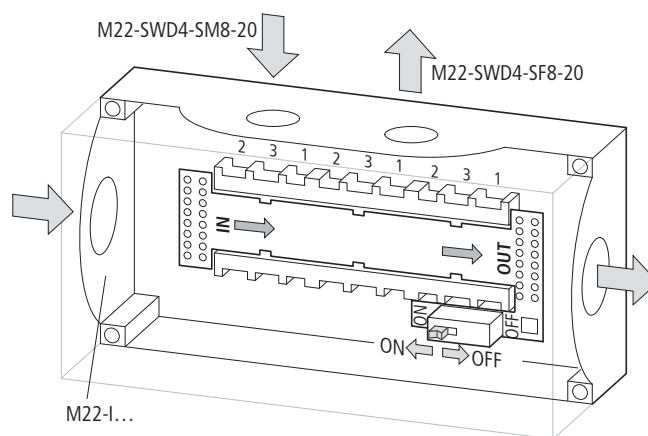


Figure 92: Universal module M22-SWD-NOPC in enclosure M22-I3

### 11.5 commissioning

The automatic addressing of all modules in the SmartWire-DT network is performed via the gateway during commissioning. Press the configuration button on the gateway.

During the addressing process the SmartWire-DT diagnosis LED on the rear side of the M22-SWD universal module flashes. Once the addressing process is completed, the LED indicates a green continuous light.

#### 11.5.1 Exchange of modules

##### **NOTICE**

Replacement of the SmartWire-DT input/output modules is not permitted until the entire SmartWire-DT system has been switched off.

## 11 Connection for SmartWire-DT® universal module M22-SWD-NOP(C)

### 11.6 Programming

#### **NOTICE**

The order of the SmartWire-DT units must not be altered.

After replacement of the modules and connection of the voltage the configuration button must be pressed. When this is done, the new module will be assigned an address.

### 11.5.2 Device status

The individual SmartWire-DT universal modules indicate their device status with the aid of a diagnosis LED.

Table 50: Diagnostic messages of the SmartWire-DT status LED

designation	Colour	Status	Message
SmartWire-DT	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	<ul style="list-style-type: none"><li>• addressing process in progress<ul style="list-style-type: none"><li>• after gateway power On</li><li>• after actuation of the configuration button on the gateway</li></ul></li><li>• Module not in current configuration</li><li>• invalid type</li></ul>
		flashing (3 Hz)	Device reports a diagnosis. (see section "Programming", subsection "Diagnostics").

### 11.6 Programming

The universal modules contain specific information that the programming system processes. The meaning and scope are described in the following.

The universal modules always have an input byte.

The length of the input and output bytes depends on the replaced function element.

Bit 7 (SUBST) in the first input byte is set to indicate that a universal module is fitted in place of the software-configured module. All process data of the configured module is zero.

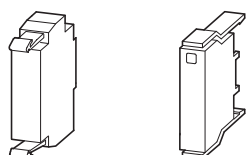


Figure 93: M22-SWD-NOP, M22-SWD-NOPC

Byte 0:

<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
SUBST	PRSENT	–	DIAG	0	0	0	0

Bit	designation	Meaning
0		0
1		0
2		0
3		0
4	DIAG	0: no diagnostic alarm
5	Not used	–
6	PRSENT	0: Module not available 1: Module available
7	SUBST	1: Universal module M22-SWD-NOP(C) present

### 11.6.0.1 Diagnostics

The module does not report a diagnosis.

## 11 Connection for SmartWire-DT® universal module M22-SWD-NOP(C)

### 11.6 Programming



## 12 Interface for NZM compact circuit-breakers

### 12.1 Introduction

The NZM-XSWD-704 SmartWire-DT module is used for querying a circuit-breaker with an electronic release (NZM 2,3,4) via a PLC, i.e. the On/Off/Trip position of the switch and the actual currents. The remote operator can be actuated via the module. The NZM-XSWD-704 is fitted on a top-hat rail in an installation compartment with protection at least to IP 54 (control panel) and is connected to the NZM via a 2.0 m data cable. The auxiliary contacts and the remote operator are wired separately.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.5, „SWD module interoperability requirements“, page 261.

### 12.2 Surface mounting

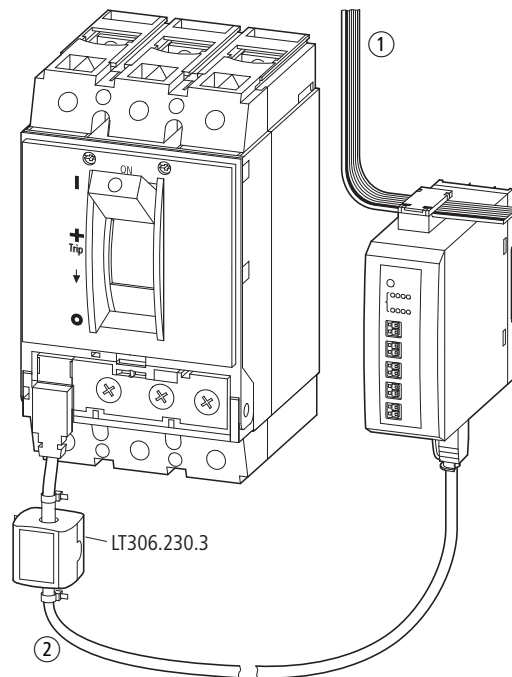


Figure 94: Fitting of NZM with NZM-XSWD-704

- ① SmartWire-DT connection
- ② Data cable NZM with NZM-XSWD-704

## 12 Interface for NZM compact circuit-breakers

### 12.2 Surface mounting

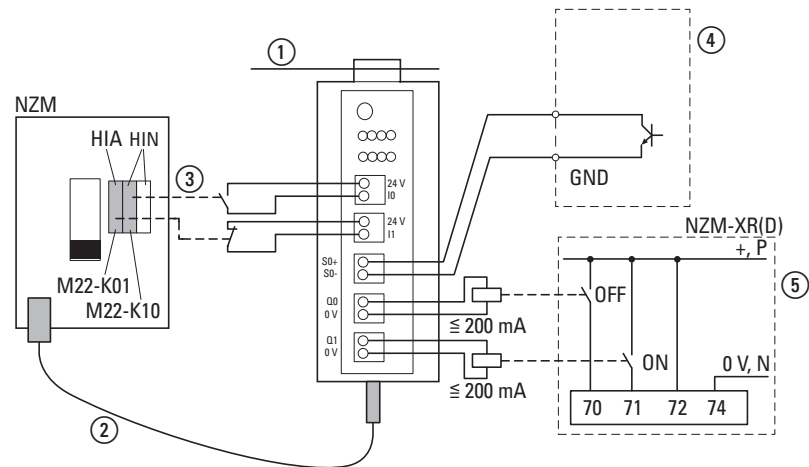


Figure 95: NZM-XSWD-704 connections to circuit-breaker

- ① SmartWire-DT connection
- ② Data cable NZM with NZM-XSWD-704
- ③ Auxiliary contacts in NZM
- ④ XMC energy metering device (external)
- ⑤ Remote operator

The max. cable length of the inputs and outputs is 2 m.

The SmartWire-DT external device plug with an adapted SmartWire-DT connecting cable is connected to the NZM-XSWD-704 module via connection ①.



For detailed instructions on how to connect the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pin SmartWire-DT ribbon cable, refer to the "Installing SWD4-8SF2-5 external device plugs" section in manual MN05006002Z-EN (previously AWB2723-1617de).

### 12.2.1 Indication and connection elements

The network status of the module is signalled via the SmartWire-DT diagnostics LED.

The other LEDs have the following function:

Cc	on	Communication with the circuit-breaker via data cable active
	off	No communication with the circuit-breaker
2x-		Without function
S		For indicating the SO energy pulses
	on	A momentary off state indicates an energy pulse.
	off	No power supply via SmartWire-DT
	flashing / ~ 1 Hz	Power meters invalid
I0	on	Voltage at I0
	off	No voltage at I0
I01	on	Voltage at I1
	off	No voltage at I1
Q0	on	Output Q0 is on
	off	Output Q0 is off
Q1	on	Output Q1 is on
	off	Output Q1 is off



The voltage state of the inputs is indicated:

I0 Led	0	1	0	1
I1 Led	0	0	1	1
Circuit-breaker status	-	off	Trip	on



The voltage state of the outputs is indicated:

Q0 Led	0	1	0	1
Q1 Led	0	0	1	1
Attribute ID	-	OFF	ON	-

### 12.2.2 Connections

The module does not require an auxiliary power supply, it is supplied completely via the SmartWire-DT connecting cable.

## 12 Interface for NZM compact circuit-breakers

### 12.2 Surface mounting

#### 12.2.3 Inputs

- I0  
The HIN slot (middle and right auxiliary contact socket of the NZM) is fitted with an N/O contact and wired between terminals 24V and I0. It is responsible for the "on" or "off" switch position.
- I1  
The HIA slot (left auxiliary contact socket of the NZM) is fitted with an N/C contact and wired between terminals 24V and I1. It is responsible for the trip indication.

The inputs I0 and I1 are shown in the following table according to the PNO profile for switchgear, and are mapped to the status data in byte 1:

Inputs	Data CB status, byte 1, bit 2 + 3			
	Init 00	off 01	On 10	Trip 11
I0	–	0	1	0
I1	–	1	1	0

#### 12.2.3.1 Energy signal inputs S0+ and S0-

These external inputs are wired to an external energy measuring module, such as the NZM...XMC-S0. The measuring module supplies an S0 pulse for a specific amount of energy, which increments a retentive counter on the NZM-SWD-704. From this count, which has a size of 32 bits, the consumed energy can be derived.

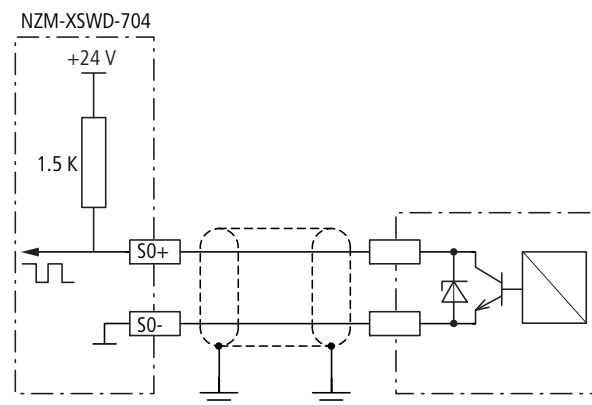


Figure 96: Connection of the S0 input

If the counter input is not required, terminals S0+ and S0- must be provided with a wire bridge. This suppresses a starting pulse when the power supply is switched on.



The 1.5-k $\Omega$ -resistor is permanently integrated in the NZM-XSWD-704 device.

### 12.2.4 Control outputs Q0 and Q1

The control outputs for the remote operator are powered using the SmartWire-DT line's supply voltage. These outputs can handle a maximum load of 200 mA. DILA-22 contactors must always be used as the interface to the NZM remote operator. After a switch command, one output will always be "1" and one output will always be "0" - please refer to → Section 12.8.1.7, „Outputs“, page 245 as well. Wiring must be done as shown in Figure 95.

Out	Data output byte 0, bit 0 + 1			
	do not change	Switch off	Switch on	do not change
	00	01	10	11
Q0	-	1	0	-
Q1	-	0	1	-

If the relevant output is actuated, terminal Q0 or Q1 has a voltage of 24 V DC.



#### DANGER

If the remote operator is used, switching commands may be delayed and therefore carried out when unexpected. This may result in voltages being applied or motors starting at unexpected moments. Because of this, make sure to carry out the „Measures for using the remote operator“ → Page 246.

The following switch commands are possible:

Status	Permissible command
on	OFF (switch off)
off	ON (switch on)
Trip	OFF (switch off)

In addition to the communication signal, the 8 pole SmartWire-DT connecting cable provides a voltage of 24 V DC to actuate the auxiliary contactors for the remote operator.

#### NOTICE

The outputs must only be used to actuate the remote operator. The remote operator can only be used for normal operational on/off switching. Any disconnection in the event of a fault must always be implemented with an undervoltage release.

## 12 Interface for NZM compact circuit-breakers

### 12.3 Engineering

#### 12.3 Engineering

The NZM-XSWD-704 is fed completely via the SWD line so that no additional power supply is required. The current requirement is:

- Current consumption  $U_{VP}$  (15 V): 35 mA
- Current consumption  $U_{Aux}$  (24 V): 300 mA with remote operator active
- Current consumption  $U_{Aux}$  (24 V): 100 mA with remote operator inactive

Actuation must always be implemented via contactor relays due to the power required for the remote operators. DILA-22 contactor relays are used with a pick-up and holding current of 125 mA.

The remote operators suitable for use are listed for additional information:

##### **XRD remote operator:**

- 110 - 240 V AC, 550 VA, max. 5 A
- 80 - 440 V AC, 650 VA, max. 1.7 A
- 24 - 250 V DC, 450 W, max. 18.75 A

##### **XR remote operator:**

- 110 - 440 V AC, 350 VA, max. 3.2 A
- 24 - 250 V DC, 250 W, max. 10.4 A

##### **NOTICE**

The sum of the pull-in power of the simultaneously tripping contactors and the sum of the holding power of the tripped contactors for each SmartWire-DT network must not exceed 72 W. If required, an additional power feeder module (EU5C-SWD-PF1-1, EU5C-SWD-PF-2) must be used (→ Section 1, „EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules“, page 13)



For data for the current consumption please refer to the table in → Chapter 14 “Appendix”, page 255.

The connection terminals on the NZM-XSWD-704 are suitable for AWG24 to AWG16 cables and for flexible conductors with a cross-section of 0.25 mm<sup>2</sup> to 1.5 mm<sup>2</sup>.

When using ferrules it has to be ensured that the ferrule length is at least 8 mm.

The maximum number of NZM-XSWD-704 modules on a SWD line depends on the field bus gateway used and the data profile selected.

Data for engineering	PROFIBUS-DP	CANopen
Maximum number of modules at the SWD line	58	99
Max. input data [Byte]	240	128
Max. output data [Byte]	240	128

<b>PROFIBUS-DP</b>	<b>Data profile 1</b>	<b>Data profile 2</b>	<b>Data profile 3</b>	<b>Data profile 4</b>
Maximum number NZM-XSWD-704/SWD line	58	22	15	7

<b>CANopen</b>	<b>Data profile 1</b>	<b>Data profile 2</b>	<b>Data profile 3</b>	<b>Data profile 4</b>
Maximum number NZM-XSWD-704/SWD line	42	11	8	4

### 12.3.1 Safety-related applications

For most applications, disconnection in the event of an emergency or the disconnection by the opening of the protective doors is also required in addition to normal operational switching. This must be implemented with suitable contactor controls.

The circuit-breaker cannot be disconnected via an “emergency switching off”, i.e. by disconnecting the 24 V supply and is also not normally required. Without the 24 V power supply, the states of the circuit-breaker are not changed and no longer displayed. In this case, bus operation is maintained.

### 12.3.2 Mounting NZM-XSWD-704

The module is fitted on a top-hat rail at a maximum distance of 2 m from the circuit-breaker. A minimum clearance of 60 mm from the NZM must be maintained.

## 12.4 commissioning

The automatic addressing of all modules in the SmartWire-DT network is performed via the gateway (actuation of the configuration pushbutton on the gateway) during commissioning. During the addressing process the SmartWire-DT diagnostics LED flashes. Once the addressing process is completed, the LED indicates a green continuous light.

## 12.5 Exchange of modules



### **DANGER**

The exchange of the SmartWire-DT module must only be carried out with the supply switched off.

After replacement of the modules and connection of the voltage the configuration button must be pressed. The new module is assigned an address by this means.

### **NOTICE**

The order of the SmartWire-DT units must not be altered.

## 12 Interface for NZM compact circuit-breakers

### 12.6 Parameter definition

#### 12.6 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

#### 12.7 Fieldbus-specific characteristics

##### Field bus Ethercat

Please note the general information for configuring parameters  
→ Chapter 13 “Using SmartWire-DT modules with the EtherCAT field bus”, page 249.

#### 12.8 Programming

##### 12.8.1 Cyclic data

###### 12.8.1.1 Data profiles



Four different profiles are made available for the cyclical data. Data profile 1 only contains the digital status data of the circuit-breaker, whilst the currents and the energy values are contained in the remaining profiles. Profile 4 contains all the information of the NZM.

Table 51: Data profile NZM-XSWD-704

	Profile 1	Profile 2 (default)	Profile 3	Profile 4
Bytes total	3	11	15	31
Digital status data	X	X	X	X
Currents	–	X	X	X
Energy values	–	–	X	X
Set values and circuit-breaker data	–	–	–	X

Note: The NZM starts the current measurement at a current greater than about 5% of the circuit-breaker's rated current; at smaller currents it outputs a zero value. A 400 A breaker, for example, supplies values at currents above about 20 A. This threshold value is independent of the rotary encoder setting.



Data bytes that are not transferred cyclically in certain profiles can still be read as acyclical data objects  
(→ Chapter 12 “Interface for NZM compact circuit-breakers”, page 248).

From byte 1, the data structure of profile 1 and 2 complies with the LVSG (Low Voltage Switchgear) profile of the PNO (PROFIBUS User Organization).



## 12 Interface for NZM compact circuit-breakers

### 12.8 Programming

Table 52: Overview of the data profiles of the NZM-XSWD-704

Byte :	Profile 1	Profile 2 (default)	Profile 3	Profile 4
0	SWD status byte	SWD status byte	SWD status byte	SWD status byte
1	Status byte 0 LVSG	Status byte 0 LVSG	Status byte 0 LVSG	Status byte 0 LVSG
2	Status byte 1 LVSG	Status byte 1 LVSG	Status byte 1 LVSG	Status byte 1 LVSG
3/4	–	Current I1	Current I1	Current I1
5/6	–	Current I2	Current I2	Current I2
7/8	–	Current I3	Current I3	Current I3
9/10	–	Current I <sub>max</sub>	Current I <sub>max</sub>	Current I <sub>max</sub>
11	–	–	S0 value high section	S0 value high section
12	–	–	S0 value high section	S0 value high section
13	–	–	S0 value low section	S0 value low section
14	–	–	S0 value low section	S0 value low section
15	–	–	–	Set value LS for I <sub>r</sub>
16	–	–	–	Set value I <sub>i</sub>
17	–	–	–	Set value t <sub>r</sub>
18	–	–	–	Set value I <sub>sd</sub>
19	–	–	–	Set value t <sub>sd</sub>
20	–	–	–	Set value I <sub>g</sub>
21	–	–	–	Set value t <sub>g</sub>
22	–	–	–	I <sup>2</sup> t of the CB on/off
23	–	–	–	Serial number NZM H byte
24	–	–	–	Serial number NZM M byte
25	–	–	–	Serial number NZM L byte
26	–	–	–	CB part no.
27	–	–	–	LS function
28	–	–	–	NZM version
29	–	–	–	Earth fault module
30	–	–	–	free

## 12 Interface for NZM compact circuit-breakers

### 12.8 Programming

#### 12.8.1.2 Special considerations when using the module with a CANopen field bus

When using data profile 1, 3 or 4 in conjunction with SmartWire gateway EU5C-SWD-CAN, entries in the setting range for associated service data objects (SDO) 2102subx must be changed in the PLC configuration program. With programming system CoDeSys, for example, change the default value from 0xA2D392 to 0xA2D592 to use PKE profile 3.

In programming systems with a controller configurator without automatic profile selection for SDO parameterization the corresponding SDO object 2102subx is inserted in the SDO object list and its content transferred when data profile 1, 3 or 4 is used.

Object 2102subx (x represents the position of the NZM module in the SWD line)	contents
Profile 1	0xA292
Profile 2 (default)	0xA2D392
Profile 3	0xA2D592
Profile 4	A29FD592

#### 12.8.1.3 Digital status data: profile 1

Byte:	Bit								Description	Note
	7	6	5	4	3	2	1	0		
0								X	1 = internal fault in NZM-XSWD-704	–
0								X	1 = Short-circuit output Q0 or Q1	–
0						X			1 = Power meters invalid	Fault found in FRAM
0					X				1 = Overload warning 2 > 120 %	I > 120 % I <sub>r</sub>
0			X						1 = Group diagnostics	from XSWD-704
0		X							1 = module present 0 = module not present	P or PRSNT
1							X	X	LS position: • 01 = LS connected • 11 = No CB connected	–
1					X	X			LS status: • 00 = Init • 01 = Off • 10 = On • 11 = Trip	–
1				X					Availability	Identical to "Off" position
1	X								1 = Overload warning 1 > 100 %	I > 100 % I <sub>r</sub>

Byte:	Bit								Description	Note
	7	6	5	4	3	2	1	0		
2							X		Group warning	Load warning or overload warning 1 or overload warning 2
2		X	X	X					000 = OK 001 = Trip I <sub>r</sub> 010 = Trip I <sub>i</sub> 011 = Trip I <sub>sd</sub> 100 = Trip I <sub>g</sub> 101 = TripTemp or Trip Err 110 = Trip I <sub>r</sub> in neutral conductor	Cause of trip <sup>1)</sup> No trip Long-time trip Instantaneous trip Short-time trip Ground fault trip Extended protection Overcurrent neutral conductor
2	X								1 = Load warning > 70%	I > 70 % I <sub>r</sub>

1) The last cause of tripping registered is always indicated. The circuit-breaker is reset by switching it on, or by switching the power supply off/on. It may take up to 30 s before the trip reason is displayed. After a trip, the last current values measured are displayed (rms values).

### 12.8.1.4 Currents: profile 2

Profile 2 contains the digital status data as well as the phase currents that the table shows.

Byte :	Bit								Description	Note
	7	6	5	4	3	2	1	0		
3	X	X	X	X	X	X	X	X	Current I1 [A] <sup>1)</sup>	RMS value
4	X	X	X	X	X	X	X	X	Current I1 [A] <sup>1)</sup>	
5	X	X	X	X	X	X	X	X	Current I2 [A] <sup>1)</sup>	
6	X	X	X	X	X	X	X	X	Current I2 [A] <sup>1)</sup>	
7	X	X	X	X	X	X	X	X	Current I3 [A] <sup>1)</sup>	
8	X	X	X	X	X	X	X	X	Current I3 [A] <sup>1)</sup>	
9	X	X	X	X	X	X	X	X	Current I <sub>max</sub> [A] <sup>1)</sup>	
10	X	X	X	X	X	X	X	X	Current I <sub>max</sub> [A] <sup>1)</sup>	

1)

- With a Motorola-based GSD (Moel4d14.gsd), the currents are stated in the order High byte, Low byte,
- With an Intel-based GSD (Moe4d14.gsd) the currents are stated as word values.
- Current values are measured from I > 0.2 × I<sub>n</sub>. At smaller currents the value is zero.

### 12.8.1.5 Energy values: profile 3

In addition to the data of profile 2, profile 3 contains the energy values shown in the table.

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### 12.8 Programming

Byte	Bit								Description	Note
	7	6	5	4	3	2	1	0		
11	X	X	X	X	X	X	X	X	Energy value high section	S0 counter value 32 bit
12	X	X	X	X	X	X	X	X	Energy value high section	S0 counter value 32 bit
13	X	X	X	X	X	X	X	X	Energy value low section	S0 counter value 32 bit
14	X	X	X	X	X	X	X	X	Energy value low section	S0 counter value 32 bit

#### 12.8.1.6 Actual parameters and circuit-breaker data: profile 4

Profile 4 contains the digital status data, the phase currents, the energy values as well as the circuit-breaker data with the currently set values.

Byte:	Dec. value	Description	Note
15	0	$I_r = 0.5 \times I_n$	Set value for $I_r$
15	1	$I_r = 0.55 \times I_n$	
15	2	$I_r = 0.6 \times I_n$	
15	3	$I_r = 0.65 \times I_n$	
15	4	$I_r = 0.7 \times I_n$	
15	5	$I_r = 0.75 \times I_n$	
15	6	$I_r = 0.8 \times I_n$	
15	7	$I_r = 0.85 \times I_n$	
15	8	$I_r = 0.9 \times I_n$	
15	9	$I_r = 0.925 \times I_n$	
15	10	$I_r = 0.95 \times I_n$	
15	11	$I_r = 0.975 \times I_n$	
15	12	$I_r = 1.0 \times I_n$	
		<ul style="list-style-type: none"> <li>NZM2-AE, -AEF-NA, -VE, -VE-NA, -VEF-NA</li> <li>NZM4-AE, -AE-NA, -AEF-NA, -VE, -VE-NA, -VEF-NA</li> </ul>	
16	0	$I_i = 2 \times I_n$	Set value for $I_i$
16	1	$I_i = 3 \times I_n$	
16	2	$I_i = 4 \times I_n$	
16	3	$I_i = 5 \times I_n$	
16	4	$I_i = 6 \times I_n$	
16	5	$I_i = 7 \times I_n$	
16	6	$I_i = 8 \times I_n$	
16	7	$I_i = 10 \times I_n$	
16	8	$I_i = 12 \times I_n$	
		<ul style="list-style-type: none"> <li>NZM3-AE-250, -AE-400, -AE-250, -AE-400-NA, -AEF-250...400-NA, -VE-250, -VE-400, -VE-250, -VE-400-NA, -VEF-250...400-NA</li> </ul>	
16	0	$I_i = 2 \times I_n$	Set value for $I_i$

Byte:	Dec. value	Description	Note
16	1	$I_i = 3 \times I_n$	
16	2	$I_i = 4 \times I_n$	
16	3	$I_i = 5 \times I_n$	
16	4	$I_i = 6 \times I_n$	
16	5	$I_i = 7 \times I_n$	
16	6	$I_i = 8 \times I_n$	
16	7	$I_i = 9 \times I_n$	
16	8	$I_i = 11 \times I_n$	
		<ul style="list-style-type: none"> <li>NZM3-AE-630, -AE-630-NA, -AEF-450...550-NA, -AEF-600-NA, VE-630, -VE-600-NA, -VEF-450...550-NA, -VEF-600-NA</li> </ul>	
16	0	$I_i = 2 \times I_n$	Set value for $I_i$
16	1	$I_i = 2.5 \times I_n$	
16	2	$I_i = 3 \times I_n$	
16	3	$I_i = 3.5 \times I_n$	
16	4	$I_i = 4 \times I_n$	
16	5	$I_i = 5 \times I_n$	
16	6	$I_i = 6 \times I_n$	
16	7	$I_i = 7 \times I_n$	
16	8	$I_i = 8 \times I_n$	

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### 12.8 Programming

Byte:	Dec. value	Description	Note
		<ul style="list-style-type: none"> <li>NZM2-ME, -SE...-NA</li> <li>NZM3-ME-220, -350, -450, -SE-220, -SE-350, -SE-450-NA</li> <li>NZM4-ME, -SE...-NA</li> </ul>	
16	0	$I_i = 2 \times I_r$	Set value for $I_i$
16	1	$I_i = 3 \times I_r$	
16	2	$I_i = 4 \times I_r$	
16	3	$I_i = 5 \times I_r$	
16	4	$I_i = 6 \times I_r$	
16	5	$I_i = 8 \times I_r$	
16	6	$I_i = 10 \times I_r$	
16	7	$I_i = 12 \times I_r$	
16	8	$I_i = 14 \times I_r$	
		<ul style="list-style-type: none"> <li>NZMX-VEF...-NA, -VE...-NA</li> <li>NZM2-ME...-NA</li> </ul>	
17	0	$t_r = 2$	Set value for $t_r$ [s]
17	1	$t_r = 4$	
17	2	$t_r = 6$	
17	3	$t_r = 8$	
17	4	$t_r = 10$	
17	5	$t_r = 12$	
17	6	$t_r = 14$	
17	7	$t_r = 17$	
17	8	$t_r = 20$	
		<ul style="list-style-type: none"> <li>NZM3-4-VE630</li> </ul>	
17	0	$t_r = 2$	Set value for $t_r$ [s]
17	1	$t_r = 4$	
17	2	$t_r = 6$	
17	3	$t_r = 8$	
17	4	$t_r = 10$	
17	5	$t_r = 14$	
17	6	$t_r = \text{infinite}$	
17	7	$t_r = 2$	
17	8	$t_r = 2$	

Byte:	Dec. value	Description	Note
	All other		
17	0	$t_r = 2$	Set value for $t_r$ [s]
17	1	$t_r = 4$	
17	2	$t_r = 6$	
17	3	$t_r = 8$	
17	4	$t_r = 10$	
17	5	$t_r = 14$	
17	6	$t_r = 17$	
17	7	$t_r = 20$	
17	8	$t_r = \text{infinite}$	
		<ul style="list-style-type: none"> <li>NZM3-VE-630, -VE-250...400-NA, , -VEF-250...400-NA, -VE-450...600-NA, -VEF-450...600-NA</li> </ul>	
18	0	$I_{sd} = 1.5 \times I_r$	Set value for $I_{sd}$
18	1	$I_{sd} = 2 \times I_r$	
18	2	$I_{sd} = 2.5 \times I_r$	
18	3	$I_{sd} = 3 \times I_r$	
18	4	$I_{sd} = 3.5 \times I_r$	
18	5	$I_{sd} = 4 \times I_r$	
18	6	$I_{sd} = 5 \times I_r$	
18	7	$I_{sd} = 6 \times I_r$	
18	8	$I_{sd} = 7 \times I_r$	
		<ul style="list-style-type: none"> <li>NZM4-VE2000</li> </ul>	
18	0	$I_{sd} = 2 \times I_r$	Set value for $I_{sd}$
18	1	$I_{sd} = 2.5 \times I_r$	
18	2	$I_{sd} = 3 \times I_r$	
18	3	$I_{sd} = 3.5 \times I_r$	
18	4	$I_{sd} = 4 \times I_r$	
18	5	$I_{sd} = 4.5 \times I_r$	
18	6	$I_{sd} = 5 \times I_r$	
18	7	$I_{sd} = 5.5 \times I_r$	
18	8	$I_{sd} = 6 \times I_r$	

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### 12.8 Programming

Byte:	Dec. value	Description	Note
18	0	$I_{sd} = 2 \times I_r$	Set value for $I_{sd}$
18	1	$I_{sd} = 3 \times I_r$	
18	2	$I_{sd} = 4 \times I_r$	
18	3	$I_{sd} = 5 \times I_r$	
18	4	$I_{sd} = 6 \times I_r$	
18	5	$I_{sd} = 7 \times I_r$	
18	6	$I_{sd} = 8 \times I_r$	
18	7	$I_{sd} = 9 \times I_r$	
18	8	$I_{sd} = 10 \times I_r$	
19	0	$t_{sd} = 0$	Set value for $t_{sd}$ [ms]
19	1	$t_{sd} = 20$	
19	2	$t_{sd} = 60$	
19	3	$t_{sd} = 100$	
19	4	$t_{sd} = 200$	
19	5	$t_{sd} = 300$	
19	6	$t_{sd} = 500$	
19	7	$t_{sd} = 750$	
19	8	$t_{sd} = 1000$	
20	0	$I_g = 0.2 \times I_n$	Set value for $I_g$
20	1	$I_g = 0.35 \times I_n$	
20	2	$I_g = 0.4 \times I_n$	
20	3	$I_g = 0.5 \times I_n$	
20	4	$I_g = 0.6 \times I_n$	
20	5	$I_g = 0.7 \times I_n$	
20	6	$I_g = 0.8 \times I_n$	
20	7	$I_g = 0.9 \times I_n$	
20	8	$I_g = 1.0 \times I_n$	
21	0	$t_g = 0$	Set value for $t_g$ [ms]
21	1	$t_g = 20$	
21	2	$t_g = 60$	
21	3	$t_g = 100$	
21	4	$t_g = 200$	
21	5	$t_g = 300$	
21	6	$t_g = 500$	
21	7	$t_g = 750$	
21	8	$t_g = 1000$	



Byte:	Dec. value	Description	Note
22	1 = I <sup>2</sup> <sub>t</sub> [A] activated 0 = I <sup>2</sup> <sub>t</sub> [A] deactivated		
23		Serial number NZM H byte	
24		Serial number NZM M byte	
25		Serial number NZM L byte	
26		CB part no.	
27		LS function	
28		Main index, bit 7, 6	NZM firmware version
		Secondary index 1, bit 5 - 3	
		Secondary index 2, bit 2 - 0	
29		0 = NZM ground fault module not present	
29		16 = NZM ground fault module present	
30		Reserve	

### 12.8.1.7 Outputs

The data structure complies with the LVSG (Low Voltage Switchgear) profile of PNO (PROFIBUS User Organization) which defines 2 bytes of output data. All functions of the second byte are not supported. A dummy byte (byte 1) is therefore required to ensure that the device is compatible with the LVSG profile. An additional byte is provided for resetting the energy value.

Byte:	Bit								Description	Note
	7	6	5	4	3	2	1	0		
0							0	0	Do not change status	–
0							0	1	Switch off	Switch command
0							1	0	Switch on	Switch command
0							1	1	Do not change status	–
1									Not used	–
2	1	0	0	0	0	0	0	0	Reset power meter to zero	Power meter

#### Behavior of NZM-XSWD-704 switching function



##### **DANGER**

If the remote operator is used, switching commands may be delayed and therefore carried out when unexpected.

This may result in voltages being applied or motors starting at unexpected moments.

Because of this, make sure to carry out the „Measures for using the remote operator“ → Page 246.

The switching function behaves differently in devices belonging to device versions up to 03 and in devices belonging to device version 04 and higher. In both cases, a switching command will remain active even if it cannot be carried out immediately. Delayed switching is possible if, for example, the remote operator is powered after a delay.

The following scenario is an example that could result in unexpected switching:

1. A switch command is issued.
2. Due to certain hardware conditions, the command cannot be carried out, e.g., the remote operator is not being powered.
3. The above condition is fixed, e.g., the remote operator's power supply is turned on.
4. The switching operation will then be performed immediately and, if applicable, unexpectedly, as the switching command will have been saved.

#### **How the switching function behaves in devices belonging to device versions up to 03**

A switching operation will only be carried out if the circuit-breaker's state is signaled to the NZM-XSWD-704 via the latter's inputs. Switching on will only be possible if the switch is open and, vice versa, switching off will only be possible if the switch is closed. In other words, the auxiliary contacts must always be wired to the inputs in order for switching operations to be possible.

Once a switching command is issued, it cannot be cancelled. The corresponding switching operation must first be carried out.

#### **How the switching function behaves in devices belonging to device version 04 and higher**

The circuit-breaker can always be switched, regardless of its state. Even though wiring the inputs is not absolutely required in order to be able to perform switching operations, we recommend controlling the switching operations.

#### **Measures for using the remote operator**

For devices belonging to device versions up to 03:

If you are using the remote operator, upgrade the NZM-XSWD-704 to device version 04. This upgrade is free. Then program the logic described in the following section for devices belonging to device version 04 or higher.

The following applies to devices belonging to device version 04 or higher:

Program the following logic for every switching operation:

- ▶ After a switching command, check whether it has been properly carried out using the appropriate input auxiliary contacts.
- ▶ If two seconds have passed and the switching command still has not been carried out successfully, cancel the switching command. To do this, enter the original state as a switching command.

## 12.8.2 Decoding CB type and CB identification

A ready-to-use function block is provided since decoding is a complex operation on account of the range of different NZM types. A special description, "Decoding CB types and CB identification," is also provided.

Both can be downloaded from the following internet page:

[ftp://ftp.moeller.net/CIRCUIT\\_BREAKER/KOMMUNIKATION/NZM\\_XSWD\\_704/](ftp://ftp.moeller.net/CIRCUIT_BREAKER/KOMMUNIKATION/NZM_XSWD_704/)

### 12.8.2.1 Diagnostics

In the event of a diagnostics message (input byte 0, bit 4 is set), the module indicates the following causes of faults:

Value	Meaning	Remedy	Notes
0x03	No circuit-breaker connected	<ul style="list-style-type: none"> <li>• Check the cable connection to the circuit-breaker.</li> <li>• If necessary, replace circuit-breaker and cables.</li> </ul>	The digital input and output states are still transferred in this state.
0x13	Short-circuit on output Q0 or Q1	<ul style="list-style-type: none"> <li>• Check wiring of the outputs.</li> </ul>	
0x14	Internal fault in NZM-XSWD-704	<ul style="list-style-type: none"> <li>• Attempt a reset by switching on the power supply again.</li> <li>• Exchange the module.</li> </ul>	
0x16	Power meters invalid	<ul style="list-style-type: none"> <li>• Reset counter value via output command and observe whether the fault is rectified.</li> <li>• Replace module as memory is faulty.</li> </ul>	A memory error has occurred in the NZM-XSWD-704.

## 12 Interface for NZM compact circuit-breakers

### 12.8 Programming

#### 12.8.3 Acyclic data

In addition to the cyclical data transfer, two acyclical objects can be read via the NZM-XSWD-704.

Object 1 contains the set values of the NZM.

The data is the same as bytes 15 to 22 of data profile 4.

Object 2 contains the circuit-breaker data of the NZM.

The data is the same as bytes 23 to 30 of data profile 4.

Table 53: Object description

Property Name	Slot Number	Index	Length [byte]	Access
Actual parameters	DT address of the XSWD-704	1	8	R
Circuit-breaker data	DT address of the XSWD-704	2	8	R

It is recommended that the actual process data is read cyclically via data profile 2 and that the actual parameters and circuit-breaker is read acyclically as required. This strategy reduces the bus load.



Further information on the subject of "acyclical data transfer" is provided in the manual MN05013002Z-EN (previously AWB2723-1612g).

## 13 Using SmartWire-DT modules with the EtherCAT field bus

The EtherCAT PLC configurator needs device description files in XML format (ESI files, where ESI = EtherCAT Slave Information) for configuration purposes (for selecting and configuring SmartWire-DT modules). In addition to process data information, these ESI files also contain a series of elements for each SmartWire-DT module, such as a module ID (Product Code), configuration data (CFG), device options (Options), and additional device parameters (Parameters).

If a SmartWire-DT module is installed, the configuration software (e.g., Twin-CAT; → see also below) will assign these data sets to each module as follows (all values in hexadecimal format):

Module 1: Index 0x8000 (example)

- Module ID (Product Code): Sub-index 06
- Configuration data (CFG): Sub-index 20
- Device options (Options): Sub-index 21
- Device parameters (Parameters): Sub-index 22

The gateway needs the module ID (Product Code) in sub-index 06 and the configuration data (CFG) in sub-index 20 for identification and configuration purposes. **Do not modify** this data!

In contrast, the device options (Options) in sub-index 21 and the device parameters (Parameters) in sub-index 22 can be modified if necessary.

### Device options

The device options (Options) in sub-index 21 are identical for all SmartWire-DT modules. They contain two pieces of information that can be modified:

Bit 1: Module is optional/not optional

Bit 4: Module can be replaced/cannot be replaced with a universal module

The corresponding option byte contains additional information that should not be modified.

Table 54: Device options

Bit	Meaning	Note
0	Module features extended parameters	Do not change this bit's value!
1	Module is optional	FALSE (0): Data communications on the SmartWire-DT network will continue even if the module is missing. TRUE (1): No data communications on the SmartWire-DT network if the module is missing (default setting).
2	CRC8 checksum	Do not change this bit's value!
3	Data format	Do not change this bit's value!
4	Can be replaced with universal module	FALSE (0): It is not permitted for the device to be replaced with a universal module (default setting). TRUE (1): It is permitted for the device to be replaced with a universal module.

## 13 Using SmartWire-DT modules with the EtherCAT field bus

Bit	Meaning	Note
5	reserved	Do not change this bit's value!
6	Module features data profiles	Do not change this bit's value!
7	Module supports acyclical data communications	Do not change this bit's value!

Since the EtherCAT configurator only allows for whole bytes to be written, the required value needs to be determined individually and the corresponding option byte must then be overwritten.

### Example

Analog module EU5E-SWD-2A2A has the following entries:

PS	CoE	0x8000.06	0x01060504 (17171716)	Product code EU5E-SWD-2A2A
PS	CoE	0x8000.20	0x00E1D110 (14799120)	CFG EU5E-SWD-2A2A
PS	CoE	0x8000.21	0x83 (131)	Options EU5E-SWD-2A2A
PS	CoE	0x8000.22	0x5002 (20482)	Parameters EU5E-SWD-2A2A

Option byte receives a value of 0x83.

Bit	Meaning	Note	Default	New
0	Module features extended parameters	Do not change this bit's value!	1	1
1	Module is optional	FALSE (0): Data communications on the SmartWire-DT network will continue even if the module is missing. TRUE (1): No data communications on the SmartWire-DT network if the module is missing (default setting).	1	0
2	CRC8 checksum	Do not change this bit's value!	0	0
3	Data format	Do not change this bit's value!	0	0
4	Can be replaced with universal module	FALSE (0): It is not permitted for the device to be replaced with a universal module (default setting). TRUE (1): It is permitted for the device to be replaced with a universal module.	0	0
5	reserved	Do not change this bit's value!	0	0
6	Module features data profiles	Do not change this bit's value!	0	0
7	Module supports acyclical data communications	Do not change this bit's value!	1	1

If you wanted data communications on the SmartWire-DT network to continue even when the module is not present, bit 1 would need to be set to 0. The option byte's new value would then be 0x81.

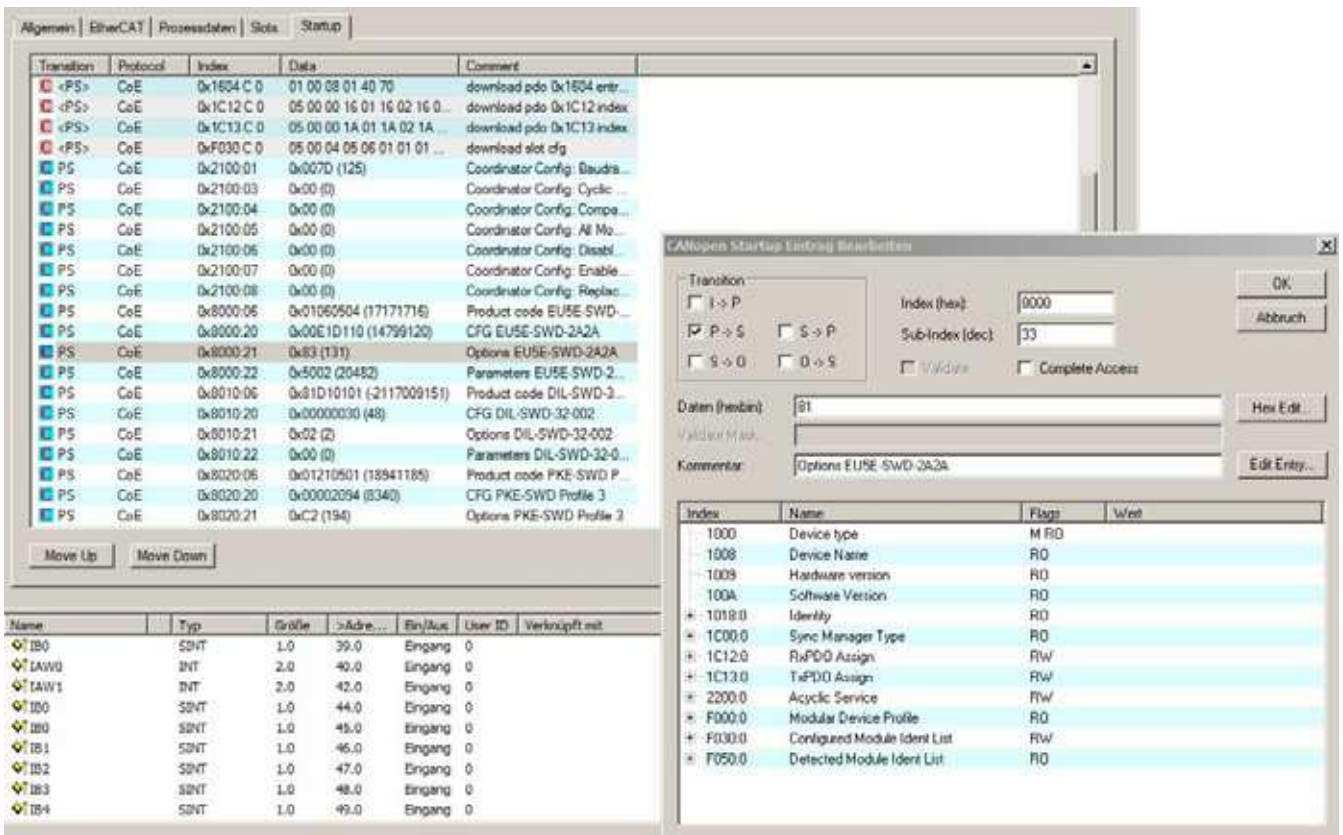


Figure 97: Changing the value of the option byte for module EU5E-SWD-2A2A

### Device parameter

Device parameters are module-specific and make it possible to individually modify module properties. For example, they can be used to select the type of sensor (Pt100, Pt100, Ni1000) and the temperature range in temperature modules. These parameters, together with their corresponding values, are described in the documentation for the individual modules. The values need to be entered the same way as previously with the option byte.

What needs to be considered here is that a length byte, which defines the total length of the parameter data including the length bytes, always precedes the parameter bytes. The presentation of the parameter data depends on the programming system used, and also, in part, on the structure of the parameter data.

### Programming system TwinCAT

If the modules have 1, 2 or 4 bytes including the length bytes, they are shown in the overview as a hexadecimal value, otherwise in ascending order.

### Example 1: EU5E-SWD-2A2A analog module

PS CoE 0x8000:22 0x5002 (20482) Parameters EU5E-SWD-2A2A

The module has a parameter byte and also a length byte. The **low byte** contains the length value 0 x 02 (1 parameter length byte + 1 parameter byte).



Please do not change this value!

The **high byte** contains the parameter value 0x 50 (all 0 - 10 V, average value generation for the analog inputs switched on at 100 ms)

### Example 2: EU5E-SWD-4PT temperature acquisition module

PS CoE 0x8050:22 03 00 00 Parameters EU5E-SWD-4PT

The module has two parameter bytes and one length byte as well, so a total of three bytes. In this case, no hexadecimal values is shown in TwinCat Manager, but instead the values are output in the byte series, so the exact opposite of the hexadecimal presentation.

The length byte is 3, the two parameter bytes 0, which means that no temperature sensor has been defined (pre-setting)

### Changing parameter values

The parameters are changed the same way that option bytes as changed. Press on the **Edit** button to open the dialog where you can change the parameter values. Here, irrespective of the number of parameter data, the values in the hexadecimal presentation are output in ascending order; so

Length byte

Parameter byte 1:

Parameter byte 2

...

For the two examples above, this means:

- EU5E-SWD-2A2A module:
  - Length byte: 2
  - Parameter byte 1: 50
- EU5E-SWD-4PT module:
  - Length byte: 3
  - Parameter byte 1: 00
  - Parameter byte 2: 00



### 13 Using SmartWire-DT modules with the EtherCAT field bus



Figure 98: Dialog window in which parameter values are entered or changed

## 13 Using SmartWire-DT modules with the EtherCAT field bus

14.1 Maximum current consumption of SmartWire-DT modules on U<sub>SWD</sub>

## 14 Appendix

14.1 Maximum current consumption of SmartWire-DT modules on U<sub>SWD</sub>

Part no.	Article no.	Current consumption [mA]	Notes
<b>M22-SWD-INC</b>	179982	10	–
<b>M22-SWD-K11</b>	115964	10	–
<b>M22-SWD-K22</b>	115965	10	–
<b>M22-SWD-LED-W</b>	115966	22	–
<b>M22-SWD-LED-B</b>	115967	22	–
<b>M22-SWD-LED-G</b>	115968	22	–
<b>M22-SWD-LED-R</b>	115969	22	–
<b>M22-SWD-K11LED-W</b>	115972	22	–
<b>M22-SWD-K11LED-B</b>	115973	22	–
<b>M22-SWD-K11LED-G</b>	115974	22	–
<b>M22-SWD-K11LED-R</b>	115975	22	–
<b>M22-SWD-K22LED-W</b>	115978	22	–
<b>M22-SWD-K22LED-B</b>	115979	22	–
<b>M22-SWD-K22LED-G</b>	115980	22	–
<b>M22-SWD-K22LED-R</b>	115981	22	–
<b>M22-SWD-NOP</b>	147637	10	–
<b>M22-SWD-KC11</b>	115995	10	–
<b>M22-SWD-KC22</b>	115996	10	–
<b>M22-SWD-LEDC-W</b>	115997	22	–
<b>M22-SWD-LEDC-B</b>	115998	22	–
<b>M22-SWD-LEDC-G</b>	115999	22	–
<b>M22-SWD-LEDC-R</b>	116000	22	–
<b>M22-SWD-K11LEDC-W</b>	116003	22	–
<b>M22-SWD-K11LEDC-B</b>	116004	22	–
<b>M22-SWD-K11LEDC-G</b>	116005	22	–
<b>M22-SWD-K11LEDC-R</b>	116006	22	–
<b>M22-SWD-K22LEDC-W</b>	116009	22	–
<b>M22-SWD-K22LEDC-B</b>	116010	22	–
<b>M22-SWD-K22LEDC-G</b>	116011	22	–
<b>M22-SWD-K22LEDC-R</b>	116012	22	–
<b>M22-SWD-NOPC</b>	147638	10	–
<b>M22-SWD-R</b>	179293	10	–
<b>DIL-SWD-32-001</b>	118560	40	–
<b>DIL-SWD-32-002</b>	118561	40	–
<b>PKE-SWD</b>	150613, 150614	35	–
<b>PKE-SWD-32</b>	126895	58	–
<b>PKE-SWD-CP</b>	172735	35	–
<b>NZM-XSWD-704</b>	135530	35	–
<b>EMS-DO-T-2.4-SWD-ADP</b>	172760	22	–
<b>EMS-DO-T-9-SWD-ADP</b>	172762	22	–
<b>EMS-RO-T-2.4-SWD-ADP</b>	172761	22	–
<b>EMS-RO-T-9-SWD-ADP</b>	172763	22	–
<b>EU5E-SWD-8DX</b>	116381	16	–
<b>EU5E-SWD-4DX</b>	144060	33	–
<b>EU5E-SWD-4D4D</b>	116382	33	–
<b>EU5E-SWD-4D2R</b>	116383	45	–
<b>EU5E-SWD-X8D</b>	144061	43	–
<b>EU5E-SWD-4AX</b>	144062	22	–
<b>EU5E-SWD-2A2A</b>	144063	22	–
<b>EU5E-SWD-4PT</b>	144064	22	–

## 14 Appendix

### 14.2 Power-/current consumption of the SWD stations on U<sub>AUX</sub>

Part no.	Article no.	Current consumption [mA]	Notes
<b>EU5E-SWD-4PT-2</b>	172560	22	–
<b>M22-SWD-I1-LP01</b>	115990	17	with bus termination resistor switched on
<b>M22-SWD-I2-LP01</b>	115991	17	
<b>M22-SWD-I3-LP01</b>	115992	17	
<b>M22-SWD-I4-LP01</b>	115993	17	
<b>M22-SWD-I6-LP01</b>	115994	17	
<b>SL4-SWD</b>	171311	26	–
<b>SL7-SWD</b>	171459	26	–
<b>SWD4-RC8-10</b>	116020	17	–

### 14.2 Power-/current consumption of the SWD stations on U<sub>AUX</sub>

			<b>DIL-SWD-32-...</b>	
<b>Pull-in power</b>				
at DILMA, DILM7	W		3	
at DILM7 – DILM15	W		4.5	
at DILM17 – DILM38	W		12	
<b>Pick-up current</b>				
at DILM7 – DILM9	mA		125	
at DILM12 – DILM15	mA		188	
at DILM17 – DILM38	mA		500	
<b>Sealing power</b>				
at DILMA, DILM7	W		3	
at DILM7 – DILM15	W		4.5	
at DILM17 – DILM38	W		0.5	
<b>Holding current</b>				
at DILMA, DILM7	mA		125	
at DILM7 – DILM15	mA		188	
at DILM17 – DILM38	mA		21	
			<b>EMS-...-SWD-ADP</b>	
<b>Current</b>				
Switch on	mA		120	
Operation	mA		60	
			<b>NZM-XSWD-704</b>	
<b>Current</b>				
With active remote operator	mA		300	
With inactive remote operator	mA		100	
			<b>SL4-SWD</b>	<b>SL7-SWD</b>
<b>Current</b>				
With an LED light module				
Continuous light	mA		33	54
Flashing light	mA		36	58
Strobe light	mA		65	135
With an LM high-power LED				
Continuous light	mA		–	200
Flashing light	mA		–	265
Strobe light	mA		–	265

14.2 Power-/current consumption of the SWD stations on  $U_{AUX}$ 

		SL4-SWD	SL7-SWD
With a filament lamp light module	mA	167	292
With an acoustic module			
Continuous or pulsed tone	mA	39	92
Continuous or pulsed tone, 8	mA	–	115

## 14 Appendix

### 14.3 Data requirement (bytes) SmartWire-DT modules

#### 14.3 Data requirement (bytes) SmartWire-DT modules

SmartWire-DT module	Input	Output
M22-SWD-INC	3	3
M22-SWD-K11	1	0
M22-SWD-K22	1	0
M22-SWD-LED-W	1	1
M22-SWD-LED-B	1	1
M22-SWD-LED-G	1	1
M22-SWD-LED-R	1	1
M22-SWD-K11LED-W	1	1
M22-SWD-K11LED-B	1	1
M22-SWD-K11LED-G	1	1
M22-SWD-K11LED-R	1	1
M22-SWD-K22LED-W	1	1
M22-SWD-K22LED-B	1	1
M22-SWD-K22LED-G	1	1
M22-SWD-K22LED-R	1	1
M22-SWD-KC11	1	0
M22-SWD-KC22	1	0
M22-SWD-LEDC-W	1	1
M22-SWD-LEDC-B	1	1
M22-SWD-LEDC-G	1	1
M22-SWD-LEDC-R	1	1
M22-SWD-K11LEDC-W	1	1
M22-SWD-K11LEDCnc-B	1	1
M22-SWD-K11LEDC-G	1	1
M22-SWD-K11LEDC-R	1	1
M22-SWD-K22LEDC-W	1	1
M22-SWD-K22LEDC-B	1	1
M22-SWD-K22LEDC-G	1	1
M22-SWD-K22LEDC-R	1	1
M22-SWD-R	3	0
DIL-SWD-32-001	1	1
DIL-SWD-32-002	1	1
PKE-SWD profile 1	2	1
PKE-SWD profile 2	4	1
PKE-SWD profile 3	5	1
PKE-SWD-32 profile 1	2	1
PKE-SWD-32 profile 2	4	1
PKE-SWD-32 profile 3	5	1
PKE-SWD-CP Profile 1	2	1
PKE-SWD-CP Profile 2	4	1
PKE-SWD-CP Profile 3	5	1
PKE-SWD-CP Profile 4	8	1
NZM-XSWD-704 profile 1	3	3
NZM-XSWD-704 profile 2	11	3
NZM-XSWD-704 profile 3	15	3
NZM-XSWD-704 profile 4	31	3
EMS-...-SWD-ADP	1	1
EU5E-SWD-4DX	2	0
EU5E-SWD-8DX	2	0
EU5E-SWD-4D4D	1	1
EU5E-SWD-4D2R	1	1
EU5E-SWD-X8D	1	1
EU5E-SWD-4AX	9	0
EU5E-SWD-2A2A	5	4

## 14.3 Data requirement (bytes) SmartWire-DT modules

<b>SmartWire-DT module</b>	<b>Input</b>	<b>Output</b>
<b>EU5E-SWD-4PT</b>	9	0
<b>EU5E-SWD-4PT-2</b>	9	0
<b>M22-SWD-I1-LP01</b>	0	0
<b>M22-SWD-I2-LP01</b>	0	0
<b>M22-SWD-I3-LP01</b>	0	0
<b>M22-SWD-I4-LP01</b>	0	0
<b>M22-SWD-I6-LP01</b>	0	0
<b>SL4-SWD</b>	1	1
<b>SL7-SWD</b>	1	1
<b>SWD4-RC8-10</b>	0	0

## 14 Appendix

### 14.4 Reference table: Part no., SmartWire-DT vs. Eaton catalog number

#### 14.4 Reference table: Part no., SmartWire-DT vs. Eaton catalog number

Part no.	Eaton catalog number
DILM7(C)-...(24VDC)	XTCE(C)007B...TD
DILM9(C)-...(24VDC)	XTCE(C)009B...TD
DILM12(C)-...(24VDC)	XTCE(C)012B...TD
DILM15(C)-...(24VDC)	XTCE(C)015B...TD
DILM17(C)-...(24VDC)	XTCE(C)017C...TD
DILM25(C)-...(24VDC)	XTCE(C)025C...TD
DILM32(C)-...(24VDC)	XTCE(C)032C...TD
DILM38(C)-...(24VDC)	XTCE038C...TD
<b>contactor relay</b>	
DILA(C)-...(24VDC)	XTRE(C)10B...TD
<b>Motor-Protective Circuit-Breakers</b>	
PKZM0	XTPR...BC1(NL)
PKE12	XTPE012B(NL)
PKE32	XTPE032B(NL)
PKE65	XTPE065B(NL)
PKE-XTUA-1.2	XTPEXTA1P2B
PKE-XTUA-4	XTPEXTA004B
PKE-XTUA-12	XTPEXTA012B
PKE-XTUA-32	XTPEXTA032B
PKE-XTUWA-32	XTPEXTA032D
PKE-XTUA-65	XTPEXTA065D
PKE-XTUACP-36	XTPEXTA036BD
PKE-XTUWACP-36	XTPEXTA036DD
PKE-XTUACP-65	XTPEXTA065DD
<b>Accessories for motor-protective circuit-breaker</b>	
NHI-E...-PKZO	XTPAXFA...
NHI...-PKZO	XTPAXSA...
AGM2...-PKZO	XTPAXSATR...
<b>Electronic motor starter</b>	
EMS-DO-T-2.4-SWD-ADP	EMS-DO-T-2P4-SWD-ADP
EMS-RO-T-2.4-SWD-ADP	EMS-RO-T-2P4-SWD-ADP
<b>Motor-starter combination</b>	
MSC-D-...(24VDC)	XTSE...TD...
MSC-DEA-...(24VDC)	XTNE...TD...
<b>wiring set</b>	
DILM12-XRL	XTCEXRLB
DILM12-XP2	XTCEXPBB
DILM12-XR	XTCEXRBB-OA2
DILM12-XEV	XTCEXLBB
DILM32-XRL	XTCEXRLC
PKZM0-XRM12	XTPAXTPCRB



## 14.5 SWD module interoperability requirements

### 14.5.1 SmartWire-DT® coordinators

Interoperability between SmartWire-DT modules is guaranteed with the following SmartWire-DT coordinator firmware versions (or higher):

Table 55: SmartWire-DT coordinator firmware versions

	SmartWire-DT coordinator firmware version			
	EU5C-SWD-DP	EU5C-SWD-CAN	EU5C-SWD-EIP-MODTCP	EU5C-SWD-PROFINET
M22-SWD-...	1.00	1.00	1.00	1.00
M22-SWD-NOP(C)	1.00	1.00	1.00	1.00
DIL-SWD-32-...	1.00	1.00	1.00	1.00
DS7-34DSX...-D	1.10	1.10	1.00	1.00
DX-NET-.SWD.	1.10	1.10	1.00	1.00
EMS-...-SWD-ADP	1.20	1.20	1.00	1.00
EU5E-SWD-4DX	1.00	1.00	1.00	1.00
EU5E-SWD-8DX	1.00	1.00	1.00	1.00
EU5E-SWD-4D4D	1.00	1.00	1.00	1.00
EU5E-SWD-4D2R	1.00	1.00	1.00	1.00
EU5E-SWD-X8D	1.00	1.00	1.00	1.00
EU5E-SWD-4AX	1.20	1.20	1.00	1.00
EU5E-SWD-2A2A	1.20	1.20	1.00	1.00
EU5E-SWD-4PT	1.20	1.20	1.00	1.00
EU5E-SWD-4PT-2	1.20	1.20	1.00	1.00
NZM-XSWD-704	1.10	1.10	1.00	1.00
PKE-SWD-32	1.10	1.10	1.00	1.00
PKE-SWD-CP	1.20	1.20	1.00	1.00
PKE-SWD	1.20	1.20	1.00	1.00
SL4-SWD, SL7-SWD	1.10	1.10	1.00	1.00
SWD4-FFR-PF1-1, SWD4-FFR-ST1-1	1.30	1.30	1.10	–
SWD4-RC8-10	1.00	1.00	1.00	1.00



The firmware of the SmartWire-DT gateway can be updated using the SWD-Assist program. This program and firmware versions are available for free at:

<http://www.eaton.eu/software>

## 14 Appendix

### 14.5 SWD module interoperability requirements

#### 14.5.2 Fieldbus description files

The latest fieldbus descriptions and predecessor versions are available for download on the Internet. To find them quickly, please go to

<http://www.eaton.com/documentation>

and enter the gateway designation, e.g., EU5C-SWD-DP, as a search term.

You will find the fieldbus description file matching the firmware version as organized in the corresponding directories.

Table 56: Compatible fieldbus description files for SmartWire-DT modules

SmartWire-DT gateway	EU5C-SWD-CAN	EU5C-SWD-DP Intel	EU5C-SWD-DP Motorola	EU5C-SWD-PROFINET
		(Intel-based CPU) Moe4d14.gsd Firmware version	(Motorola-based CPU) Moel4d14.gsd Firmware version	GSDML-V2.2-Hilscher- EU5C-SWD- 20131022.xml
DIL-SWD-32-... EU5E-SWD-4D2R EU5E-SWD-4D4D EU5E-SWD-8DX M22-SWD-K... M22-SWD-L...	EU5C-SWD-CAN.eds	1.00	1.00	✓
PKE-SWD-32 NZM-XSWD-704	EU5C-SWD- CAN_V110.eds	1.10	1.10	✓
EM SWD ADAPTER EU5E-SWD-X8D EU5E-SWD-4DX EU5E-SWD-4AX EU5E-SWD-2A2A EU5E-SWD-4PT M22-SWD-NOP(C) PKE-SWD	EU5C-SWD- CAN_V120.eds	1.20	1.20	✓
DS7-SWD	EU5C-SWD- CAN_V120.eds	1.30	1.20	✓
DX-NET-SWD... EU5E-SWD-4PT-2 SL4-SWD,SL7-SWD	EU5C-SWD- CAN_V130.eds	1.30	1.30	✓
SWD4-FFR-PF1-1/ ST1-1	EU5C-SWD- CAN_V130.eds	1.30	1.30	–
EMS-...-SWD-ADP PKE-SWD-CP	EU5C-SWD- CAN_V130.eds	1.30	1.30	✓

### 14.5.3 SWD assist

The following table provides an overview of which SmartWire-DT modules can be used with which SWD-Assist program versions and higher. This information can also be obtained by clicking on the ReadMe menu option in SWD-Assist.

SmartWire-DT module	SWD-Assist version
M22-SWD-...	1.0
M22-SWD-NOP(C)	1.3
DIL-SWD-32-001, DIL-SWD-32-002	1.0
DS7-34DSX...-D	1.60
DX-NET-SWD.	1.80
EMS-...-SWD-ADP	1.90
EU5E-SWD-4DX	1.30
EU5E-SWD-8DX	1.0
EU5E-SWD-4D4D	1.0
EU5E-SWD-4D2R	1.0
EU5E-SWD-X8D	1.30
EU5E-SWD-4AX	1.30
EU5E-SWD-2A2A	1.30
EU5E-SWD-4PT	1.30
EU5E-SWD-4PT-2	1.80
NZM-XSWD-704	1.20
PKE-SWD-32	1.10
PKE-SWD-CP	1.90
PKE-SWD	1.40
SL4-SWD, SL7-SWD	1.80
SWD4-FFR-PF1-1, SWD4-FFR-ST1-1	1.70
SWD4-RC8-10	1.0

## 14.6 Technical Data

### 14.6.1 Power feeder module

			EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
<b>General</b>				
Standards			IEC/EN 61131-2, EN 50178	
Dimensions (W x H x D)	mm		35 x 90 x 124	
Weight	kg		0.11	0.17
mounting			Top-hat rail IEC/EN 60715, 35 mm	
Mounting position			vertical	
<b>Ambient mechanical conditions</b>				
Degree of protection (IEC/EN 60529, EN50178, VBG 4)			IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
constant amplitude 3.5 mm	Hz		5 - 8.4	5 - 8.4
constant acceleration 1 g	Hz		8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms	Impact resistances		9	9
Drop to IEC/EN 60068-2-31	Drop height	mm	50	50
Free fall, packaged (IEC/EN 60068-2-32)		m	0.3	0.3
<b>Electromagnetic compatibility (EMC)</b>				
Over voltage category			II	II
Pollution degree			2	2
Electrostatic discharge (IEC/EN 61131-2:2008)				
Air discharge (Level 3)	kV		8	8
Contact discharge (Level 2)	kV		4	4
Electromagnetic fields (IEC/EN 61131-2:2008)				
80 - 1000 MHz	V/m		10	10
1.4 - 2 GHz	V/m		3	3
2 - 2.7 GHz	V/m		1	1
Radio interference suppression (SmartWire-DT)				
Burst (IEC/EN 61131-2:2008, Level 3)				
Supply cables	kV		2	2
CAN/DP bus cable	kV		–	–
SmartWire-DT cables	kV		1	1
Surge (IEC/EN 61131-2:2008, Level 1)				
Supply cables/CAN/DP bus cable			Supply cables 0.5 kV	
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V		10	10

			EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
<b>Ambient climatic conditions</b>				
Operating ambient temperature (IEC 60068-2)	°C		-25 - +55	-25 - +55
Condensation				
Storage	°C		-40 - 70	-40 - 70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 - 95	5 - 95
<b>Supply voltage U<sub>AUX</sub></b>				
Rated operating voltage	V		24 DC -15% +20%	
Residual ripple of input voltage	%		≤ 5	≤ 5
Protection against polarity reversal			yes	yes
max. current	I <sub>max</sub>	A	3	3
Short-circuit strength			no, external fuse FAZ Z3	
Heat dissipation	W		normally 1	normally 1
Potential isolation			no	no
Rated operating voltage of 24-V-DC modules	V		typical U <sub>AUX</sub> - 0.2	typical U <sub>AUX</sub> - 0.2
<b>Supply voltage U<sub>POW</sub></b>				
Supply voltage	V		–	24 DC -15 % + 20 %
Residual ripple of input voltage	%		–	≤ 5
Protection against polarity reversal			–	yes
Rated operational current	I	A	–	0.7
Overload proof			–	yes
Inrush current and length	A		–	12.5 A/6 ms
Heat dissipation at 24 V DC	W		–	3.8
Potential isolation between U <sub>POW</sub> and 15 V SmartWire-DT supply voltage			–	yes
Bridging voltage dips	ms		–	10
Repetition rate	s		–	1
status display	LED		–	yes
<b>SmartWire-DT supply voltage U<sub>SWD</sub></b>				
Rated operational voltage	U <sub>e</sub>	V	14.5 ± 3 %	14.5 ± 3 %
max. current	I <sub>max</sub>	A	0.7	0.7
Short-circuit strength			–	yes
<b>Connection supply voltages</b>				
Connection type			Push in terminals	
solid	mm <sup>2</sup>		0.2 - 1.5 (AWG24 - 16)	
flexible with ferrule	mm <sup>2</sup>		0.25 - 1.5	0.25 - 1.5
<b>System SmartWire-DT</b>				
Module type			–	–

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		EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
Number of SmartWire-DT modules		–	–
Baud Rate	kbps	–	–
Address setting		–	–
status display		–	–
Connections		2 x plug, 8 pole	
plug connector		2 blade terminals SWD4-8MF2	
<b>Notes</b>		1) If contactors with a total power consumption > 3 A are connected, a power feeder module EU5C-SWD-PF1/2 has to be used. 2) If contactors with a total power consumption > 0.7 A are connected, a power feeder module EU5C-SWD-PF2 has to be used.	

#### 14.6.2 I/O modules

		EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D	EU5E-X8D
<b>General</b>						
Standards		IEC/EN 61131-2, EN 50178				
Dimensions (W x H x D)	mm	35 x 90 x 101	35 x 90 x 101	35 x 90 x 101	35 x 90 x 101	35 x 90 x 101
Weight	kg	0.1	0.1	0.1	0.1	0.1
mounting		Top-hat rail IEC/EN 60715, 35 mm				
Mounting position		vertical				
<b>Ambient mechanical conditions</b>						
Degree of protection (IEC/EN 60529, EN50178, VBG 4)		IP20	IP20	IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)						
constant amplitude 3.5 mm	Hz	5 - 8.4	5 - 8.4	5 - 8.4	5 - 8.4	5 - 8.4
Constant acceleration, 1 g	Hz	8.4 - 150	8.4 - 150	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms	Impact resistances	9	9	9	9	9
Drop to IEC/EN 60068-2-31	Drop height	50	50	50	50	50
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	0.3	0.3	0.3	0.3
<b>Electromagnetic compatibility (EMC)</b>						
Over voltage category		II	II	II	II	II
Pollution degree		2	2	2	2	2
Electrostatic discharge (IEC/EN 61131-2:2008)						
Air discharge (Level 3)	kV	8	8	8	8	8
Contact discharge (Level 2)	kV	4	4	4	4	4

			EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D	EU5E-X8D
Electromagnetic fields (IEC/EN 61131-2:2008)							
80 - 1000 MHz	V/m		10	10	10	10	10
1.4 - 2 GHz	V/m		3	3	3	3	3
2 - 2.7 GHz	V/m		1	1	1	1	1
Radio interference suppression (SmartWire-DT) EN55011			Class A	Class A	Class A	Class A	Class A
Burst (IEC/EN 61131-2:2008, Level 3)							
Supply cables	kV		2	2	2	2	2
Signal cables	kV		1	1	1	1	1
SmartWire-DT cables	kV		1	1	1	1	1
Surge (IEC/EN 61131-2:2008, Level 1)			–	Supply cables 0.5 kV	–	Supply cables 0.5 kV	Supply cables 0.5 kV
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V		10	10	10	10	10
<b>Ambient climatic conditions</b>							
Operating ambient temperature (IEC 60068-2)	°C		-25 - +55	-25 - +55	-25 - +55	-25 - +55	-25 - +55
Condensation			prevent with suitable measures				
Storage	°C		-40 - +70	-40 - +70	-40 - +70	-40 - +70	-40 - +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 - 95	5 - 95	5 - 95	5 - 95	5 - 95
<b>SmartWire-DT interface</b>							
Module type			SmartWire-DT module (slave)				
Baud rate setting			Automatic	Automatic	Automatic	Automatic	Automatic
Status SmartWire-DT	LED		green	green	green	green	green
Device supply voltage SWD module	$U_{SWD}$	V DC, (%)	14.5 (±3)				
Current consumption at $U_{SWD}$			→ Page 255				
Pin			Pin contact strip, 8-pin; Connector: External device plug SWD4-8SF2-5				
<b>Connection supply and I/O</b>							
Connection type			Push-In	Push-In	Push-In	Push-In	Push-In
solid	mm <sup>2</sup>		0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5
flexible with ferrule <sup>1)</sup>	mm <sup>2</sup>		0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5
UL/CSA solid or stranded	AWG		24 - 16	24 - 16	24 - 16	24 - 16	24 - 16
<b>24 V DC supply for output supply</b>							
Rated operational voltage	$U_e$	V DC	–	24 -15 % / +20 %	–	24 -15 % / +20 %	24 -15 % / +20 %
Residual ripple of input voltage	%		–	≤ 5	–	≤ 5	≤ 5
Protection against polarity reversal			no	yes	no	yes	yes

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		EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D	EU5E-X8D
<b>Digital inputs</b>						
Quantity		8	4 (three-wire connection with supply I+, I-)	4	4	
Input current	mA	Normally 4 at 24 V DC	Normally 4 at 24 V DC	Normally 4 at 24 V DC	Normally 4 at 24 V DC	–
Voltage level to IEC/EN 61131-2						
Limit value type 1		Low < 5 V DC; High > 15 V DC				
Input delay		High Low typ. < 0.2 ms Low High typ. < 0.2 ms				
Status display inputs	LED	yellow	yellow	yellow	yellow	yellow
Input supply I+, I-						
Supply voltage	V		U <sub>e</sub> - 0.16 V			
Output current per input supply	A		≤ 0.5			
Overload proof			yes, with diagnostics			
Status display inputs	LED	yellow	yellow	yellow	yellow	
<b>Digital semiconductor outputs</b>						
Quantity		–			4	8
Output current	A	–			typ. 0.5 on 24 V DC	typ. 0.5 on 24 V DC
Short-circuit tripping current	A	–			max. 1.2 over 3 ms	max. 1.2 over 3 ms
lamp load	R <sub>LL</sub> W	–			≤ 3	≤ 3
Overload proof		–			yes, with diagnostics	yes, with diagnostics
Switching capacity		–			EN 60947-5-1 utilization category DC-13	EN 60947-5-1 utilization category DC-13
<b>Relay outputs</b>						
Quantity		–	–	2	–	–
Contact type		–	–	Normally open contact	–	–
c (contacts)						
Utilization category AC-1, 250 V, 6 A		–	–	> 6 x 10 <sup>4</sup>	–	–
Utilization category AC-15, 250 V, 3 A		–	–	> 5 x 10 <sup>4</sup>	–	–
Utilization category DC-13, 24 V, 1 A		–	–	> 2 x 10 <sup>5</sup>	–	–
Safe disconnection	V AC	–	–	230	–	–
minimum load current	mA	–	–	100 mA, 12 V DC	–	–
Response/reset time	ms	–	–	5/2.5	–	–
Bounce duration	ms	–	–	part no. 1.5	–	–
short-circuit protection		–	–	external 4 A gL/gG	–	–



		EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D	EU5E-X8D
Status display outputs	LED	–	–	yellow	yellow	yellow
<b>Potential isolation</b>						
Input to SmartWire-DT		yes	yes	yes	yes	–
Output to SmartWire-DT		–	no	yes	yes	yes
Input to input		no	no	no	no	–
Output to input		–	no	yes	no	–
Output to output		–	no	yes	no	no
<b>Notes</b>	1) Minimum length 8 mm					

### 14.6.3 Analog module

		EU5E-SWD-4AX	EU5E-SWD-2A2A	EU5E-SWD-4PT EU5E-SWD-4PT-2
<b>General</b>				
Standards		IEC/EN 61131-2, EN 50178		
Dimensions (W x H x D)	mm	35 x 90 x 101	35 x 90 x 101	35 x 90 x 101
Weight	kg	0.1	0.1	0.1
mounting		Top-hat rail IEC/EN 60715, 35 mm		
Mounting position		vertical	vertical	vertical
<b>Ambient mechanical conditions</b>				
Protection type (IEC/EN 60529, EN50178, VBG 4)		IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
constant amplitude 3.5 mm	Hz	5 - 8.4	5 - 8.4	5 - 8.4
Constant acceleration, 1 g	Hz	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms	Impact resistances	9	9	9
Drop to IEC/EN 60068-2-31	Drop height	50	50	50
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	0.3	0.3
<b>Electromagnetic compatibility (EMC)</b>				
Over voltage category		II	II	II
Pollution degree		2	2	2
Electrostatic discharge (IEC/EN 61131-2:2008)				
Air discharge (Level 3)	kV	8	8	8
Contact discharge (Level 2)	kV	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)				
80 - 1000 MHz	V/m	10	10	10

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			<b>EU5E-SWD-4AX</b>	<b>EU5E-SWD-2A2A</b>	<b>EU5E-SWD-4PT EU5E-SWD-4PT-2</b>
1.4 - 2 GHz	V/m		3	3	3
2 - 2.7 GHz	V/m		1	1	1
Radio interference suppression (SmartWire-DT)			EN55011 Class A	EN55011 Class A	EN55011 Class A
<b>Burst (IEC/EN 61131-2:2008, Level 3)</b>					
Supply cables	kV		2	2	2
Signal cables	kV		2	2	2
SmartWire-DT cables	kV		2	2	2
Surge (IEC/EN 61131-2:2008, Level 1)			Supply cables 1 kV	Supply cables 1 kV	Supply cables 1 kV
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V		10	10	10
<b>Ambient climatic conditions</b>					
Operating ambient temperature (IEC 60068-2)	°C		-25 - +55	-25 - +55	-25 - +55
Condensation			prevent with suitable measures		
Storage	°C		-40 - +70	-40 - +70	-40 - +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 - 95	5 - 95	5 - 95
<b>SmartWire-DT interface</b>					
Module type			SmartWire-DT module (slave)		
Baud rate setting			Automatic	Automatic	Automatic
Status SmartWire-DT	LED		green	green	green
Pin			Pin contact strip, 8-pin; Connector: External device plug SWD4-8SF2-5		
Device supply voltage SWD module	U <sub>SWD</sub>	V DC, (%)	14.5 (±3)		
Current consumption at U <sub>SWD</sub>			→ Page 255		
<b>Connection supply and I/O</b>					
Connection type			Push-In	Push-In	Push-In
solid	mm <sup>2</sup>		0.25 - 1.5 (AWG24-16)	0.25 - 1.5 (AWG24-16)	0.25 - 1.5 (AWG24-16)
flexible with ferrule <sup>1)</sup>	mm <sup>2</sup>		0.25 - 1.5 (AWG24-16)	0.25 - 1.5 (AWG24-16)	0.25 - 1.5 (AWG24-16)
UL/CSA solid or stranded	AWG		24 - 16	24 - 16	24 - 16
<b>Supply 24 V DC</b>					
Rated operational voltage	U <sub>e</sub>	V DC	24 -15 % / +20 %	24 -15 % / +20 %	24 -15 % / +20 %
Residual ripple of input voltage	%		≤ 5	≤ 5	≤ 5
Current consumption	mA		< 10	< 50	
Protection against polarity reversal			yes	yes	yes
<b>Analog inputs</b>					

		EU5E-SWD-4AX	EU5E-SWD-2A2A	EU5E-SWD-4PT EU5E-SWD-4PT-2
Quantity		4	2	4
2 two-wire connection, screened, length < 10 m				
<b>Parameter definition</b>				
Type		Voltage, current	Voltage, current	
Averaging		adjustable	adjustable	
<b>Voltage</b>				
Input voltage	V	0 - 10	0 - 10	
Input resistance	kΩ	13.3	13.3	
<b>Current</b>				
Input current	mA	0 - 20	0 - 20	
Input resistance	Ω	< 250	< 250	
Resolution	Bit	12	12	
Conversion time	ms	20	20	
Accuracy	%			
<b>Dielectric strength</b>				
<b>Analog outputs</b>				
Quantity: two-wire connection, screened)		–	2	2
Parameter definition (type)		–	Voltage, current	–
<b>Voltage</b>				
Output voltage	V		0 - 10	
maximum output current	mA		10	
<b>Current</b>				
Output current	mA		0 - 20	
Load resistance	Ω		< 500	
protected against overload/short-circuit proof			yes	
Resolution	Bit		12	
Conversion time	ms			
Cumulative error	%		±1 %	
Repetition accuracy			±0.5 %	
<b>Temperature inputs</b>				
Quantity: two-, three-wire connection, screened, length < 10 m)				4
<b>Parameter definition</b>				
Temperature sensor		–	–	Pt100, Pt1000, Ni1000
Scan time/mean-value generation		adjustable	adjustable	adjustable
<b>Temperature range</b>				

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		<b>EU5E-SWD-4AX</b>	<b>EU5E-SWD-2A2A</b>	<b>EU5E-SWD-4PT EU5E-SWD-4PT-2</b>
Pt100, Pt1000:	°C	–	–	EU5E-SWD-4PT -50 to +200 EU5E-SWD-4PT-2 -100 to +400
Ni1000:	°C	–	–	EU5E-SWD-4PT -50 to +150 EU5E-SWD-4PT-2 -50 to +200
Resolution	°C			0.1
Application Style				°C, °F, nonlinear
Conversion time	ms			50
Cumulative error	%			±1
Repetition accuracy	%			±0.5
<b>Potential isolation</b>				
Input to SmartWire-DT		yes	yes	yes
Output to SmartWire-DT			yes	
Input to input		no	no	no
Output to input			no	
Output to output			no	
<b>Notes</b>	1) Minimum length 8 mm			

### 14.6.4 DIL contactor modules

			DIL-SWD-32-001	DIL-SWD-32-002
<b>General</b>				
Standards			IEC/EN 61131-2, EN 50178, IEC/EN 60947	
Dimensions (W x H x D)	mm		45 x 38 x 76	45 x 38 x 76
Weight	kg		0.04	0.04
mounting			on DILM7 - DILM38	
Mounting position			as DILM7 - DILM38	
<b>Ambient mechanical conditions</b>				
Degree of protection (IEC/EN 60529, EN50178, VBG 4)			IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
constant amplitude 3.5 mm	Hz		5 - 8.4	5 - 8.4
Constant acceleration, 1 g	Hz		8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27)	Impact resistances		9	9
semi-sinusoidal 15 g/11 ms				
Drop to IEC/EN 60068-2-31	Drop height	mm	50	50
Free fall, packaged (IEC/EN 60068-2-32)	m		0.3	0.3
<b>Electromagnetic compatibility (EMC)</b>				
Over voltage category			II	II
Pollution degree			2	2
Electrostatic discharge (IEC/EN 61131-2:2008)				
Air discharge (Level 3)	kV		8	8
Contact discharge (Level 2)	kV		4	4
Electromagnetic fields (IEC/EN 61131-2:2008)				
80 - 1000 MHz	V/m		10	10
1.4 - 2 GHz	V/m		3	3
2 - 2.7 GHz	V/m		1	1
Radio interference suppression (SmartWire-DT)			EN 55011 Class A	EN 55011 Class A
Burst (IEC/EN 61131-2:2008, Level 3)				
CAN/DP bus cable	kV		1	1
SmartWire-DT cables	kV		1	1
Radiated RFI (IEC/EN 61131-2:2008, Level 3)			10	10
<b>Ambient climatic conditions</b>				
Operating ambient temperature (IEC 60068-2)			-25 to +60	-25 to +60
Condensation			prevent with suitable measures	
Storage				
relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 - 95	5 - 95
<b>SmartWire-DT network</b>				
Module type			SmartWire-DT module (slave)	
Baud rate setting			Automatic	
Status SmartWire-DT			LED green/orange	
Connections			Plug, 8-pole	
plug connector			External device plug SWD4-8SF2-5	
Device supply voltage SWD module	U <sub>SWD</sub>	V DC, (%)	14.5 (±3)	
Current consumption at U <sub>SWD</sub>			→ Page 255	
<b>Operating mode</b>				

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			DIL-SWD-32-001	DIL-SWD-32-002
Manual/automatic mode			no	yes
Setting			–	Rotary switches
<b>Connection auxiliary contact</b>				
Quantity			2	2
Rated voltage <sup>1)</sup>	$U_e$	V DC	15	15
Input current for state 1, typical		mA	3	3
Potential separation			no	no
Cable length		m	≤ 2.8	≤ 2.8
Connection type			Push-In	Push-In
<b>Terminal capacity</b>				
solid		mm <sup>2</sup>	0.2 - 1.5 (AWG24 - AWG16)	
flexible with ferrule <sup>2)</sup>		mm <sup>2</sup>	0.25 - 1.5	0.25 - 1.5

**Notes**

- 1) own supply  
2) Minimum length 8 mm

### 14.6.5 Electronic motor-protective circuit-breaker PKE-SWD-..

		PKE-SWD-32	PKE-SWD PKE-SWD-CP
<b>General</b>			
Standards		IEC/EN 61131-2, EN 50178, IEC/EN 60947	IEC/EN 61131-2
Dimensions (W x H x D)	mm	45 x 39 x 77.5	45 x 70.3 x 47
Weight	kg	0.04	0.021
mounting		on DILM7 - DILM32	at PKE12/32/65
Mounting position		as DILM7 - DILM32	as PKE12/32/65
<b>Ambient mechanical conditions</b>			
Degree of protection (IEC/EN 60529, EN50178, VBG 4)		IP20	IP20
Vibrations (IEC/EN 61131-2:2008)			
Constant amplitude 3.5 mm	Hz	5 - 8.4	5 - 8.4
Constant acceleration, 1 g	Hz	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms	Impact resistances	9	9
Drop to IEC/EN 60068-2-31	mm	50	50
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	0.3
<b>Electromagnetic compatibility (EMC)</b>			
Over voltage category		II	II
Pollution degree		2	2
Electrostatic discharge (IEC/EN 61131-2:2008)			
Air discharge (Level 3)	kV	8	8
Contact discharge (Level 2)	kV	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)			
80 - 1000 MHz	V/m	10	10
1.4 - 2 GHz	V/m	3	3
2 - 2.7 GHz	V/m	1	1
Radio interference suppression (SmartWire-DT)		EN 55011 Class A	EN 55011 Class A
Burst (IEC/EN 61131-2:2008, Level 3)			
Fieldbus cable	kV	1	1
SmartWire-DT cables	kV	1	1
Radiated RFI (IEC/EN 61131-2:2008, Level 3)		10	10
<b>Ambient climatic conditions</b>			
Operating ambient temperature (IEC 60068-2)	°C	-25 to +60	-25 to +60
Condensation		prevent with suitable measures	prevent with suitable measures
Storage	°C	-30 to +70	-30 to +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95	5 - 95
<b>SmartWire-DT interface</b>			
Function		SmartWire-DT module (slave)	SmartWire-DT module (slave)
Baud rate setting		Automatic	Automatic
Status SmartWire-DT	LED	green/orange	green
Pin		Plug, 8-pole	Plug, 8-pole
plug connector		External device plug SWD4-8SF2-5	External device plug SWD4-8SF2-5

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			PKE-SWD-32	PKE-SWD PKE-SWD-CP
Device supply voltage SWD module	U <sub>SWD</sub>	V DC, (%)	14.5 (±3)	
Current consumption at U <sub>SWD</sub>		mA	→ Page 255	
<b>Operating mode</b>				
Manual/automatic mode			yes	–
Setting			Rotary switches	–
<b>Connection electrical enable</b>				
Cable length		m	≤ 2.8	–
Connection type			Push-In	–
<b>Terminal capacity</b>				
solid		mm <sup>2</sup>	0.2 - 1.5 (AWG24 - 16)	–
Flexible with ferrule (minimum section length 8 mm)		mm <sup>2</sup>	0.25 - 1.5	–



### 14.6.6 Electronic motor starter EMS-...-SWD-ADP

		EMS-...-2.4-SWD-ADP	EMS-...-9-SWD-ADP
<b>General</b>			
Standards		IEC/EN 60947-4-2	
Dimensions (W x H x D)	mm	30 x 157 x 139	
Weight	kg	0.32	
mounting		on mounting rail	
Mounting position		horizontal / vertical	
Degree of protection (IEC/EN 60529, EN50178, VBG 4)		IP20	
<b>Ambient climatic conditions</b>			
Operating ambient temperature (IEC 60068-2)	°C	-25 to +60	
Condensation		prevent with suitable measures	
Storage	°C	-40 to +80	
<b>Dielectric strength</b>			
Over voltage category		II	
Pollution degree		2	
Measurement of the clearance and creepage distance		EN 50178, UL 508, CSA C22.2, No. 142	
Dielectric strength		EN 50178	
Rated surge voltage invariability	kV	6	
<b>Electromagnetic compatibility (EMC)</b>			
Electrostatic discharge (DIN EN 61000-4-2)			
Air discharge (Level 3)	kV	8	
Contact discharge (Level 2)	kV	6	
Electromagnetic fields (DIN EN 61000-4-3)			
80 - 1000 MHz	V/m	10	
1.4 - 2 GHz	V/m	3	
2 - 2.7 GHz	V/m	1	
Radio interference suppression (DIN EN 61000-6-4)		Class A	
Burst (DIN EN 61000-4-4)			
Main circuits	kV	2	
SmartWire-DT cables	kV	1	
Fieldbus cable	kV	1	
Surge			
symmetric	kV	0.5	
asymmetric	kV	1	
EMC-inflow (DIN EN 61000-4-6)		V	
		10	
<b>SmartWire-DT interface</b>			
Module type		SmartWire-DT module (slave)	
Baud rate setting		Automatic	
Status SmartWire-DT	LED	green	
Connection		Pin contact, 8 pole; Connector: blade terminal SWD4-8MF2	
Device supply voltage SWD module	$U_{SWD}$	V DC, (%)	14.5 (±3)
Current consumption at $U_{SWD}$		→ Page 255	
<b>Potential separation</b>			
to supply voltage $U_{AUX}$		yes	

Notes 1) Minimum length 8 mm

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			EMS-...-2.4-SWD-ADP	EMS-...-9-SWD-ADP
<b>Supply voltage AUX</b>				
Rated operational voltage	$U_e$	VDC, (%)	24 (-15/+20)	
Residual ripple		%	–	
Max. power consumption at $U_{AUX}$		A	60	
Protection against polarity reversal			yes	
<b>Potential separation</b>				
Device supply voltage SWD module $U_{SWD}$			yes	
<b>Main circuits</b>				
Rated operational voltage VAC		VAC	42–500	
Basic insulation according to IEC/EN 60947-1				
between $U_{AUX}$ and switching voltage			500	
between $U_{SWD}$ and switching voltage			500	
Safe isolation according to IEC/EN 60947-1				
between $U_{AUX}$ and switching voltage			$\leq 300$ (e.g. 230/400, 277/480)	
between $U_{SWD}$ and switching voltage			$\leq 300$ (e.g. 230/400, 277/480)	
Safe isolation according to EN 50178				
between $U_{AUX}$ and switching voltage			500	
between $U_{SWD}$ and switching voltage			500	
<b>motor protection</b>				
Two-phase current measurement			2	
Measuring range	A		0.18 - 2.4	1.5 - 9.0
Phase failure monitoring				
Pick-up time	s		< 2	
Balance monitoring				
$I_{max} > I_{nenn} ((I_{max} - I_{min})/I_{max})$	%		$\geq 33 / \geq 67$	
$I_{max} < I_{nenn} ((I_{max} - I_{min})/I_{min})$	%		$\geq 33 / \geq 67$	
Pick-up time	s		150/2	
<b>Stall protection</b>				
I (L1) or I (L3)	A		–	> 45
Pick-up time			–	2
Tripping characteristic according to IEC 60947 → Section “7.3.5 Tripping characteristic”			Class 10	Class 10 ( $I_r \leq 4A$ ) Class 10A ( $I_r > 4A$ )
Nominal rated frequency	Hz		50/60	
<b>short-circuit protection</b>				
Fuse 16A gG / gL	kA		50 (500VAC)	
PKMO-4	kA		50 (415VAC)	
PKMO-6.3	kA		–	15 (415VAC)
<b>Terminal capacity</b>				

Notes 1) Minimum length 8 mm

		<b>EMS-...-2.4-SWD-ADP</b>	<b>EMS-...-9-SWD-ADP</b>
solid	mm <sup>2</sup>	0.75 – 2.5 (AWG20 - AWG14)	
flexible with ferrule <sup>1)</sup>	mm <sup>2</sup>	0.75 – 2.5 (AWG20 - AWG14)	

Notes 1) Minimum length 8 mm

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#### 14.6.7 M22-SWD connections

**M22-SWD-K11/M22-SWD-KC11**

**M22-SWD-LED-.../M22-SWD-LEDC-...**

**M22-SWD-K11LED-.../M22-SWD-K11LEDC-...**

	<b>M22-SWD-K11/ M22-SWD-KC11</b>	<b>M22-SWD-LED-.../ M22-SWD-LEDC-...</b>	<b>M22-SWD-K11LED-.../ M22-SWD-K11LEDC- ...</b>	<b>M22-SWD-R M22-SWD-INC</b>
<b>General</b>				
Standards	IEC/EN 61131-2, EN 50178			
Dimensions (W x H x D) mm	12 x 42 x 39/ 12 x 45 x 37	10 x 42 x 45/ 10 x 45 x 42	12 x 42 x 45/ 12 x 45 x 42	12 x 42 x 45/ 12 x 45 x 42
Weight g	10	10	10	10
Mounting position	Any			
<b>Ambient mechanical conditions</b>				
Degree of protection (IEC/EN 60529, EN50178, VBG 4)	IP20	IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
constant amplitude 3.5 Hz mm	5	5 - 8.4	5 - 8.4	5 - 8.4
constant acceleration 1 Hz g	8.4 - 150	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) Impact semi-sinusoidal 15 g/11 ms resistances	9	9	9	9
Drop (IEC/EN 60068-2-31); drop height mm	50	50	50	50
Free fall, packaged (IEC/EN 60068-2-32) m	0.3	0.3	0.3	0.3
<b>Electromagnetic compatibility (EMC)</b>				
Over voltage category	Not applicable			
Pollution degree	2	2	2	2
Electrostatic discharge (IEC/EN 61131-2:2008)				
Air discharge (Level 3) kV	8	8	8	8
Contact discharge (Level 2) kV	4	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)				
80-1000 MHz V/m	10	10	10	10
1.4 - 2 GHz V/m	3	3	3	3
2 - 2.7 GHz V/m	1	1	1	1
Radio interference suppression (SmartWire-DT)	EN 55011 Class A			
Burst (IEC/EN 61131-2:2008, Level 3)				
Supply cables kV	2	2	2	2
SmartWire-DT cables kV	1	1	1	1
Radiated RFI (IEC/EN 61131-2:2008, Level 3) V	10	10	10	10
<b>Ambient climatic conditions</b>				
Operating ambient temperature (IEC 60068-2) °C	-30 - +55	-30 - +55	-30 - +55	-30 - +55

	M22-SWD-K11/ M22-SWD-KC11	M22-SWD-LED-.../ M22-SWD-LEDC-...	M22-SWD-K11LED-.../ M22-SWD-K11LEDC- ...	M22-SWD-R M22-SWD-INC
Condensation	prevent with suitable measures			
Storage °C	-40 - 80	-40 - 80	-40 - 80	-40 - 80
Relative humidity, non-condensing (IEC/EN 60068-2-30) %	9 - 95	9 - 95	9 - 95	9 - 95
<b>SmartWire-DT network</b>				
Module type	SmartWire-DT module (slave)			
Baud rate setting	Automatic	Automatic	Automatic	Automatic
Status SmartWire-DT LED	green	green	green	green
Connections	Plug, 8-pole	Plug, 8-pole	Plug, 8-pole	Plug, 8-pole
plug connector	SWD4-8SF2-5/ M22-SWD-I...LP	SWD4-8SF2-5/ M22-SWD-I...LP	SWD4-8SF2-5/ M22-SWD-I...LP	SWD4-8SF2-5/ M22-SWD-I...LP
Number of insertion cycles	50	50	50	50
Device supply voltage V DC, SWD module U <sub>SWD</sub> (%)	14.5 (±3)			
Current consumption at U <sub>SWD</sub>	→ Page 255			
<b>function element</b>				
Contacts	1 change-over contact	–	1 change-over contact	–
Lifespan mechanical/electrical (operations)	1 x 10 <sup>6</sup>	–	1 x 10 <sup>6</sup>	–
LED display	no	yes	yes	no
Diagnostics	yes	no	yes	yes
fixing	Front mount/ base fixing	Front mount/ base fixing	Front mount/ base fixing	Front mount

### M22-SWD-K22/M22-SWD-KC22

### M22-SWD-K22LED-.../M22-SWD-K22LEDC-...

### M22-SWD-NOP(C)

	M22-SWD-K22/ M22-SWD-KC22	M22-SWD-K22LED-.../ M22-SWD-K22LEDC- ...	M22-SWD-NOP(C)
<b>General</b>			
Standards			
Dimensions (W x H x D) mm	17 x 42 x 39/ 17 x 45 x 37	17 x 42 x 45/ 17 x 45 x 42	12 x 42 x 39
Weight g	14	14	10
Mounting position			
<b>Ambient mechanical conditions</b>			
Degree of protection (IEC/EN 60529, EN50178, VBG 4)	IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)			
constant amplitude 3.5 Hz mm	5 - 8.4	5 - 8.4	5 - 8.4

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	M22-SWD-K22/ M22-SWD-KC22	M22-SWD-K22LED-.../ M22-SWD-K22LEDC- ...	M22-SWD-NOP(C)
constant acceleration 1 Hz g	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) Impact semi-sinusoidal 15 g/11 ms resistances	9	9	9
Drop (IEC/EN 60068-2-31); mm drop height	50	50	50
Free fall, packaged (IEC/EN 60068-2-32) m	0.3	0.3	0.3
<b>Electromagnetic compatibility (EMC)</b>			
Over voltage category			
Pollution degree	2	2	2
Electrostatic discharge (IEC/EN 61131-2:2008)			
Air discharge (Level 3) kV	8	8	8
Contact discharge (Level 2) kV	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)			
80-1000 MHz V/m	10	10	10
1.4 - 2 GHz V/m	3	3	3
2 - 2.7 GHz V/m	1	1	1
Radio interference suppression (SmartWire-DT)			
Burst (IEC/EN 61131-2:2008, Level 3)			
Supply cables kV	2	2	2
SmartWire-DT cables kV	1	1	1
Radiated RFI (IEC/EN 61131-2:2008, Level 3) V	10	10	10
<b>Ambient climatic conditions</b>			
Operating ambient temperature (IEC 60068-2) °C	-30 - +55	-30 - +55	-30 - +55
Condensation			
Storage °C	-40 - 80	-40 - 80	-40 - 80
Relative humidity, non-condensing (IEC/EN 60068-2-30) %	9 - 95	9 - 95	9 - 95
<b>SmartWire-DT network</b>			
Module type			
Baud rate setting	Automatic	Automatic	Automatic
Status SmartWire-DT LED	green	green	green
Connections	Plug, 8-pole	Plug, 8-pole	Plug, 8-pole
plug connector	SWD4-8SF2-5/ M22-SWD-I...LP	SWD4-8SF2-5/ M22-SWD-I...LP	SWD4-8SF2-5
Number of insertion cycles	50	50	50
Device supply voltage V DC, SWD module U <sub>SWD</sub> (%)	14.5 (±3)		
Current consumption at U <sub>SWD</sub>	→ Page 255		
<b>function element</b>			
Contacts	2 changeover contacts	2 changeover contacts	-

	<b>M22-SWD-K22/ M22-SWD-KC22</b>	<b>M22-SWD-K22LED-.../ M22-SWD-K22LEDC- ...</b>	<b>M22-SWD-NOP(C)</b>
Lifespan mechanical/electrical (operations)	1 x 10 <sup>6</sup>	1 x 10 <sup>6</sup>	–
LED display	no	yes	–
Diagnostics	yes	yes	–
fixing	Front mount/ base fixing	Front mount/ base fixing	–

### 14.6.8 Bus termination resistor, switch cabinet leadthroughs

		SWD4-RC8-10	SWD4-SFL8-20	SWD4-SML8-20
<b>General</b>				
Standards		IEC/EN 61131-2, EN 50178		
Dimensions (W x H x D)	mm	48.5 x 34.5 x 10	35 x 83 x 40	35 x 83 x 46
Weight	g	10	50	50
Mounting position		Any	Any	Any
<b>Ambient mechanical conditions</b>				
Degree of protection (IEC/EN 60529, EN50178, VBG 4)		IP20	IP67	IP67
Vibrations (IEC/EN 61131-2:2008)				
constant amplitude 3.5 mm	Hz	5 - 8.4	5 - 8.4	5 - 8.4
Constant acceleration, 1 g	Hz	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms	Impact resistances	9	9	9
Drop to IEC/EN 60068-2-31	Drop height mm	50	–	–
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	–	–
<b>Electromagnetic compatibility (EMC)</b>				
Over voltage category		II	–	–
Pollution degree		2	–	–
Electrostatic discharge (IEC/EN 61131-2:2008)				
Air discharge (Level 3)	kV	8	8	8
Contact discharge (Level 2)	kV	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)				
80 - 1000 MHz	V/m	10	10	10
1.4 - 2 GHz	V/m	3	3	3
2 - 2.7 GHz	V/m	1	1	1
Radio interference suppression (SmartWire-DT)		EN 55011 Class A	–	–
Burst (IEC/EN 61131-2:2008, Level 3)			–	–
SmartWire-DT cables	kV	1	–	–
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V	10	10	10
<b>Ambient climatic conditions</b>				
Ambient temperature (IEC 60068-2)	°C	-25 - +55	-25 - +55	-25 - +55
Condensation		prevent with suitable measures		
Storage	°C	-40 - +70	-40 - +70	-40 - +70
Relative humidity, no condensation (IEC/EN 60068-2-30)	%	5 - 95	5 - 95	5 - 95
<b>Connection options</b>				
SWD-In		Socket, 8-pole	Plug, 8 pole	Plug, 8-pole
Number of insertion cycles		≥ 200	≥ 200	≥ 500
SWD-Out		–	Socket, 8 pole	Socket, 8-pole
Number of insertion cycles		–	≥ 500	≥ 200
Current consumption (15-V-SmartWire-DT supply)		→ Page 255		



### 14.6.9 Enclosure bushings: plug, socket

		SWD4-SF8-20	SWD4-SM8-20
<b>General</b>			
Standards		IEC/EN 61131-2 EN 50178	IEC/EN 61131-2 EN 50178
Dimensions (W x H x D)	mm	24 x 26 x 162	24 x 26 x 170
Weight	g	20	22.5
Mounting position		Any	Any
<b>Ambient mechanical conditions</b>			
Degree of protection (IEC/EN 60529, EN50178, VBG 4)		IP67	IP67
<b>Ambient climatic conditions</b>			
Operating ambient temperature (IEC 60068-2)	°C	-25 - +55	-25 - +55
Condensation		prevent with suitable measures	
Storage	°C	-40 - +70	-40 - +70
relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95	5 - 95
<b>Connection options</b>			
SWD-In		–	Plug, 8-pole
Number of insertion cycles		–	≥ 500
SWD-Out		Socket, 8-pole	–
Number of insertion cycles		≥ 500	–
Current consumption (15-V-SmartWire-DT supply)			→ Page 255

### 14.6.10 Coupling, plug

		SWD4-8SFF2-5	SWD4-8SF2-5	SWD4-8FRF-10
<b>General</b>				
Standards		IEC/EN 61131-2, EN 50178		
Dimensions (W x H x D)	mm	48.5 x 34.5 x 10	15 x 36.5 x 17.5	35 x 90 x 35
Weight	g	4.5	5.5	42
Mounting position		Any	Any	Any
<b>Ambient mechanical conditions</b>				
Degree of protection (IEC/EN 60529, EN50178, VBG 4)		IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
constant amplitude 3.5 mm	Hz	5 - 8.4	5 - 8.4	5 - 8.4
constant acceleration 1 g	Hz	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27)	Impact resis- tances	9	9	9
<b>Electromagnetic compatibility (EMC)</b>				
Electrostatic discharge (IEC/EN 61131-2:2008)				
Air discharge (Level 3)	kV	8	–	–
Contact discharge (Level 2)	kV	4	–	–
<b>Ambient climatic conditions</b>				
Operating ambient temperature (IEC 60068-2)	°C	-25 - +55	-25 - +55	-25 - +55
Condensation		prevent with suitable measures		

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		<b>SWD4-8SFF2-5</b>	<b>SWD4-8SF2-5</b>	<b>SWD4-8FRF-10</b>
Storage	°C	-40 - +70	-40 - +70	-40 - +70
relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95	5 - 95	5 - 95
<b>Connection options</b>				
SWD-In		Plug, 8-pole	Plug connector	Plug, 8-pole
Number of insertion cycles		≥ 200	1	≥ 200
SWD-Out		Plug, 8-pole	Socket, 8-pole	Push in terminals
Number of insertion cycles		≥ 200	≥ 200	–
Current consumption (15-V-SmartWire-DT supply)		→ Page 255		

### 14.6.11 SWD base modules for signal towers

SmartWire-DT base modules for signal towers are meant exclusively for use with SmartWire-DT® systems.

			SL4-SWD	SL7-SWD
<b>General</b>				
Standards			IEC/EN 61131-2, EN 50178	
Dimensions (W x H x D)	mm		80 x 157 x 80	80 x 192 x 80
Weight	kg		0.204	0.293
mounting			Screw fixing	
Mounting position			Any	
<b>Ambient mechanical conditions</b>				
Degree of protection (IEC/EN 60529, EN50178, VBG 4)			IP66	
Can be used in environments with pollution degree			2	
Vibrations (IEC/EN 61131-2:2008)				
	constant amplitude 3.5 mm	Hz	5 – 8.4	
	Constant acceleration, 1 g	Hz	8.4 – 150	
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms			Impact resistances	3 per shaft, pos. and neg.
Drop to IEC/EN 60068-2-31	Drop height	mm	100	
Free fall, packaged (IEC/EN 60068-2-32)			m	
			0.3	
<b>Insulation resistance</b>				
Over voltage category			II	
Pollution degree			2	
Measurement of the clearance and creepage distance			EN 50178, UL 508, CSA C22.2, No. 142	
Dielectric strength			EN 50178	
<b>Electromagnetic compatibility (EMC)</b>				
Electrostatic discharge (IEC/EN 61131-2:2008)			Performance criterion B	
	Air discharge (Level 3)	kV	8	
	Contact discharge (Level 2)	kV	4	
Electromagnetic fields (IEC/EN 61131-2:2008)				
	80 - 1000 MHz	V/m	10	
	1.4 - 2 GHz	V/m	10	
	2 - 2.7 GHz	V/m	10	
Radio interference suppression (SmartWire-DT) EN55011			Class A	
Burst (IEC/EN 61131-2:2008, Level 3)				

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			SL4-SWD	SL7-SWD
Supply cables	kV		2	
Signal cables	kV		2	
SmartWire-DT cables	kV		1	
Surge (IEC/EN 61131-2:2008, Level 1)			Figure 99:	Performance criterion B (tested with 0.5kV/0.5kV)
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V		10	
<b>Ambient climatic conditions</b>				
Operating ambient temperature (IEC 60068-2)	°C		-30 to +60	
Condensation			prevent with suitable measures	
Storage	°C		-30 to +85	
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 – 95	
<b>SmartWire-DT interface</b>				
Module type			SmartWire-DT module (slave)	
Baud rate setting			Automatic	
Status SmartWire-DT	LED		green	
Connection			Pin contact, 8 pole; Connector: blade terminal SWD4-8MF2	
Device supply voltage SWD module	$U_{SWD}$	V DC, (%)	14.5 (±3)	
Current consumption at $U_{SWD}$			→ Page 255	
<b>Potential isolation</b>				
			From supply voltage $U_{AUX}$ From 24 VDC external supply voltage From the light/acoustic modules	
			yes	
<b>Supply voltage AUX</b>				
Rated operational voltage	$U_e$	VDC, (%)	24 (-15/+20)	
Residual ripple		%	–	
max. current consumption		A	0.9	1.5
Protection against polarity reversal			yes	
<b>Potential isolation</b>				
			From 24 VDC external auxiliary power From device supply voltage for SmartWire-DT modules $U_{SWD}$	
			yes	
			From the light/acoustic modules	
			no	
<b>External supply voltage 24 V DC</b>				
Connection type			Push-In	
solid		mm <sup>2</sup>	0.25 – 1.5	
flexible with ferrule <sup>1)</sup>		mm <sup>2</sup>	0.25 – 1.5	

			SL4-SWD	SL7-SWD
UL/CSA solid or stranded		AWG	24 – 16	
Rated operating voltage	$U_e$	VDC, (%)	24 (-15/+20)	
Residual ripple		%	–	
max. current consumption		A	0.9	1.5
Protection against polarity reversal			yes	
<b>Potential isolation</b>				
From supply voltage $U_{AUX}$			yes	
From device supply voltage for SmartWire-DT modules $U_{SWD}$				
From the light/acoustic modules			no	
<b>Light and acoustic modules</b>				
Max. quantity			5	
Max. current per module		mA	300	
Short-circuit / overload proof			yes, with diagnostics	

1) Minimum length 8 mm

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14.6.12 NZM circuit-breakers-...

		NZM-XSWD-704
<b>General</b>		
Standards		IEC/EN 61131-2; EN 50178
Dimensions W x H x D	mm	35 x 90 x 101
Weight	kg	0.1
mounting		Top-hat rail IEC/EN 60715, 35 mm
Mounting position		vertical
<b>Ambient mechanical conditions</b>		
Degree of protection (IEC/EN 60529, EN50178, VBG 4)		IP20
Vibrations (IEC/EN 61131-2:2008)		
constant amplitude 3.5 mm	Hz	5 - 8.4
Constant acceleration, 1 g	Hz	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27)	Impact resistances	9
semi-sinusoidal 15 g/11 ms		
Drop to IEC/EN 60068-2-31	Drop height	
	mm	50
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3
<b>Electromagnetic compatibility (EMC)</b>		
Over voltage category		II
Pollution degree		2
Electrostatic discharge (IEC/EN 61131-2:2008)		
Air discharge (Level 3)	kV	8
Contact discharge (Level 2)	kV	4
Electromagnetic fields (IEC/EN 61131-2:2008)		
80-1000 MHz	V/m	10
1.4 - 2 GHz	V/m	3
2 - 2.7 GHz	V/m	1
Radio interference suppression (SmartWire-DT)		EN 55011 Class A
Burst (IEC/EN 61131-2:2008, Level 3)		
Supply cables	kV	2
Signal cables	kV	1
SmartWire-DT cables	kV	1
Surge (IEC/EN 61131-2:2008, Level 1)		–
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V	10
<b>Ambient climatic conditions</b>		
Operating ambient temperature (IEC 60068-2)	?C	–25 - +55
Condensation		prevent with suitable measures
Storage	°C	–40 - +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95
<b>SmartWire-DT interface</b>		
Module type		SmartWire-DT module (slave)

			NZM-XSWD-704
Baud rate setting			Automatic
Status SmartWire-DT	LED		green
Pin			Plug, 8-pole Connection plug: External device plug SWD4-8SF2-5
Device supply voltage SWD module	$U_{SWD}$	V DC, (%)	14.5 ( $\pm 3$ )
Current consumption at $U_{SWD}$			→ Page 255
Connection supply and I/O			
Connection type			Push-In
solid		mm <sup>2</sup>	0.2 - 1.5 (AWG24 - AWG16)
flexible with ferrule <sup>1)</sup>		mm <sup>2</sup>	0.25 - 1.5
24 V DC supply for output supply			
Rated operational voltage	$U_e$	V	–
Residual ripple of input voltage		%	–
Protection against polarity reversal			–
1) Minimum length 8 mm			
			NZM-XSWD-704
Digital inputs			
Quantity			2
Input current		mA	normally 4 at 24 V DC
Voltage level to IEC/EN 61131-2 Limit value type 1			Low < 5 V DC; High > 15 V DC
Input delay			High → Low typ. < 0.2 ms Low → High typ. < 0.2 ms
Status display inputs	LED		yellow
Digital semiconductor outputs			
Quantity			2
Output current		A	0.2 at 24 V DC
Short-circuit tripping current		A	
lamp load	$R_{LL}$	W	
Overload proof			yes, with diagnostics
Switching capacity			EN 60947-5-1 utilization category DC-13
Relay outputs			
Quantity			–
Contact type			–
c (contacts)			–
Utilization category AC-1, 250 V, 6 A			–
Utilization category AC-15, 250 V, 3 A			–
Utilization category DC-13, 24 V, 1 A			–
Safe disconnection		V AC	–
minimum load current		mA	–
Response/reset time		ms	–
Bounce duration		ms	–
short-circuit protection			–
Status display outputs	LED		–
Potential separation			
Inputs for SmartWire-DT			yes

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	<b>NZM-XSWD-704</b>
Semi-conductor outputs for SmartWire-DT	yes
Semi-conductor outputs for inputs	–
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