

SmartWire-DT SWD module IP20



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Original operating manual

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Subject to alteration.



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 changes have been made in comparison to previous issues (1st edition from 02/2009):

Publication date	Page	Keyword	New	Modification
07/2013	203	Chapter "SL4-SWD and SL7-SWD base modules for signal towers"	✓	
	275	EU5E-SWD-4PT-2 added to → Section "2.14 Analog modules EU5E-SWD-4PT and EU5E-SWD-4PT-2", page 59		✓
	275	„SL4-SWD“, „SL7-SWD“, „EU5E-SWD-4PT-2“ added to table „Maximum current consumption of SWD modules on USWD“		✓
	278	„SL4-SWD“, „SL7-SWD“, „EU5E-SWD-4PT-2“ added to „Data requirement (bytes) SmartWire-DT modules“		✓
	291	„SL4-SWD“, „SL7-SWD“, „EU5E-SWD-4PT-2“ added to table Table 14.8.3, „I/O modules, analog“		✓
	298	Chapter "M22-SWD connections"	✓	
11/2013	139	Chapter "PKE-SWD-CP, Connection for circuit-breaker PKE"	✓	
	153	Chapter 7 „Electronic motor starter EMS-...-SWD-ADP“	✓	
04/2014	213	Chapter "Interface module MCB-HK-SWD for circuit-breakers and residual current circuit-breakers"	✓	
05/2015	21	Corrections in Chapter "I/O modules EU5E-SWD..."		✓
	155	Chapter "Pilot devices M22-SWD..." restructured		✓
	159	Chapter "Potentiometers M22-SWD-R"	✓	
	160	Chapter "Encoders M22-SWD-INC"	✓	
08/2015	51.56	EU5E-SWD-4PT-2, temperature corrected		✓
04/2017	147, 149	Trip reasons changed in Section "Outputs" and Section "Differential trip indication (TRIPR)"		✓
	149	Measuring accuracy changed in Section "Relative current value (I-REL)"		✓
	34	"EU5E-SWD-4D4D-R module	✓	✓
09/2017	34 ff.	Module "EU5E-SWD-4D4D-R" corrected		✓
12/2017	155 ff.	Dimmable LED		✓
	–	Chapter 7 „Electronic motor starter EMS-...-SWD-ADP“ replaced with "EMS-...-SWD, Electronic Motor Starter", MN034002ZU		✓

0 About this manual

0.2 SmartWire-DT system overview

Publication date	Page	Keyword	New	Modification
01/2020	155 ff	M22-SWD-LED(C)-RGB added to Chapter "Pilot devices M22-SWD..."		✓
	157	Multi-color indicator light added to Chapter "M22-SWD-LED(C)-RGB"	✓	
	280	Multi-color indicator light added to Chapter "Color tables M22-SWD-LED(C)-RGB"	✓	
	160	Chapter "Encoders M22-SWD-INC" parameter configuration modified	✓	✓
07/2021	247 ff	Chapter "Interface PXR-RCAM-SWD for NZM compact circuit-breakers"	✓	
	279	Chapter "SWD cable length"	✓	
02/2022	265	Chapter "Acyclic data", Important note regarding registers	✓	
02/2023	160	Function added Encoder M22-SWD-INC		✓
10/2024	247	Engineering added PXR-RCAM-SWD		✓

0.2 SmartWire-DT system overview

The SmartWire-DT communication 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.

The SmartWire-DT system makes it possible to connect up to 99 modules to a SmartWire-DT line.

These modules can be SmartWire-DT modules used to connect DIL contactors, 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.

0.2.1 SWD-Assist

The SmartWire-DT planning and ordering program (SWD-Assist) can be extremely useful when planning and configuring a SWD line in terms of hardware and software.

SWD Assist provides support in selecting and configuring the various SWD components and the SWD network.

The SWD-Assist planning program has the current consumption specifications for all SmartWire-DT modules. During planning, it will automatically calculate and display the corresponding system's current consumption.

The latest version, which features all currently supported SWD modules, can be downloaded by using the integrated update function in SWD-Assist or directly from the Eaton Download Center:



SWD-Assist runs on the following operating systems: Windows Vista (32 Bit), Windows 7, Windows 8 and Windows 10.



The **SWD Assist software** is available free of charge **for download** on the Eaton website at:

They can be quickly located at

Eaton.com → Customer support → Download center – Software by entering "SWD-Assist" as a search term into the Quick Search field.

T-connectors are supported in SWD-Assist Version V2.20 and higher; Block modules are supported in Version V2.40 and higher.

0.3 Additional documents dealing with SmartWire-DT

For more information on the subject of SmartWire-DT, please refer to
in the following manual:

- MN05006002Z, SmartWire-DT The System
- MN120006, SmartWire-DT module IP67
- MN05013002Z SmartWire-DT Gateways
- MN05002002Z signal modules (chapter „Diagnostics on the slave“)

in the Installation instructions:

- IL04716001Z, SWD4...: Wiring material and accessories
- IL05032ZU, PXR-RCAM-SWD NZM Interface
- IL050001Z, cable adapter ("SWD4-FFR-PF1-1, SWD4-FFR-ST1-1")
- IL05006001Z SWD gateways and power feeder module ("EU5C-SWD-PF...")
- IL05006002Z SWD input/output modules ("EU5E-SWD-...")
- IL0120005Z, SWD input/output modules ("EU1E-SWD-...", EU2E-SWD-..., EU1S-SWD-..., EU2A-SWD-...")
- IL0120006ZU SWD input/output modules ("EU6E-SWD...", EU8E-SWD-...")
- IL120007ZU SWD input/output modules ("EU1HE-SWD...")



The aforementioned documents, as well as the manual you are reading right now, can also be downloaded free of charge from the Internet in PDF format at:

<https://www.eaton.com/gb/en-gb/support/download-center.html>

www.eaton.com/gb/ → **Customer support** → **Download center – Documentation**

Enter the document number ("05006002" or "**120006**", for example) or "SWD" into the Quick Search text field.

0.4 Target group

This manual is intended for engineers, electricians, and automation technicians. Electrical engineering and physics-related knowledge and skills, as well as advanced familiarity with the field bus being used, will be required in order to be able to commission the corresponding devices.
In addition, readers must be familiar with how to use the SmartWire-DT system.



CAUTION

Installation requires qualified electrician

0.5 Writing conventions

Symbols used in this manual have the following meanings:

- Indicates instructions to be followed.

0.5.1 Hazard warnings of material damages

ACHTUNG

Warns about the possibility of material damage.

0.5.2 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.

0.5.3 Tips



Indicates useful tips.

0 About this manual
0.5 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

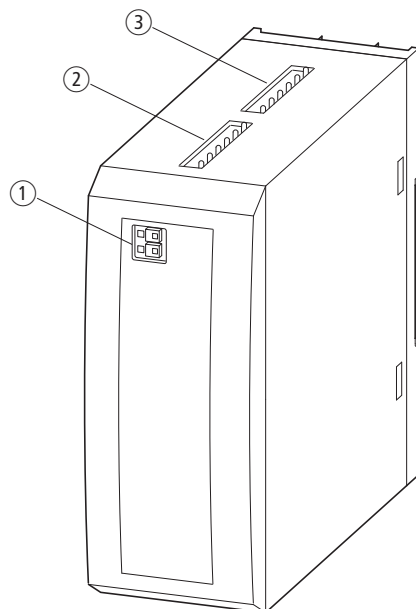


Figure 1: Connections of the EU5C-SWD-PF1-1 module

- 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.

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

1.2 EU5C-SWD-PF1-1

1.2.2 Engineering

1.2.3 Area of application of the SmartWire-DT power module EU5C-SWD-PF1-1 line AWG24 up to AWG16

- 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 65).



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 "Mount the external device plug" section in manual MN05006002Z-EN (previously AWB2723-1617en).

The connection terminals are suitable for cables AWG24 to AWG16 and flexible conductors with a cross section of 0.5 to 1.5 mm².

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

1.2 EU5C-SWD-PF1-1

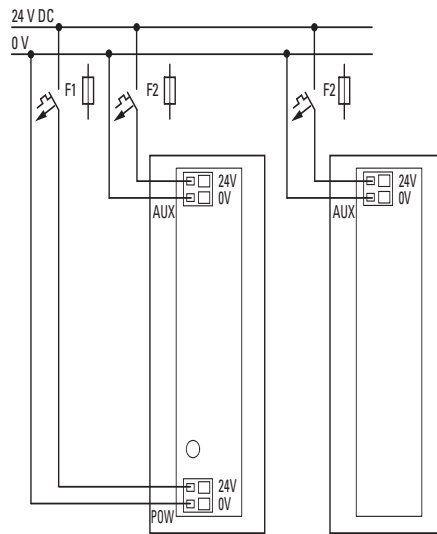


Figure 2: Terminal capacities

- flexible: cross-section 0.25 mm² to 1.5 mm², with the ferrule (minimum length 8 mm)
- solid: 0.14 to 1.5 mm²



Information on the cable protection is provided on Page 20

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

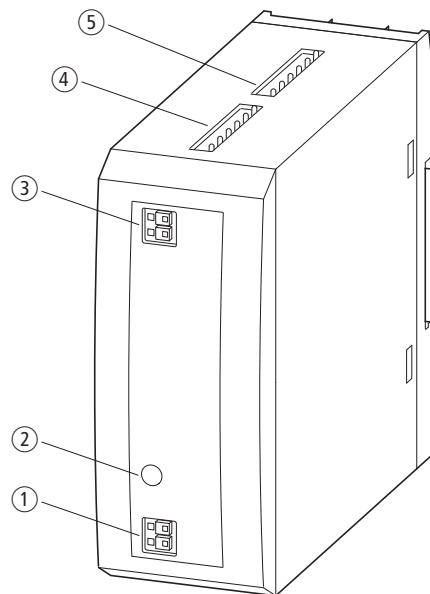


Figure 3: Connections of the EU5C-SWD-PF2-1 module

- 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 DC supply voltage (AUX) of the module. There is voltage reversal and EMC protection.

1.3.2 Engineering

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 65).



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 mm².

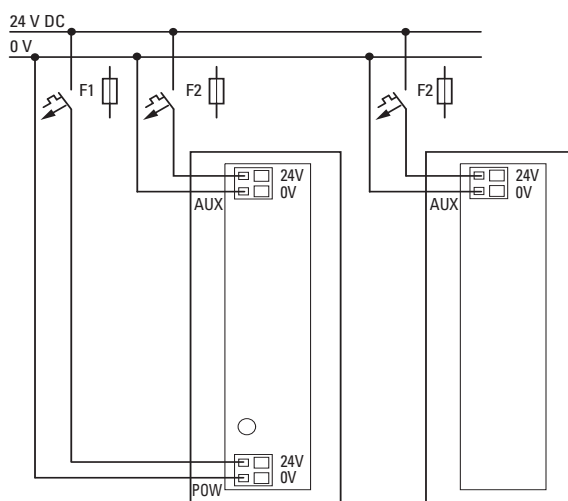


Figure 4: Terminal capacities

- flexible, cross-section 0.25 mm² to 1.5 mm², 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 mm²

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 AWG24 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 AWG24 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 I/O 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 14.7, „SWD module interoperability requirements“, page 282.

2.2 Surface mounting

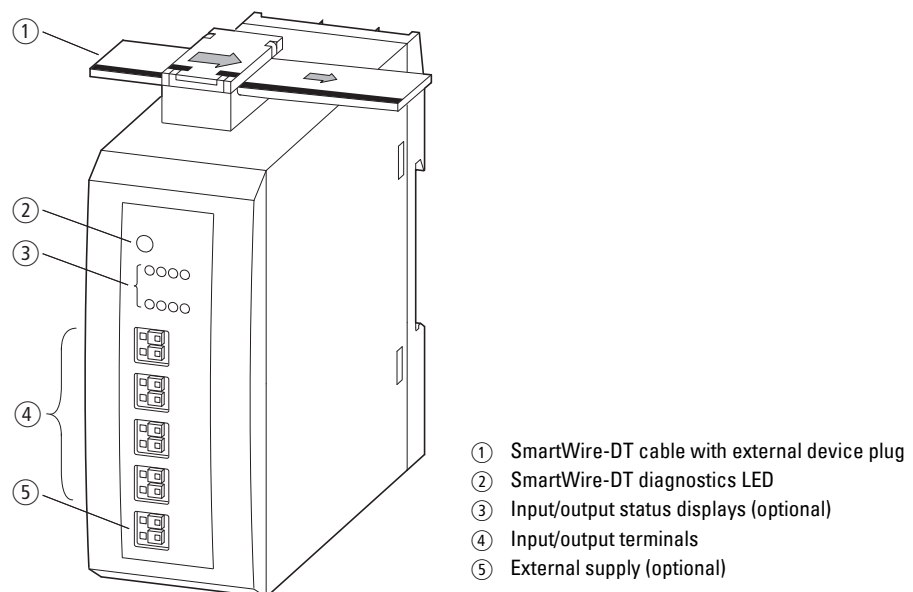


Figure 5: Connections of a SmartWire-DT I/O module

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 designed to accommodate wires with a gauge of AWG24 to AWG16 and wires with a cross-sectional area of 0.25 to 1.5 mm².



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 275.

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 SWD modules with the EtherCAT field bus", page 269.

2.5 Installation

The SmartWire-DT input/output modules are envisaged for top hat mounting. They must be installed in a vertical position.

- ▶ Mount the module on the top hat rail.

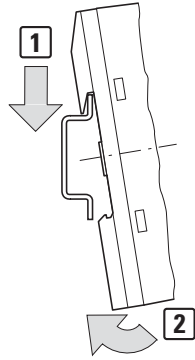


Figure 6: Mounting on top-hat rail

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



Detailed instructions explaining how to assemble an SWD4-8SF2-5 SmartWire-DT external device plug onto an 8-pin SmartWire-DT ribbon cable can be found in the "SmartWire-DT, The System" manual, in the "Mount the external device plug" section.

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 capacities

- flexible: cross-section 0.25 mm² to 1.5 mm², with the ferrule (minimum length 8 mm)
- solid: 0.25 to 1.5 mm²
- AWG24 to AWG16

2.5.3 Wiring of analog sensors/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.

2 I/O modules EU5E-SWD...

2.5 Installation

- Lay the AC supply voltage cables in separate cable ducts to those used for signal or data cables.
- Lay signal and data cables as close as possible to the earthed surfaces of the switchgear cabinet.

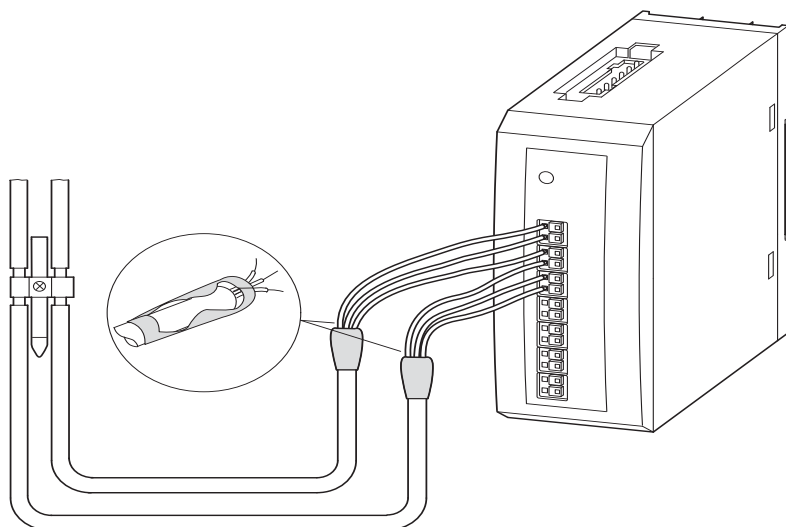


Figure 7: Wiring of analog sensors/actuators

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

ACHTUNG

Switch off the entire SmartWire-DT system before replacing SmartWire-DT input/output 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.

ACHTUNG

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	Color	State	Message
SWD	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	- addressing process in progress - after gateway power On - after actuation of the configuration button on the gateway - Module not in current configuration - invalid type
		flashing (3 Hz)	Device reports a diagnostics. (see section "Programming", subsection "Diagnostics").

2.5.7 Detailed descriptions

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

Digital modules IP20

- EU5E-SWD-8DX → Page 26
- EU5E-SWD-4DX → Page 29
- EU5E-SWD-4D4D → Page 32
- EU5E-SWD-4D4D-R → Page 36
- EU5E-SWD-4D2R → Page 42
- EU5E-SWD-X8D → Page 46

Analog modules IP20

- EU5E-SWD-4AX → Page 49
- EU5E-SWD-2A2A → Page 54
- EU5E-SWD-4PT / EU5E-SWD-4PT-2 → Page 59

2.6 Digital module 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 SmartWire-DT diagnostic LED indicates the network status.

2.6.2 Surface mounting

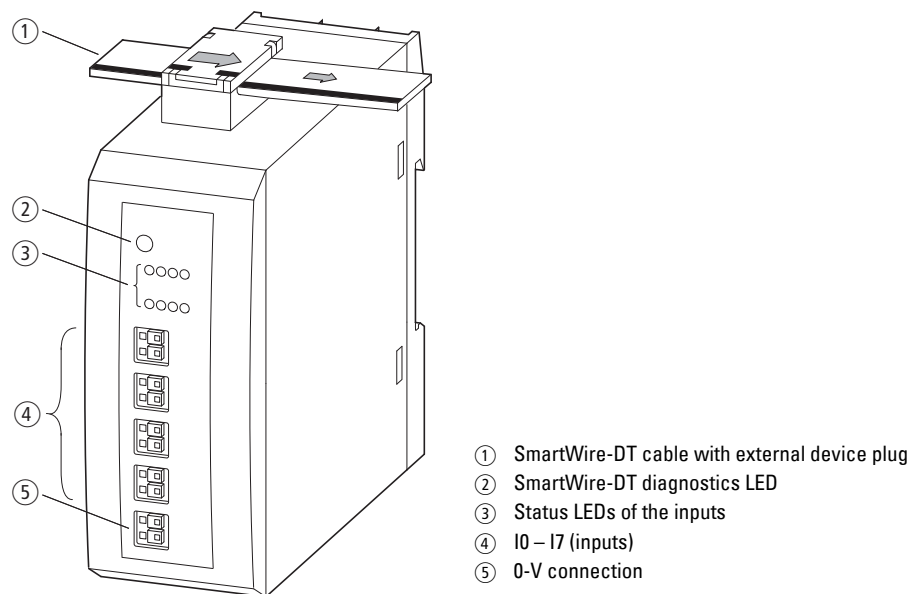


Figure 8: Connections of the module EU5E-SWD-8DX

2.6.3 Engineering

There are no specific engineering notes for this device model.

2.6.4 Installation

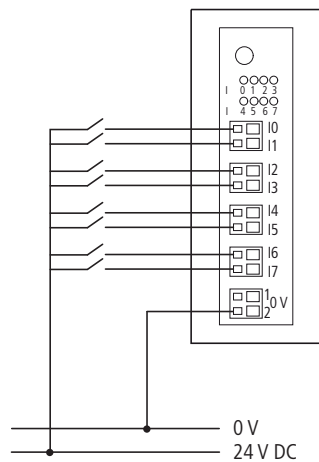


Figure 9: Connecting inputs and reference potential

- ▶ Connect the sensors to the corresponding inputs I0 to I7.
- ▶ Connect the reference potential 0 V DC to connection 0V.

2.6.5 Parameterization

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

Fieldbus EtherCAT

Please note the general information for configuring parameters
→ Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269, particularly
→ Section , „Device options“, page 269..

2.6.7 Programming

The module has two input bytes at its disposal.

2.6.7.1 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	–	–

2 I/O modules EU5E-SWD...

2.6 Digital module EU5E-SWD-8DX

Bit	Designation	Description
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
I7	I6	I5	I4	I3	I2	I1	I0

Bit	Designation	Description
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 Digital module EU5E-SWD-4DX

2.7.1 INTRODUCTION

SmartWire-DT I/O module EU5E-SWD-4DX provides four digital inputs I0 to I3. The inputs are three-wire digital inputs, and the module also includes the 24 V supply for them.

The inputs' status is indicated with the help of LEDs.

The SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.7.2 Surface mounting

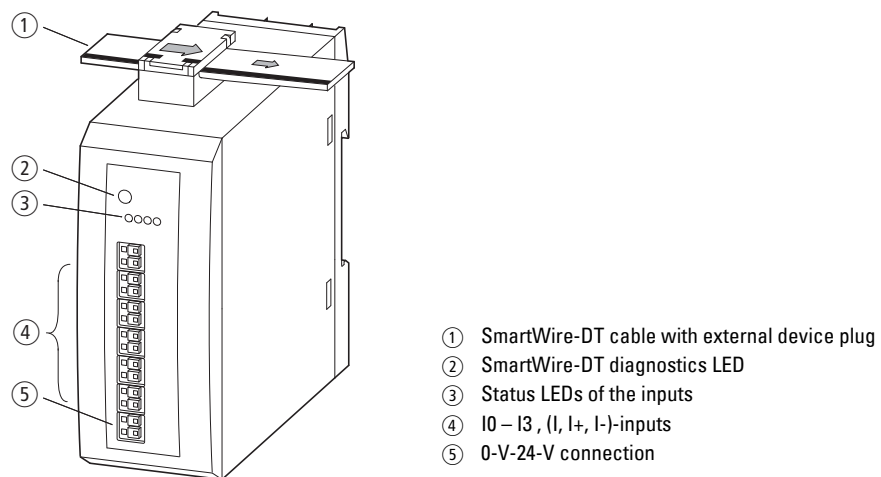


Figure 10: Layout of module EU5E-SWD-4DX

2.7.3 Engineering

The four inputs use a three-wire connection configuration.

Input	Description
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.

2 I/O modules EU5E-SWD...

2.7 Digital module EU5E-SWD-4DX



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

2.7.4 Installation

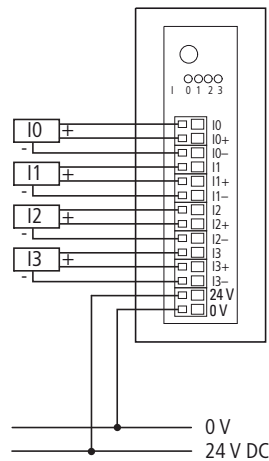


Figure 11: Connecting inputs and power supply

- ▶ 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 Parameterization

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

Fieldbus EtherCAT

Please note the general information for configuring parameters

→ Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269, particularly

→ Section , „Device options“, page 269.

2.7.7 Programming

The module has two input bytes at its disposal.

2.7.7.1 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	—	—	—

Bit	Designation	Description
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	Description
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 fault cause (bit 4 in input byte 0 is set):

Value	Description
0x13	Short-circuit/overload at supply voltage

2.8 Digital module 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 inputs'/outputs' status is indicated with the help of LEDs.

The SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.8.2 Surface mounting

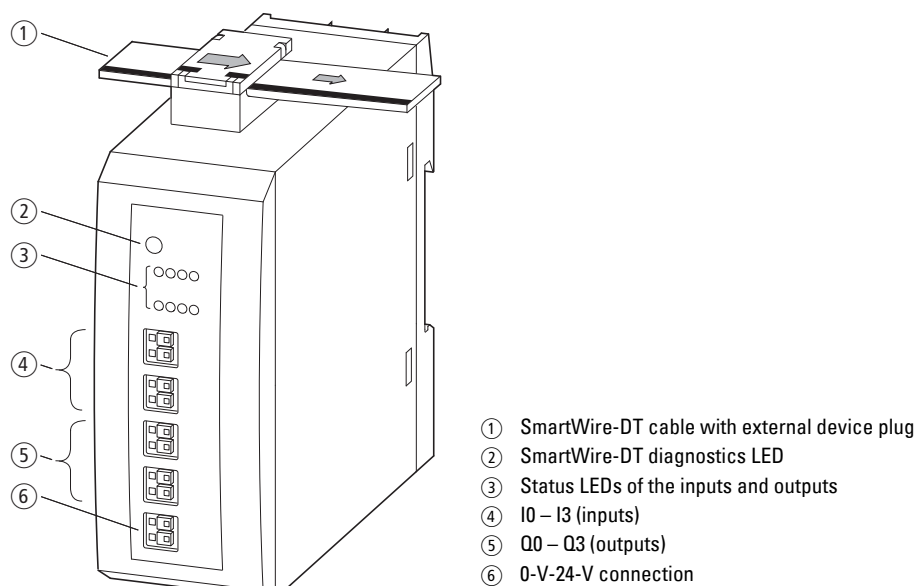


Figure 12: Connections of the modules EU5E-SWD-4D4D

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.

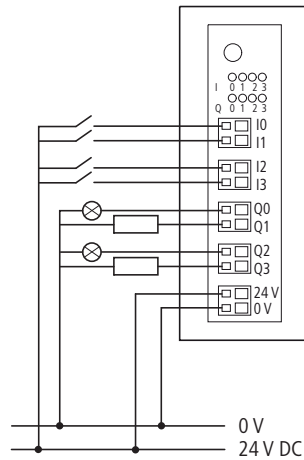


Figure 13: Connecting inputs/outputs and power supply

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 Parameterization

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

Fieldbus EtherCAT

Please note the general information for configuring parameters

- Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269, particularly
- Section , „Device options“, page 269.

2.8.7 Programming

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

2 I/O modules EU5E-SWD...

2.8 Digital module EU5E-SWD-4D4D

2.8.7.1 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	—	—	—

Bit	Designation	Description
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	Description
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	Description
0	Q0	Actuation output Q0
1	Q1	Actuation output Q1
2	Q2	Actuation output Q2
3	Q3	Actuation output Q3
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

2.8.7.3 Diagnostics

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

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

2.9 Digital module EU5E-SWD-4D4D-R

2.9.1 INTRODUCTION

The SmartWire-DT I/O module EU5E-SWD-4D4D-R 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 module is retentive, i.e., the outputs' state will be maintained even in the event of a loss of voltage or communications or if the controller is stopped.

The inputs'/outputs' status is indicated with the help of LEDs.

Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.9.2 Surface mounting

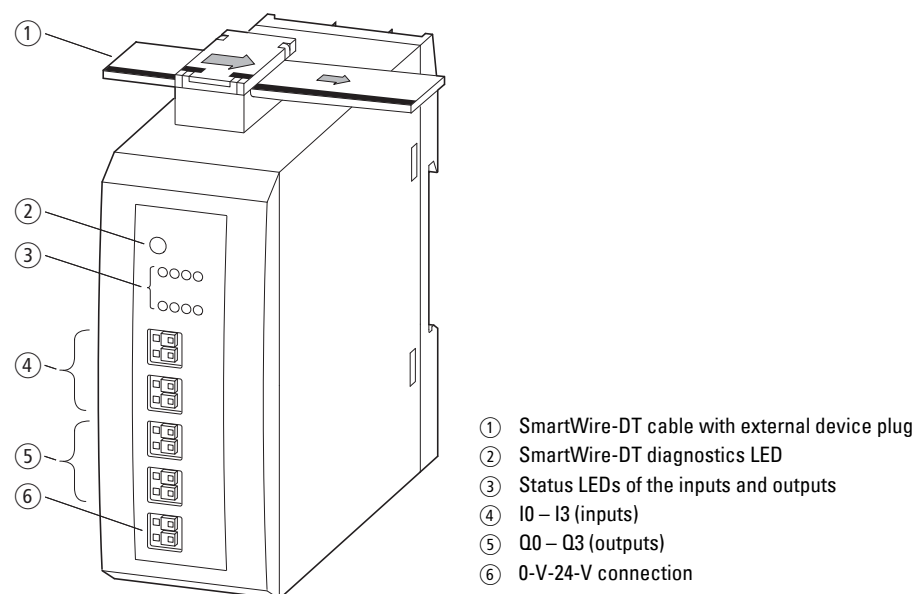


Figure 14: Connections of the modules EU5E-SWD-4D4D-R

2.9.3 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 outputs are ready for operation again.

By configuring the module appropriately, the outputs' behavior can be changed in such a way that the output state will not be reset automatically in certain cases, such as a communication error on the field bus or the PLC stopping.



DANGER

As a result of unintended actuation!
When a project is transferred to a controller, it will have an immediate effect on the controller's ongoing operation. This may result in errors in the process being controlled. The safety mechanisms being used on site must not be disabled as a result of a project being transferred.

Precondition:

- There must be 24 VDC at Upow on the gateway
- If EU5C-SWD-PF..-1 power feeder modules are installed upstream of the I/O module but downstream of the gateway, they must also be powered via the Upow terminal.
- There must be 24 VDC at the 0 V, 24 V terminals on the I/O module in order to power the outputs
- The output channels must be configured appropriately

Condition for disconnection:

- The 24 VDC at the I/O module (power for outputs) being removed -> No energy for driving the downstream contactors. However, the outputs remain logically "switched" and would remain on when the power is restored.
- The Upow 24 V at the coordinator (gateway) or EU5C-SWD-PF2-1 module being switched off. This would cause the module to lose its operating voltage (15 V) and no longer be able to drive the outputs. After switching the power back on, the outputs would remain off.
- The configuration button on the gateway being pressed or the corresponding function being run in SWD-Assist, triggering a new configuration import as a result. In this case, SmartWire-DT would restart and the switched outputs would be switched off for a brief moment (a few 100 ms).
- Loading a new PLC configuration with modified parameters.

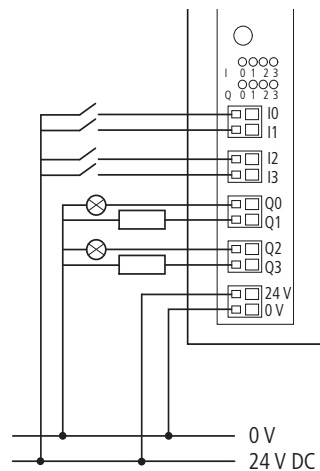


Figure 15: Connecting inputs/outputs and power supply

2.9.4 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
- ▶ Connect the module to the SmartWire-DT network.

2.9.5 Parameterization

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.

Retentive behavior outputs Q0..Q3

The selection for this parameter defines the behavior of the outputs in the event that:

- Communication between the SmartWire-DT coordinator (e.g., gateway) and the higher-level controller is interrupted
or
- The controller switches to a stop

Normally, all outputs will be switched off in these cases.

Details to retentive behavior → Section 2.9.3, „Engineering“, page 36.

Parameter	Setting options	Basic Setting
Retentive behavior output Q0	• Output Q0 will retain its state even if there is a loss of communication or the controller stops • Output Q0 will be reset	Output Q0 will be reset
Retentive behavior output Q1	• Output Q1 will retain its state even if there is a loss of communication or the controller stops • Output Q1 will be reset	Output Q1 will be reset
Retentive behavior output Q2	• Output Q2 will retain its state even if there is a loss of communication or the controller stops • Output Q2 will be reset	Output Q2 will be reset
Retentive behavior output Q3	• Output Q3 will retain its state even if there is a loss of communication or the controller stops • Output Q3 will be reset	Output Q3 will be reset

2.9.6 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: retentive behavior

Bit	Parameter	Configuration	Default
0	Retentive behavior Output Q0	1: Output Q0 will retain its state even if there is a loss of communication or the controller stops 0: Output Q0 will be reset	0: Output Q0 will be reset
1	Retentive behavior Output Q1	1: Output Q1 will retain its state even if there is a loss of communication or the controller stops 0: Output Q1 will be reset	0: Output Q1 will be reset
2	Retentive behavior Output Q2	1: Output Q2 will retain its state even if there is a loss of communication or the controller stops 0: Output Q2 will be reset	0: Output Q2 will be reset
3	Retentive behavior Output Q3	1: Output Q3 will retain its state even if there is a loss of communication or the controller stops 0: Output Q3 will be reset	0: Output Q3 will be reset
4-7	reserved	0	0

Fieldbus EtherCAT

Please note the general information for configuring parameters
→ Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269, particularly
→ Section , „Device options“, page 269.

Device index: sub-index 22

Parameter data length: 0x02

Structure of parameter byte 1: retentive behavior

Bit	Parameter	Configuration	Default
0	Retentive behavior Output Q0	1: Output Q0 will retain its state even if there is a loss of communication or the controller stops 0: Output Q0 will be reset	0: Output Q0 will be reset
1	Retentive behavior Output Q1	1: Output Q1 will retain its state even if there is a loss of communication or the controller stops 0: Output Q1 will be reset	0: Output Q1 will be reset
2	Retentive behavior Output Q2	1: Output Q2 will retain its state even if there is a loss of communication or the controller stops 0: Output Q2 will be reset	0: Output Q2 will be reset
3	Retentive behavior Output Q3	1: Output Q3 will retain its state even if there is a loss of communication or the controller stops 0: Output Q3 will be reset	0: Output Q3 will be reset
4-7	reserved	0	0

2.9.7 Programming

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

2.9.7.1 Input points

Byte 0: status SmartWire-DT

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	—	—	—

2 I/O modules EU5E-SWD...

2.9 Digital module EU5E-SWD-4D4D-R

Bit	Designation	Description
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: State of digital inputs/outputs

7	6	5	4	3	2	1	0
–	–	–	–	I3	I2	I1	I0

Bit	Designation	Description
0	I0	Status input I0
1	I1	Status input I1
2	I2	Status input I2
3	I3	Status input I3
4	Stat_Q0	Output Q0 status
5	Stat_Q1	Output Q1 status
6	Stat_Q2	Output Q2 status
7	Stat_Q3	Output Q3 status

The Stat_Qx status bits indicate the outputs' state. This means that if outputs have been configured as "retentive," the outputs' state can be identified in the user program after communications are restored or when the PLC starts.



This is the logical driving state.

If an output is being driven but is switched off by the output stage due to a short-circuit / overload situation, or if the 24 V power for the outputs is missing, a "1" will still be returned.

2.9.7.2 Outputs

Byte 0: outputs

The way the outputs are driven will depend on the selected configuration.

Output configured as retentive:

Driving will be based on a 2-bit combination for setting and resetting.

This ensures that undesired changes will not occur at the outputs when the controller is started.

Output configured as non-retentive (default setting):
Driving will be based on simple output setting and resetting.

7	6	5	4	3	2	1	0
–	–	–	–	Q3	Q2	Q1	Q0

Bit	Designation	Meaning Output configured as retentive			Meaning Output configured as non-retentive	
0	Q0R	Bit 1	Bit 0		Bit 1	
		0	0	No Change		
		0	1	Output OFF		
1	Q0S	1	0	Output ON	1	Output ON
		1	1	No Change	0	Output OFF
2	Q1R	Bit 3	Bit 2		Bit 3	
		0	0	No Change		
		0	1	Output OFF		
3	Q1S	1	0	Output ON	1	Output ON
		1	1	No Change	0	Output OFF
4	Q2R	Bit 5	Bit 4		Bit 5	
		0	0	No Change		
		0	1	Output OFF		
5	Q2S	1	0	Output ON	1	Output ON
		1	1	No Change	0	Output OFF
6	Q3R	Bit 7	Bit 6		Bit 7	
		0	0	No Change		
		0	1	Output OFF		
7	Q3S	1	0	Output ON	1	Output ON
		1	1	No Change	0	Output OFF

2.9.7.3 Diagnostics

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

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

2.10 Digital module EU5E-SWD-4D2R

2.10.1 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 inputs' outputs' status is indicated with the help of LEDs.

The SmartWire-DT diagnostic LED indicates the network status.

2.10.2 Surface mounting

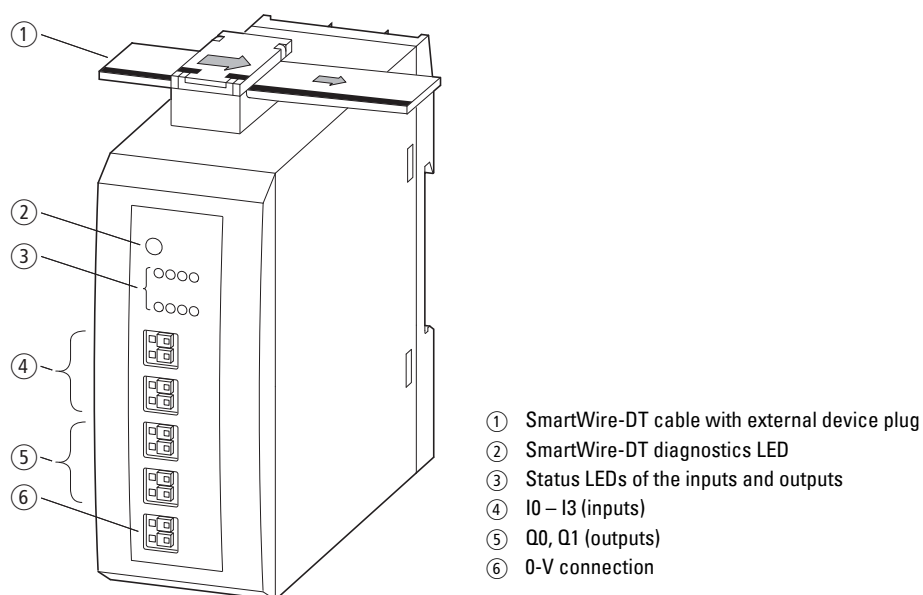


Figure 16: Connections of the modules EU5E-SWD-4D2R

2.10.3 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.

2.10.4 Installation

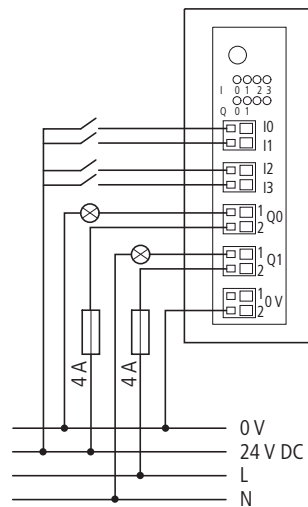


Figure 17: Connecting the inputs/outputs of module EU5E-SWD-4D2R

- ▶ 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.

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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.

2.10.5 Parameterization

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

Fieldbus EtherCAT

Please note the general information for configuring parameters

→ Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269, particularly

→ Section , „Device options“, page 269.

2.10.7 Programming

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

2.10.7.1 Input points

Byte 0:

2 I/O modules EU5E-SWD...

2.10 Digital module EU5E-SWD-4D2R

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	—	—	—

Bit	Designation	Description
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	Description
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	—

2.10.7.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	Q1	Q0

Bit	Designation	Description
0	Q0	Actuation output Q0
1	Q1	Actuation output Q1
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

2.10.7.3 Diagnostics

The module does not report a diagnosis.

2.11 Digital module EU5E-SWD-X8D

2.11.1 INTRODUCTION

SmartWire-DT I/O module EU5E-SWD-X8D provides eight digital outputs Q0 to Q7.

The outputs are used to operate actuators.

The outputs' status is indicated with the help of LEDs.

The SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.11.2 Surface mounting

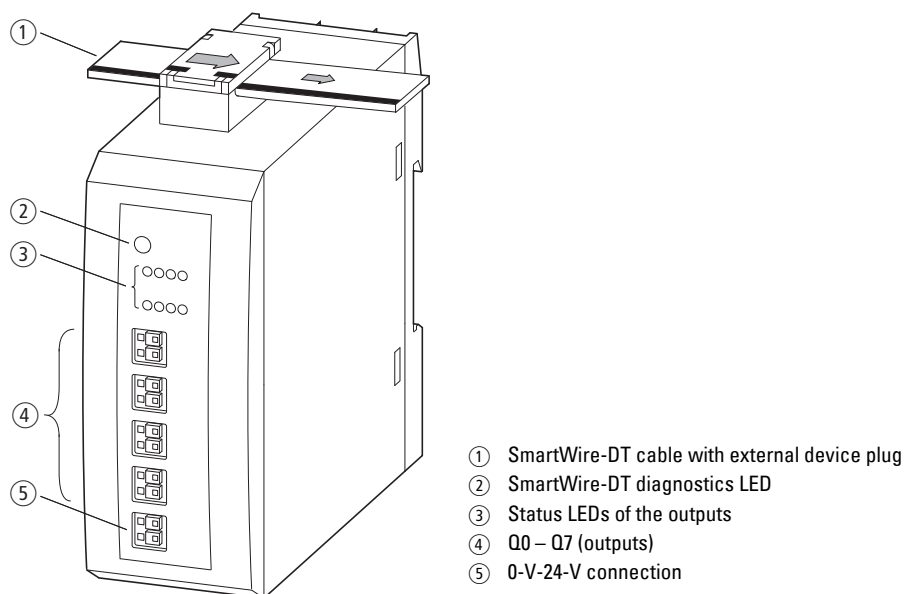


Figure 18: Layout of module EU5E-SWD-X8D

2.11.3 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.

2.11.4 Installation

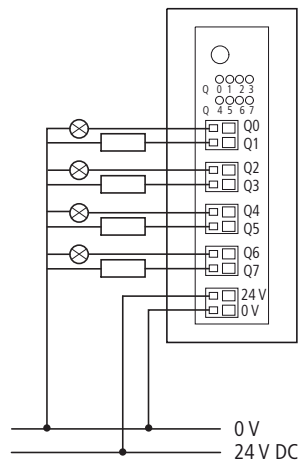


Figure 19: Connecting outputs and supply

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

2.11.5 Parameterization

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.

2.11.6 Fieldbus-specific characteristics

Fieldbus EtherCAT

Please note the general information for configuring parameters

→ Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269, particularly

→ Section , „Device options“, page 269.

2.11.7 Programming

The module has one input byte and one output byte.

2 I/O modules EU5E-SWD...

2.11 Digital module EU5E-SWD-X8D

2.11.7.1 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Description
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

2.11.7.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
Q7	Q6	Q5	Q4	Q3	Q2	Q1	Q0

Bit	Designation	Description
0	Q0	Actuation output Q0
1	Q1	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

2.11.7.3 Diagnostics

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

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

2.12 Analog module EU5E-SWD-4AX

2.12.1 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 SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.12.2 Surface mounting

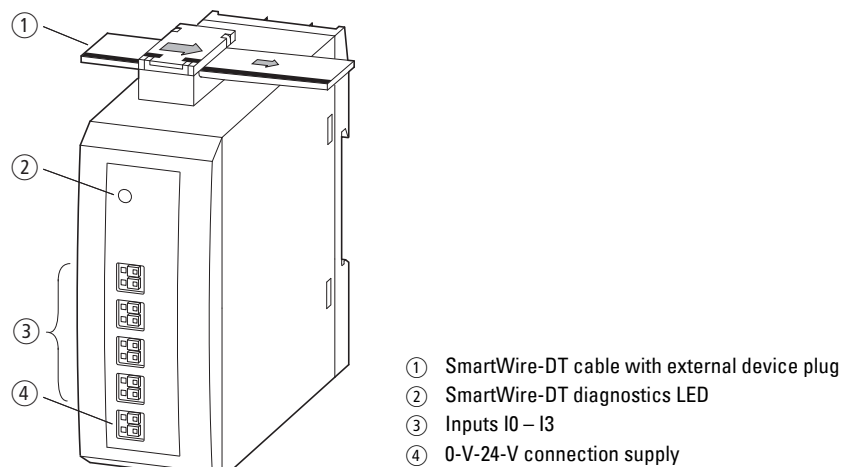


Figure 20: Layout of module EU5E-SWD-4AX

2.12.3 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 inputs. The selection is made 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.

2.12.4 Installation

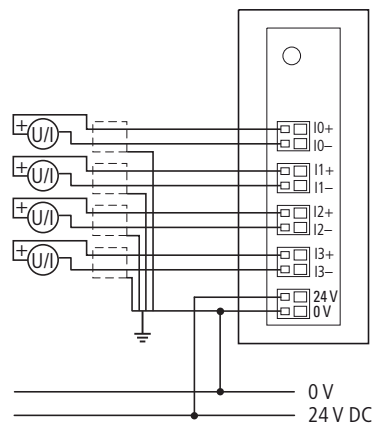


Figure 21: Connecting inputs and power supply

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

2.12.5 Parameterization

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

Parameter	Setting options	Basic 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 can be activated separately.

2.12.6 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	0 = Voltage 1 = Current															
1	Sensor selection Input 2	0 = Voltage 1 = Current															
2	Sensor selection Input 3	0 = Voltage 1 = Current															
3	Sensor selection Input 4	0 = Voltage 1 = Current															
4, 5	Reading refresh rate	<table> <tr> <td>Bit 5</td><td>Bit 4</td><td></td></tr> <tr> <td>0</td><td>0</td><td>= 20 ms</td></tr> <tr> <td>0</td><td>1</td><td>= 100 ms</td></tr> <tr> <td>1</td><td>0</td><td>= 200 ms</td></tr> <tr> <td>1</td><td>1</td><td>= 500 ms</td></tr> </table>	Bit 5	Bit 4		0	0	= 20 ms	0	1	= 100 ms	1	0	= 200 ms	1	1	= 500 ms
Bit 5	Bit 4																
0	0	= 20 ms															
0	1	= 100 ms															
1	0	= 200 ms															
1	1	= 500 ms															
6	Mean value	0 = off 1 = on															
7	reserved	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 20 ms, can increase data traffic on the field bus.

2 I/O modules EU5E-SWD...

2.12 Analog module EU5E-SWD-4AX

Fieldbus EtherCAT

Please note the general information for configuring parameters
→ Chapter 13 “Using SWD modules with the EtherCAT field bus”, page 269, particularly
→ Section , „Device options“, page 269.

Defining the sensor type and EtherCAT of 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	0 = Voltage 1 = Current
1	Sensor selection Input 2	0 = Voltage 1 = Current
2	Sensor selection Input 3	0 = Voltage 1 = Current
3	Sensor selection Input 4	0 = Voltage 1 = Current
4, 5	Reading refresh rate	Bit 5 Bit 4 0 0 = 20 ms 0 1 = 100 ms 1 0 = 200 ms 1 1 = 500 ms
6	Mean value	0 = off 1 = on
7	reserved	0

Bold values indicate the default settings.

2.12.7 Programming

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

2.12.7.1 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	—	—	—

Bit	Designation	Description
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

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

Data addressing depends on the chosen programming system.

Input points

	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

2.12.7.2 Diagnostics

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

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

2.13 Analog module EU5E-SWD-2A2A

2.13.1 INTRODUCTION

SmartWire-DT I/O module EU5E-SWD-2A2A provides two analog inputs and two analog outputs for current.

Current (0 – 20 mA) or voltage (0 – 10 V) sensors or actuators can be connected to the inputs/outputs.

The resolution is 12 Bit.

The SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.13.2 Surface mounting

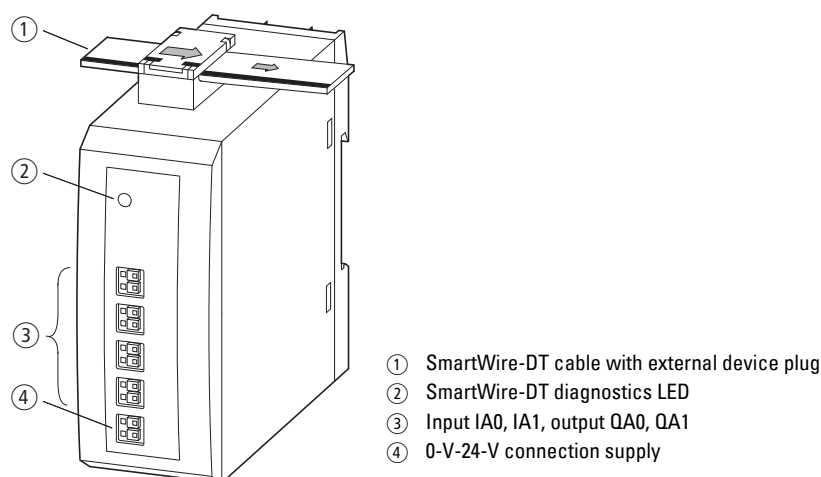


Figure 22: Layout of module EU5E-SWD-2A2A

2.13.3 Engineering

The signal range (voltage 0 – 10 V, current 0 – 20 mA) can be separately set for each input and output. The selection is made in the programming system's control configurator.

The inputs/outputs are electrically isolated from the SmartWire-DT network but not from each other.

The resolution is 12 Bit.

The outputs are short-circuit proof.



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

2.13.4 Installation

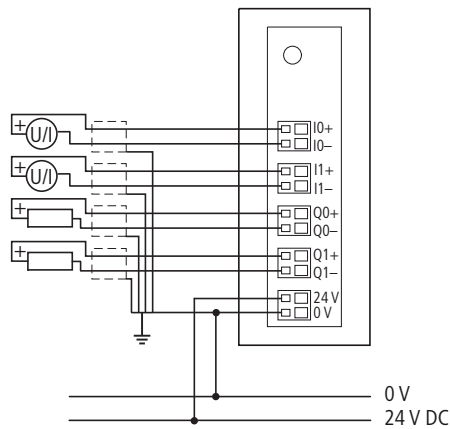


Figure 23: Connecting inputs and supply of module EU5E-SWD-2A2A

- ▶ 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.

2.13.5 Parameterization

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

Parameter	Setting options	Basic 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.

2.13.6 Fieldbus-specific characteristics

Field bus CANopen

2 I/O modules EU5E-SWD...

2.13 Analog module 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	0 = Voltage 1 = Current
1	Sensor selection Input 2	0 = Voltage 1 = Current
2	Sensor selection Output 1	0 = Voltage 1 = Current
3	Sensor selection Output 2	0 = Voltage 1 = Current
4 , 5	Reading refresh rate	Bit 5 Bit 4 0 0 = 20 ms 0 1 = 100 ms 1 0 = 200 ms 1 1 = 500 ms
6	Mean value	0 = off 1 = on
7	reserved	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 20 ms, can increase data traffic on the field bus.

Fieldbus EtherCAT

Please note the general information for configuring parameters

→ Chapter 13 “Using SWD modules with the EtherCAT field bus”, page 269, particularly

→ Section , „Device options“, page 269.

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

Bold values indicate the default settings.

2.13.7 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 I/O modules EU5E-SWD...

2.13 Analog module EU5E-SWD-2A2A

2.13.7.1 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Description
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

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

Data addressing depends on the chosen programming system.

Input points

	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

2.13.7.2 Diagnostics

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

Value	Description
0x13	Short-circuit/overload on at least one analog output
0x13	Overload on at least one analog current input ($I > 23 \text{ mA}$)
0x14	No 24 V DC supply voltage connected

2.14 Analog modules EU5E-SWD-4PT and EU5E-SWD-4PT-2

2.14.1 INTRODUCTION

SmartWire-DT I/O modules EU5E-SWD-4PT and EU5E-SWD-4PT-2 provide four analog temperature inputs. Pt100, Pt1000, or Ni1000 RTDs sensors in two-wire or three-wire connection configurations can be connected to the inputs. The modules vary in terms of the temperature range. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.14.2 Surface mounting

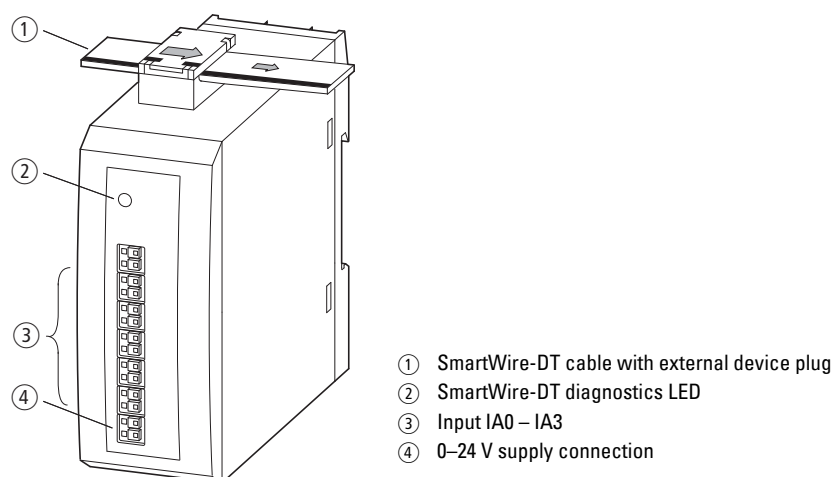


Figure 24: Layout of EU5E-SWD-4PT and EU5E-SWD-4PT-2 modules

2.14.3 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 up to +150	-50 up to +200
Pt100	°C	-50 up to +200	-100 up to +400
Pt1000	°C	-50 up to +200	-100 up to +400

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.

2.14.4 Installation

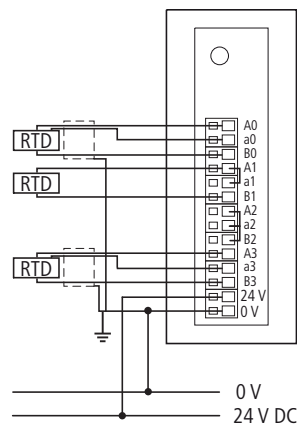


Figure 25: Connecting inputs and supply of module EU5E-SWD-4PT/...4PT-2

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

2.14.5 Parameterization

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

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

2.14.6 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	Bit 1 Bit 0 0 0 = not used 0 1 = PT100 1 0 = PT1000 1 1 = NI1000
2, 3	Sensor selection Input 2	Bit 3 Bit 2 0 0 = not used 0 1 = PT100 1 0 = PT1000 1 1 = NI1000
4, 5	Sensor selection Input 3	Bit 5 Bit 4 0 0 = not used 0 1 = PT100 1 0 = PT1000 1 1 = NI1000
6, 7	Sensor selection Input 4	Bit 7 Bit 6 0 0 = not used 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	Bit 1 Bit 0 0 0 = degrees Celsius 0 1 = degrees Fahrenheit 1 0 = Binary value
2, 3	Reading refresh rate	Bit 3 Bit 2 0 0 = 0.25 s 0 1 = 1 s 1 0 = 2.5 s 1 1 = 10 s
4	reserved	0
5	reserved	0
6	reserved	0
7	reserved	0

Bold values indicate the default settings.

2 I/O modules EU5E-SWD...

2.1.4 Analog modules EU5E-SWD-4PT and EU5E-SWD-4PT-2



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.

Fieldbus EtherCAT

Please note the general information for configuring parameters

→ Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269, particularly

→ Section , „Device options“, page 269.

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	Bit 1 Bit 0 0 0 = not used 0 1 = PT100 1 0 = PT1000 1 1 = NI1000
2, 3	Sensor selection Input 2	Bit 3 Bit 2 0 0 = not used 0 1 = PT100 1 0 = PT1000 1 1 = NI1000
4, 5	Sensor selection Input 3	Bit 5 Bit 4 0 0 = not used 0 1 = PT100 1 0 = PT1000 1 1 = NI1000
6, 7	Sensor selection Input 4	Bit 7 Bit 6 0 0 = not used 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	Bit 1 Bit 0 0 0 = degrees Celsius 0 1 = degrees Fahrenheit 1 0 = Binary value
2, 3	Reading refresh rate	Bit 3 Bit 2 0 0 = 0.25 s 0 1 = 1 s 1 0 = 2.5 s 1 1 = 10 s
4	reserved	0
5	reserved	0
6	reserved	0
7	reserved	0

Bold values indicate the default settings.

2.14.7 Programming

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

2.14.7.1 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	—	—	—

Bit	Designation	Description
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 I/O modules EU5E-SWD...

2.14 Analog modules EU5E-SWD-4PT and EU5E-SWD-4PT-2

Input points

	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 up to +200	-500 up to +2000	-580 – +3920	0 – 4095
	Ni1000	-50 up to +150	-500 up to +1500	-580 up to +3020	0 – 4095
4PT-2	Pt100, Pt1000	-100 up to +400	-500 up to +4000	-580 up to +7520	0 – 4095
	Ni1000	-50 up to +200	-500 up to +2000	-580 up to +3920	0 – 4095

2.14.7.2 Diagnostics

For diagnostics (bit 4 in input byte 0 is set), the module will report the following fault cause (group information):

Value	Description
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. In the case of an open wire, the reading will be 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.

ATTENTION

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.

ATTENTION

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 281.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.7, „SWD module interoperability requirements“, page 282.

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.

DIL-SWD-32-001

DIL-SWD-32-002

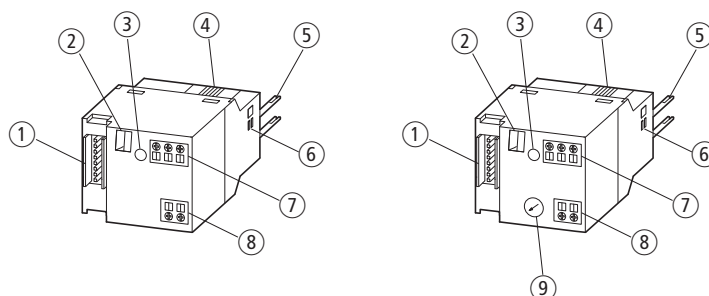


Figure 26: Structure of the SmartWire-DT modules DIL-SWD-32-001 and DIL-SWD-32-002 for DILM

- 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 "Mount the external device plug" section in manual MN05006002Z-EN (previously AWB2723-1617en).

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 81).

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

Application	Number of SmartWire-DT modules for DILM
DILM contactor	1
Motor starter MSC	
DOL starter (PKZ and DILM)	1
Reversing starter	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	Pick-up power [W]	Pick-up current with 24 V DC [mA]	Sealing power [W]	Holding current with 24 V DC [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

ATTENTION

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-PF2-1) must be used
(→ Chapter 1 “EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules”, page 15)



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 275.

DIL-SWD-32-001

DIL-SWD-32-002

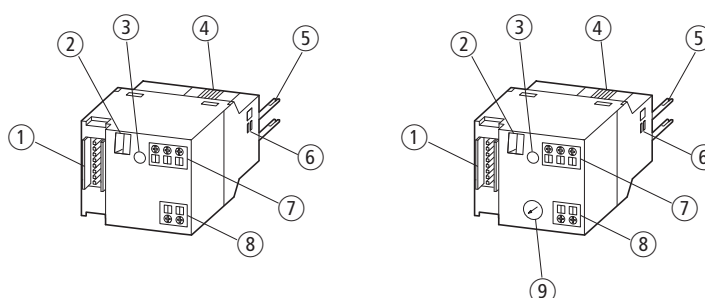


Figure 27: Connections of the SmartWire-DT module
DIL-SWD-32-001 or DIL-SWD-32-002 for DILM

- 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 DOL 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.

ATTENTION

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 73).

The auxiliary switches integrated into the contactor can be used, for example, as safety locking devices.

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).

ATTENTION

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 mm² to 1.5 mm².

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:

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

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

3.3 Engineering



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.

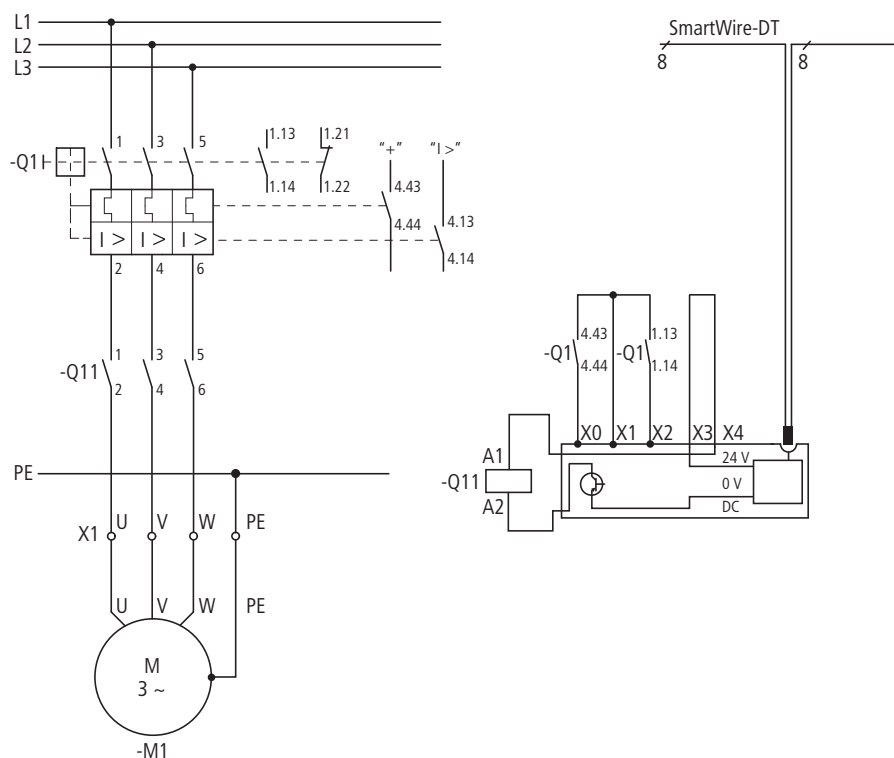


Figure 28: Circuit diagram of the direct starter

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.

ATTENTION

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 30. 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 73).

The auxiliary switches integrated into the contactor can be used, for example, as safety locking devices.

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).

ATTENTION

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 mm² to 1.5 mm².

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

ATTENTION

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

The following jumpers can be used for wiring reversing starters.

Table 5: Links for reversing starters

	DILM7 – DILM15	DILM17 – DILM32
L1, L2 and 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 Fig. 29 should be used. On the other hand, an electrical interlock with wire jumpers should be implemented according to the circuit Fig. 30.

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.

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

3.3 Engineering

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.

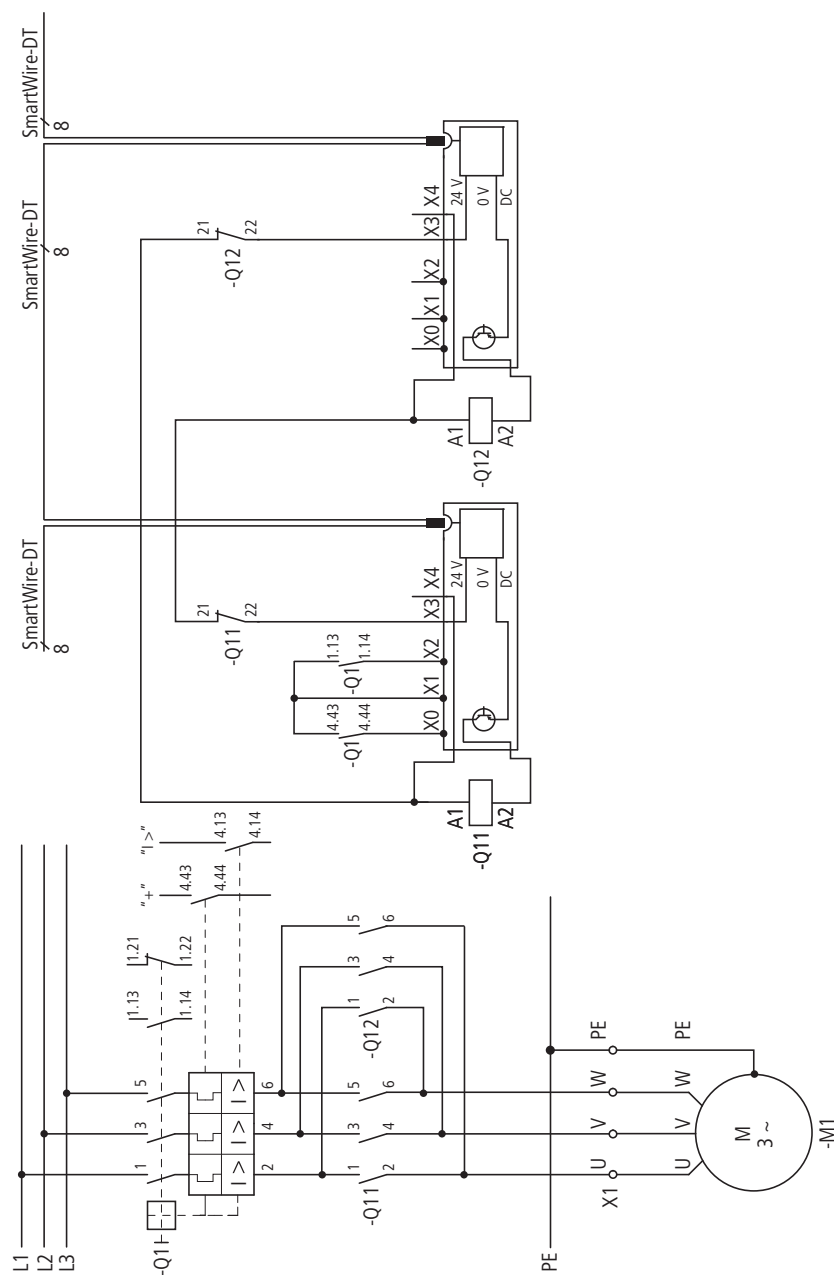


Figure 29: Circuit diagram of the reversing starter in combination with DILM12-XEV

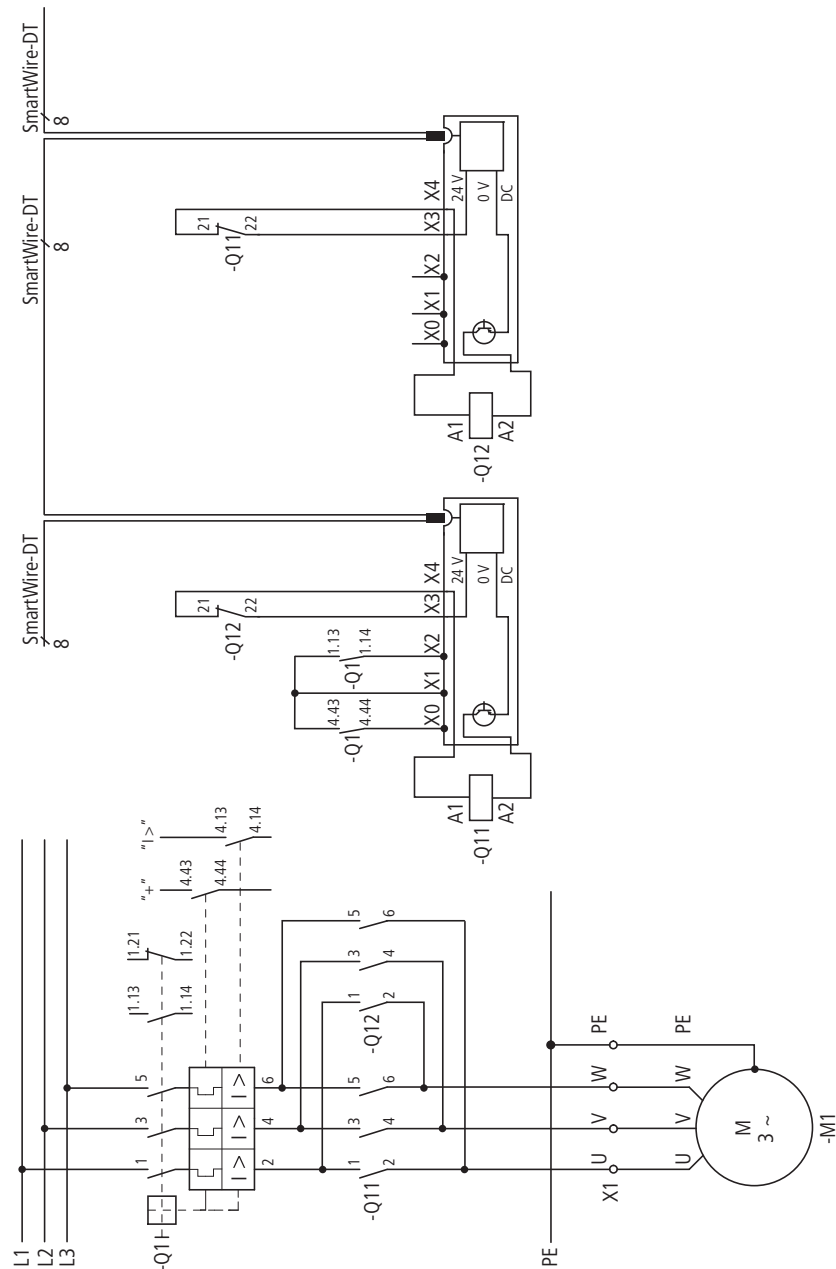


Figure 30: Circuit diagram of the reversing starter

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

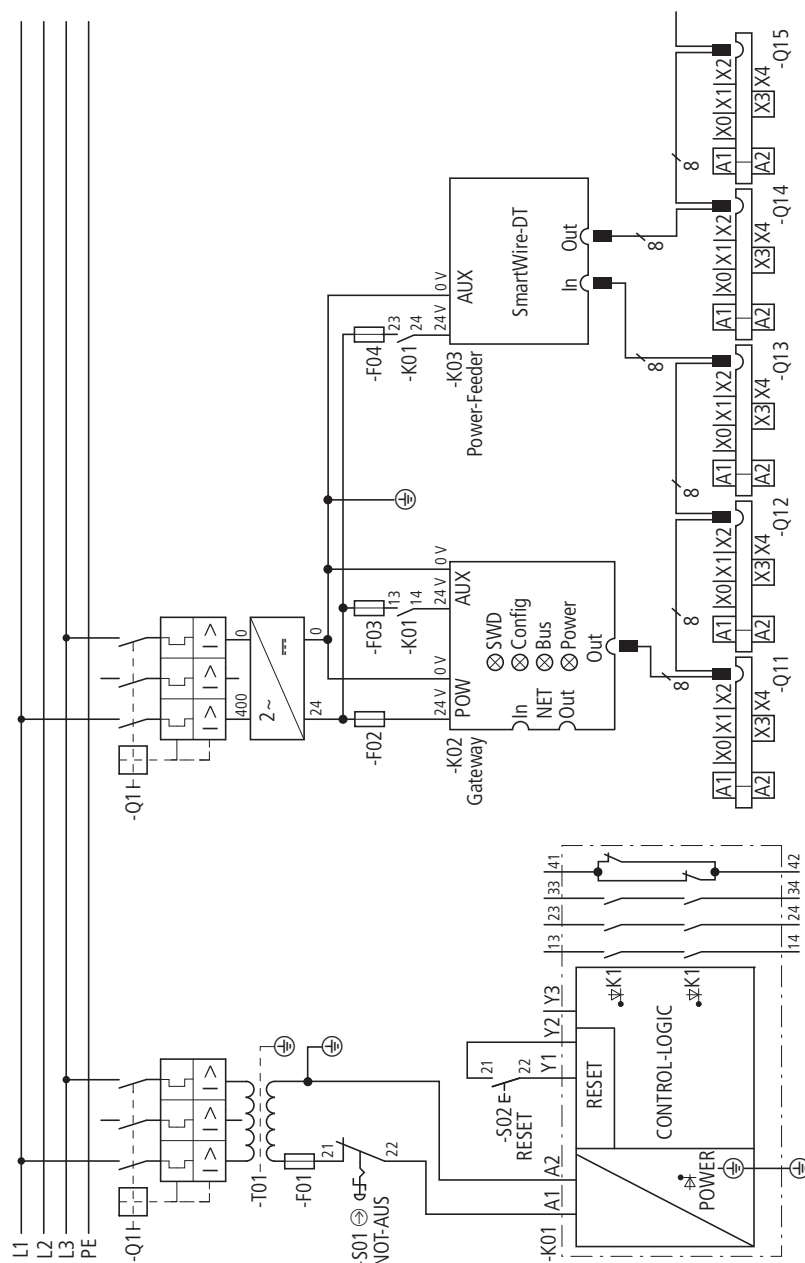


Figure 31: Actuating circuit for safety relevant switch-off

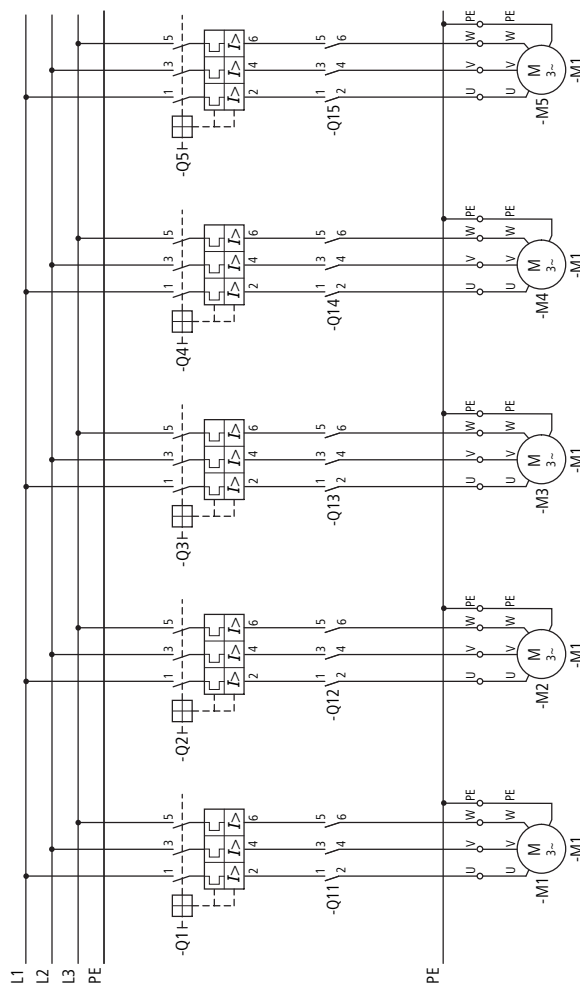


Figure 32: Main circuit for safety relevant switch-offs

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 loop

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

3.3 Engineering

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.

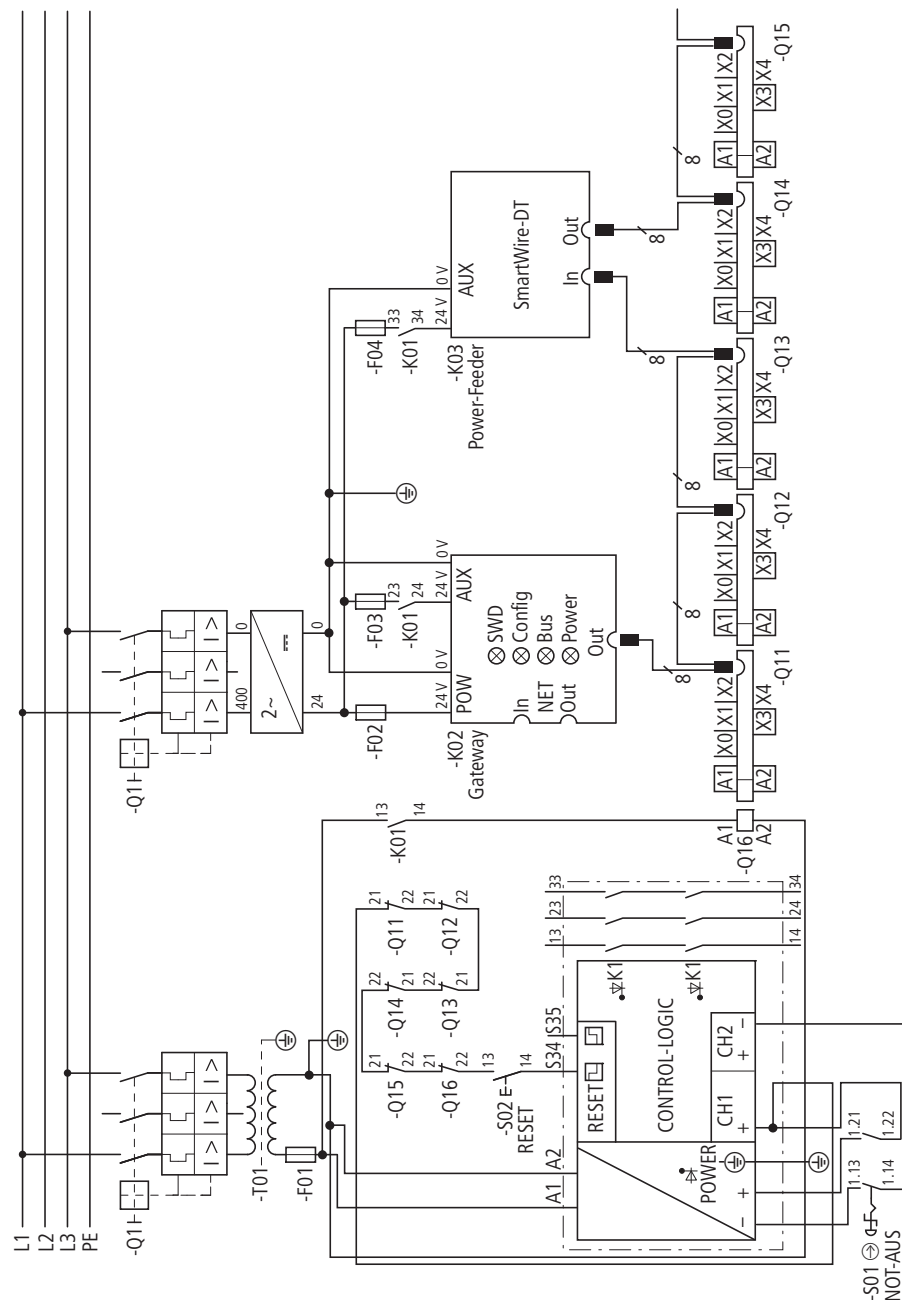


Figure 33: Actuating circuit for redundant switch-off

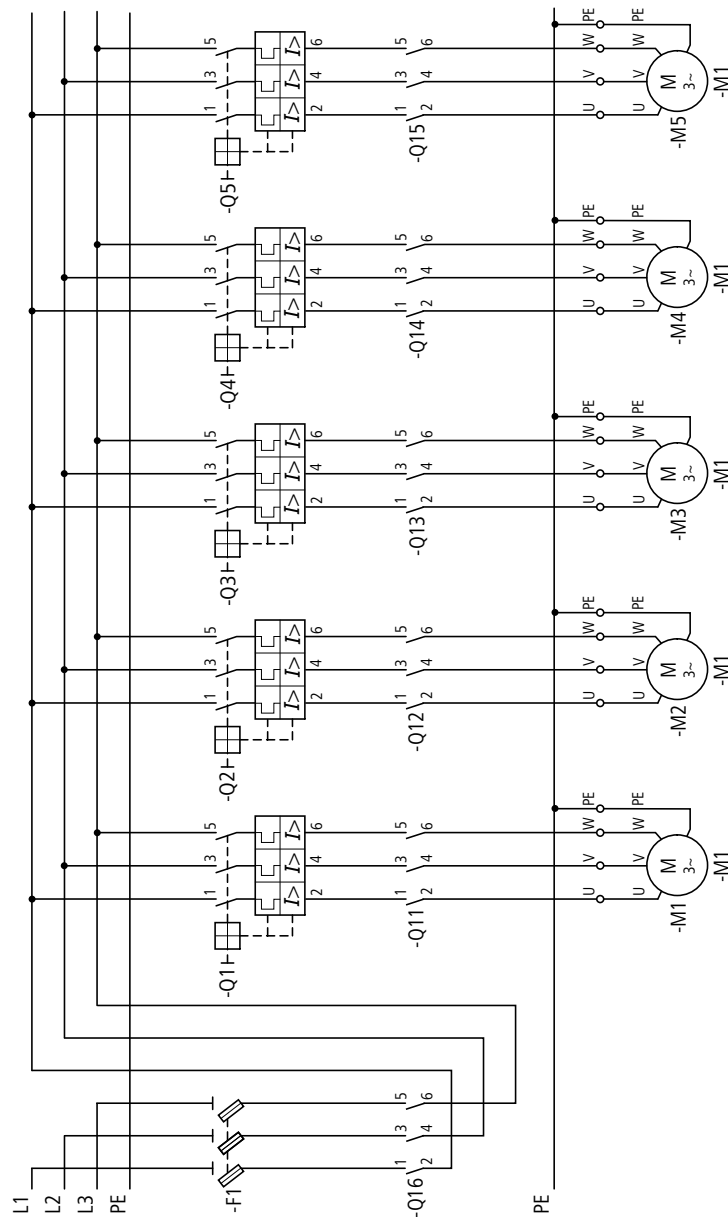


Figure 34: Mains circuit for redundant switch off.

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.

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

3.3 Engineering



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 15).

3.3.7.2 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.



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 [Internet](#).

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 30, 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.

ATTENTION

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

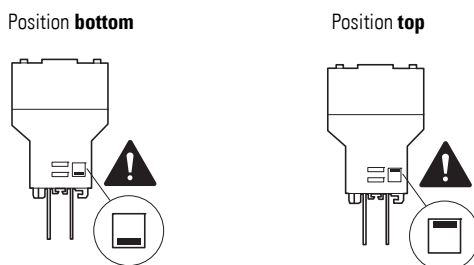


Figure 35: Adjustment of the adjusting slide on DIL-SWD-32-001 or DIL-SWD-32-002

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

3.4 Installation

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

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

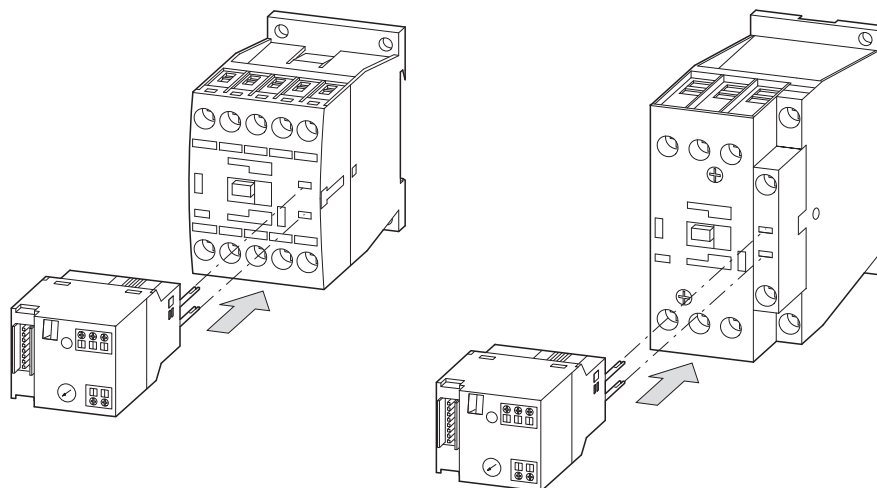


Figure 36: Placement of the DIL-SWD-32-001 or DIL-SWD-32-002 onto the contactor

- Lock the SmartWire-DT module for DILM.

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

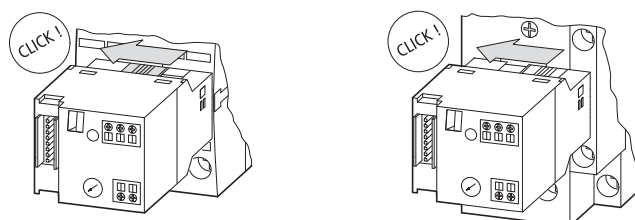


Figure 37: Locking of the DIL-SWD-32-001 or DIL-SWD32-002

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

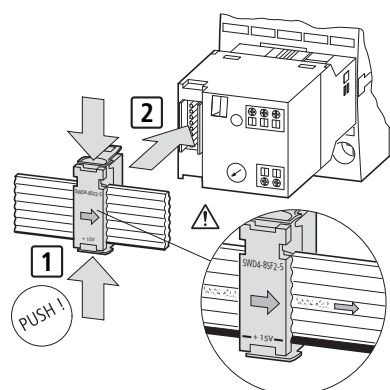


Figure 38: Connection of SmartWire-DT external device plug

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.

ATTENTION

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	Color	State	Message
Ready	Orange	Continuous light	Switching command for contactor via SmartWire-DT
	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	- addressing process in progress - after gateway power On - after actuation of the configuration button on the gateway - Module not in current configuration - invalid type

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

3.8 Programming

3.7.1 Parameterization

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 SWD modules with the EtherCAT field bus”, page 269.

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 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	I1 (X1-X0)	I0 (X1-X2)	C

Bit	Designation	Description
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	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

3.8.1.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

Bit	Designation	Description
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 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	M	I (X1-X0)	I0 (X1- X2)	C

Bit	Designation	Description
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
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
–	–	–	–	–	–	–	Q0

Bit	Designation	Description
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	–

3.8.2.3 Diagnostics

The module does not report a diagnosis.

4 PKE-SWD-32, interface for motor-starter combination with 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).

ACHTUNG

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

ACHTUNG

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.

ACHTUNG

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 281.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.7, "SWD module interoperability requirements", page 282.

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

4.2 Surface mounting

4.2 Surface mounting

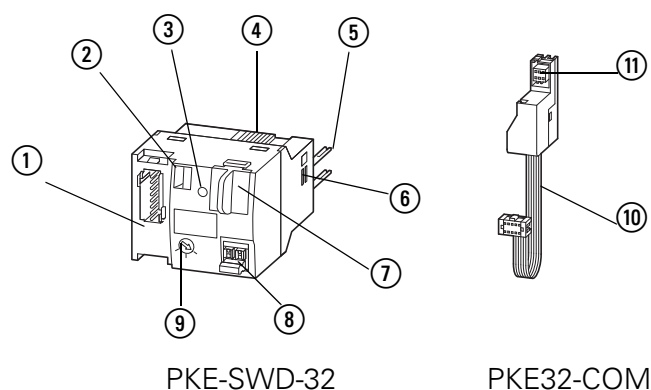


Figure 39: Connections PKE-SWD-32 and PKE32-COM module

- 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 "Mount the external device plug" section in manual MN05006002Z-EN (previously AWB2723-1617en).

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 108).

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 Engineering

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 65).

Table 7: Combination options

Application	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 with a voltage of 24 V DC:

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

4.3 Engineering

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

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

ACHTUNG

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

(→ Chapter 1, "EU5C-SWD-PF1-1, EU5C-SWD-PF2-1 power modules", page 15).



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 276.

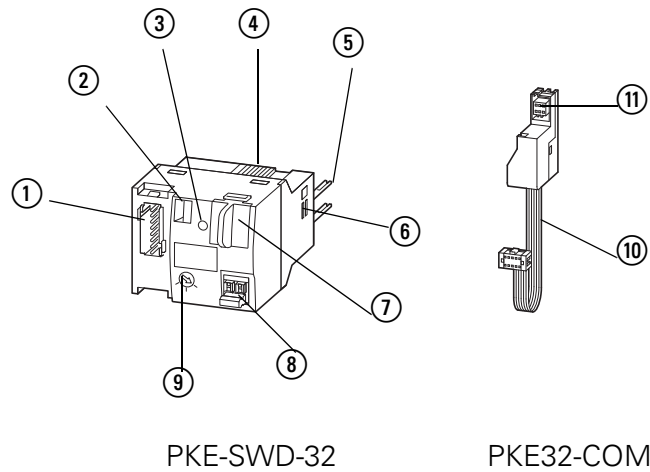


Figure 40: Connections PKE-SWD-32 and PKE32-COM-Module

- 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 starter

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.

ACHTUNG

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 PKE12/32

4.3 Engineering

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 95).

The auxiliary switches integrated into the contactor can be used, for example, as safety locking devices.

ACHTUNG

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 mm² to 1.5 mm².

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.

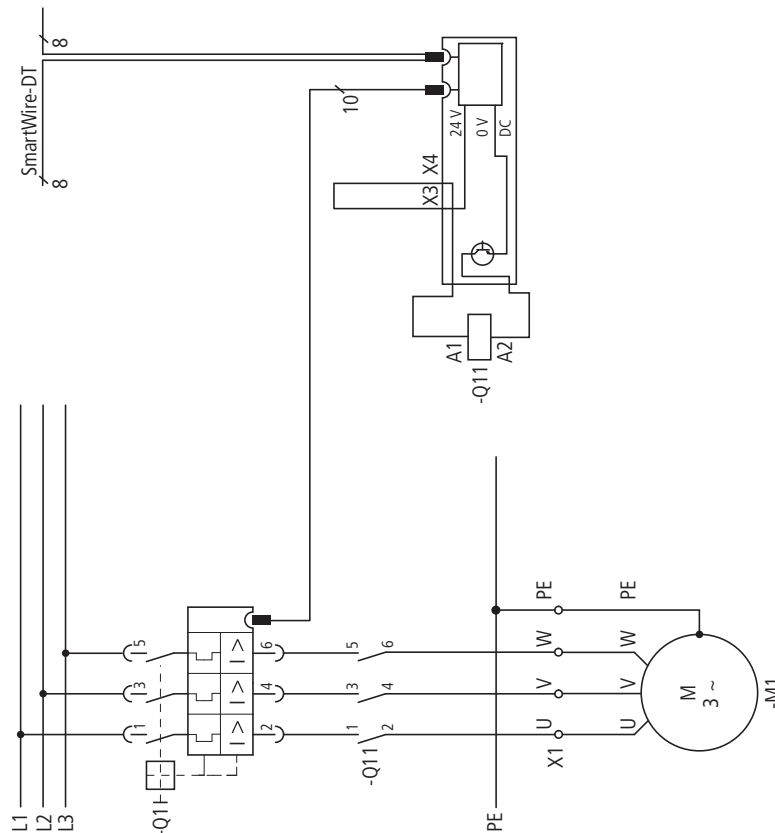


Figure 41: Circuit diagram of the direct starter

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 115).

ACHTUNG

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 PKE12/32

4.3 Engineering

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 95).

The auxiliary switches integrated into the contactor can be used, for example, as safety locking devices.

ACHTUNG

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 mm².

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

ACHTUNG

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

The following jumpers can be used for wiring reversing starters:

	DILM7 – DILM15	DILM17 – DILM32
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 42 should be used. On the other hand, an electrical interlock with wire jumpers should be implemented according to the circuit Figure 43.

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.

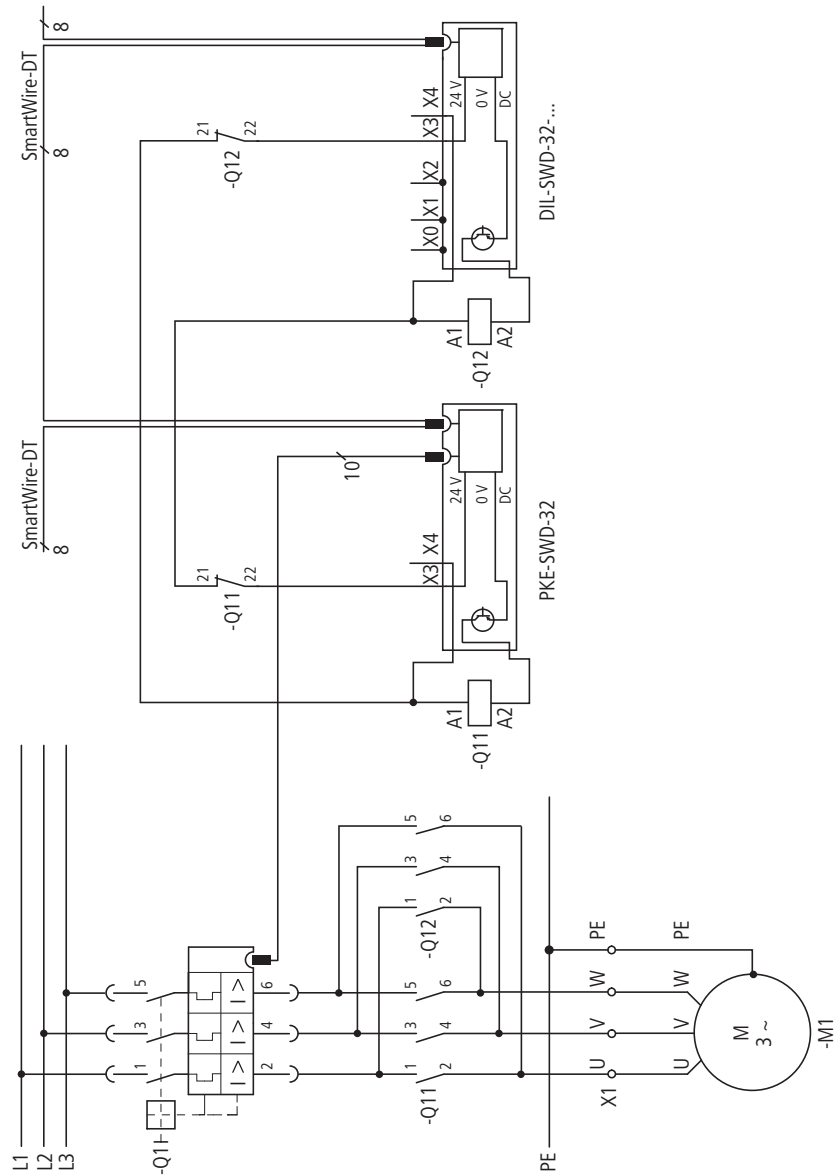


Figure 42: Circuit diagram of the reversing starter in combination with DILM12-XEV

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

4.3 Engineering

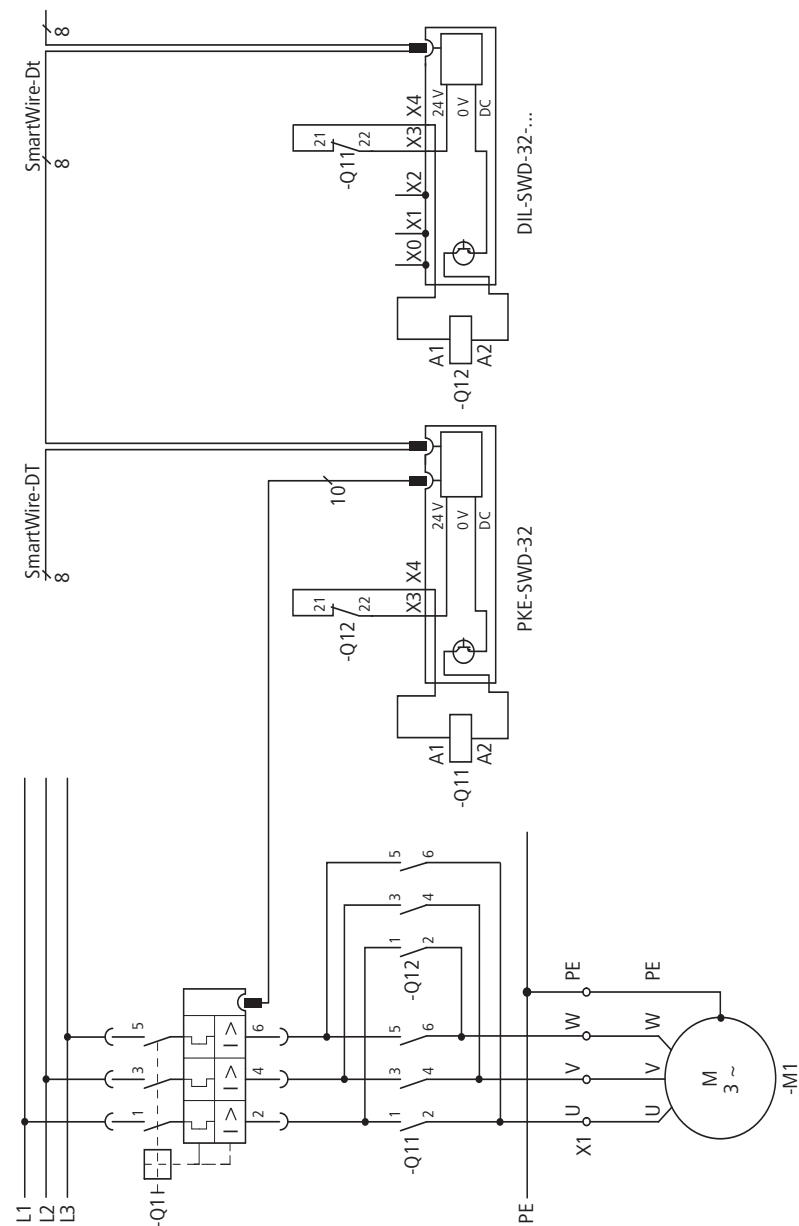


Figure 43: Circuit diagram of the reversing starter

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 supply unit.

ACHTUNG

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.

4.3.3.1 Safety-related disconnection of a single drive

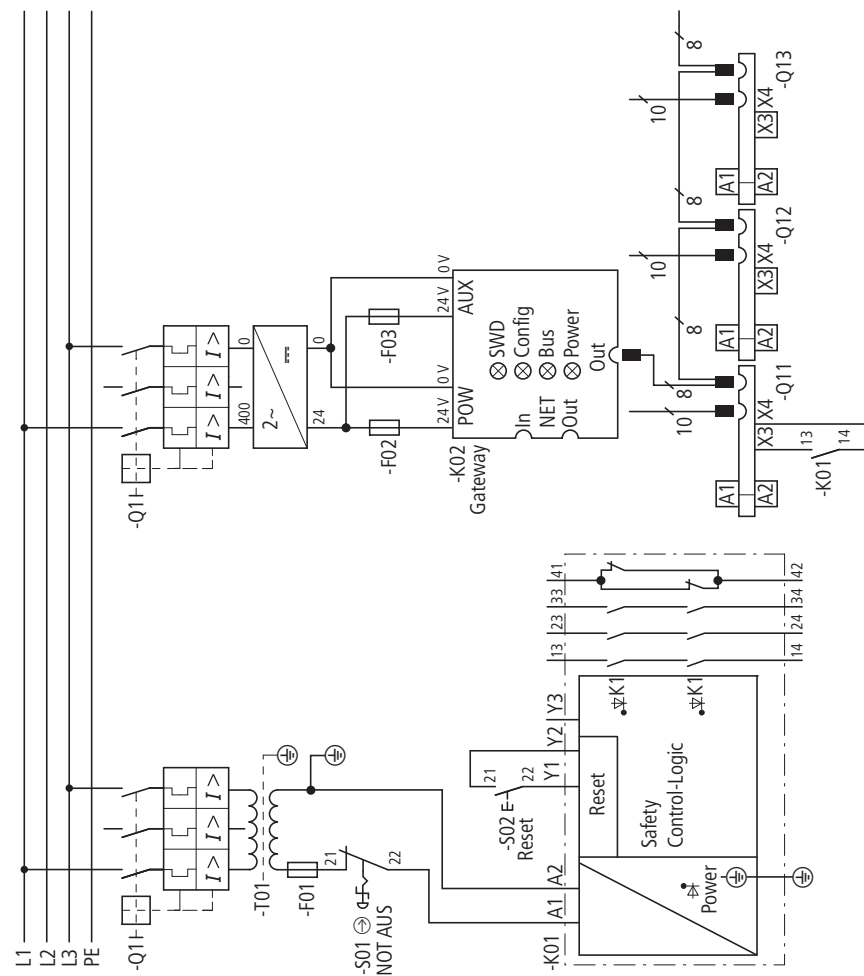


Figure 44: Actuating circuit for safety-related disconnection of a single drive

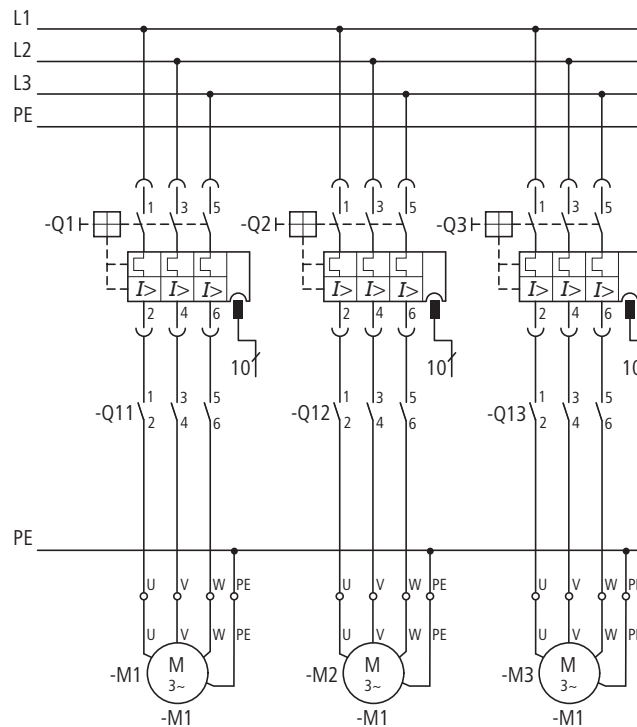


Figure 45: Mains circuit for safety-related disconnection of a single drive

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 Engineering

4.3.3.2 Safety-related disconnection of drive groups

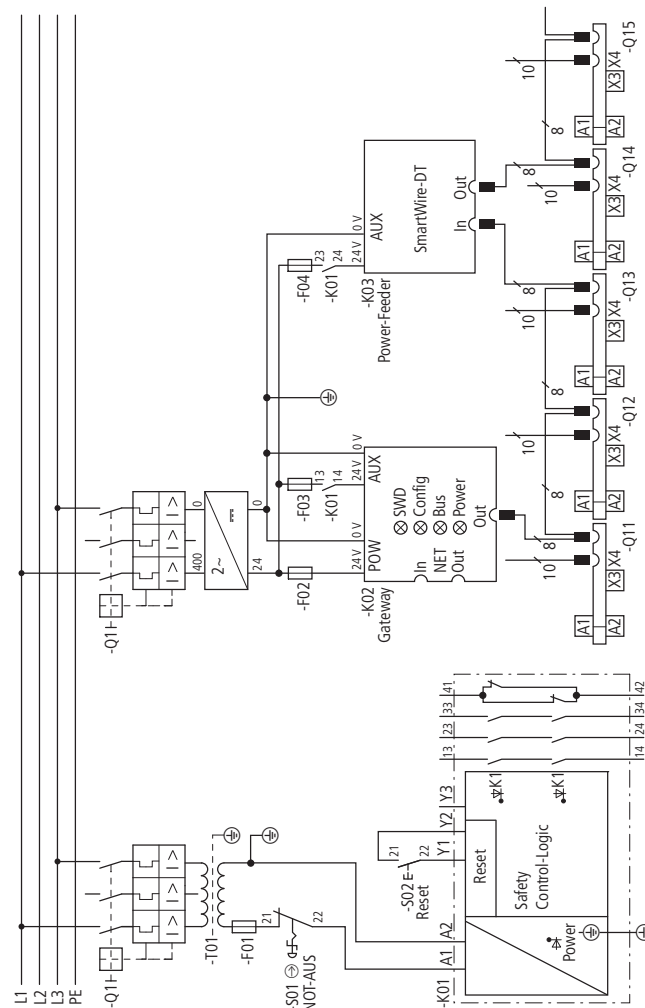


Figure 46: Actuating circuit for safety-related disconnection of drive groups

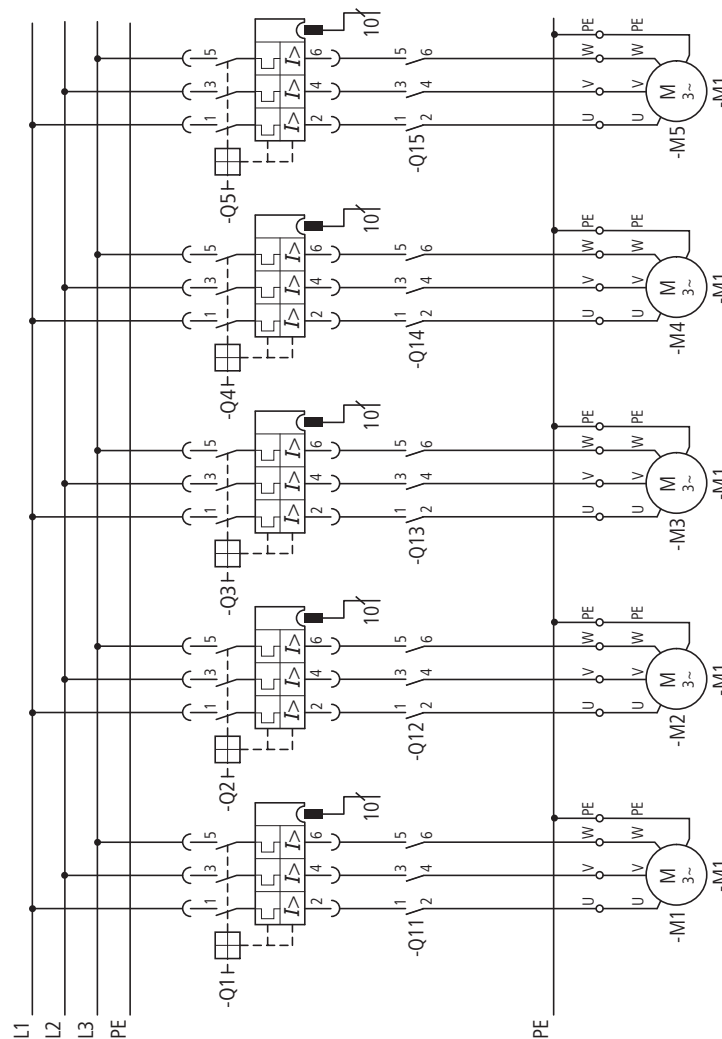


Figure 47: Main circuit for safety-related disconnection of drive groups

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 loop

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.

4.3.5 Measures for higher safety categories

In many applications controls systems compliant with safety category 3 or 4 to EN 954-1 are required. 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

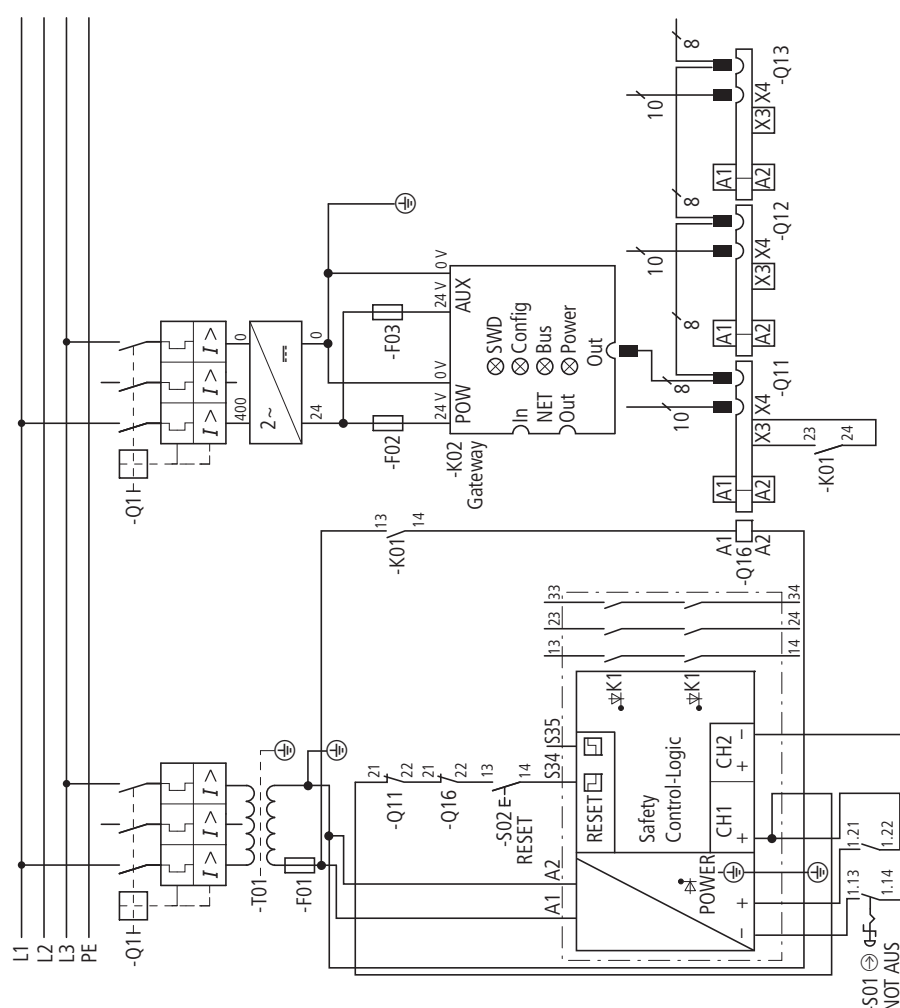


Figure 48: Actuating circuit for redundant disconnection of a single drive

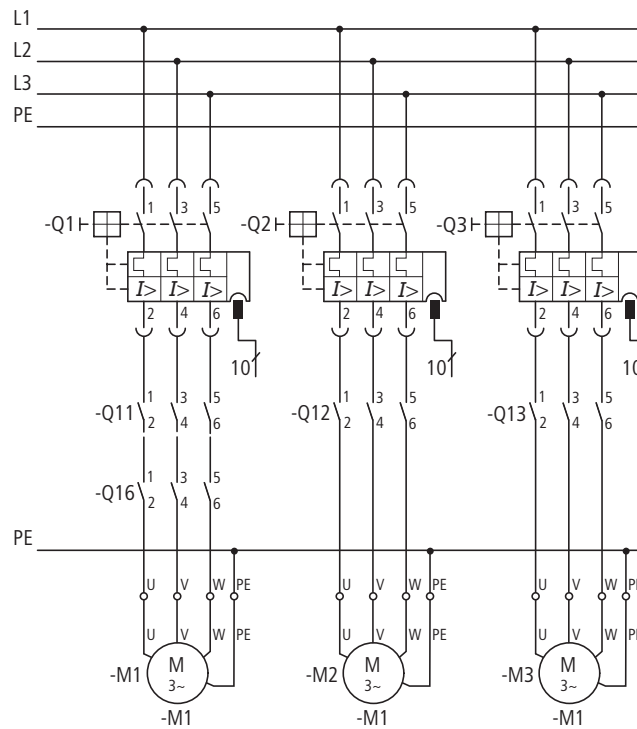


Figure 49: Main circuit for redundant disconnection of a single drive

4.3.5.1 Redundant disconnection of drive groups

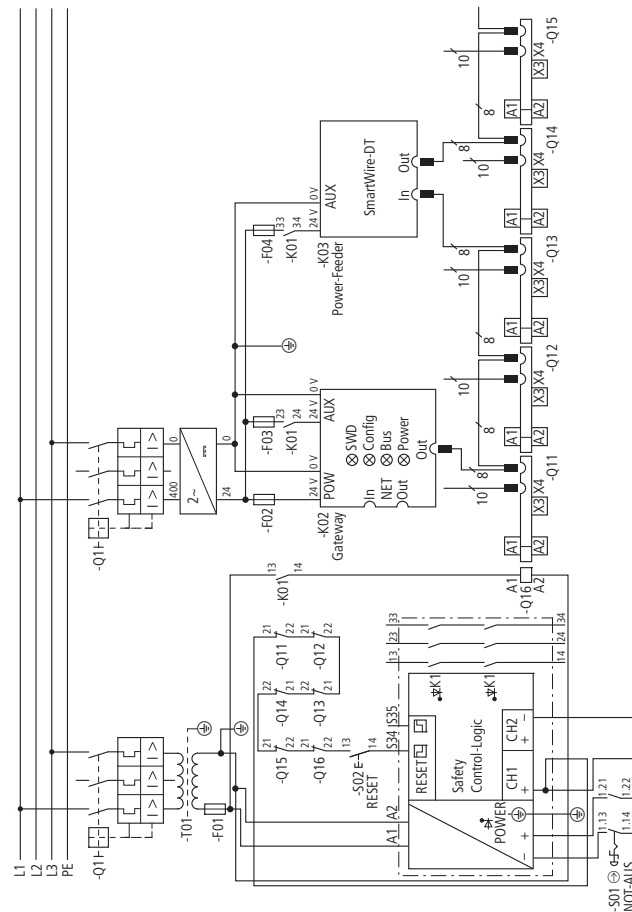


Figure 50: Actuating circuit for redundant disconnection of drive groups

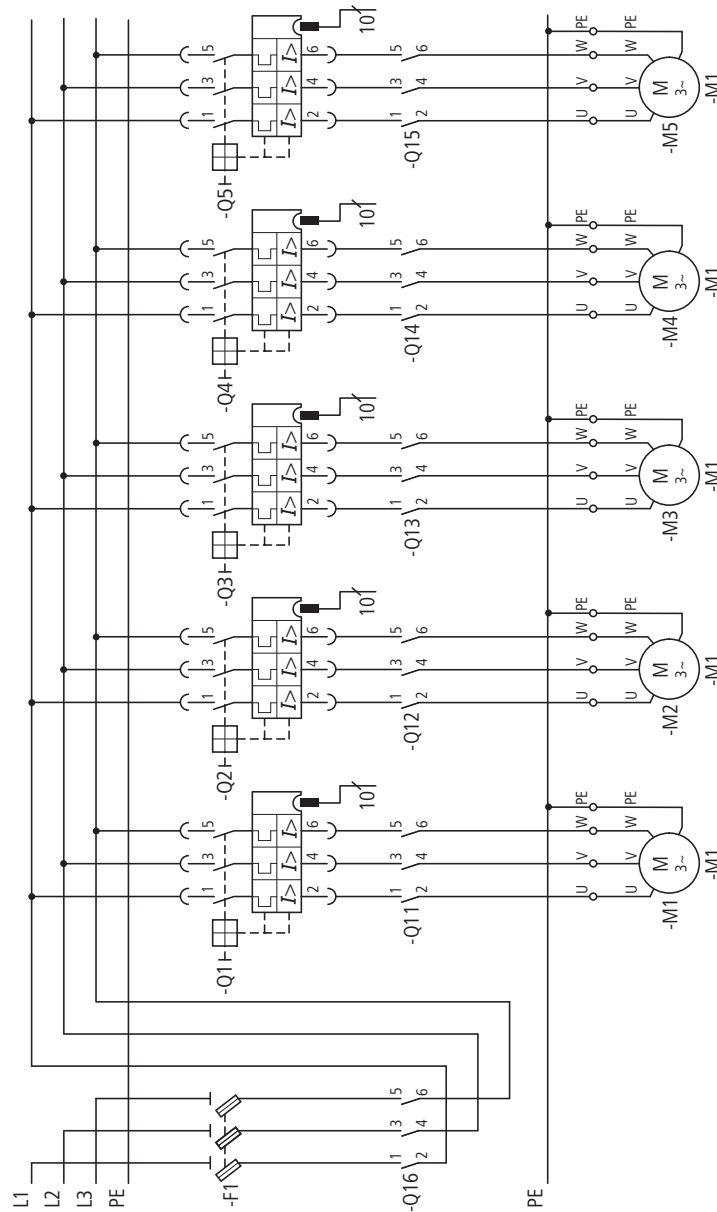


Figure 51: Main circuit for redundant disconnection of drive groups

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 15).

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

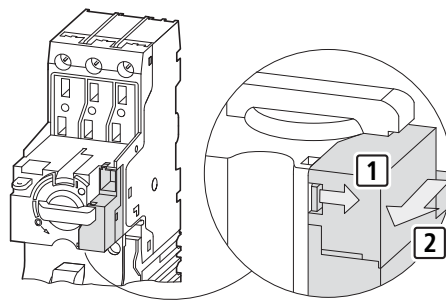
Apart from the special features described in Section "DOL starter" it must be taken into account that reversing starters in the North American market must be fitted additionally with a mechanical and electrical interlock. The electrical locking is realized via the connection "Enable" ⑧ auxiliary contact.

4.4 Installation

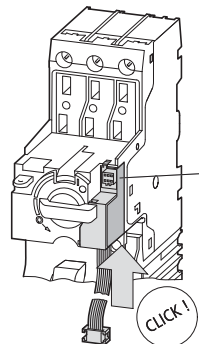
The installation of the PKE communication connection an SmartWire-DT is only possible with a DILM contactor or a part no. MSC-DEA-... electronic motor-starter combination. When using individual components (PKE and contactor separately on the top-hat rail) observe the maximum distance between the PKE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

4.4.1 Mounting PKE32-COM

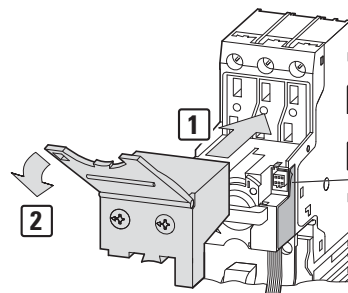
- Remove the empty module on the PKE basic device.



- 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 PKE12/32

4.4 Installation

4.4.2 Mounting PKE-SWD-32

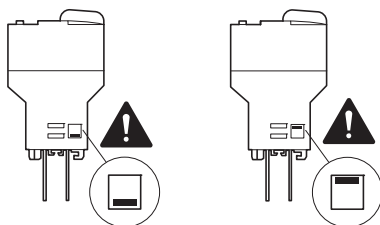
The PKE-SWD-32 must be adapted to the relevant contactor size before it is fitted. The necessary settings are made via the slide adjuster of the PKE-SWD-32.

ACHTUNG

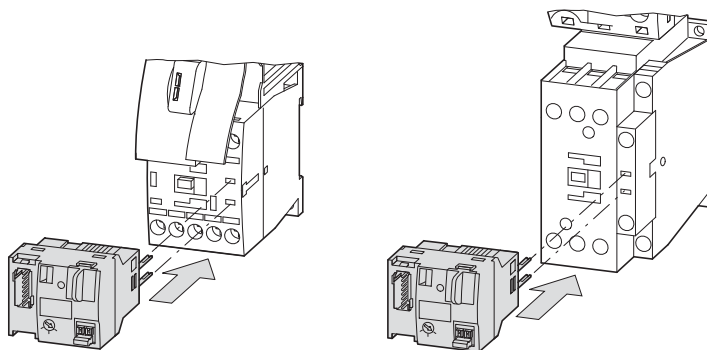
The PKE-SWD-32 may be installed and detached only after the control voltage and supply cable have been switched off.

► 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:

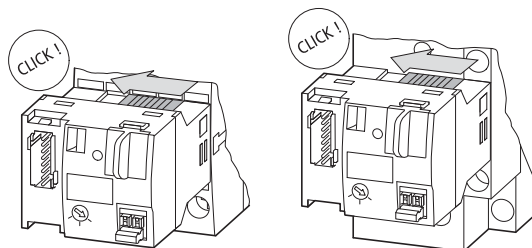
- Position **bottom**: DILM7, DILM9, DILM12, DILM15 (state of delivery)
- Position **top**: DILM17, DILM25 and DILM32



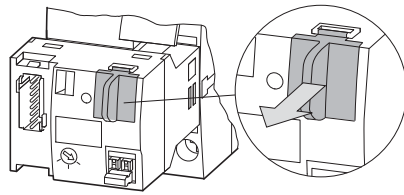
► Set the PKE-SWD-32 for the appropriate contactor.



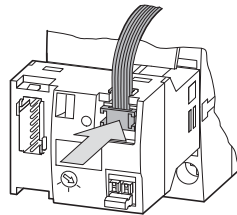
► Interlock the PKE-SWD-32.



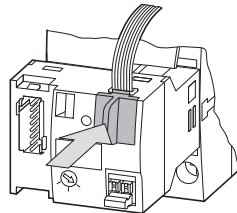
► Remove the cover of the communication interface.



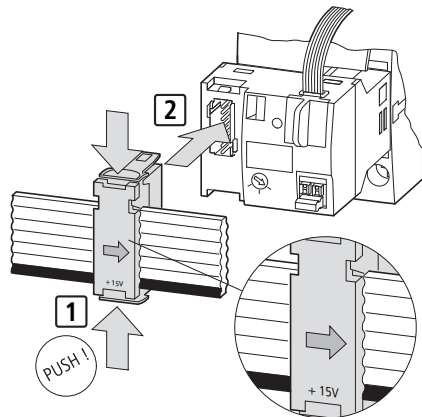
- Connect the PKE32-COM.



- 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.

4.6 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.

ACHTUNG

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	Color	State	Message
Ready	Orange	Continuous light	Switching command for contactor via SmartWire-DT
		Flashing	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)	- Addressing process in progress - after gateway power On - after actuation of the configuration button on the gateway - Module not in current configuration - invalid type
		Flashing (3 Hz)	- Incorrect manual/automatic switch setting - Communication to PKE is interrupted

4.8 Parameterization

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 120).

4.9.1.1 Input points

Byte 0:

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

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

Data bit	Designation	Description
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 PKE12/32

4.9 Programming

Data bit	Designation	Description	Notes
0 - 3	I _r	Set value I _r	→ Section 4.9.1.4, "Set value I _r ", page 111
4 - 6	TRIPR = Trip reason	Trip Reason	→ Section 4.9.1.5, "Trip reason (TRIPR)", page 112
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 116

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	Description	Notes
0 - 7	I-REL	Motor current [%]	→ Section 4.9.1.6, "Motor current [%] (I-REL)", page 113

Byte 3:

Thermal motor image [%]

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

Data bit	Designation	Description	Notes
0 - 7	TH	Thermal motor image [%]	→ Section 4.9.1.7, "Thermal motor image [TH]", page 113

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	Description	Notes
0 - 2	TYPE	Control option part no.	→ Section 4.9.1.8, "Type of trip block (TYPE)", page 114
3 - 5	CLASS	Set time lag	→ Section 4.9.1.9, "Time delay setting (CLASS)", page 114
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	–	Q0

Data bit	Designation	Description	Notes
0	Q0	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 115
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	Description	Remedy	Notes
0x03	No communication between PKE-SWD-32 and PKE trip block	- Check whether the PKE trip block used is of part no. PKE-XTUA-.... - Check the terminals of the PKE32-COM and connect the PKE32-COM if necessary.	During this state, the module can be still used for activating the connected contactor. In case of overload, the main current paths are disconnected by the PKE.
0x15	No unambiguous position of the 1-0-A switch for more than 4 seconds	Move the 1-0-A switch to one of the three defined positions.	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 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 scenario, 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	Contactors 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 121).

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).

The main circuits are interrupted as a result of a motor overload if the thermal motor model 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 %.

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

4.9 Programming



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

Base 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 121).

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. 52 and Fig. 53) illustrate the acknowledgement options for overloads with "manual" ZMR operating mode activated.

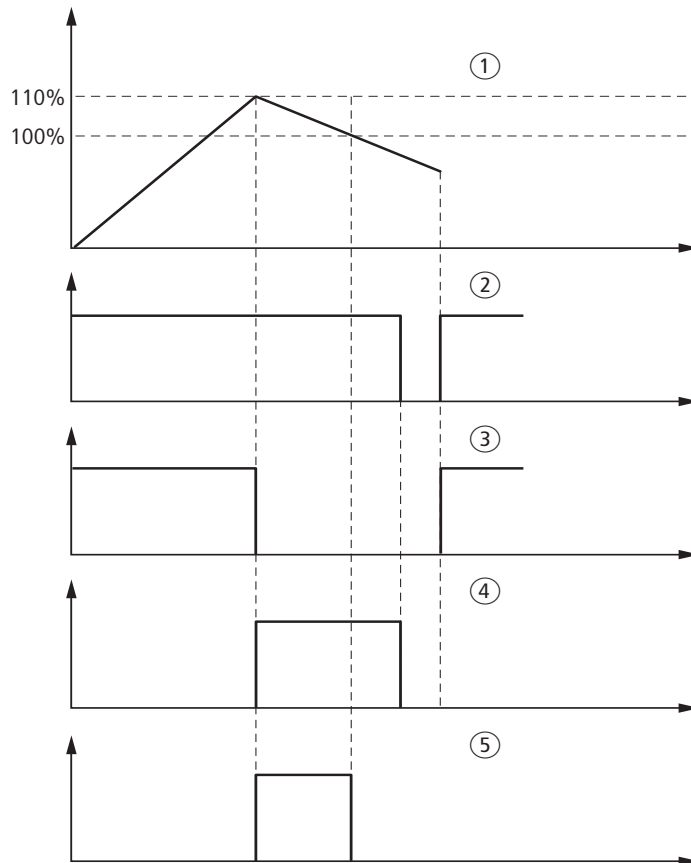


Figure 52: Acknowledgement of manual ZMR operating mode by "Contactor OFF" command

- 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

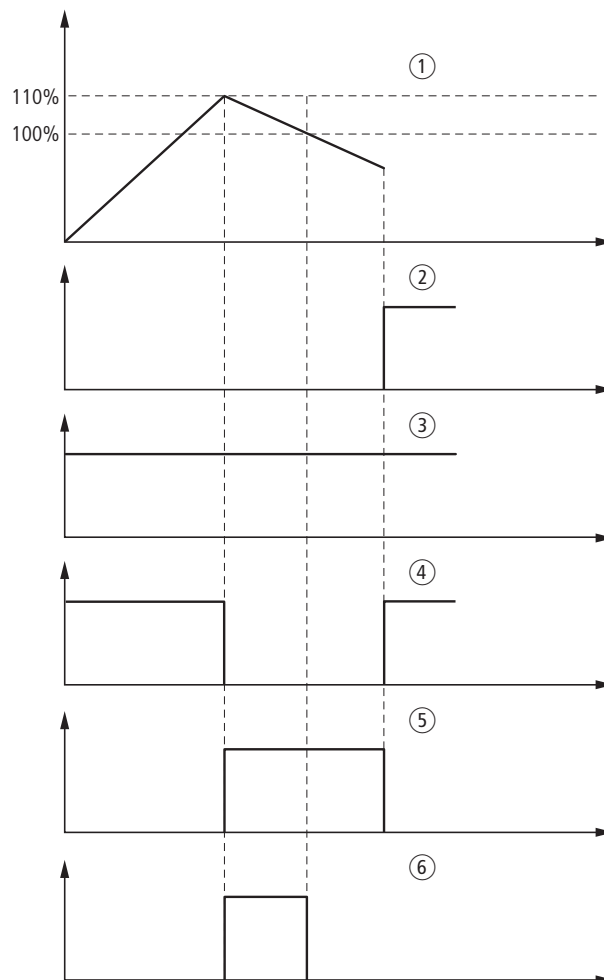


Figure 53: Acknowledgement of manual ZMR operating mode by changing the ZMR mode

- 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

ACHTUNG

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

4.9.2.2 ZMR Automatic mode

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. 54) illustrates the switching behavior of the contactor after an overload with the "automatic" ZMR operating mode active.

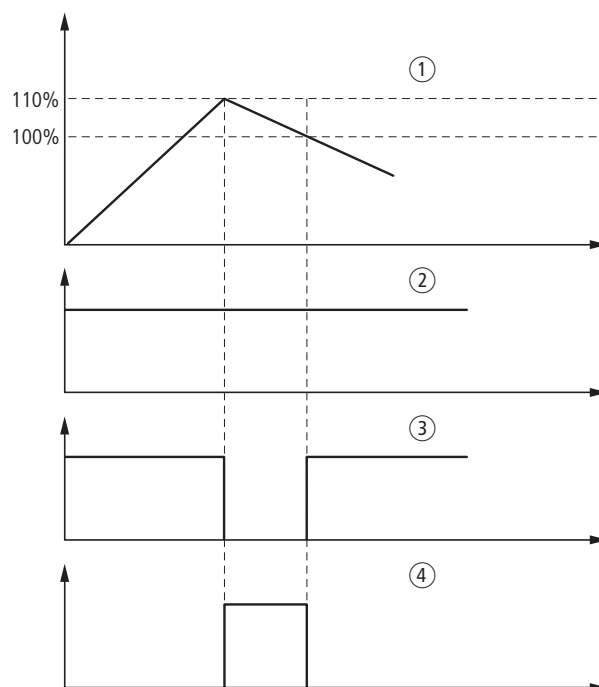


Figure 54: "Automatic" ZMR operating mode

- 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 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, "Acyclical data", page 121).

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". Meanwhile, the "Index" parameter specifies the address of the actual 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:

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 byte	Data bit	Designation	Description	Notes
0	0 - 7	I-REL	Motor current [%]	→ Section 4.9.1.6, "Motor current [%] (I-REL)", page 113

Object 2 [Index 2]:

Byte 0:

7	6	5	4	3	2	1	0
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 113

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

4.9 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 4.9.1.8, "Type of trip block (TYPE)", page 114
	3 - 5	CLASS	Set time lag	→ Section 4.9.1.9, "Time delay setting (CLASS)", page 114
	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).

ATTENTION

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

ATTENTION

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 281.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.7, „SWD module interoperability requirements“, page 282.

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

5.2 Surface mounting

5.2 Surface mounting

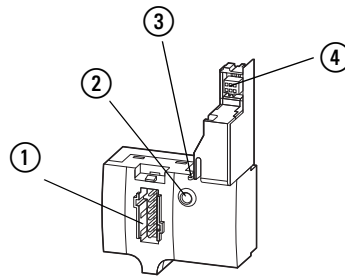


Figure 55: Figure 1: Connections PKE-SWD

- 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 "Mount the external device plug" section in manual MN05006002Z-EN (previously AWB2723-1617en).

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 128).

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
PKE12	✓	✓	✓	X	X	X
PKE32	X	X	✓	✓	X	X
PKE65	X	X	X	X	✓	✓

Where motor-protective circuit-breakers and contactors up to DILM38 are spatially separated ¹⁾ 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

Application	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
Spatially separate arrangement ¹⁾				
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.



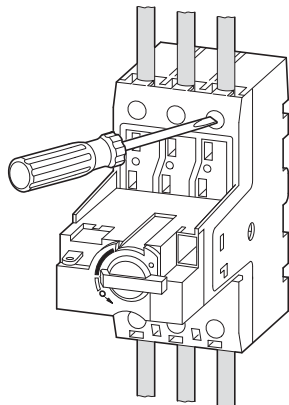
For data for the current requirement please refer to the table in the appendix on Page 275.

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

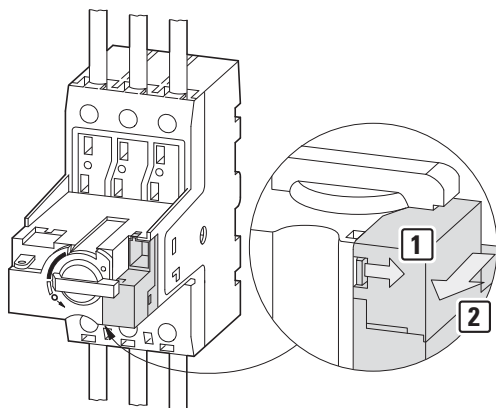
5.4 Installation

5.4 Installation

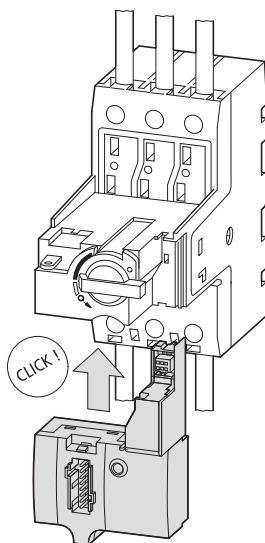
- ▶ Wire the main circuits of the PKE device.



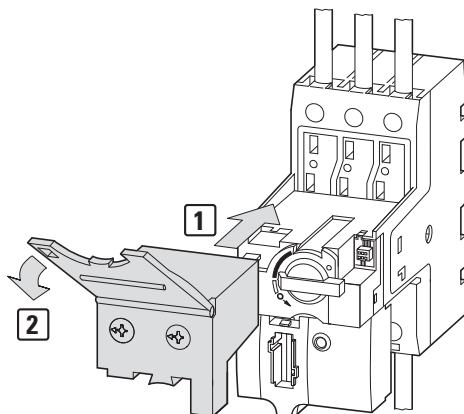
- ▶ Remove the empty module on the PKE basic device.



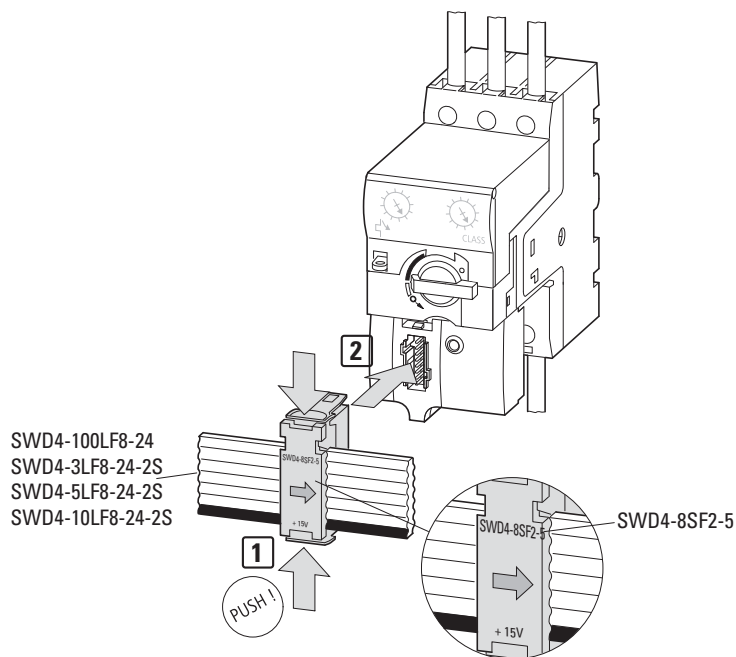
- ▶ Connect the PKE-SWD on the PKE basic device.



- ▶ 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.

ATTENTION
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	Color	State	Message
Ready	Green	Continuous light	Device is operating error-free.
		Flashing (1 Hz)	- Addressing process in progress - after gateway power On - after actuation of the configuration button on the gateway - Module not in current configuration - invalid type
		Flashing (3 Hz)	Communication to trip block PKE is interrupted

5.8 Parameterization

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 SWD modules with the EtherCAT field bus”, page 269.

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 136).

5.10.1.1 Input points

Byte 0:

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

Data bit	Designation	Description
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 _r	I _r	I _r	I _r

Data bit	Designation	Description	Notes
0-3	I _r	Set value I _r	→ Section 5.10.1.4, „Set value (I _r)“, page 132
4-6	TRIPR = Trip reason	Trip Reason	→ Section 5.10.1.5, „Differential trip indication (TRIPR)“, page 133
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	Description	Notes
0-7	I-REL	Relative current value	→ Section 5.10.1.6, „Relative current value (I-REL)“, page 133

Byte 3:

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

Data bit	Designation	Description	Notes
0 - 7	TH	Thermal motor image [%]	→ Section 5.10.1.7, „Thermal motor image [TH]“, page 134

Byte 4:

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

Data bit	Designation	Description	Notes
0 - 2	TYPE	Control option part no.	→ Section 5.10.1.8, „Type of trip block (TYPE)“, page 134
3 - 5	CLASS	Set time lag	→ Section 5.10.1.9, „Time delay setting (CLASS)“, page 135
6	Not used	-	-
7	Not used	-	-

5.10.1.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	R-TRIP	–

Data bit	Designation	Description	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 → $I_{\min} = 0.85 \times 1\text{ A} = 0.85\text{ A}$).

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 diagnosis the module reports the following error causes (input byte 0, bit 4 is set):

Value	Description	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 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 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 overload release. The accuracy of the relative current indication depends on the

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

5.10 Programming

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 136).

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 model 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

Base 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 136).

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 → $I_{\min} = 0.85 \times 1\text{A} = 0.85\text{A}$). 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 136).

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.

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". Meanwhile, the "Index" parameter specifies the address of the actual object. The first object is assigned number 1, the second 2 etc. For the PKE-SWD, object 1 supplies current value "I-REL".

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

5.10 Programming

Object 1 [Index 1]:

Byte 0:

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 byte	Data bit	Designation	Description	Notes
0	0 - 7	I-REL	Motor current [%]	→ Section 5.10.1.6, „Relative current value (I-REL)“, page 133

Object 2 [Index 2]:

Byte 0:

7	6	5	4	3	2	1	0
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 134

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 134
	3 - 5	CLASS	Set time lag	→ Section 5.10.1.9, „Time delay setting (CLASS)“, page 135
	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.

ATTENTION

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 275.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.7, „SWD module interoperability requirements“, page 282.

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

6.2 Surface mounting

6.2 Surface mounting

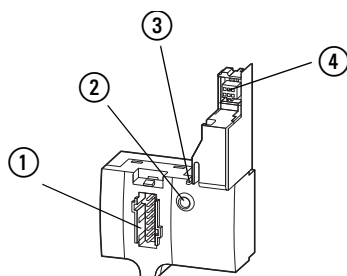


Figure 56: Connections PKE-SWD-CP

- 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 "Mount the external device plug" 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 144).

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 Engineering

The following PKE 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 feeder module to your configuration.



For data for the current consumption please refer to the table
→ Chapter 14 "Appendix", page 275

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

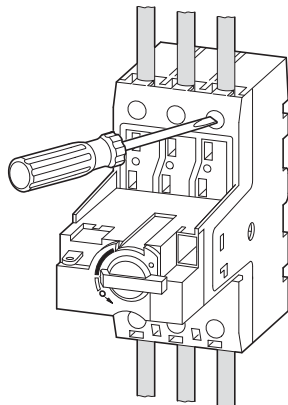
6.4 Installation

6.4 Installation

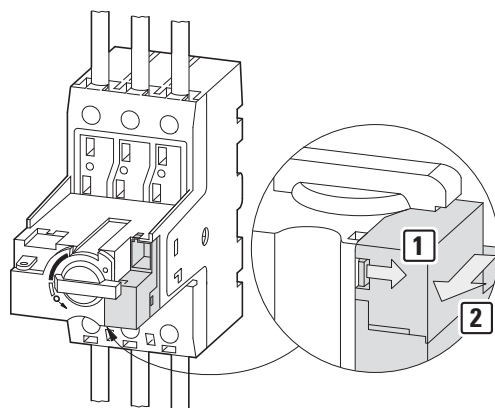


When installing the module, the PKE basic device must not have a PKE trip block installed on it.

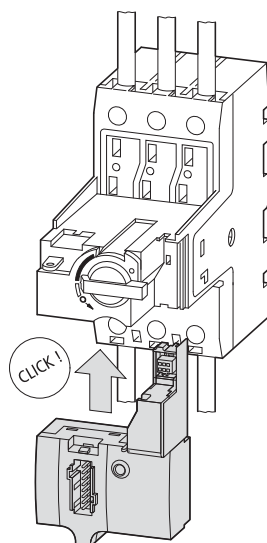
- Wire the main circuits of the PKE device.



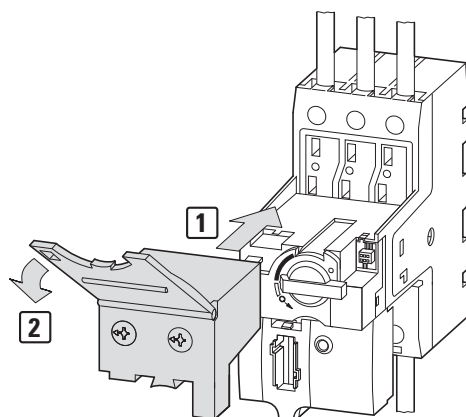
- Remove the empty module on the PKE basic device.



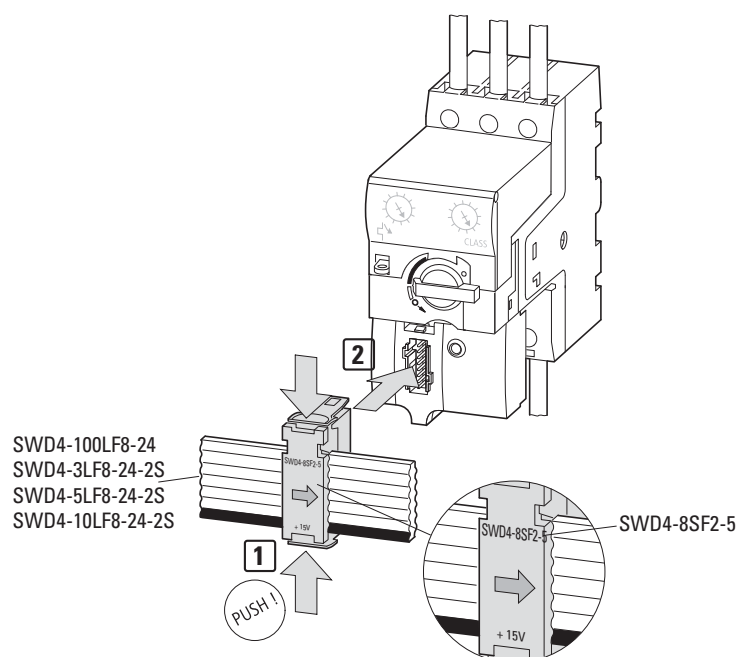
- Connect the PKE-SWD-CP on the PKE basic device.



- 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.

6.6 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.

ATTENTION
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	Color	State	Message
Ready	Green	Continuous light	Device is operating error-free.
		Flashing (1 Hz)	- Addressing process in progress - After the coordinator is powered on - after actuation of the configuration button on the coordinator - Module not in current configuration - invalid type
		Flashing (3 Hz)	- Communication to trip block PKE is interrupted - The trip block is not of part no. PKE-XTU(W)ACP-...

6.8 Parameterization

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 SWD modules with the EtherCAT field bus”, page 269.

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 152).

6.10.1.1 Input points

Byte 0:

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

Data bit	Designation	Description
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 _r	I _r	I _r	I _r

Data bit	Designation	Description	Notes
0-3	I _r	Set value I _r	→ Section 6.10.1.4, „Set value (I _r)“, page 148
4-6	TRIPR = Trip reason	Trip Reason	→ Section 6.10.1.5, „Differential trip indication (TRIPR)“, page 149
7	Not used	–	–

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

6.10 Programming

Byte 2:

7	6	5	4	3	2	1	0
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	Description	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 149

Byte 3:

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

Data bit	Designation	Description	Notes
0 - 7	TH	Thermal motor image [%]	→ Section 6.10.1.7, „Thermal model (TH)“, page 150

Byte 4:

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

Data bit	Designation	Description	Notes
0 - 2	TYPE	Control option part no.	→ Section 6.10.1.8, „Type of trip block (TYPE)“, page 150
3 - 5	I >	Factor for short-circuit current	→ Section 6.10.1.9, „Short-circuit release (I >) factor“, page 151
6	Not used	-	-
7	Not used	-	-

Byte 5:

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 bit	Designation	Description	Notes
0 - 2	I-REL-L1	Relative phase current L1	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 149

Byte 6:

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 bit	Designation	Description	Notes
0 - 2	I-REL-L2	Relative phase current L2	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 149

Byte 7:

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 bit	Designation	Description	Notes
0 - 2	I-REL-L3	Relative phase current L3	→ Section 6.10.1.6, „Relative current value (I-REL)“, page 149

6.10.1.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	R-TRIP	–

Data bit	Designation	Description	Notes
0	–	Not used	
1	R-TRIP	Remote tripping, PKE basic device 0: no remote tripping 1: Remote tripping	
2-7	–	Not used	

If remote tripping is enabled with the R-TRIP output bit, there will be a trip if the trip block phase currents exceed the values specified below:

	PKE-XTU(W)ACP-36	PKE-XTUACP-65
single-phase	15 A	30A
two-phase	12A	24A
three-phase	8A	16A

6.10.1.3 Diagnostics

In the event of a diagnosis the module reports the following error causes (input byte 0, bit 4 is set):

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6.10 Programming

Value	Description	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 position test on the PKE trip block, as well as the remote tripping function when enabled with the R-TRIP output bit, will result in a trip if the trip block phase currents exceed the specified values; see → Section "Table 27: Trip reasons for position test and R-TRIP").

Table 27: Trip reasons for position test and R-TRIP

	PKE-XTU(W)ACP-36	PKE-XTUACP-65
single-phase	15A	30A
two-phase	12A	24A
three-phase	8A	16A

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.

The maximum measuring accuracy of the transferred relative current value is 5 %. This value will be achieved if the phase current being measured exceeds the minimum trip block currents specified below:

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	PKE-XTU(W)ACP-36	PKE-XTUACP-65
Minimum current value	7.2A	14.4A

The value in data field I-REL-MAX can also be read as an acyclical object (→ Section 6.10.3, „Acyclic data PKE-SWD-CP“, page 153).

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 153).

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 28: Combination options of the PKE basic device with PKE trip block

Base 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 29: 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 153).

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 30: 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

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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 31: Data profile for PKE-SWD-CP

	Data byte 7	Data byte 6	Data-byte 5	Data-byte 4	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, „Acyclical data PKE-SWD-CP“, page 153).

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". Meanwhile, the "Index" parameter specifies the address of the actual 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:

7	6	5	4	3	2	1	0
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 149

Object 2 [Index 2]:

Byte 0:

7	6	5	4	3	2	1	0
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 150

Object 3 [Index 3]:

Byte 0:

7	6	5	4	3	2	1	0
—	—	I >	I >	I >	TYPE	TYPE	TYPE

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 150
	3 - 5	I >	Factor for short-circuit current	→ Section 6.10.1.9, „Short-circuit release (I >) factor", page 151
	6-7	Not used	—	—

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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 149

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 149

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 149



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.

7 Pilot devices M22-SWD...

7.1 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. In the case of function elements with LEDs, the indicator brightness can be adjusted to any of eight settings.

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), blue (B), or multi-color (RGB)
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.

7.2 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.

7.2.1 Surface mounting

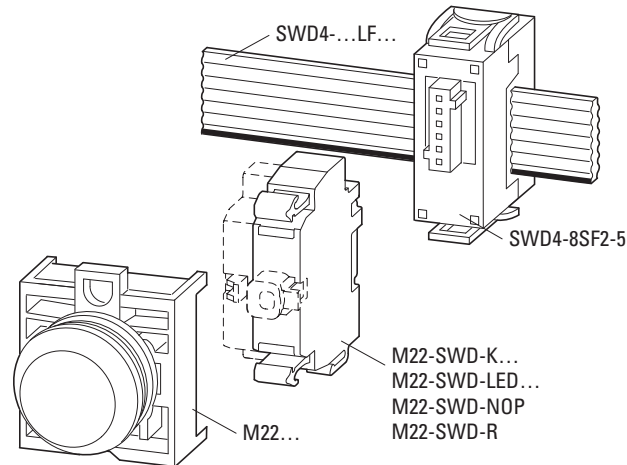


Figure 57: Layout M22-SWD front fixing

7.2.2 Engineering

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).

7.2.2.1 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.

7.2.2.2 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.

7.2.2.3 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.

7.2.2.4 M22-SWD-LED(C)-RGB

This function element can be used in combination with the indicator lights M22-L.... In order for the multiple colors to be as visible as possible, however, it should be combined with M22-L-T.

7.2.2.5 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.

7.2.2.6 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.

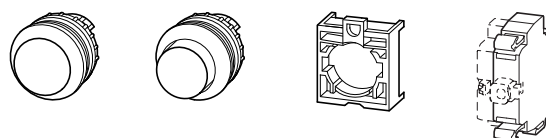


Figure 58: SmartWire-DT:Function elements

7 Pilot devices M22-SWD...

7.2 M22-SWD front mount

Table 32: Combination options for the M22 front element with SmartWire-DT function elements

front element	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)K	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)LK	M22-A	M22-SWD-K11LED
M22(S)-W(R)LK-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 33: Configurations of the M22-A adapter

Function element	Configuration of the M22-A adapter (front mount - viewed from the rear while equipping the adapter)		
Marking on adapter	1/4	3/6	2/5
M22-SWD-K11	0	X ¹⁾	0 ²⁾
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 276.

The software program SWD-Assist also supports you in doing this by automatically performing these calculations.

7.2.2.7 Potentiometers M22-SWD-R

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.

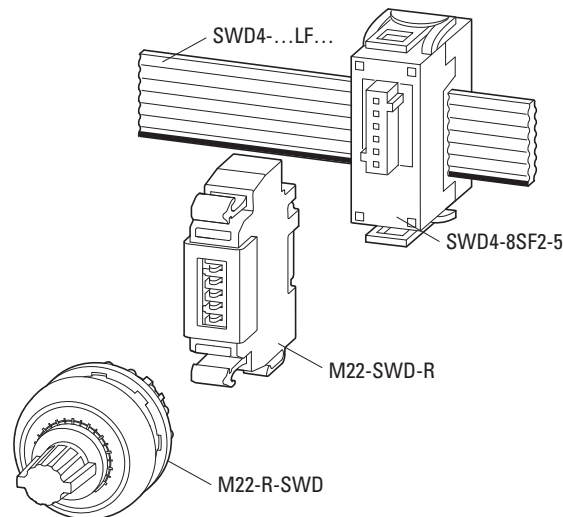


Figure 59: M22-SWD-R front mount

7.2.2.8 Encoders 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.

If the confirmation button is pressed for longer (>3 seconds), the value change is blocked and the diagnostic bit is set. A value setting when the confirmation key is pressed is therefore not possible.

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.

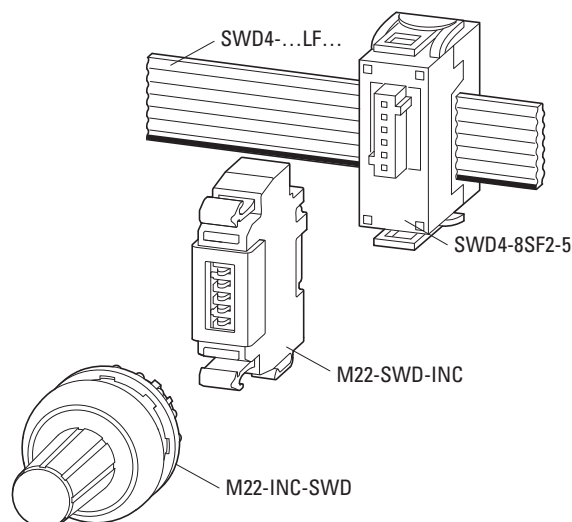


Figure 60: M22-SWD INC front mount

7.2.3 Installation

The function elements are snapped onto the adapter M22-A in the middle position.

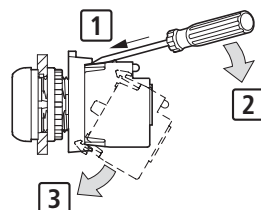


Figure 61: Connection to the adapter

The SWD 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.

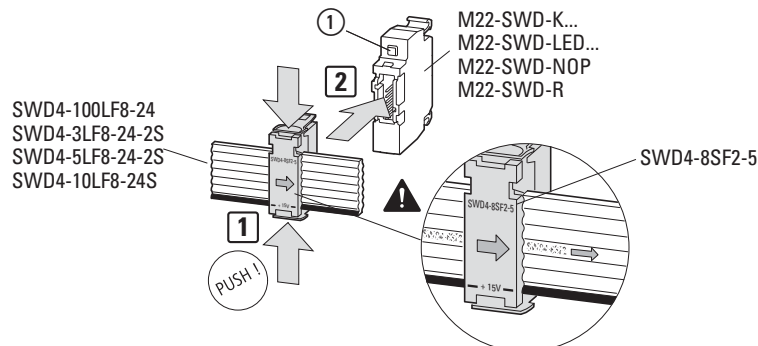


Figure 62: Connection of the function element to the SWD ribbon cable

① Diagnosis LED

7.2.4 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.

7.2.5 Exchange of modules

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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.

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

7.2.6 Device Status

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

Table 34: Diagnostic messages of the SmartWire-DT status LED

Designation	Color	State	Message
SWD	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	• addressing process in progress • after gateway power On • after actuation of the configuration button on the gateway • Module not in current configuration • invalid type
		flashing (3 Hz)	Device reports a diagnostics.(→ Section "7.3.9 Programming", sub-point "Diagnostics".)

7.2.7 Parameterization

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.

7.2.8 Fieldbus-specific characteristics

Field bus Ethercat

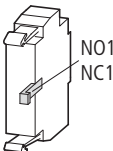
Please note the general information for configuring parameters
→ Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269.

7.2.9 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.

7.2.9.1 M22-SWD-K11

The function element has one input byte at its disposal.



Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	—	NO1	NC1 numer- ical convert er

Bit	Designation	Description
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

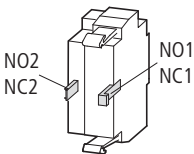
Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Description
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

7.2.9.2 M22-SWD-K22

The function element has one input byte at its disposal.



Input points

Byte 0:

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7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	NO2	NC2 numer- ical convert er	NO1	NC1 numer- ical convert er

Bit	Designation	Description
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

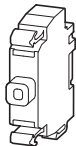
Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Description
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

7.2.9.3 M22-SWD-LED-(W/B/G/R)

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



Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Description
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
DIM2	DIM1	DIM0	–	–	–	–	Q0

Bit	Designation	Description
0	Q0	Activation of the LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	DIM0	Dimming setting adjustments (device version 02 and higher)
6	DIM1	
7	DIM2	

By changing the content of bits 5 to 7, the brightness can be reduced to any of eight settings. The LED will continue to be switched on and off via output Q0.

Table 35: Brightness setting

DIM2	DIM1	DIM0	
0	0	0	Full brightness
0	0	1	First dimming setting
–	–	–	...
1	1	1	Eighth dimming setting

Diagnostics

The module does not report a diagnosis.

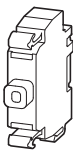
7.2.9.4 M22-SWD-LED(C)-RGB

The function element features five data profiles that are used to define the scope of the corresponding cyclical data.

- 1. Profile 1 - Compact Solution
One color out of five preset colors can be selected with an index.
- 2. Profile 2 - Index
There are 7 fixed preset colors. In addition, 16 colors can be defined at runtime in a color table with SWD-Assist. The colors can be selected with an index.
- 3. Profile 3 - RGB16
65,535 colors can be defined in one word.
- 4. Profile 4 - RGB24
For showing 24-bit color with an LED. There is one byte available for the red, green, and blue color components each. This means that 16,777,216 colors can be defined. The color information will be transmitted at runtime with cyclical services.
- 5. Profile 5- Index+RGB24
Provides the option of either selecting the color from the color table with an index as in profile 2 or of defining the color components with three bytes (as in profile 4). The color information will be transmitted at runtime with cyclical services.

All profiles allow for the LED to flash. Moreover, profiles 2 to 5 allow dimming.

Profile	Number of input bytes	Number of output bytes
1	1	1
2	1	2
3	2	3
4	1	4
5	1	5



Input points

The input byte is the same for all profiles.

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Description
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

Profile 1 – Compact solution

1 input byte, 1 output byte

The index can be used to select a color from five fixed, defined colors in the color table. In addition, flashing mode can be selected for red and green. For more information, please refer to the color table → Section “14.5.1 Color table profile 1”, page 280.

Outputs

Byte 0:

7	6	5	4	3	2	1	0
Index							

Index	Color	(RGB)	Flashing	?Frequency
0	LED off		–	–
1	Red	(200, 0, 0)	–	–
2	Green	(0, 200, 0)	–	–
3	Yellow	(100, 100, 0)	–	–
4	Blue	(0, 0, 200)	–	–
5	Green	(0, 200, 0)	50/50 %	1 Hz
6	White	(70, 70, 70)	–	–
7	Red	(200, 0, 0)	50/50 %	1 Hz

Profile 2 – Index

1 input byte, 2 output bytes

The index can be used to select one of the fixed, defined colors in ROM. In addition, the index can be used to select one of the colors from the color table created with SWD-Assist. This color table cannot be saved, and is not part of the project. For more information, please refer to the color table → Section “14.5.2 Color table profile 2...5”, page 280.

Outputs

Byte 0:

The LED is switched on and off with bit 0.

7	6	5	4	3	2	1	0
Brightness			?Frequency		Flashing		LED on/off

By changing the content of bits 5 to 7, the brightness can be reduced to any of seven settings.

Table 36: Brightness setting

Bit 7	Bit 6	Bit 5	
0	0	0	Full brightness
0	0	1	First dimming setting
-	-	-	...
1	1	1	Seventh dimming setting



Please note that when using mixed colors, there may be color deviations in the last two dimming settings.

By changing the content of bits 3 to 4, the LED's flashing frequency can be defined. If both bits have a state of "0", the LED will not flash even if a mark-to-space ratio has been set.

Table 37: Flashing frequency settings

Bit 4	Bit 3	
0	0	No flashing
0	1	1 Hz
1	0	0.5 Hz
1	1	2 Hz

By changing the content of bits 1 to 2, the mark-to-space ratio for LED flash- ing can be defined. If both bits have a state of "0", there will be no flashing even if a flashing frequency has been set.

Table 38: Flashing mark-to-space ratio settings

Bit 2	Bit 1	Mark-to-space ratio as a percentage of the total signal
0	0	No flashing
0	1	50 / 50
1	0	25 / 75
1	1	75 / 25

Byte 1:

Color selection with index in the color table. For more information, please refer to the color table → Section “14.5.2 Color table profile 2...5”, page 280.

7	6	5	4	3	2	1	0
Index							

Profile 3 – RGB16

1 input byte, 3 output bytes

The 16-bit color is defined with one word that defines the red, green, and blue color components.

Outputs

Byte 0:

The LED is switched on and off with bit 0.

7	6	5	4	3	2	1	0
Brightness			?Frequency		Flashing		LED on/off

By changing the content of bits 5 to 7, the brightness can be reduced to any of seven settings.

Table 39: Brightness setting

Bit 7	Bit 6	Bit 5	
0	0	0	Full brightness
0	0	1	First dimming setting
-	-	-	...
1	1	1	Seventh dimming setting



Please note that when using mixed colors, there may be color deviations in the last two dimming settings.

By changing the content of bits 3 to 4, the LED's flashing frequency can be defined. If both bits have a state of "0", the LED will not flash even if a mark-to-space ratio has been set.

Table 40: Flashing frequency settings

Bit 4	Bit 3	
0	0	No flashing
0	1	1 Hz
1	0	0.5 Hz
1	1	2 Hz

By changing the content of bits 1 to 2, the mark-to-space ratio for LED flashing can be defined. If both bits have a state of "0", there will be no flashing even if a flashing frequency has been set.

Table 41: Flashing mark-to-space ratio settings

Bit 2	Bit 1	Mark-to-space ratio as a percentage of the total signal
0	0	No flashing
0	1	50 / 50
1	0	25 / 75
1	1	75 / 25

Byte 1 and byte 2:

The color is selected with R, G, B color components in the color space. The red and blue components can be defined at any of 32 levels, the green component at any of 64.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Red component					Green component						Blue component				

Profile 4 – RGB24

1 input byte, 4 output bytes

The 24-bit color is defined with three bytes. There is one byte each for the red, green, and blue color components.

Outputs

Byte 0:

The LED is switched on and off with bit 0.

7	6	5	4	3	2	1	0
Brightness			?Frequency		Flashing		LED on/off

By changing the content of bits 5 to 7, the brightness can be reduced to any of seven settings.

Table 42: Brightness setting			
Bit 7	Bit 6	Bit 5	
0	0	0	Full brightness
0	0	1	First dimming setting
-	-	-	...
1	1	1	Seventh dimming setting



Please note that when using mixed colors, there may be color deviations in the last two dimming settings.

By changing the content of bits 3 to 4, the LED's flashing frequency can be defined. If both bits have a state of "0", the LED will not flash even if a mark-to-space ratio has been set.

Table 43: Flashing frequency settings		
Bit 4	Bit 3	
0	0	No flashing
0	1	1 Hz
1	0	0.5 Hz
1	1	2 Hz

By changing the content of bits 1 to 2, the mark-to-space ratio for LED flashing can be defined. If both bits have a state of "0", there will be no flashing even if a flashing frequency has been set.

Table 44: Flashing mark-to-space ratio settings

Bit 2	Bit 1	Mark-to-space ratio as a percentage of the total signal
0	0	No flashing
0	1	50 / 50
1	0	25 / 75
1	1	75 / 25

Byte 1:

Color selection with red component of 0 to 255 in RGB color space.

7	6	5	4	3	2	1	0
Red color component							

Byte 2:

Color selection with green component of 0 to 255 in RGB color space.

7	6	5	4	3	2	1	0
Green color component							

Byte 3:

Color selection with blue component of 0 to 255 in RGB color space.

7	6	5	4	3	2	1	0
Blue color component							

Profile 5 – Index+RGB24

1 input byte, 5 output bytes

The 24-bit color can be optionally selected with bytes 2 to 4 or with the index in byte 1.

Outputs

Byte 0:

The LED is switched on and off with bit 0.

7	6	5	4	3	2	1	0
Brightness			?Frequency		Flashing		LED on/off

By changing the content of bits 5 to 7, the brightness can be reduced to any of seven settings.

Table 45: Brightness setting			
Bit 7	Bit 6	Bit 5	
0	0	0	Full brightness
0	0	1	First dimming setting
-	-	-	...
1	1	1	Seventh dimming setting



Please note that when using mixed colors, there may be color deviations in the last two dimming settings.

By changing the content of bits 3 to 4, the LED's flashing frequency can be defined. If both bits have a state of "0", the LED will not flash even if a mark-to-space ratio has been set.

Table 46: Flashing frequency settings		
Bit 4	Bit 3	
0	0	No flashing
0	1	1 Hz
1	0	0.5 Hz
1	1	2 Hz

By changing the content of bits 1 to 2, the mark-to-space ratio for LED flashing can be defined. If both bits have a state of "0", there will be no flashing even if a flashing frequency has been set.

Table 47: Flashing mark-to-space ratio settings

Bit 2	Bit 1	Mark-to-space ratio as a percentage of the total signal
0	0	No flashing
0	1	50 / 50
1	0	25 / 75
1	1	75 / 25

Byte 1:

The color is selected with the index in the color table. For more information, please refer to the color table → Section “14.5.1 Color table profile 1”, page 280.

If the index is set to a value of 255, bytes 2 to 4 will be evaluated for the color selection.

7	6	5	4	3	2	1	0
Index							

Byte 2:

Color selection with red component of 0 to 255 in RGB color space.

7	6	5	4	3	2	1	0
Red color component							

Byte 3:

Color selection with green component of 0 to 255 in RGB color space.

7	6	5	4	3	2	1	0
Green color component							

Byte 4:

Color selection with blue component of 0 to 255 in RGB color space.

7	6	5	4	3	2	1	0
Blue color component							

Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

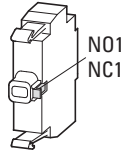
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Value	Description
0x34	Invalid index
0x35	Invalid color Dimming the mixed color will reduce an RGB color component to such an extent that it will assume a value of 1. In this case, it will no longer be possible to reproduce the mixed color correctly.

7.2.9.5 M22-SWD-K11LED-(W/B/G/R)

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



Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	N01	NC1 numerical converter

Bit	Designation	Description
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	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
DIM2	DIM1	DIM0	–	–	–	–	Q0

Bit	Designation	Description
0	Q0	Activation of the LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–

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Bit	Designation	Description
5	DIM0	Dimming setting adjustments (device version 02 and higher)
6	DIM1	
7	DIM2	

By changing the content of bits 5 to 7, the brightness can be reduced to any of eight settings. The LED will continue to be switched on and off via output Q0.

Table 48: Brightness setting

DIM2	DIM1	DIM0	
0	0	0	Full brightness
0	0	1	First dimming setting
-	-	-	...
1	1	1	Eighth dimming setting

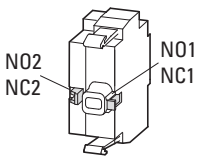
Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Description
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

7.2.9.6 M22-SWD-K22LED-(W/B/G/R)

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



Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	N02	NC2 numerical converter	N01	NC1 numerical converter

Bit	Designation	Description
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
DIM2	DIM1	DIM0	—	—	—	—	Q0

Bit	Designation	Description
0	Q0	Activation of the LED
1	Not used	—
2	Not used	—
3	Not used	—
4	Not used	—
5	DIM0	Dimming setting adjustments (device version 02 and higher)
6	DIM1	
7	DIM2	

By changing the content of bits 5 to 7, the brightness can be reduced to any of eight settings. The LED will continue to be switched on and off via output Q0.

Table 49: Brightness setting

DIM2	DIM1	DIM0	
0	0	0	Full brightness
0	0	1	First dimming setting
-	-	-	...
1	1	1	Eighth dimming setting

Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

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Value	Description
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

7.2.9.7 Potentiometers M22-SWD-R

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.

Input points

Byte 0:

The same for both profiles.

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Description
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	Description
0x14	Internal error
0x2B	Front element not plugged in
0x2C	Wrong front element plugged in
0x2D	Malfunctioning front element and/or plug-in connection

Parameterization

With the programming system's control configurator, a user can define the measured value refresh rate and averaging.

Parameter	Reading update	Averaging	
		On (default)	AUS
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	0 = percentage value 1 = absolute value		
1	Averaging	0 = Off 1 = On		
2, 3	Reading refresh rate	Bit 2	Bit 3	
		0	0	20 ms
		0	1	100 ms
		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.

7.2.9.8 Encoders M22-SWD-INC

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.

Input points

The encoder's profiles are different from each other in terms of how input bytes 1 and 2 are interpreted.

Byte 0:

The same for both profiles.

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	CNS	CTRCA CK	CTRC

Bit	Designation	Description
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	CTRCA CK	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 "Parameterization", page 185. 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 $1 \leq n \leq 254$	Byte 1								Byte 0							
	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	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)

Sub-Index $1 \leq n \leq 254$	Byte 1								Byte 0							
	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
	MSB															LSB

Outputs

The number of outputs depends on the selected data profile.

Profile 1

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	RESET	ACK CTRC

Bit	Designation	Description
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:

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Reset value as an unsigned integer

Address Bit	Byte 1								Byte 0							
	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
QW1	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 50. 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 50.

Profile 2

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	RESET	ACK CTRC

Bit	Designation	Description
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,
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 51. 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	Description
0x14	Internal error
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

Parameterization

Users can configure the following values using the programming system's PLC configurator:

Function element	Description
Count 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.
Scroll 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.
Quick 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	Updating interval for the numeric 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
Reset with pushbutton	Defines whether the pushbutton 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.
Suppress 0x2E diagnostics	If the pushbutton is pressed for longer than four seconds, a "Pushbutton fault" (fault number (0x2E)) diagnostic message normally occurs. Setting this parameter will suppress this diagnostic alarm. (available from device version 02).
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).

7.2.10 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.

Object 2102subx (x represents the position of the M22-SWD-INC in the SmartWire-DT line)	Contents
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.



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.

Structure of parameter byte 1:

Table 50: Structure of parameter byte 0

Bit	Function	Configuration															
0	Count direction	0 = The count will increase when the encoder is turned clockwise 1 = The count will increase when the encoder is turned counter-clockwise															
1	Quick scrolling	0 = Off 1 = On															
2, 3	Reading refresh rate	<table><tr><td>Bit 2</td><td>Bit 3</td><td></td></tr><tr><td>0</td><td>0</td><td>20 ms</td></tr><tr><td>0</td><td>1</td><td>100 ms</td></tr><tr><td>1</td><td>0</td><td>200 ms</td></tr><tr><td>1</td><td>1</td><td>500 ms</td></tr></table>	Bit 2	Bit 3		0	0	20 ms	0	1	100 ms	1	0	200 ms	1	1	500 ms
Bit 2	Bit 3																
0	0	20 ms															
0	1	100 ms															
1	0	200 ms															
1	1	500 ms															

Bold values indicate the default settings.

Bit	Function	Configuration
4, 5	Scroll speed	Bit 4 Bit 5
		0 0 = Increase every detent
		0 1 = Increase every 2 detents
		1 0 Increase every 4 detents
		1 1 = Increase every 8 detents
6	Reset with pushbutton	0 = Off 1 = On
7	Suppress 0x2E diagnostics	0 = "Pushbutton fault" (0x2E) will be signaled 1 = "Pushbutton fault" (0x2E) will not be signaled

Bold values indicate the default settings.

Field bus Ethercat

Please note the general information for configuring parameters

→ Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269, particularly

→ Section " Device options", page 269.

Device index: sub-index 22

Parameter data length: 0x07-

Structure of parameter byte 1:

Table 51: Structure of parameter byte 0

Bit	Function	Configuration
0	Count direction	0 = The count will increase when the encoder is turned clockwise 1 = The count will increase when the encoder is turned counter-clockwise
1	Quick scrolling	0 = Off 1 = On
2, 3	Reading refresh rate	Bit 2 Bit 3
		0 0 20 ms
		0 1 100 ms
		1 0 200 ms
		1 1 500 ms

Bold values indicate the default settings.

7 Pilot devices M22-SWD...

7.2 M22-SWD front mount

Bit	Function	Configuration		
4, 5	Scroll speed	Bit 4	Bit 5	
		0	0	= Increase every detent
		0	1	= Increase every 2 detents
		1	0	Increase every 4 detents
		1	1	= Increase every 8 detents
6	Reset with pushbutton	0 = Off 1 = On		
7	Suppress 0x2E diagnostics	0 = "Pushbutton fault" (0x2E) will be signaled 1 = "Pushbutton fault" (0x2E) will not be signaled		

Bold values indicate the default settings.

For additional information, please refer to "Fieldbus-specific characteristics" in the "Parameter configuration" section for each individual module.

7.3 M22-SWD base fixing

M22-SWD base function elements are used in connection with M22-I... surface mounting enclosures and M22 front elements.

7.3.1 Surface mounting

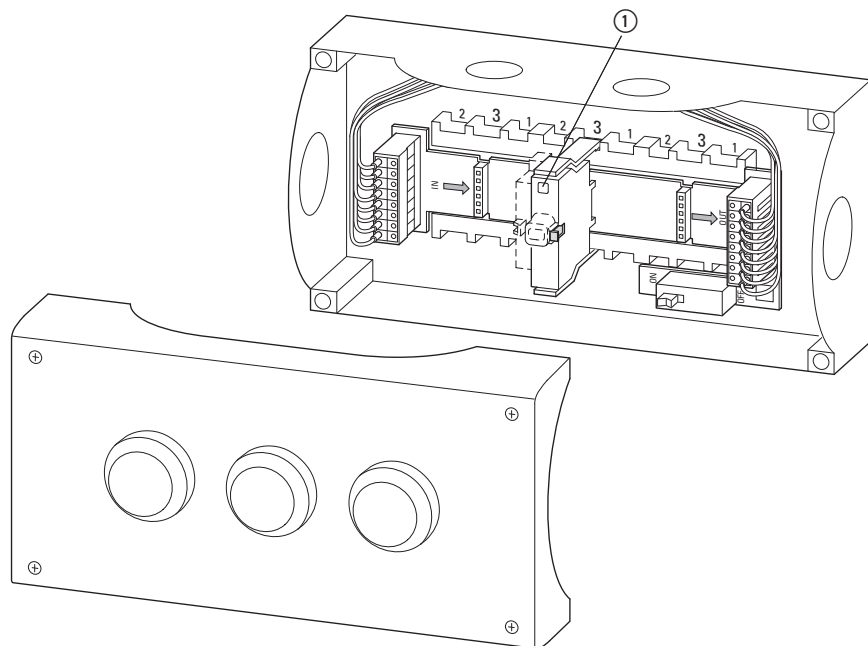


Figure 63: Base function element on a PCB in an M22-I... surface mounting enclosure

① Diagnosis LED

7.3.2 Engineering



The base function elements replace the previous M22-KC10 / KC01 contact elements and the corresponding M22 LEDC... elements. .

The SmartWire-DT base function elements are used in surface mounting enclosures M22-I1 to M22-I6 with the corresponding M22-SWD-I1-LP1 to M22-SWD-I6-LP6 PCBs.

Up to six operator control and indicator light functions can be realized with them. The PCB establishes the connection to the SmartWire-DT network. The M22 front elements for the control circuit function are used at the front of the enclosure.

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.

7.3.2.1 Connection of the round cable to the cable gland

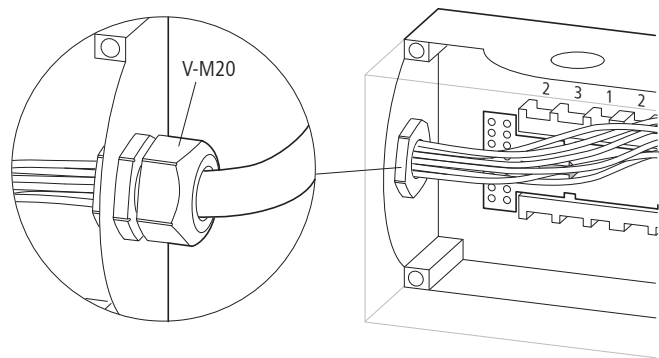


Figure 64: Connection with a cable gland

7.3.2.2 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 sockets	SWD Element
Housing bushing socket for M22	SWD4-SF8-20
Housing bushing plug for M22	SWD4-SM8-20

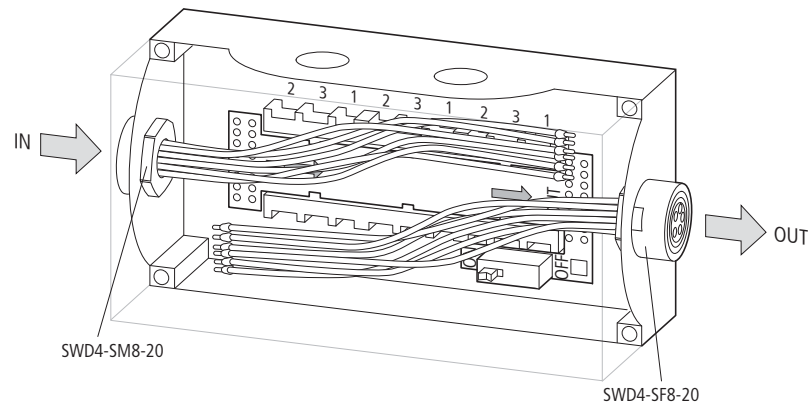


Figure 65: Plug connection

Connection to the round cable in this case is via 8 pole plugs/sockets.

Housing bushing sockets	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

- ➔ 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 operator controlled 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)

7 Pilot devices M22-SWD...

7.3 M22-SWD base fixing

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 52: 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 Table 53 shows what possibilities there are.

Table 53: Configuration in the M22-I... enclosure

Function element	M22-I... enclosure configuration (base fixing - viewed from the front while equip- ping the enclosure)		
	2	3	1
Location on the PCB (marking on the enclosure base)			
M22-SWD-KC11	0	X ¹⁾	0 ²⁾
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; if necessary, plan for an additional feeder module EU5E-SWD-PF2-1.

You will find information on the current consumption in the appendix on Page 275.

For questions about current consumption the software program SWD-Assist also supports you in doing this by automatically performing these calculations.

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

7.3.3 Installation

The functional elements are mounted on the PCB M22-SWD-I...-LP... 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.)

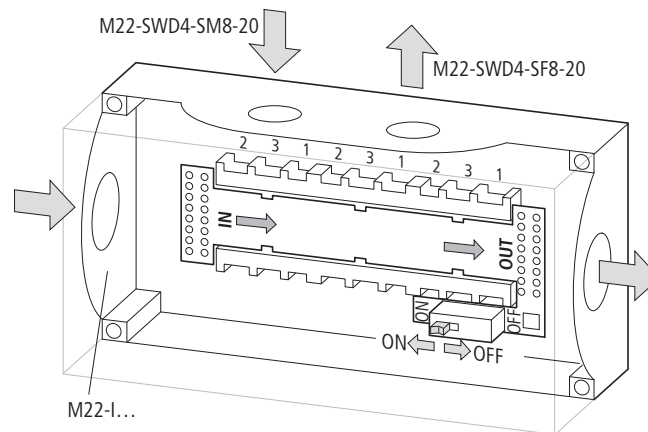


Figure 66: Surface-mounting enclosure with PCB M22-SWD-I...-LP...

- ▶ 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.

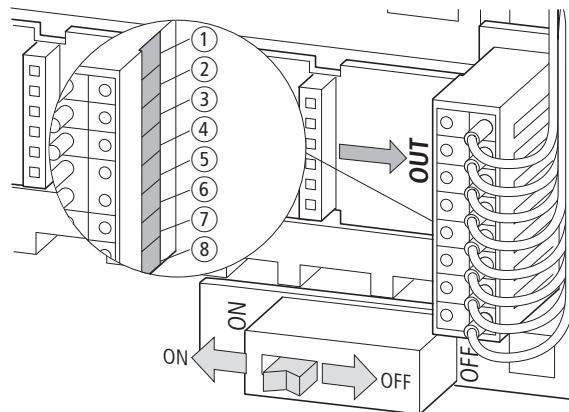


Figure 67: Bus termination resistor

- ▶ 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.

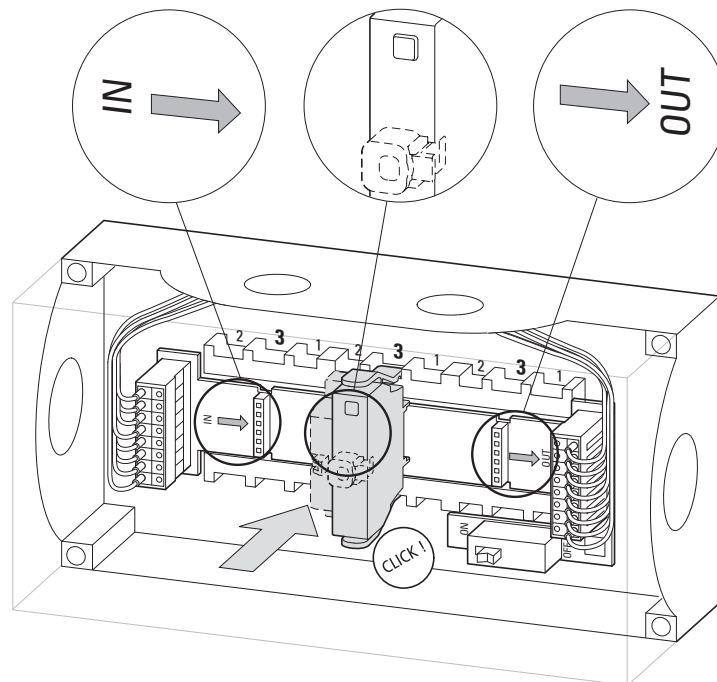


Figure 68: Equipping the enclosure slots

7.3.4 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.

7.3.5 Exchange of modules

ACHTUNG

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.

ACHTUNG

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

7.3.6 Device Status

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

Table 54: Diagnostic messages of the SmartWire-DT status LED

Designation	Color	State	Message
SWD	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	• addressing process in progress • after gateway power On • after actuation of the configuration button on the gateway • Module not in current configuration • invalid type
		flashing (3 Hz)	Device reports a diagnostics.(→ Section "7.3.9 Programming", sub-point "Diagnostics".)

7.3.7 Parameterization

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.

7.3.8 Fieldbus-specific characteristics

Field bus Ethercat

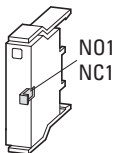
Please note the general information for configuring parameters
→ Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269.

7.3.9 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.

7.3.9.1 M22-SWD-KC11

The function element has one input byte at its disposal.



Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	NO1	NC1 numer- ical convert er

Bit	Designation	Description
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

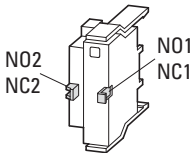
Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Description
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

7.3.9.2 M22-SWD-KC22

The function element has one input byte at its disposal.



Input points

Byte 0:

7 Pilot devices M22-SWD...

7.3 M22-SWD base fixing

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	NO2	NC2 numer- ical convert er	NO1	NC1 numer- ical convert er

Bit	Designation	Description
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

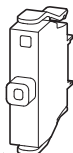
Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Description
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

7.3.9.3 M22-SWD-LEDC-(W/B/G/R)

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



Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	—	—	—

Bit	Designation	Description
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
DIM2	DIM1	DIM0	—	—	—	—	Q0

Bit	Designation	Description
0	Q0	Activation of the LED
1	Not used	—
2	Not used	—
3	Not used	—
4	Not used	—
5	DIM0	Dimming setting adjustments (device version 02 and higher)
6	DIM1	
7	DIM2	

By changing the content of bits 5 to 7, the brightness can be reduced to any of eight settings. The LED will continue to be switched on and off via output Q0.

Table 55: Brightness setting

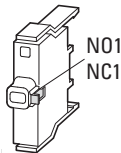
DIM2	DIM1	DIM0	
0	0	0	Full brightness
0	0	1	First dimming setting
-	-	-	...
1	1	1	Eighth dimming setting

Diagnostics

The module does not report a diagnosis.

7.3.9.4 M22-SWD-K11LEDC-(W/B/G/R)

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



input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	NO1	NC1 numer- ical convert er

Bit	Designation	Description
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
DIM2	DIM1	DIM0	–	–	–	–	Q0

Bit	Designation	Description
0	Q0	Activation of the LED
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	DIM0	Dimming setting adjustments (device version 02 and higher)
6	DIM1	
7	DIM2	

By changing the content of bits 5 to 7, the brightness can be reduced to any of eight settings. The LED will continue to be switched on and off via output Q0.

Table 56: Brightness setting

DIM2	DIM1	DIM0	
0	0	0	Full brightness
0	0	1	First dimming setting
-	-	-	...
1	1	1	Eighth dimming setting

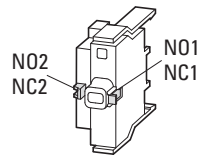
Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value	Description
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

7.3.9.5 M22-SWD-K22LEDC-(W/B/G/R)

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



Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	N02	NC2 numerical converter	N01	NC1 numerical converter

Bit	Designation	Description
0	NC1 = Normally Closed	0: contact 1 actuated 1: contact 1 not actuated
1	N01 = 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	N02 = Normally Open	0: contact 2 not actuated 1: contact 2 actuated

7 Pilot devices M22-SWD...

7.3 M22-SWD base fixing

Bit	Designation	Description
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
DIM2	DIM1	DIM0	—	—	—	—	Q0

Bit	Designation	Description
0	Q0	Activation of the LED
1	Not used	—
2	Not used	—
3	Not used	—
4	Not used	—
5	DIM0	Dimming setting adjustments (device version 02 and higher)
6	DIM1	
7	DIM2	

By changing the content of bits 5 to 7, the brightness can be reduced to any of eight settings. The LED will continue to be switched on and off via output Q0.

Table 57: Brightness setting

DIM2	DIM1	DIM0	
0	0	0	Full brightness
0	0	1	First dimming setting
-	-	-	...
1	1	1	Eighth dimming setting

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	Description
0x10	The contact is in the middle position for longer than four seconds.
0x11	Contact short-circuit

8 SL4-SWD and SL7-SWD base modules for signal towers

8.1 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.

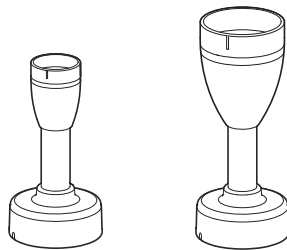
A variety of light and acoustic modules are available for this purpose.

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 14.7, „SWD module interoperability requirements“, page 282.

8.2 Surface mounting



SL4

SL7

Figure 69: Lateral view of base modules

8 SL4-SWD and SL7-SWD base modules for signal towers

8.2 Surface mounting

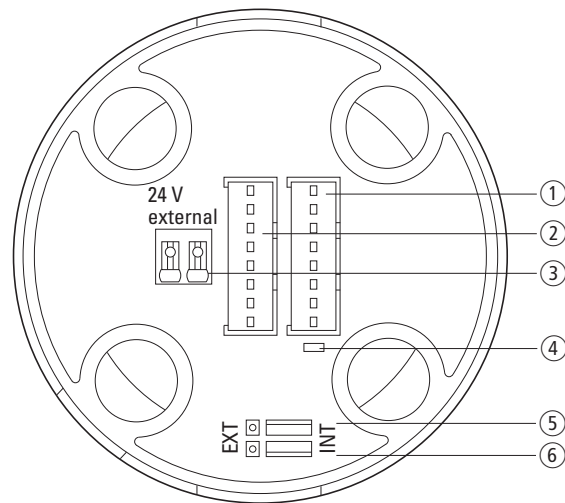


Figure 70: Bottom view of SL4-SWD and SL7-SWD base modules and corresponding connections

- 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+

8.3 Engineering

Base modules SL4-SWD and SL7-SWD require two supply voltages.

The first one - the 15-V U_{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_{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 mm².

The current requirement is:

- U_{SWD} (15 V DC): 26 mA,
- U_{AUX} (24 V DC) 276.



Please calculate your SmartWire-DT system's total power consumption and, if necessary, add an additional EU5C-SWD-PF2-1 feeder module. For more information, please refer to the manual "SmartWire-DT The system", MN05006002Z.



For data regarding the SmartWire-DT modules' current consumption, please refer to the tables in the appendix on pages 275 and 276.

8 SL4-SWD and SL7-SWD base modules for signal towers

8.4 Installation

8.4 Installation

The SmartWire-DT base modules are designed for screw fixing. They can be placed in any mounting position.

8.4.1 Mounting

ACHTUNG

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.

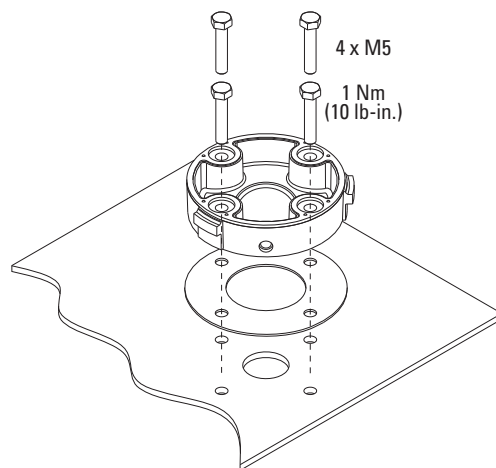


Figure 71: Installing the rapid mounting adapter

- ▶ 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 8.4.2, „Connecting the external supply voltage“, page 208.
- ▶ Connect the SmartWire DT → Section 8.4.3, „Connect SmartWire-DT“, page 208.

- ▶ 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.

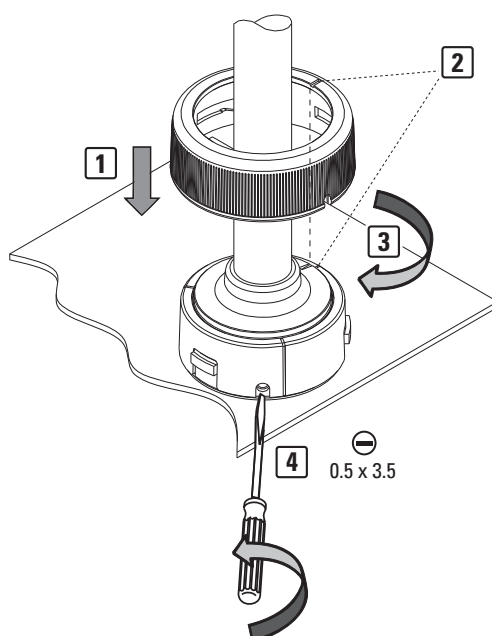


Figure 72: Attaching the base module on the rapid mounting adapter



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 "Mount the SWD4-8MF2 blade terminal" chapter in the "SmartWire-DT The system", MN05006002Z manual.

8.4.2 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.

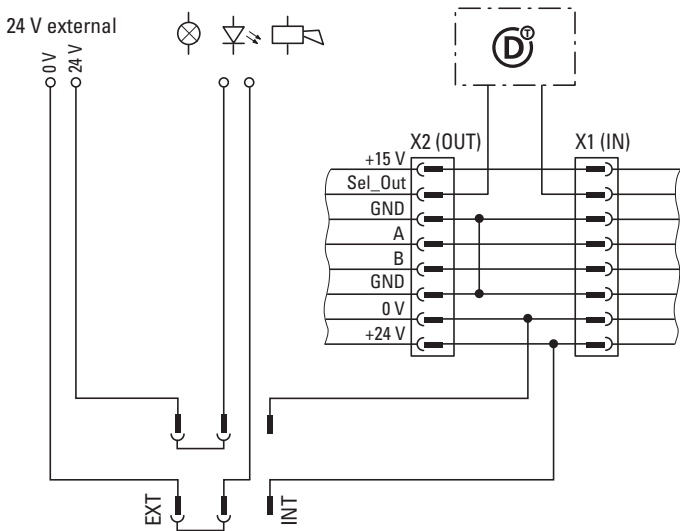


Figure 73: How the supply voltage is routed when there is an external supply and the jumpers are set accordingly

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 8.4.4, „Terminal capacities“, page 209.
- ▶ Set the jumpers on the pins as shown in the following table.

External power supply

On	Off
	
EXT	EXT
INT	INT

Figure 74: Connecting the external supply voltage with jumpers

The external supply voltage is applied.

8.4.3 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 SWD ribbon cable correctly. For detailed information, refer to the "SmartWire-DT The system", MN05006002Z manual.

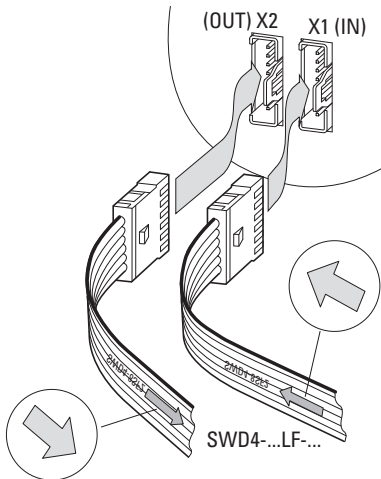
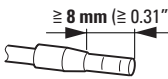


Figure 75: Plugging in the coming and going SWD ribbon cables

8.4.4 Terminal capacities

Table 58: External auxiliary power, 24 V DC

Figure	Version	Terminal capacity
	Flexible with ferrule	0.25 - 1.5 mm² (Minimum length 8 mm)
	solid	0.25 to 1.5 mm² (AWG 24 - 16)

8.5 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 continous green light.

8.5.1 Exchange of modules

ACHTUNG

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.

ACHTUNG

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

8.5.2 Device status

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

Table 59: Module LED diagnostic messages

Designation	Color	State	Message
Module-LED	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	- addressing process in progress - after gateway power On - after actuation of the configuration button on the gateway - Module not in current configuration - invalid type
		AUS	no 15 V supply voltage

8.6 Parameterization

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.

8.6.1 Fieldbus-specific characteristics

Field bus Ethercat

Please note the general information for configuring parameters

→ Chapter 13 “Using SWD modules with the EtherCAT field bus”, page 269.

8.7 Programming

The module has one input byte.

8.7.1 Input points

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Description
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

8.7.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	Q4	Q3	Q2	Q1	Q0

Bit	Designation	Description
0	Q0	Turns on light module Q0
1	Q1	Turns on light module Q1
2	Q2	Turns on light module Q2
3	Q3	Turns on light module Q3
4	Q4	Turns on light module Q4

8 SL4-SWD and SL7-SWD base modules for signal towers

8.7 Programming

8.7.3 Diagnostics

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

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

9 Interface module MCB-HK-SWD for circuit-breakers and residual current circuit-breakers

9.1 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.

9.2 Surface mounting

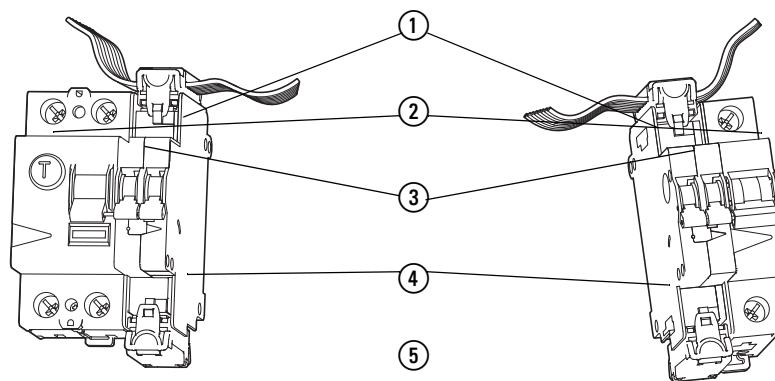


Figure 76: MCB-HK-SWD parts

- 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

9.3 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 implemented via the SWD device plug SWD4-8SF2-5. The connection can be established either to the top or bottom of the interface module. The unused connector must be covered with the included cap.



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.

9.4 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.

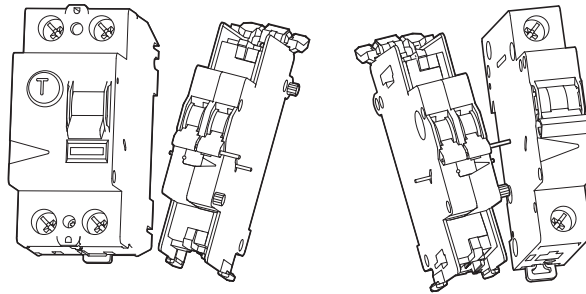


Figure 77: Connecting the interface module to the circuit-breaker

- 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.

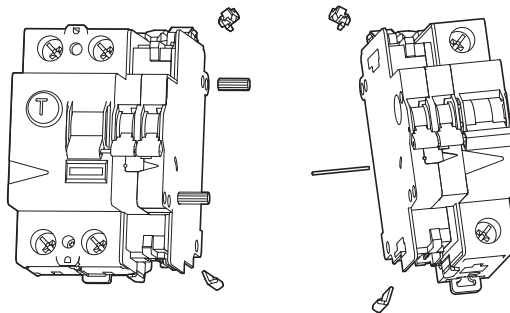


Figure 78: Removing the connection pins

- 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.

9 Interface module MCB-HK-SWD for circuit-breakers and residual current circuit-breakers

9.5 Commissioning

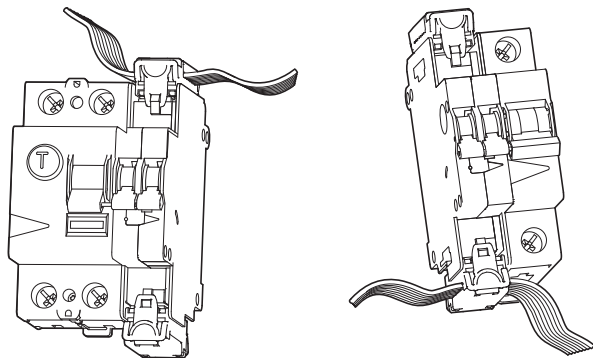


Figure 79: Connecting the SmartWire-DT cable

➔ For detailed instructions for adapting the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pole SmartWire-DT cable, see chapter "Mount the external device plug" of manual "SmartWire-DT, The System" (MN05006002Z-EN, previously AWB2723-1617en).

9.5 Commissioning

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

9.6 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.

9.7 Device Status

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

Table 60: Diagnostic messages of the SmartWire-DT status LED

Designation	Color	State	Message
SmartWire-DT	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	• addressing process in progress • after gateway power On • after actuation of the configuration button on the gateway • Module not in current configuration • invalid type
		flashing (3 Hz)	Device reports a diagnostics. (➔ Section 9.8.2, "Diagnostics", page 217)

9.8 Programming

The module has one input byte.

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	—	—	ON	TRIP

Bit	Designation	Description
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	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: Universal module M22-SWD-NOP(C) present

9.8.1 Outputs

None

9.8.2 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	Description
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.

9 Interface module MCB-HK-SWD for circuit-breakers and residual current circuit-breakers

9.8 Programming

10 SmartWire-DT universal module M22-SWD-NOP and M22-SWD-NOP-C

10.1 Introduction

Universal modules can be installed as placeholders for modules that have been configured in a system but that have not yet been installed or will only be installed in a future expansion

- On the SmartWire-DT ribbon cable with universal module M22-SWD-NOP (front mount) or
- In the M22-I...- surface mounting enclosure on the SmartWire-DT PCB with universal module M22-SWD-NOPC (base mount).

The goal is to make it possible to configure and program a full system or system expansion in the corresponding PLC user program without having to physically install the required hardware right away so that modules can be easily added later on.

The user program can detect the presence of a universal module (bit 4 and bit 7 in the first input byte's input table).

If the universal module is replaced with the configured device in the system later on, the user program in the PLC and the hardware configuration will not need to be changed.

The interoperability requirements for these SmartWire-DT modules are described in → Section 14.7, „SWD module interoperability requirements“, page 282.

10.1.1 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, install a universal module in place of this 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.

10.2 Surface mounting

The universal modules can be both front- and base-fixed.

10 SmartWire-DT universal module M22-SWD-NOP and M22-SWD-NOP-C

10.2 Surface mounting

10.2.1 Front mounting

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.

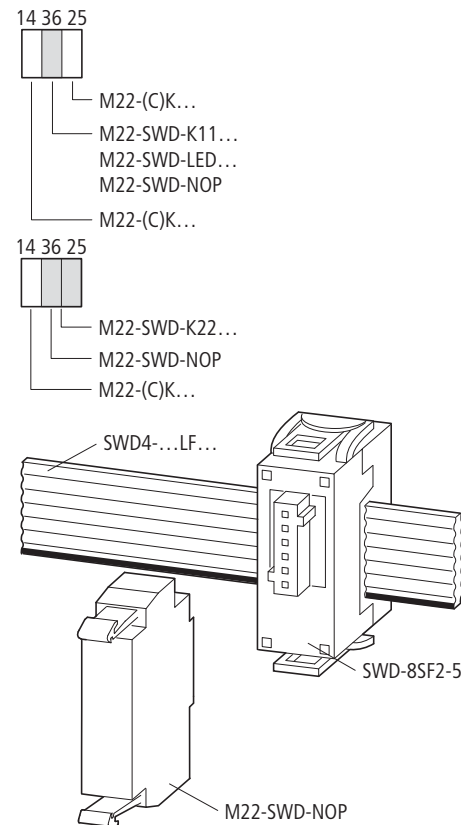


Figure 80: RMQ module as carrier element of a universal module for front mounting

10.2.1.1 Advantages

- Good mechanical adaptability.
- Can be mounted directly on top-hat rail.
- Telescopic clip for height compensation, for example to the motor-starter combinations.

10.2.2 Base mounting

Base-fixing universal modules M22-SWD are used as placeholders in combination with surface mounting enclosures M22-I....

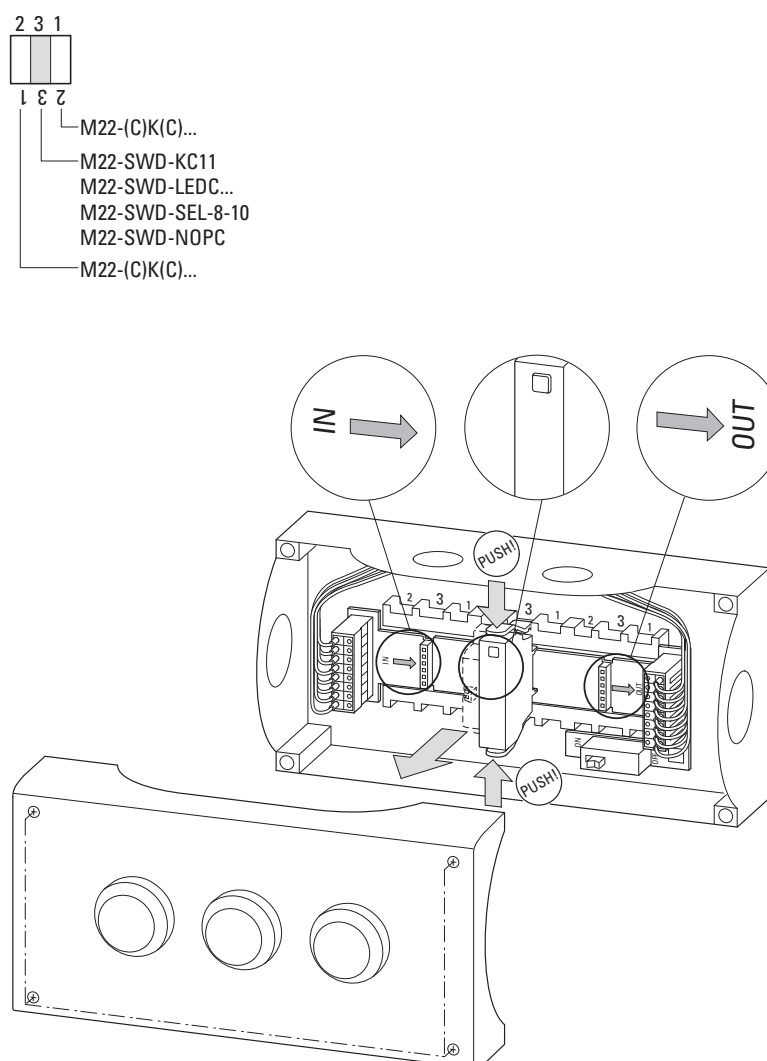


Figure 81: M22-SWD-NOPC in enclosure M22-I3

10.3 Engineering

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.

10 SmartWire-DT universal module M22-SWD-NOP and M22-SWD-NOP-C

10.4 Installation

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.

10.4 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....

10.4.1 Front mounting

Universal module M22-SWD-NOP is snap-fitted to adapter M22-A in the middle position.

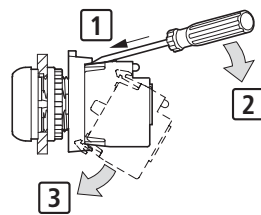


Figure 82: Connection to the adapter

The SWD 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.

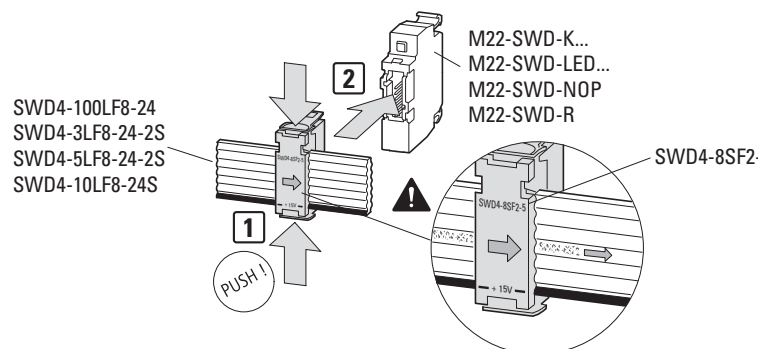


Figure 83: Connection of the universal module to the SWD ribbon cable

10.4.2 Base mounting

Universal module M22-SWD-NOPC is fitted to circuit card M22-SWD-I...-LP... 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). Equip unused slots with the link M22-SWD-SEL8-10.

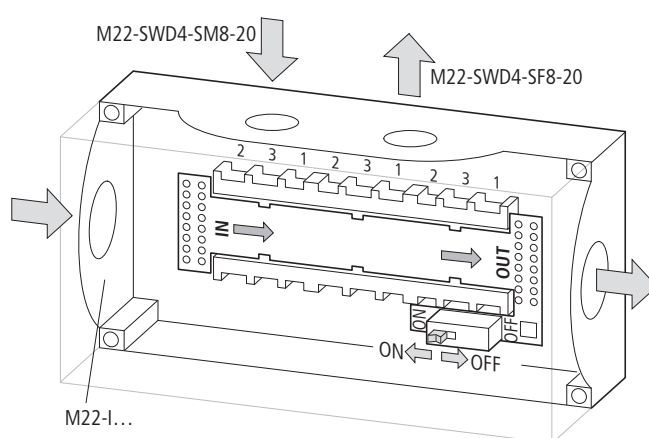


Figure 84: Universal module M22-SWD-NOPC in enclosure M22-I3

10.5 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 address assignment, the SmartWire-DT diagnostic LED at the back of the M22-SWD universal module will flash. Once the addressing process is completed, the LED indicates a green continuous light.

10.5.1 Exchange of modules

ATTENTION

Switch off the entire SmartWire-DT system before replacing SmartWire-DT universal modules.

ATTENTION

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.

10.5.2 Device status

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

Table 61: Diagnostic messages of the SmartWire-DT status LED

Designation	Color	State	Message
SWD	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	• addressing process in progress • after gateway power On • after actuation of the configuration button on the gateway • Module not in current configuration • invalid type
		flashing (3 Hz)	Device reports a diagnostics. (see section "Programming", subsection "Diagnostics").

10.6 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.

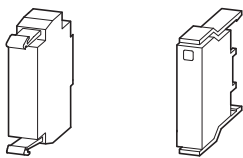


Figure 85: M22-SWD-NOP, M22-SWD-NOPC

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	—	DIAG	0	0	0	0

Bit	Designation	Description
0		0
1		0
2		0
3		0
4	DIAG	0: no diagnostic alarm
5	Not used	—
6	PRSNT	0: Module not available 1: Module available
7	SUBST	1: Universal module M22-SWD-NOP(C) present

10.6.0.1 Diagnostics

The module does not report a diagnosis.

10 SmartWire-DT universal module M22-SWD-NOP and M22-SWD-NOP-C

10.6 Programming

11 Interface NZM-XSWD-704 for NZM compact circuit-breakers

11.1 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 14.7, "SWD module interoperability requirements", page 282.

11.2 Surface mounting

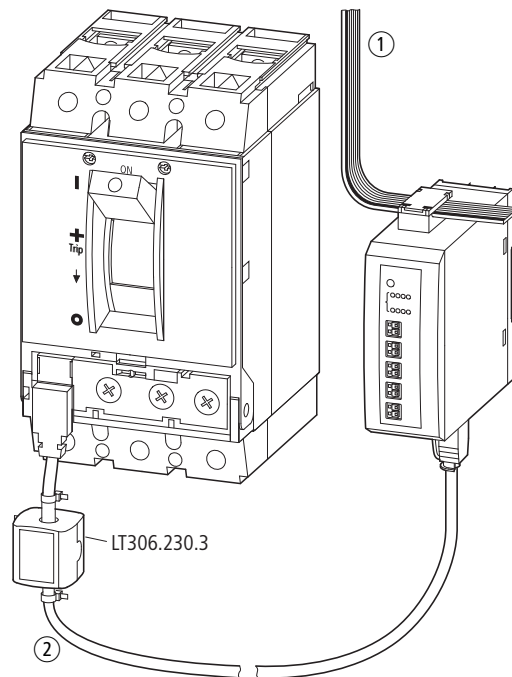


Figure 86: Fitting of NZM with NZM-XSWD-704

- ① SmartWire-DT connection
- ② Data cable NZM with NZM-XSWD-704

11 Interface NZM-XSWD-704 for NZM compact circuit-breakers

11.2 Surface mounting

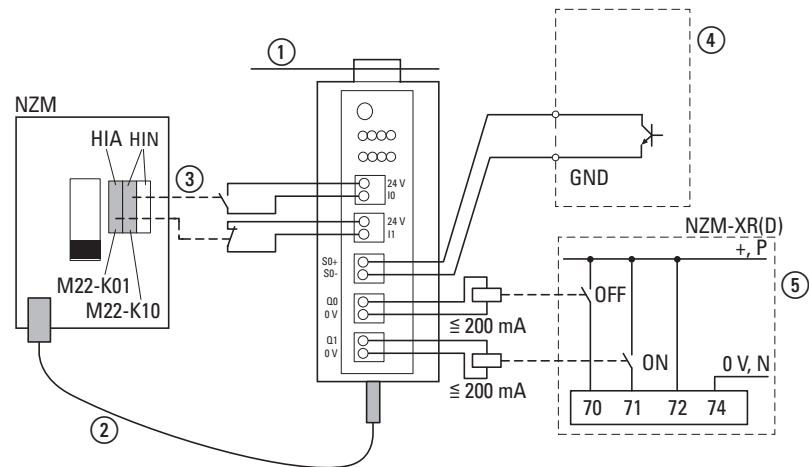


Figure 87: NZM-XSWD-704 connections to circuit-breaker

- 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 AWB2723-1617en).

11.2.1 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:

C	on	Communication with the circuit-breaker via data cable active
	off	No communication with the circuit-breaker
2x-		Without function
S		For indicating the S0 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	-

11.2.2 Porting

The module does not require an auxiliary power supply, it is supplied completely via the SmartWire-DT connecting cable.

11 Interface NZM-XSWD-704 for NZM compact circuit-breakers

11.2 Surface mounting

11.2.3 Input points

- 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:

Input points	Data CB status, byte 1, bit 2 + 3			
	Init	Off	On	Trip
	00	01	10	11
I0	–	0	1	0
I1	–	1	1	0

11.2.3.1 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.

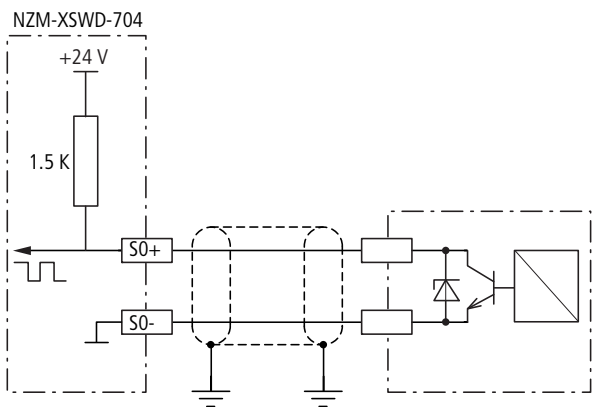


Figure 88: Connection of the S0 input

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-kΩ-resistor is permanently integrated in the NZM-XSWD-704 device.

11.2.4 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 11.8.1.7, "Outputs", page 242 as well. Wiring must be done as shown in Figure 87.

Output	Data output byte 0, bit 0 + 1			
	do not change 00	Switch off 01	Switch on 10	do not change 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 243.

The following switch commands are possible:

State	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.

ACHTUNG

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.

11.3 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

ACHTUNG

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 15)



For data for the current consumption please refer to the table
→ Chapter 14 "Appendix", page 275.

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 mm² to 1.5 mm².

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

PROFIBUS-DP	Data profile 1	Data profile 2	Data profile 3	Data profile 4
Maximum number NZM-XSWD-704/SWD line	58	22	15	7

CANopen	Data profile 1	Data profile 2	Data profile 3	Data profile 4
Maximum number NZM-XSWD-704/SWD line	42	11	8	4

11.3.1 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.

11.3.2 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.

11.4 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.

11.5 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. When this is done, the new module will be assigned an address.

ACHTUNG

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

11.6 Parameterization

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.

11.7 Fieldbus-specific characteristics

Field bus Ethercat

Please note the general information for configuring parameters
→ Chapter 13 “Using SWD modules with the EtherCAT field bus”, page 269.

11.8 Programming

11.8.1 Cyclic data

11.8.1.1 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 62: 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 11 “Interface NZM-XSWD-704 for NZM compact circuit-breakers”, page 245).

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).

Table 63: Overview of the data profiles of the NZM-XSWD-704

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11.8 Programming

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 _{max}	Current I _{max}	Current I _{max}
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 _r
16	–	–	–	Set value I _i
17	–	–	–	Set value t _r
18	–	–	–	Set value I _{sd}
19	–	–	–	Set value t _{sd}
20	–	–	–	Set value I _g
21	–	–	–	Set value t _g
22	–	–	–	I ² 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

11.8.1.2 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.

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11.8 Programming

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

11.8.1.3 Digital status data: profile 1

Byte	Bit								Description	Remark
	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 _r
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 _r
2							X		Group warning	Load warning or overload warning 1 or overload warning 2
2		X	X	X					000 = OK 001 = Trip I _r 010 = Trip I _i 011 = Trip I _{sd} 100 = Trip I _g 101 = TripTemp or Trip Err 110 = Trip I _r in neutral conductor	Cause of trip ¹⁾ 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 _r

- 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).

11.8.1.4 Currents: profile 2

Profile 2 contains the digital status data as well as the phase currents that the table shows.

Byte	Bit								Description	Remark
	7	6	5	4	3	2	1	0		
3	X	X	X	X	X	X	X	X	Current I1 [A] ¹⁾	RMS value
4	X	X	X	X	X	X	X	X	Current I1 [A] ¹⁾	
5	X	X	X	X	X	X	X	X	Current I2 [A] ¹⁾	
6	X	X	X	X	X	X	X	X	Current I2 [A] ¹⁾	
7	X	X	X	X	X	X	X	X	Current I3 [A] ¹⁾	
8	X	X	X	X	X	X	X	X	Current I3 [A] ¹⁾	Maximum value of the three phase currents
9	X	X	X	X	X	X	X	X	Current $I_{\max}$ [A] ¹⁾	
10	X	X	X	X	X	X	X	X	Current $I_{\max}$ [A] ¹⁾	

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 $I > 0.2 \times I_n$. At smaller currents the value is zero.

11.8.1.5 Energy values: profile 3

In addition to the data of profile 2, profile 3 contains the energy values shown in the table.

Byte	Bit								Description	Remark
	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

11.8.1.6 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	Remark
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	$I_r = 0.75 \times I_n$	

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11.8 Programming

Byte	Dec. value	Description	Remark
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	$I_r = 1.0 \times I_n$	
• NZM2-AE, -AEF-NA, -VE, -VE-NA, -VEF-NA • NZM4-AE, -AE-NA, -AEF-NA, -VE, -VE-NA, -VEF-NA			
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	$I_i = 12 \times I_n$	
• 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			
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	$I_i = 9 \times I_n$	
16	8	$I_i = 11 \times I_n$	
• 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			
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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11.8 Programming

Byte	Dec. value	Description	Remark
	- NZM2-ME, -SE...-NA - NZM3-ME-220, -350, -450, -SE-220, -SE-350, -SE-450-NA - NZM4-ME, -SE...-NA		
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	$I_i = 14 \times I_r$	
	- NZMX-VEF...-NA, -VE...-NA - NZM2-ME...-NA		
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	$t_r = 20$	
	NZM3-4-VE630		
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	$t_r = 2$	

11 Interface NZM-XSWD-704 for NZM compact circuit-breakers

11.8 Programming

Byte	Dec. value	Description	Remark
	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	$t_r = \text{infinite}$	
	• NZM3-VE-630, -VE-250...400-NA, , -VEF-250...400-NA, -VE-450...600-NA, -VEF-450...600-NA		
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	$I_{sd} = 7 \times I_r$	
	• NZM4-VE2000		
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	$I_{sd} = 6 \times I_r$	

1.1 Interface NZM-XSWD-704 for NZM compact circuit-breakers

1.1.8 Programming

Byte	Dec. value	Description	Remark
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	$t_g = 1000$	

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11.8 Programming

Byte	Dec. value	Description	Remark
22	1 = I ² t[A] activated 0 = I ² t[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 Secondary index 1, bit 5 - 3 Secondary index 2, bit 2 - 0		NZM firmware version
29	0 = NZM ground fault module not present		
29	16 = NZM ground fault module present		
30	Reserve		

11.8.1.7 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	Remark
	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 243.

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:

11 Interface NZM-XSWD-704 for NZM compact circuit-breakers

11.8 Programming

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.

11.8.2 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.

To decoding CB types and CB identification, please contact Eaton Service.

11.8.2.1 Diagnostics

In the event of a diagnosis the module reports the following error causes (input byte 0, bit 4 is set):

Value	Description	Remedy	Notes
0x03	No circuit-breaker connected	• Check the cable connection to the circuit-breaker. • If necessary, replace circuit-breaker and cables.	The digital input and output states are still transferred in this state.
0x13	Short-circuit on output Q0 or Q1	• Check wiring of the outputs.	
0x14	Internal fault in NZM-XSWD-704	• Attempt a reset by switching on the power supply again. • Exchange the module.	
0x16	Power meters invalid	• Reset counter value via output command and observe whether the fault is rectified. • Replace module as memory is faulty.	A memory error has occurred in the NZM-XSWD-704.

11.8.3 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 64: Object description

Object 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 SmartWire-DT Gateway EU5C-SWD-DP (MN05013002Z), please visit www.eaton.eu/doc.

11 Interface NZM-XSWD-704 for NZM compact circuit-breakers

11.8 Programming

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.1 Introduction

The PXR-RCAM-SWD SmartWire-DT module is used for querying a circuit-breaker (NZM 2,3,4) with a communication module PXR-RCAM-MRTU-I via a SWD Coordinator. On/Off/Trip position of the circuit-breaker and actual currents, voltages and power values can be queried. The PXR-RCAM-SWD is fitted on a top-hat rail in an installation compartment with protection at least to IP 54 (control panel) and could be connected to the NZM via data cable with a maximal length of 3.0 m. The interoperability requirements for these SmartWire-DT modules are described in → Section 14.7, „SWD module interoperability requirements“, page 282.

12.2 Surface mounting

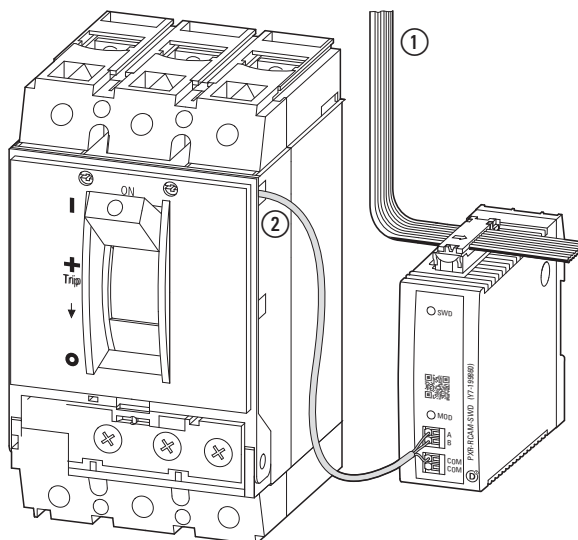


Figure 89: Fitting of NZM with PXR-RCAM-SWD

- ① SmartWire-DT connection with SWD4-8SF2-5
- ② Data cable NZM with PXR-RCAM-SWD

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.3 Indication and connection elements

12.3 Indication and connection elements

The network status of the module is signalled via the SmartWire-DT diagnostics LED SWD. The communication status with circuit breaker is signaled via diagnostics LED MOD.

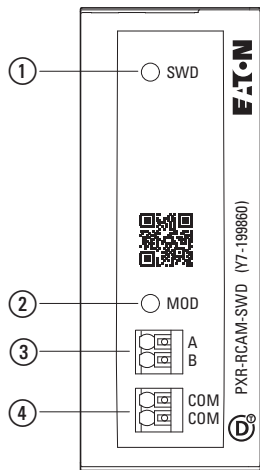


Figure 90: Front of PXR-RCAM-SWD

- ① LED SWD
- ② LED MOD
- ③ Modbus RTU signal wires
- ④ Modbus RTU COM wire

LEDs have the following function:

Designation	Color	State	Message
SWD	Green	Continuous light	Device is operating fault-free.
		flashing (1 Hz)	• addressing process in progress • after gateway power On • after actuation of the configuration button on the gateway • Module not in current configuration • invalid type
		flashing (3 Hz)	Device reports a diagnostics. (→ Section 12.10.1.10, „Diagnostics“, page 264)
MOD	Green	Continuous light	NZM is connected and communicates properly
		Off	Initialization of MODBUS during enumerating of SmartWire-DT device
		flashing (5 Hz)	NZM is unconnected or not communicating, e.g. not matching communication parameters, power loss

12.4 Engineering

The PXR-RCAM-SWD 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

The connection terminals on the PXR-RCAM-SWD are suitable for AWG24 to AWG16 cables and for flexible conductors with a cross-section of 0.25 mm² to 1.5 mm².

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

The maximum number of PXR-RCAM-SWD modules on a SWD line depends on the field bus gateway used and the data profile selected.

For detailed information, see the manual for the corresponding gateway. Information on maximum input and output data for the selected profile, see → Section 14.3, „Data requirement (bytes) SmartWire-DT modules“, page 278.

A terminating resistor is integrated in the PXR-RCAM-SWD. This does not need to be connected or configured. The module can be connected directly to the Modbus interface of the NZM.

The standard communication parameters of the PXR-RCAM-SWD match the standard settings of the NZM, but can be adjusted via SWD-Assist.

Default values:

- Address: 2
- Baud rate: 19.200 bit/s
- Parity: Even
- 1 Stop bit



Use a shielded twisted pair cable for the connection.
Recommendation: LIYCY-TP-2x2x0.14 or LIYCY-TP-3x2x0.14.

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.5 Installation

12.5 Installation



Prerequisite:
NZM is already mounted on top-hat rail.

- ▶ Power off the NZM device!
- ▶ Mount PXR-RCAM-SWD on a top-hat rail at a maximum distance of 3 m from the circuit-breaker. A minimum clearance of 60 mm from the NZM must be maintained.

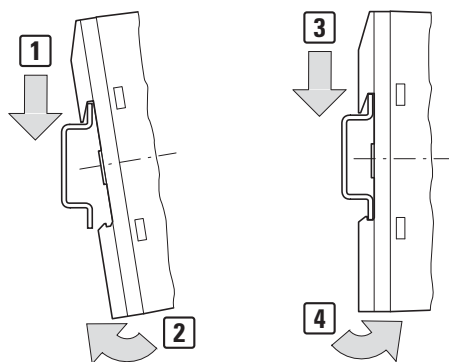


Figure 91: Mounting PXR-RCAM-SWD

- ▶ Open NZM and remove the connector PXR-RCAM-MRTU-I.

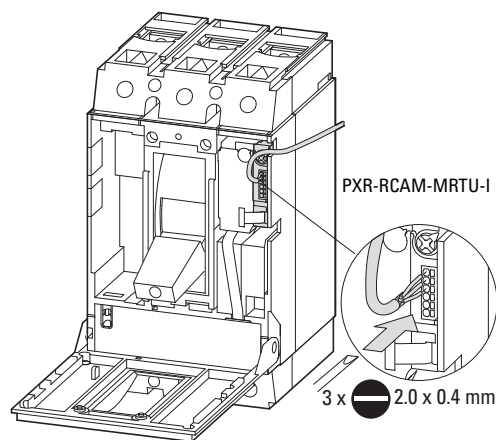


Figure 92: NZM Release unit with connector PXR-RCAM-MRTU-I

- ▶ Connect PXR-RCAM-MRTU-I and PXR-RCAM-SWD as shown in the figure below. Use cable described in → Section 12.5.1, „Modbus RTU – integrated Modbus port specification“, page 252.

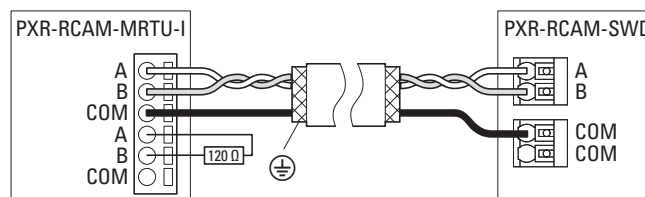


Figure 93: PXR-RCAM-SWD connection to circuit-breaker

The max. cable length of the Modbus cable is 3 m.

- Reinsert the connector PXR-RCAM-MRTU-I.

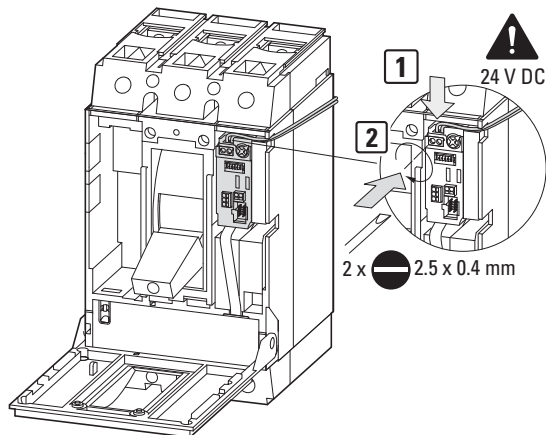


Figure 94: Insert PXR-RCAM-MRTU-I

- Carefully install the cable at the cut-out in the front and close the NZM.

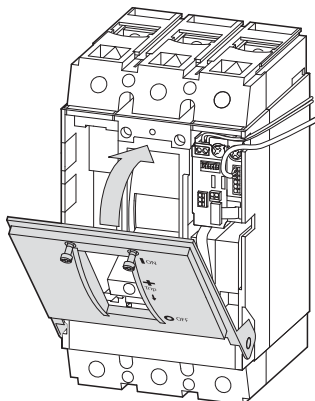


Figure 95: Closing NZM

- Connect the SmartWire-DT external device plug SWD4-8SF2-5 with an SWD ribbon cable to the PXR-RCAM-SWD module via connection.

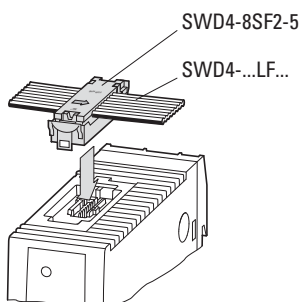


Figure 96: Connect SWD coordinator to PXR-RCAM-SWD



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.

12.5.1 Modbus RTU – integrated Modbus port specification

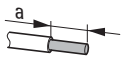
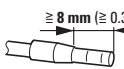
The internal Modbus communication module is an optional accessory for digital NZM circuit breakers with PXR technology.

This module enables the communication between the release unit and a Modbus RTU fieldbus.

If supplied with a voltage of 24 V DC, the trip unit can communicate as a slave device via the Modbus A, Modbus B and Modbus COM contacts.

The Modbus cable has to comply with the following specifications:

- at least one pair of twisted wires (signal cable Modbus A, Modbus B)
- at least one ground wire (Modbus COM)
- HF-compatible shielding (including HF-compatible grounding)
- compatibility with the respective environmental conditions (temperature, humidity, chemical resistance, etc.)
- The cross section of the wire is as follows:

	PXR-RCAM-MRTU-I		PXR-RCAM-SWD
	a = 6 mm (a = 0.24 ")		
	0.20 - 0.5 mm ² AWG24 - AWG20		0.25 - 1.5 mm ² AWG24 - AWG16
	0.20 - 0.5 mm ² AWG24 - AWG20		0.20 - 1.5 mm ² AWG24 - AWG16
	0.25- 0.5 mm ² AWG24 - AWG21		
	2.0 x 0.4 mm		

The wiring is done as follows:

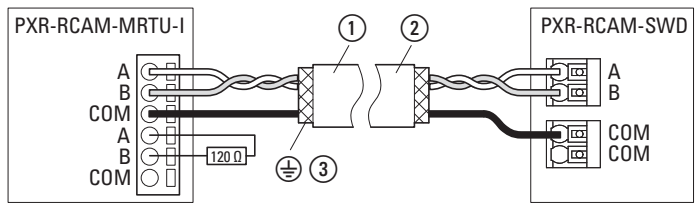


Figure 97: Wiring

- ① Modbus RTU input cable
- ② Modbus RTU-compatible cable: triple wire shielded; two twisted signal wires; one COM wire
- ③ HF-compatible functional grounding

12.6 Commissioning

The automatic addressing of all modules in the SmartWire-DT line is performed via the coordinator (actuation of the configuration pushbutton on the coordinator) 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.

12.7 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. When this is done, the new module will be assigned an address.

CAUTION

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

12.8 Parameterization

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.

12.9 Fieldbus-specific characteristics

Field bus Ethercat

Please note the general information for configuring parameters
 → Chapter 13 "Using SWD modules with the EtherCAT field bus", page 269.

12.10 Programming

12.10.1 Cyclic data

More information see manual „PXR10, PXR20, PXR25 Electronic trip unit“, MN012005EN, Chapter 9.3 „Modbus register map“.

12.10.1.1 Data profiles



Seven 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 voltages are contained in profile 2 and 3. Profile 4 contains all the information of the NZM including power values.



Profile 2, 3, 4 are floating point based.
 Profile 5, 6, 7 are integer based.

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.10 Programming



Non-existing register values are represented as 0x7FF20000 (NaN) in profiles 2, 3, 4.

Non-existing register values and negative values are represented as 0xFFFF in profiles 5, 6, 7.

Table 65: Data profile size PXR-RCAM-SWD

	Profile						
	1	2	3	4	5	6	7
Words+Bytes total	3+1	13+1	25+1	35+1	8+1	14+1	19+1
Bytes total	7	27	51	71	17	29	39
Digital status data	✓	✓	✓	✓	✓	✓	✓
Currents	–	✓	✓	✓	✓	✓	✓
Voltages	–	–	✓	✓	–	✓	✓
Power values, frequency	–	–	–	✓	–	–	✓



Data bytes that are not transferred cyclically in certain profiles can still be read as acyclic data objects (→ Section 12.10.3, „Acyclic data“, page 265).

From byte 1, the data structure of profile 1 and 2 complies with the Low Voltage Switchgear (LVSG) profile of the PROFIBUS User Organization (PNO).

In profiles 2, 3, and 4 the current, voltage, power and frequency values are represented as 32 bit floating point types.

In profiles 5, 6 and 7 the same values are represented as 16 bit unsigned integer types.



Please check, if the profiles data words are supported by the circuit-breaker and the release unit.

Which circuit-breaker supports which data of the profile can be found in → Section 12.10.2, „Release units support profile information“, page 264. Detailed information you will find in Manual „PXR10, PXR20, PXR25 – Electronic trip unit Power Xpert Release PXR for NZM... circuit breakers“, MN012005, Chapter 3 „Protection and measurement functions“.

For more information on the NZM Input Status Data and its NZM Input Status Validity, as well as NZM Device Status, including primary and secondary device status, refer to MN012005, "PXR10, PXR20, PXR25", chapter 9.3.1 "Input status", chapter 9.3.10 "Primary status codes" and chapter 9.3.11 "Secondary status codes".

Table 66: Overview of the data profiles 1...4 of the PXR-RCAM-SWD

Word	Profile 1 (default)	Profile 2	Profile 3	Profile 4
0 (Byte)	SWD status byte	SWD status byte	SWD status byte	SWD status byte

1) Data within light grey cells depends on circuit-breaker type

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.10 Programming

Word	Profile 1 (default)	Profile 2	Profile 3	Profile 4
1	NZM Input Status Data	NZM Input Status Data	NZM Input Status Data	NZM Input Status Data
2	NZM Input Status Validity	NZM Input Status Validity	NZM Input Status Validity	NZM Input Status Validity
3	NZM Device Status	NZM Device Status	NZM Device Status	NZM Device Status
4	—	Current $I_{L1}(IA)$ (Hi)	Current $I_{L1}(IA)$ (Hi)	Current $I_{L1}(IA)$ (Hi)
5	—	Current $I_{L1}(IA)$ (Lo)	Current $I_{L1}(IA)$ (Lo)	Current $I_{L1}(IA)$ (Lo)
6	—	Current $I_{L2}(IB)$ (Hi)	Current $I_{L2}(IB)$ (Hi)	Current $I_{L2}(IB)$ (Hi)
7	—	Current $I_{L2}(IB)$ (Lo)	Current $I_{L2}(IB)$ (Lo)	Current $I_{L2}(IB)$ (Lo)
8	—	Current $I_{L3}(IC)$ (Hi)	Current $I_{L3}(IC)$ (Hi)	Current $I_{L3}(IC)$ (Hi)
9	—	Current $I_{L3}(IC)$ (Lo)	Current $I_{L3}(IC)$ (Lo)	Current $I_{L3}(IC)$ (Lo)
10	—	Current $I_G(IG)$ (Hi)	Current $I_G(IG)$ (Hi)	Current $I_G(IG)$ (Hi)
11	—	Current $I_G(IG)$ (Lo)	Current $I_G(IG)$ (Lo)	Current $I_G(IG)$ (Lo)
12	—	Current $I_N(IN)$ (Hi)	Current $I_N(IN)$ (Hi)	Current $I_N(IN)$ (Hi)
13	—	Current $I_N(IN)$ (Lo)	Current $I_N(IN)$ (Lo)	Current $I_N(IN)$ (Lo)
14	—	—	Voltage $U_{L1-L2}(VAB)$ (Hi)	Voltage $U_{L1-L2}(VAB)$ (Hi)
15	—	—	Voltage $U_{L1-L2}(VAB)$ (Lo)	Voltage $U_{L1-L2}(VAB)$ (Lo)
16	—	—	Voltage $U_{L2-L3}(VBC)$ (Hi)	Voltage $U_{L2-L3}(VBC)$ (Hi)
17	—	—	Voltage $U_{L2-L3}(VBC)$ (Lo)	Voltage $U_{L2-L3}(VBC)$ (Lo)
18	—	—	Voltage $U_{L3-L1}(VCA)$ (Hi)	Voltage $U_{L3-L1}(VCA)$ (Hi)
19	—	—	Voltage $U_{L3-L1}(VCA)$ (Lo)	Voltage $U_{L3-L1}(VCA)$ (Lo)
20	—	—	Voltage $U_{L1-N}(VAN)$ (Hi)	Voltage $U_{L1-N}(VAN)$ (Hi)
21	—	—	Voltage $U_{L1-N}(VAN)$ (Lo)	Voltage $U_{L1-N}(VAN)$ (Lo)
22	—	—	Voltage $U_{L2-N}(VBN)$ (Hi)	Voltage $U_{L2-N}(VBN)$ (Hi)
23	—	—	Voltage $U_{L2-N}(VBN)$ (Lo)	Voltage $U_{L2-N}(VBN)$ (Lo)
24	—	—	Voltage $U_{L3-N}(VCN)$ (Hi)	Voltage $U_{L3-N}(VCN)$ (Hi)
25	—	—	Voltage $U_{L3-N}(VCN)$ (Lo)	Voltage $U_{L3-N}(VCN)$ (Lo)
26	—	—	—	Real 3-phase Power (Hi)
27	—	—	—	Real 3-phase Power (Lo)
28	—	—	—	Reactive 3-phase Power (Hi)

1) Data within light grey cells depends on circuit-breaker type

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.10 Programming

Word	Profile 1 (default)	Profile 2	Profile 3	Profile 4
29	–	–	–	Reactive 3-phase Power (Lo)
30	–	–	–	Apparent 3-phase Power (Hi)
31	–	–	–	Apparent 3-phase Power (Lo)
32	–	–	–	Power Factor (Hi)
33	–	–	–	Power Factor (Lo)
34	–	–	–	Frequency (Hi)
35	–	–	–	Frequency (Lo)

1) Data within light grey cells depends on circuit-breaker type

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.10 Programming

Table 67: Overview of the unsigned integer data profiles 5...7 of the PXR-RCAM-SWD

Word	Profile 5	Profile 6	Profile 7
0 (Byte)	SWD status byte	SWD status byte	SWD status byte
1	NZM Input Status Data	NZM Input Status Data	NZM Input Status Data
2	NZM Input Status Validity	NZM Input Status Validity	NZM Input Status Validity
3	NZM Device Status	NZM Device Status	NZM Device Status
4	Current I_{L1} (IA)	Current I_{L1} (IA)	Current I_{L1} (IA)
5	Current I_{L2} (IB)	Current I_{L2} (IB)	Current I_{L2} (IB)
6	Current I_{L3} (IC)	Current I_{L3} (IC)	Current I_{L3} (IC)
7	Current I_G (IG)	Current I_G (IG)	Current I_G (IG)
8	Current I_N (IN)	Current I_N (IN)	Current I_N (IN)
9	–	Voltage U_{L1-L2} (VAB)	Voltage U_{L1-L2} (VAB)
10	–	Voltage U_{L2-L3} (VBC)	Voltage U_{L2-L3} (VBC)
11	–	Voltage U_{L1-L3} (VCA)	Voltage U_{L1-L3} (VCA)
12	–	Voltage U_{L1-N} (VAN)	Voltage U_{L1-N} (VAN)
13	–	Voltage U_{L2-N} (VBN)	Voltage U_{L2-N} (VBN)
14	–	Voltage U_{L3-N} (VCN)	Voltage U_{L3-N} (VCN)
15	–	–	Real 3-phase Power
16	–	–	Reactive 3-phase Power
17	–	–	Apparent 3-phase Power
18	–	–	Power scaling factor 100
19	–	–	Frequency scaling factor 100
20... 35	–	–	–

1) Data availability depends on circuit-breaker type, within light grey cells

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

When using data profile 2...7 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 XSOFT-CODESYS, for example, change the default value from 0xD290 to 0xD8DF90 to use PKE profile 3.

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.10 Programming

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 2...7 is used.

Object 2102subx (x represents the position of the PXR-RCAM-SWD module in the SWD line)	Contents
Profile 1 (default)	0x0000D290
Profile 2	0x0000DC90
Profile 3	0x00D8DF90
Profile 4	0xD2DFDF90
Profile 5	0x0000D790
Profile 6	0x0000DD90
Profile 7	0x00D2DF90

12.10.1.3 Profile 1: SWD Status, NZM Input Status Data, NZM Device Status

Table 68: 7 byte input data: SWD Status, NZM Input StatusData, NZM Device Status

Byte	Word	Bit																Object Index ¹⁾ (hex)	Description
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
0	0																X	16#6000:16#01	1 = SWD cyclic data is valid
																X			1 = Acyclic request is complete and data is ready
													X						1 = Group diagnostic is present
											x								1 = SWD module present
										x									
1	1																X	16#6001:16#01	Breaker is in closed position
																X			Unacknowledged trip condition
														X					Active or unacknowledged alarm
												X							Maintenance mode is active
												X							
2							X											16#6001:16#02	Overload mode is active (an overload is present)
						X													Zone selectivity (ZSI) is active
				X															Ground fault protection type is „source ground“ is valid.
3	2																X	16#6001:16#02	"Breaker is in closed position" is valid
																X			"Un-acknowledged trip condition" is valid
														X					"Active or un-acknowledged alarm" is valid
												X							"Maintenance mode is active" is valid
												X							
4							X											16#6001:16#03	"Overload mode is active (an overload is present)" is valid
						X													"Zone selectivity (ZSI) is active" is valid
				X															Ground fault protection type is „source ground“ is valid.
5	3	Primary device status								Primary device status								16#6001:16#03	Device status
6		Secondary device status								Secondary device status									

1) Standard CAN objects represented e.g. in XSOFT-CODESYS-3.

For more information on the NZM Input Status Data and its NZM Input Status Validity, as well as NZM Device Status, including primary and secondary device status, refer to MN012005, "PXR10, PXR20, PXR25", chapter 9.3.1 "Input status", chapter 9.3.10 "Primary status codes" and chapter 9.3.11 "Secondary status codes".

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.10 Programming

12.10.1.4 Profile 2: Currents

Profile 2 contains all data of profile 1, see → table 68, as well as the phase currents shown in the following table.

Table 69: 27 byte input data currents

Byte	Word	Value	Object Index ³⁾ (hex)	Description
				Values in brackets () reflect the American notation
7	4	I _{L1} (IA)[High]	16#6001:16#04	Current I _{L1} (IA) [A] ¹⁾
8				
9	5	I _{L1} (IA)[Low]	16#6001:16#05	
10				
11	6	I _{L2} (IB)[High]	16#6001:16#06	Current I _{L2} (IB) [A] ¹⁾
12				
13	7	I _{L2} (IB)[Low]	16#6001:16#07	
14				
15	8	I _{L3} (IC)[High]	16#6001:16#08	Current I _{L3} (IC) [A] ¹⁾
16				
17	9	I _{L3} (IC)[Low]	16#6001:16#09	
18				
19	10	I _G (IG)[High]	16#6001:16#0A	Current I _G (IG) [A] ^{1) 2)}
20				
21	11	I _G (IG)[Low]	16#6001:16#0B	
22				
23	12	I _N (IN)[High]	16#6001:16#0C	Current I _N (IN) [A] ^{1) 2)}
24				
25	13	I _N (IN)[Low]	16#6001:16#0D	
26				

1) Byte order

- With a Motorola-based GSD (MoeI4d14.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.

2) Data availability depends on circuit-breaker type, within light grey cells

3) Standard CAN objects represented e.g. in XSOF-CODESYS-3.

12.10.1.5 Profile 3: Voltage values:

Profile 3 contains all data of profile 2 as well as the voltage values shown in the following table.

Byte	Word	Value	Object Index ³⁾ (hex)	Description
				Values in brackets () reflect the American notation
27	14	U _{L1-L2} (VAB) [High] (32 bit float)	16#6001:16#0E	Voltage U _{L1-L2} (VAB) [V] ^{1) 2)}
28				
29	15	U _{L1-L2} (VAB) [Low] (32 bit float)	16#6001:16#0F	
30				
31	16	U _{L2-L3} (VBC) [High] (32 bit float)	16#6001:16#10	Voltage U _{L2-L3} (VBC) [V] ^{1) 2)}
32				
33	17	U _{L2-L3} (VBC) [Low] (32 bit float)	16#6001:16#11	
34				
35	18	U _{L3-L1} (VCA) [High] (32 bit float)	16#6001:16#12	Voltage U _{L3-L1} (VCA) [V] ^{1) 2)}
36				
37	19	U _{L3-L1} (VCA) [Low] (32 bit float)	16#6001:16#13	
38				
39	20	U _{L1-N} (VAN) [High] (32 bit float)	16#6001:16#14	Voltage U _{L1-N} (VAN) [V] ^{1) 2)}
40				
41	21	U _{L1-N} (VAN) [Low] (32 bit float)	16#6001:16#15	
42				
43	22	U _{L2-N} (VBN) [High] (32 bit float)	16#6001:16#16	Voltage U _{L2-N} (VBN) [V] ^{1) 2)}
44				
45	23	U _{L2-N} (VBN) [Low] (32 bit float)	16#6001:16#17	
46				
47	24	U _{L3-N} (VCN) [High] (32 bit float)	16#6001:16#18	Voltage U _{L3-N} (VCN) [V] ^{1) 2)}
48				
49	25	U _{L3-N} (VCN) [Low] (32 bit float)	16#6001:16#19	
50				

1) Byte order

- 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.

2) Data availability depends on circuit-breaker type, within light grey cells

3) Standard CAN objects represented e.g. in XSOF-CODESYS-3.

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.10 Programming

12.10.1.6 Profile 4: Actual parameters and circuit-breaker data

Profile 4 contains all data of profile 3, digital status data, the phase currents, voltages as well as power values and frequency shown in the following table.

Byte	Word	Value	Object Index ⁴⁾ (hex)	Description
51	26	Active 3-phase power [High] (32 bit float)	16#6001:16#1A	Active 3-phase power [W] ^{1) 2)}
52				
53	27	Active 3-phase power [Low] (32 bit float)	16#6001:16#1B	
54				
55	28	Reactive 3-phase power [High] (32 bit float)	16#6001:16#1C	Reactive 3-phase power [Var] ^{1) 2)}
56				
57	29	Reactive 3-phase power [Low] (32 bit float)	16#6001:16#1D	
58				
59	30	Apparent 3-phase power [High] (32 bit float)	16#6001:16#1E	Apparent 3-phase power [VA] ^{1) 2)}
60				
61	31	Apparent 3-phase power [Low] (32 bit float)	16#6001:16#1F	
62				
63	32	Power factor [High] (32 bit float)	16#6001:16#20	Power factor ^{1) 2) 3)}
64				
65	33	Power factor [Low] (32 bit float)	16#6001:16#21 ³⁾	
66				
67	34	Frequency [High] (32 bit float)	16#6001:16#22 ³⁾	Frequency [Hz] ^{1) 2) 3)}
68				
69	35	Frequency [Low] (32 bit float)	16#6001:16#23 ³⁾	
70				

1) Byte order

- 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.

2) Data availability depends on circuit-breaker type, within light grey cells

3) Requires manual mapping

4) Standard CAN objects represented e.g. in XSOF-CODESYS-3.

12.10.1.7 Profile 5: Currents

Profile 5 contains all data of profile 1, see → table 68, as well as the phase currents shown in the following table.

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12.10 Programming

Word	Value	Object Index ³⁾ (hex)	Description
			(Values in brackets () reflect the American notation.)
4	I _{L1} (IA)	16#6001:16#04	Current I _{L1} (IA) [A] ¹⁾
5	I _{L2} (IB)	16#6001:16#05	Current I _{L2} (IB) [A] ¹⁾
6	I _{L3} (IC)	16#6001:16#06	Current I _{L3} (IC) [A] ¹⁾
7	I _G (IG)	16#6001:16#07	Current I _G (IG) [A] ^{1) 2)}
8	I _N (IN)	16#6001:16#08	Current I _N (IN) [A] ^{1) 2)}

- 1) Byte order
- 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.
- 2) Data availability depends on circuit-breaker type, within light grey cells
- 3) Standard CAN objects represented e.g. in XSOF-CODESYS-3.

12.10.1.8 Profile 6: Voltage values:

Profile 6 contains all data of profile 5 as well as the voltage values shown in the following table.

Word	Value	Object Index ³⁾ (hex)	Description
			(Values in brackets () reflect the American notation.)
9	U _{L1-L2} (VAB)	16#6001:16#09	Voltage U _{L1-L2} (VAB) [V] ^{1) 2)}
10	U _{L2-L3} (VBC)	16#6001:16#0A	Voltage U _{L2-L3} (VBC) [V] ^{1) 2)}
11	U _{L3-L1} (VCA)	16#6001:16#0B	Voltage U _{L3-L1} (VCA) [V] ^{1) 2)}
12	U _{L1-N} (VAN)	16#6001:16#0C	Voltage U _{L1-N} (VAN) [V] ^{1) 2)}
13	U _{L2-N} (VBN)	16#6001:16#0D	Voltage U _{L2-N} (VBN) [V] ^{1) 2)}
14	U _{L3-N} (VCN)	16#6001:16#0E	Voltage U _{L3-N} (VCN) [V] ^{1) 2)}

- 1) Byte order
- 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.
- 2) Data availability depends on circuit-breaker type, within light grey cells
- 3) Standard CAN objects represented e.g. in XSOF-CODESYS-3.

12 Interface PXR-RCAM-SWD for NZM compact circuit-breakers

12.10 Programming

12.10.1.9 Profile 7: Actual parameters and circuit-breaker data

Profile 7 contains all data of profile 6, digital status data, the phase currents, voltages as well as power values and frequency shown in the following table.

Word	Value	Object Index ³⁾ (hex)	Description
15	Active 3-phase power	16#6001:16#0F	Active 3-phase power [W] ^{1) 2)}
16	Reactive 3-phase power	16#6001:16#10	Reactive 3-phase power [Var] ^{1) 2)}
17	Apparent 3-phase power	16#6001:16#11	Apparent 3-phase power [VA] ^{1) 2)}
18	Power factor	16#6001:16#12	Power factor scaling factor 100 ^{1) 2)}
19	Frequency	16#6001:16#13	Frequency scaling factor 100 [Hz] ^{1) 2)}

1) Byte order

- 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.

2) Data availability depends on circuit-breaker type, within light grey cells

3) Standard CAN objects represented e.g. in XSOFT-CODESYS-3.

12.10.1.10 Diagnostics

In the event of a diagnosis the module reports the following error causes to its SWD coordinator (input byte 0, bit 4 is set):

Value	Description	Remedy
0x03	No communication with NZM circuit-breaker	• Check the cable connection to the circuit-breaker. • Check Modbus RTU communication parameters on both sides • Check powering of NZM circuit-breaker

12.10.2 Release units support profile information

The following table shows which information of the respective profile is supported by which release unit or NZM devices.

Profile	PXR10	PXR20			PXR25		
Word	-AX	-MX	-VX	-VX...-T	-PX	-PX...-TZ(TAZ)	-PMX
Profil1	–	✓	✓	✓	✓	✓	✓
Profil2...4							
10...11 (I _G)	–	–	–	✓	–	✓	–
12...13 (I _N)	–	✓ ¹⁾	✓ ¹⁾	✓ ¹⁾	✓ ¹⁾	✓ ¹⁾	✓ ¹⁾
14...35	–	–	–	–	✓	✓	✓
Profil5...7							
7 (I _G)	–	–	–	✓	–	✓	–
8 (I _N)	–	✓ ¹⁾	✓ ¹⁾	✓ ¹⁾	✓ ¹⁾	✓ ¹⁾	✓ ¹⁾
10...19	–	–	–	–	✓	✓	✓

1) when using 4-pole NZM devices

12.10.3 Acyclic data



Do not modify configuration registers of NZM circuit breaker with PXR technology.

For more information see manual „PXR10, PXR20, PXR25 Electronic trip unit“, MN012005EN, Chapter 9.3.5 Configuration register, Table 33: Configuration register.

In addition to the cyclical data transfer, two acyclical objects can be read via the PXR-RCAM-SWD.

Object 1

Object 1 is read-only and contains Modbus RTU interface settings configured by SWD parameters.

Table 70: Object 1, read only

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0								X	1 = Modbus interface is enabled
1								X	1 = Job is active
							X		1 = Job is completed
2	1...247								Modbus address of the circuit breaker
3					X	X	X	X	Baudrate of Modbus interface
			X	X					Parity mode of Modbus interface
	X	X							Number of stop bits of Modbus interface
4	1...255								Slave response timeout of Modbus interface
5	0...255								Exception code of last executed job

Object 2

Object 2 is read-write and is used to send customised commands to a circuit breaker. Writing the object 2 configures command code and data to send to a circuit breaker. The results of sending the last configured command can be read using acyclic object 2 read request.

This is the format of acyclic object 2, write request:

Table 71: Object 2, write request

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	values = 2, 3, 4, 6, 16								Modbus function code to execute
1	1...122								Number of Modbus registers to read/write
2,3	user defined								Modbus starting register address
4	1...247								—
5	reserved								For 16 Bit alignment
6...n									Modbus write data for function codes 6 and 16

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12.10 Programming

After a circuit breaker responds (or timeout occurs), the result of the command can be retrieved from PXR-RCAM-SWD by acyclic object 2, read request. The response has the following format:

Table 72: Object 2, read request

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0								X	1 = Job is active
							X		1 = Job is completed
1	1...247								Slave address of the last job
2	FC = 2, 3, 4, 6, 16								Function code (FC) of the last job
3	1...255								Exception code of last executed job
4, 5	1...122								Number of Modbus registers of the last job
6, 7	user defined								Modbus starting register address of the last job
8...n									Modbus read data for function codes FC = 2, 3, 4

Acyclic request have the priority before cyclic polling and are executed as soon as possible. Bit 1 in SWD status byte indicates if acyclic request has been executed and if its result is ready to be read.

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 SmartWire-DT Gateway EU5C-SWD-DP (MN05013002Z), please visit Eaton.com/documentation.

12.10.4 PDO Mapping

Automatic mapping limits

PXR-RCAM-SWD modules are added to the CANopen device, the corresponding addresses will be assigned automatically. In contrast to vendor-specific objects, the PXR-RCAM-SWD modules' product-specific objects will be automatically mapped. 16 PDOs will be mapped automatically. A PDO contains a maximum of 8 bytes of process data. For XSOFT-CODESYS-3, automatic PDO mapping is limited.

The maximum number of PDOs will depend on the number of PDOs supported by the gateway.

This default "mapping" and activation of process data is specified in accordance with communication profile CiA DS-301.

Digital values are mapped by byte and analog values are mapped by word.

Depending on the number of modules used and the profile selected in each case, the automatic mapping may not be able to map all the data of the modules into the PDOs because of the data types to be taken into account.

Please refer to Table 65, page 254 for the data profile size.

Example 1

Application with 1 module PXR-RCAM-SWD using profile 4 has a data profile size of 35 Words and 1 Byte. The automatic Mapping includes only 32 words and 1 byte. So 3 words have to be mapped manually into still free PDO areas.

Example 2

Application with 2 modules PXR-RCAM-SWD using profile 1 has a data profile size of 6 Words and 2 Bytes. The automatic Mapping includes 32 words and 1 byte. So all data could be mapped automatically.

Example 3

Application with 2 modules PXR-RCAM-SWD using profile 7 has a data profile size of 38 Words and 2 Bytes. The automatic Mapping includes only 32 words and 1 byte. So 6 Words and 1 Byte have to be mapped manually into still free PDO areas.

Manual mapping with XSOFT-CODESYS-3

Certain PXR-RCAM-SWD modules provide information that needs to be mapped manually to unused PDOs.

In order to see the all input data on Profile 4 with CANopen, the last two registers need to be mapped manually on PDOs. The automatic mapping in CANopen leaves them out.

Manual mapping is only for CANopen and EtherCAT fieldbuses available.

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12.10 Programming

13 Using SWD 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 SWD 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 SWD 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 73: Device options

Bit	Description	Remark
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 SWD modules with the EtherCAT field bus

Bit	Description	Remark
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	Description	Remark	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.

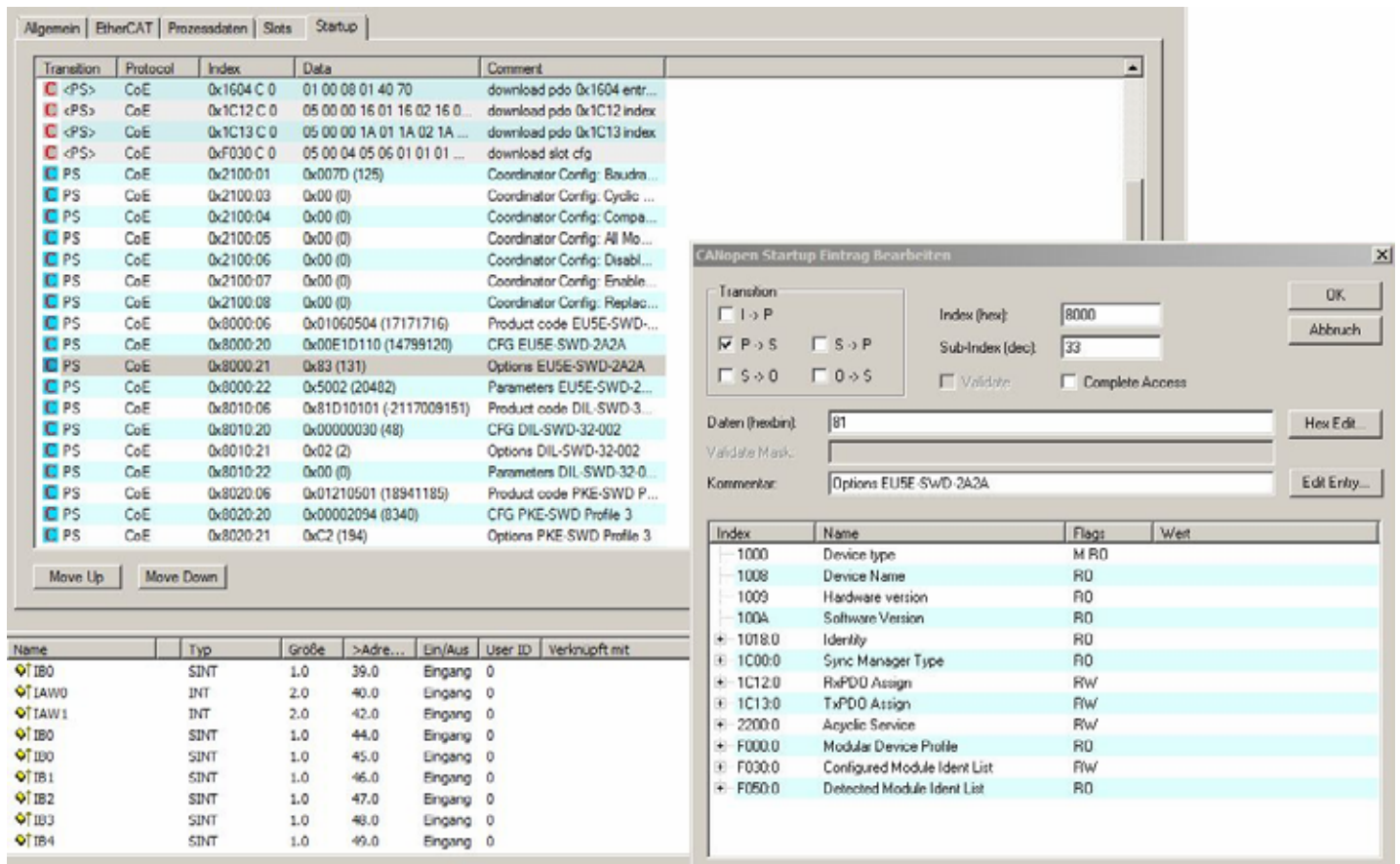


Figure 98: Changing the value of the option byte for module EU5E-SWD-2A2A

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

CANopen Startup Eintrag Bearbeiten

Transition:
☐ I → P
☒ P → S
☐ S → O
☐ O → S

Index (hex): 8000
 Sub-Index (dec): 34
☐ Validate ☐ Complete Access

Daten (hexbin): 02 50
 Validate Mask:
 Kommentar: Parameters EUSE-SWD-2A2A

OK
 Abbruch
 Hex Edit...
 Edit Entry...

Index	Name	Flags	Wert
1000	Device type	M RO	
1000	Device Name	RO	
1009	Hardware version	RO	
100A	Software Version	RO	
1010:0	Identity	RO	
1C00:0	Syno Manager Type	RO	
1C12:0	RxPDO Assign	RW	
1C13:0	TxPDO Assign	RW	
2200:0	Acyclic Service	RW	
F000:0	Modular Device Profile	RO	
F030:0	Configured Module Ident List	RW	
F050:0	Detected Module Ident List	RO	

Figure 99: Dialog window in which parameter values are entered or changed

13 Using SWD modules with the EtherCAT field bus

14.1 Maximum current consumption of SWD modules on U_{SWD}

14 Appendix

14.1 Maximum current consumption of SWD modules on U_{SWD}

Catalog number	Article no.	Current consumption [mA]	Notes
M22-SWD-INC	179982	10	—
M22-SWD-K11	115964	10	—
M22-SWD-K22	115965	10	—
M22-SWD-LED-W	115966	22	—
M22-SWD-LED-B	115967	22	—
M22-SWD-LED-G	115968	22	—
M22-SWD-LED-R	115969	22	—
M22-SWD-K11LED-W	115972	22	—
M22-SWD-K11LED-B	115973	22	—
M22-SWD-K11LED-G	115974	22	—
M22-SWD-K11LED-R	115975	22	—
M22-SWD-K22LED-W	115978	22	—
M22-SWD-K22LED-B	115979	22	—
M22-SWD-K22LED-G	115980	22	—
M22-SWD-K22LED-R	115981	22	—
M22-SWD-NOP	147637	10	—
M22-SWD-KC11	115995	10	—
M22-SWD-KC22	115996	10	—
M22-SWD-LEDC-W	115997	22	—
M22-SWD-LEDC-B	115998	22	—
M22-SWD-LEDC-G	115999	22	—
M22-SWD-LEDC-R	116000	22	—
M22-SWD-K11LEDC-W	116003	22	—
M22-SWD-K11LEDC-B	116004	22	—
M22-SWD-K11LEDC-G	116005	22	—
M22-SWD-K11LEDC-R	116006	22	—
M22-SWD-K22LEDC-W	116009	22	—
M22-SWD-K22LEDC-B	116010	22	—
M22-SWD-K22LEDC-G	116011	22	—
M22-SWD-K22LEDC-R	116012	22	—
M22-SWD-NOPC	147638	10	—
M22-SWD-R	179293	10	—
DIL-SWD-32-001	118560	40	—
DIL-SWD-32-002	118561	40	—
PKE-SWD	150613, 150614	35	—
PKE-SWD-32	126895	58	—
PKE-SWD-CP	172735	35	—
PXR-RCAM-SWD	199860	35	—
NZM-XSWD-704	135530	35	—
EMS-DO-T-2.4-SWD-ADP	172760	22	—
EMS-DO-T-9-SWD-ADP	172762	22	—
EMS-RO-T-2.4-SWD-ADP	172761	22	—
EMS-RO-T-9-SWD-ADP	172763	22	—
EU5E-SWD-8DX	116381	16	—
EU5E-SWD-4DX	144060	33	—
EU5E-SWD-4D4D, ...-R	116382, 191941	33	—
EU5E-SWD-4D2R	116383	45	—
EU5E-SWD-X8D	144061	43	—
EU5E-SWD-4AX	144062	22	—
EU5E-SWD-2A2A	144063	22	—
EU5E-SWD-4PT	144064	22	—
EU5E-SWD-4PT-2	172560	22	—

14 Appendix

14.2 Power-/current consumption of the SWD stations on U_{AUX}

Catalog number	Article no.	Current consumption [mA]	Notes
M22-SWD-I1-LP01	115990	17	with bus termination resistor switched on
M22-SWD-I2-LP01	115991	17	
M22-SWD-I3-LP01	115992	17	
M22-SWD-I4-LP01	115993	17	
M22-SWD-I6-LP01	115994	17	
SL4-SWD	171311	26	–
SL7-SWD	171459	26	–
SWD4-RC8-10	116020	17	–

14.2 Power-/current consumption of the SWD stations on U_{AUX}

DIL-SWD-32-...		
Pick-up power		
for DILMA, DILM7	W	3
at DILM7 – DILM15	W	4.5
at DILM17 – DILM38	W	12
Pick-up current		
at DILM7 – DILM9	mA	125
at DILM12 – DILM15	mA	188
at DILM17 – DILM38	mA	500
Sealing power		
for DILMA, DILM7	W	3
at DILM7 – DILM15	W	4.5
at DILM17 – DILM38	W	0.5
Holding current		
for DILMA, DILM7	mA	125
at DILM7 – DILM15	mA	188
at DILM17 – DILM38	mA	21

EMS-...-SWD-ADP		
Current		
Switch on	mA	120
Operation	mA	60

NZM-XSWD-704		
Current		
With active remote operator	mA	300
With inactive remote operator	mA	100

		SL4-SWD	SL7-SWD
Current			
With an LED light module			
Continuous light	mA	33	54
Beacon	mA	36	58
Strobe light	mA	65	135
With an LM high-power LED			
Continuous light	mA	–	200
Beacon	mA	–	265
Strobe light	mA	–	265
With a filament lamp light module	mA	167	292
With an acoustic module			

14.2 Power-/current consumption of the SWD stations on U_{AUX}

		SL4-SWD	SL7-SWD
Continuous or pulsed tone	mA	39	92
Continuous or pulsed tone, 8 types of	mA	—	115

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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
PXR-RCAM-SWD profile 1	7	0
PXR-RCAM-SWD profile 2	27	0
PXR-RCAM-SWD profile 3	51	0
PXR-RCAM-SWD profile 4	71	0
PXR-RCAM-SWD profile 5	17	0
PXR-RCAM-SWD profile 6	29	0
PXR-RCAM-SWD profile 7	39	0
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, ...-R	1	1
EU5E-SWD-4D2R	1	1
EU5E-SWD-X8D	1	1
EU5E-SWD-4AX	9	0

SmartWire-DT module	Input	Output
EU5E-SWD-2A2A	5	4
EU5E-SWD-4PT	9	0
EU5E-SWD-4PT-2	9	0
M22-SWD-I1-LP01	0	0
M22-SWD-I2-LP01	0	0
M22-SWD-I3-LP01	0	0
M22-SWD-I4-LP01	0	0
M22-SWD-I6-LP01	0	0
SL4-SWD	1	1
SL7-SWD	1	1
SWD4-RC8-10	0	0

14.4 SWD cable length

An SWD network can have a length of up to 600 m. The actual value will depend on the baud rate and cable type used (SWD ribbon cable or SWD round cable).

Table 74: Max. cable lengths

Baud Rate	SWD ribbon cable	SWD round cable (5-pole)	SWD round cable (8-pole)
125 KBaud	600 m	600 m	600 m
250 KBaud	600 m	600 m	600 m
500 KBaud	300 m	300 m	300 m
1 MBaud	150 m	150 m	150 m
2 MBaud	75 m	75 m	75 m

Special conditions apply to the line lengths of stubs.

Table 75: Max. cable lengths for stubs

Baud Rate	Total length of all SWD stubs	Single length of a stubs
125 KBaud	300 m	10 m
250 KBaud	300 m	10 m
500 KBaud	150 m	5 m
1 MBaud	75 m	2,5 m
2 MBaud	37 m	1,2 m

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14.5 Color tables M22-SWD-LED(C)-RGB

14.5 Color tables M22-SWD-LED(C)-RGB

14.5.1 Color table profile 1

Index	Color	(RGB)	Flashing	?Frequency
0	LED off		-	-
1	Red	(200, 0, 0)	-	-
2	Green	(0, 200, 0)	-	-
3	Yellow	(100, 100, 0)	-	-
4	Blue	(0, 0, 200)	-	-
5	Green	(0, 200, 0)	50/50 %	1 Hz
6	White	(70, 70, 70)	-	-
7	Red	(200, 0, 0)	50/50 %	1 Hz

14.5.2 Color table profile 2...5

	Index	Color	(R, G, B)
Defined in ROM	0	White	(70, 70, 70)
	1	Red	(200, 0, 0)
	2	Green	(0, 200, 0)
	3	Yellow	(100, 100, 0)
	4	Blue	(0, 0, 200)
	5	Magenta	(100, 0, 100)
	6	Cyan	(0, 100, 100)
Predefined colors in ROM	7	undefined	
	...		
	43		
20 user-defined colors programmed by Eaton	44		
	...		
	63		
16 colors in RAM with acyclical Smart-Wire-DT service "1"	64	Color table is defined in SWD-Assist	
	...		
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14.6 Reference table: Part no., SmartWire-DT vs. Eaton catalog number

14.6 Reference table: Part no., SmartWire-DT vs. Eaton catalog number

Type designation	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
contactor relay	
DILA(C)-...(24VDC)	XTRE(C)10B...TD
Motor-Protective Circuit-Breakers	
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
Accessories for motor-protective circuit-breaker	
NHI-E...-PKZ0	XTPAXFA...
NHI...-PKZ0	XTPAXSA...
AGM2...-PKZ0	XTPAXSATR...
Electronic motor starter	
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
Motor-starter combination	
MSC-D-...(24VDC)	XTSE...TD...
MSC-DEA-...(24VDC)	XTNE...TD...
Wiring set	
DILM12-XRL	XTCEXRLB
DILM12-XP2	XTCEXPBB
DILM12-XR	XTCEXRBB-OA2
DILM12-XEV	XTCEXLBB
DILM32-XRL	XTCEXRLC
PKZM0-XRM12	XTPAXTPCRB

14.7 SWD module interoperability requirements

14.7.1 SmartWire-DT coordinators

Interoperability between SmartWire-DT modules is guaranteed with the following SmartWire-DT coordinator firmware versions (or higher):

Table 76: 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, ...-R	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
PXR-RCAM-SWD	1.20	1.20	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>

14.7.2 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.eu/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 77: Compatible fieldbus description files for SmartWire-DT modules

SmartWire-DT gateway	EU5C-SWD-CAN	EU5C-SWD-DP Intel (Intel-based CPU) Moe4d14.gsd Firmware version	EU5C-SWD-DP Motorola (Motorola-based CPU) Moel4d14.gsd Firmware version	EU5C-SWD-PROFINET GSDML-V2.2-Hilscher- EU5C-SWD-20131022.xml
DIL-SWD-32-... EU5E-SWD-4D2R EU5E-SWD-4D4D,... -R EU5E-SWD-8DX M22-SWD-K... M22-SWD-L...	EU5C-SWD-CAN.eds	1.00	1.00	✓
PKE-SWD-32 NZM-XSWD-704 PXR-RCAM-SWD	EU5C-SWD-CAN_V110.eds has to be defined manually, → section " Manual mapping with XSOFT- CODESYS-3", page 267	1.10 1.24	1.10 1.23	✓ ✓ : Version V2.25 GSDML-V2.25-Hilscher- EU5C-SWD-20210520.xml
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	✓

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14.7 SWD module interoperability requirements

14.7.3 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, ...-R	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
PXR-RCAM-SWD	3.00
SL4-SWD, SL7-SWD	1.80
SWD4-FFR-PF1-1, SWD4-FFR-ST1-1	1.70
SWD4-RC8-10	1.0

14.8 Technical data

14.8.1 Power feeder module

			EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
General				
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			DIN-rail IEC/EN 60715, 35 mm	
Mounting position			vertical	
Ambient mechanical conditions				
Degree of protection (IEC/EN 60529, EN50178, VBG 4)			IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
Constant amplitude of 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
Electromagnetic compatibility (EMC)				
Overvoltage 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
Ambient climatic conditions				
Operating ambient temperature (IEC 60068-2)	°C		-25 - +55	-25 - +55

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14.8 Technical data

			EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
Condensation				
Storage	°C		–40 - 70	–40 - 70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 - 95	5 - 95
Supply voltage U_{AUX}				
Rated operating voltage	V		24 DC -15% +20%	
Residual ripple of input voltage	%		≤ 5	≤ 5
Protection against polarity reversal			Yes	Yes
max. current	I _{max}	A	3	3
Short-circuit rating			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 _{AUX} - 0.2	typical U _{AUX} - 0.2
Supply voltage U_{POW}				
Specifications for connection to 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 duration	A		–	12.5 A/6 ms
Heat dissipation at 24 V DC	W		–	3.8
Potential isolation between U _{POW} and 15 V SmartWire-DT supply voltage			–	Yes
Bridging voltage dips	ms		–	10
Repetition rate	s		–	1
status display	LED		–	Yes
SmartWire-DT supply voltage U_{SWD}				
Rated operating voltage	U _e	V	14.5 ± 3 %	14.5 ± 3 %
max. current	I _{max}	A	0.7	0.7
Short-circuit rating			–	Yes
Connection supply voltages				
Connection type			Push in terminals	
solid	mm ²		0.2 - 1.5 (AWG24 - 16)	
Flexible with ferrule	mm ²		0.25 - 1.5	0.25 - 1.5
System SmartWire-DT				
Module type			–	–
Number of SmartWire-DT modules			–	–
Baud Rate	kbps		–	–
Address allocation			–	–
status display			–	–
Porting			2 x plug, 8 pole	
Plug connector			2 blade terminals SWD4-8MF2	

	EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
Notes	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.	

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14.8 Technical data

14.8.2 I/O modules, digital

		EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D/ EU5E-...-4D4D-R	EU5E-X8D
General						
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		DIN-rail IEC/EN 60715, 35 mm				
Mounting position		vertical				
Ambient mechanical conditions						
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	50mm	50	50	50	50
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	0.3	0.3	0.3	0.3
Electromagnetic compatibility (EMC)						
Overvoltage 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
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		2 kV	2 kV	2 kV	2 kV	2 kV
Signal cables		1 kV	1 kV	1 kV	1 kV	1 kV
SmartWire-DT cables		1 kV	1 kV	1 kV	1 kV	1 kV
Surge (IEC/EN 61131-2:2008, Level 1)		—	Supply cables 0.5 kV	—	Supply cables 0.5 kV	Supply cables 0.5 kV

	EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D/ EU5E-...-4D4D-R	EU5E-X8D
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	10 V				
Ambient climatic conditions					
Operating ambient temperature (IEC 60068-2)	-25 - +55 °C				
Condensation	Must be prevented with suitable measures				
Storage	-40 - +70°C				
Relative humidity, non-condensing (IEC/EN 60068-2-30)	5 - 95 %				
SmartWire-DT interface					
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}	14.5V DC (±3 %)				
Current consumption at U _{SWD}	→ Page 275				
Connection	Pin contact strip, 8-pin; Connector: External device plug SWD4-8SF2-5				
Connection supply and I/O					
Connection type	Push-In	Push-In	Push-In	Push-In	Push-In
solid mm2	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5
flexible with ferrule ¹⁾ mm2	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
24 V DC supply for output supply					
Rated operating U _e voltage	–	24 V DC -15 % / +20 %	–	24 V DC -15 % / +20 %	24 V DC -15 % / +20 %
Residual ripple of input voltage	–	≤ 5%		≤ 5%	≤ 5%
Protection against polarity reversal	no	Yes	no	Yes	Yes
Digital inputs					
Qty.	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-					
Specifications for connection to supply voltage V		U _e - 0.16 V			
Output current per input supply A		≤ 0.5			

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14.8 Technical data

		EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D/ EU5E-...-4D4D-R	EU5E-X8D
Overload proof			yes, with diagnostics			
Status display inputs	LED	yellow	yellow	yellow	yellow	
Digital semiconductor outputs						
Qty.		—			4	8
Output current	A	—			normally 0.5 at 24 V DC	normally 0.5 at 24 V DC
Short-circuit detection threshold	A	—			max. 1.2 over 3 ms	max. 1.2 over 3 ms
lamp load	R _{LL}	—			≤ 3W	≤ 3W
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
Relay outputs						
Qty.		—	—	2	—	—
Contact type		—	—	Make	—	—
c (contacts)						
Utilization category AC-1, 250 V, 4 A		—	—	> 5 x 10 ⁴	—	—
Utilization category AC-15, 250 V, 3 A		—	—	> 5 x 10 ⁴	—	—
Utilization category DC-13, 24 V, 1 A		—	—	> 2 x 10 ⁵	—	—
Safe disconnection	V AC	—	—	230	—	—
minimum load current	mA	—	—	100 mA, 12 V DC	—	—
Response/reset time	ms	—	—	5/2.5	—	—
Bounce duration	ms	—	—	Normally 1.5	—	—
Short circuit protection		—	—	external 4 A gL/gG	—	—
Status display outputs	LED	—	—	yellow	yellow	yellow
Potential isolation						
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
Notes 1) Minimum length 8 mm						

14.8.3 I/O modules, analog

			EU5E-SWD-4AX	EU5E-SWD-2A2A	EU5E-SWD-4PT EU5E-SWD-4PT-2
General					
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			DIN-rail IEC/EN 60715, 35 mm		
Mounting position			vertical	vertical	vertical
Ambient mechanical conditions					
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) semi-sinusoidal 15 g/11 ms	Impact resis- tances		9	9	9
Drop to IEC/EN 60068-2-31	Drop height	mm	50	50	50
Free fall, packaged (IEC/EN 60068-2-32)		m	0.3	0.3	0.3
Electromagnetic compatibility (EMC)					
Overvoltage 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
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
Burst (IEC/EN 61131-2:2008, Level 3)					
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
Ambient climatic conditions					
Operating ambient temperature (IEC 60068-2)			-25 - +55	-25 - +55	-25 - +55
Condensation			Must be prevented with suitable measures		

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			EU5E-SWD-4AX	EU5E-SWD-2A2A	EU5E-SWD-4PT EU5E-SWD-4PT-2
Storage	°C		-40 - +70	-40 - +70	-40 - +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 - 95	5 - 95	5 - 95
SmartWire-DT interface					
Module type			SmartWire-DT module (slave)		
Baud rate setting			Automatic	Automatic	Automatic
Status SmartWire-DT	LED		Green	Green	Green
Connection			Pin contact strip, 8-pin; Connector: External device plug SWD4-8SF2-5		
Device supply voltage SWD module	U _{SWD}	V DC, (%)	14.5 (±3)		
Current consumption at U _{SWD}			→ Page 275		
Connection supply and I/O					
Connection type			Push-In	Push-In	Push-In
solid	mm2		0.25 - 1.5 (AWG24-16)	0.25 - 1.5 (AWG24-16)	0.25 - 1.5 (AWG24-16)
flexible with ferrule ¹⁾	mm2		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
Supply 24 V DC					
Rated operating voltage	U _e	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
Analog inputs					
Quantity 2 two-wire connection, screened, length < 10 m			4	2	4
Parameterization					
Catalog number			Voltage, current	Voltage, current	
Averaging			adjustable	adjustable	
Voltage					
Input voltage			0 - 10	0 - 10	
Input resistance			13.3	13.3	
Current					
Input current			0 - 20	0 - 20	
Input resistance			< 250	< 250	
Resolution			12	12	
Conversion time			20	20	
accuracy					
Electric strength					
Analog outputs					
Quantity: two-wire connection, screened)			—	2	2

		EU5E-SWD-4AX	EU5E-SWD-2A2A	EU5E-SWD-4PT EU5E-SWD-4PT-2
Parameter definition (type)		–	Voltage, current	–
Voltage				
Output voltage	V		0 - 10	
maximum output current	mA		10	
Current				
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 %	
Repeat accuracy			±0.5 %	
Temperature inputs				
Quantity: two-, three-wire connection, screened, length < 10 m)				4
Parameterization				
Temperature sensor		–	–	Pt100, Pt1000, Ni1000
Scan time/mean-value generation		adjustable	adjustable	adjustable
Temperature range				
Pt100, Pt1000:	°C	–	–	EU5E-SWD-4PT -50 up to +200 EU5E-SWD-4PT-2 -100 up to +400
Ni1000:	°C	–	–	EU5E-SWD-4PT -50 up to +150 EU5E-SWD-4PT-2 -50 up to +200
Resolution	°C			0.1
Look				°C, °F, nonlinear
Conversion time	ms			50
Cumulative error	%			±1
Repeat accuracy	%			±0.5
Potential isolation				
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	
Notes		1) Minimum length 8 mm		

14.8.4 DIL contactor modules

			DIL-SWD-32-001	DIL-SWD-32-002
General				
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	
Ambient mechanical conditions				
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
Electromagnetic compatibility (EMC)				
Overvoltage 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
Ambient climatic conditions				
Operating ambient temperature (IEC 60068-2)	°C		-25 up to +60	-25 up to +60
Condensation			Must be prevented with suitable measures	
Storage	°C		-30 up to +70	-30 up to +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 - 95	5 - 95
SmartWire-DT network				
Module type			SmartWire-DT module (slave)	
Baud rate setting			Automatic	
Status SmartWire-DT	LED		green/orange	
Porting			Plug, 8-pole	
Plug connector			External device plug SWD4-8SF2-5	
Device supply voltage	U _{SWD}	V DC, (%)	14.5 (±3)	
Current consumption at U _{SWD}			→ Page 275	
Operating mode				

			DIL-SWD-32-001	DIL-SWD-32-002
Manual/automatic mode			no	Yes
Setting			—	Rotary switches
Connection auxiliary contact				
Qty.			2	2
Rated voltage ¹⁾	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
Terminal capacities				
solid		mm ²	0.2 - 1.5 (AWG24 - AWG16)	
flexible with ferrule ²⁾		mm ²	0.25 - 1.5	0.25 - 1.5
Notes			1) own supply 2) Minimum length 8 mm	

14.8.5 Electronic motor-protective circuit-breaker PKE-SWD-..

			PKE-SWD-32	PKE-SWD PKE-SWD-CP
General				
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
Ambient mechanical conditions				
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
Electromagnetic compatibility (EMC)				
Overvoltage 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
Ambient climatic conditions				
Operating ambient temperature (IEC 60068-2)	°C		-25 up to +60	-25 up to +60
Condensation			Must be prevented with suitable measures	Must be prevented with suitable measures
Storage	°C		-30 up to +70	-30 up to +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 - 95	5 - 95
SmartWire-DT interface				
Function			SmartWire-DT module (slave)	SmartWire-DT module (slave)
Baud rate setting			Automatic	Automatic
Status SmartWire-DT	LED		green/orange	Green
Connection			Plug, 8-pole	Plug, 8-pole
Plug connector			External device plug SWD4-8SF2-5	External device plug SWD4-8SF2-5
Device supply voltage U_{SWD}	V DC, (%)		14.5 (±3)	
Current consumption at U_{SWD}	mA		→ Page 275	

		PKE-SWD-32	PKE-SWD PKE-SWD-CP
Operating mode			
Manual/automatic mode		Yes	—
Setting		Rotary switches	—
Connection electrical enable			
Cable length	m	≤ 2.8	—
Connection type		Push-In	—
Terminal capacities			
solid	mm ²	0.2 - 1.5 (AWG24 - 16)	—
Flexible with ferrule (minimum section length 8 mm)	mm ²	0.25 - 1.5	—

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14.8.6 M22-SWD connections

M22-SWD-K11/M22-SWD-KC11

M22-SWD-LED-.../M22-SWD-LEDC-...

M22-SWD-K11LED-.../M22-SWD-K11LEDC-...

	M22-SWD-K11/ M22-SWD-KC11	M22-SWD-LED-.../ M22-SWD-LEDC-...	M22-SWD-K11LED-.../ M22-SWD-K11LEDC-...	M22-SWD-R M22-SWD-INC
General				
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
Weight	g	10	10	10
Mounting position	Any			
Ambient mechanical conditions				
Degree of protection (IEC/EN 60529, EN50178, VBG 4)	IP20	IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
Constant amplitude 3.5 mm	Hz	5	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 (IEC/EN 60068-2-31); drop height	mm	50	50	50
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	0.3	0.3
Electromagnetic compatibility (EMC)				
Overvoltage category	Not Applicable			
pollution degree	2	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)	EN 55011 Class A			
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
Ambient climatic conditions				
Operating ambient temperature (IEC 60068-2)	°C	-30 - +55	-30 - +55	-30 - +55
Condensation	Must be prevented with suitable measures			
Storage	°C	-40 - 80	-40 - 80	-40 - 80
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%	9 - 95	9 - 95	9 - 95
SmartWire-DT network				
Module type	SmartWire-DT module (slave)			

	M22-SWD-K11/ M22-SWD-KC11	M22-SWD-LED-.../ M22-SWD-LEDC-...	M22-SWD-K11LED-.../ M22-SWD-K11LEDC-...	M22-SWD-R M22-SWD-INC
Baud rate setting	Automatic	Automatic	Automatic	Automatic
Status SmartWire-DT LED	Green	Green	Green	Green
Porting	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, (%)	14.5 (±3)			
SWD module U _{SWD}				
Current consumption at U _{SWD}	→ Page 275			
Function element				
Contacts	1 changeover contacts	–	1 changeover contacts	–
Lifespan mechanical/electrical (operations)	1 x 10 ⁶	–	1 x 10 ⁶	–
LED indicator	no	Yes	Yes	no
Diagnostics	Yes	no	Yes	Yes
Mounting	Front mount/ base fixing	Front mount/ base fixing	Front mount/ base fixing	Front mounting

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)
General			
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			
Ambient mechanical conditions			
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
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	9	9	9
Drop (IEC/EN 60068-2-31); drop height mm	50	50	50
Free fall, packaged (IEC/EN 60068-2-32) m	0.3	0.3	0.3
Electromagnetic compatibility (EMC)			
Overvoltage category			
pollution degree	2	2	2
Electrostatic discharge (IEC/EN 61131-2:2008)			

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	M22-SWD-K22/ M22-SWD-KC22	M22-SWD-K22LED-.../ M22-SWD-K22LEDC-...	M22-SWD-NOP(C)
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 V (IEC/EN 61131-2:2008, Level 3)	10	10	10
Ambient climatic conditions			
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
SmartWire-DT network			
Module type			
Baud rate setting	Automatic	Automatic	Automatic
Status SmartWire-DT LED	Green	Green	Green
Porting	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 _{SWD}	14.5 (±3)		
Current consumption at U _{SWD}	→ Page 275		
Function element			
Contacts	2 changeover contacts	2 changeover contacts	—
Lifespan mechanical/electrical (operations)	1 x 10 ⁶	1 x 10 ⁶	—
LED indicator	no	Yes	—
Diagnostics	Yes	Yes	—
Mounting	Front mount/ base fixing	Front mount/ base fixing	—

14.8.7 Bus termination resistor, switch cabinet leadthroughs

		SWD4-RC8-10	SWD4-SFL8-20	SWD4-SML8-20
General				
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
Ambient mechanical conditions				
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)	Impact resistances	9	9	9
semi-sinusoidal 15 g/11 ms				
Drop to IEC/EN 60068-2-31	Drop height	50	—	—
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	—	—
Electromagnetic compatibility (EMC)				
Overvoltage 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
Ambient climatic conditions				
Ambient temperature (IEC 60068-2)	°C	-25 - +55	-25 - +55	-25 - +55
Condensation		Must be prevented 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
Connection options				
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 275		

14.8.8 Enclosure bushings: plug, socket

		SWD4-SF8-20	SWD4-SM8-20
General			
Standards		IEC/EN 61131-2 EN 50178_x	IEC/EN 61131-2 EN 50178_x
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
Ambient mechanical conditions			
Degree of protection (IEC/EN 60529, EN50178, VBG 4)		IP67	IP67
Ambient climatic conditions			
Operating ambient temperature (IEC 60068-2)	°C	-25 - +55	-25 - +55
Condensation		Must be prevented with suitable measures	
Storage	°C	-40 - +70	-40 - +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95	5 - 95
Connection options			
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 275

14.8.9 Coupling, plug

		SWD4-8SFF2-5	SWD4-8SF2-5	SWD4-8FRF-10
General				
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
Ambient mechanical conditions				
Degree of protection (IEC/EN 60529, EN50178, VBG 4)		IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
Constant amplitude of 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 resistances	9	9	9
semi-sinusoidal 15 g/11 ms				
Electromagnetic compatibility (EMC)				
Electrostatic discharge (IEC/EN 61131-2:2008)				
Air discharge (Level 3)	kV	8	—	—
Contact discharge (Level 2)	kV	4	—	—
Ambient climatic conditions				
Operating ambient temperature (IEC 60068-2)	°C	-25 - +55	-25 - +55	-25 - +55
Condensation		Must be prevented 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
Connection options				
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 275		

14.8.10 SWD-Basemodules for signal towers

SWD base modules for signal towers are meant exclusively for use with SmartWire-DT systems.

			SL4-SWD	SL7-SWD
General				
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	
Ambient mechanical conditions				
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	
Dielectric strength				
Overvoltage 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_x	
Electromagnetic compatibility (EMC)				
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)				
Supply cables	kV		2	
Signal cables	kV		2	
SmartWire-DT cables	kV		1	

			SL4-SWD	SL7-SWD
Surge (IEC/EN 61131-2:2008, Level 1)			Figure 100: Performance criterion B (tested with 0.5kV/0.5kV)	
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V		10	
Ambient climatic conditions				
Operating ambient temperature (IEC 60068-2)	°C		-30 up to +60	
Condensation			Must be prevented with suitable measures	
Storage	°C		-30 up to +85	
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%		5 – 95	
SmartWire-DT interface				
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 275	
Potential isolation				
From supply voltage U _{AUX} From 24 VDC external supply voltage From the light/acoustic modules			Yes	
Supply voltage AUX				
Rated operating voltage	U _e	VDC, (%)	24 (-15/+20)	
Residual ripple		%	–	
max. current consumption		A	0.9	1.5
Protection against polarity reversal			Yes	
Potential isolation				
From 24 VDC external auxiliary power From device supply voltage for SmartWire-DT modules U _{SWD}			Yes	
From the light/acoustic modules			no	
External supply voltage 24 V DC				
Connection type			Push-In	
solid		mm ²	0.25 – 1.5	
flexible with ferrule ¹⁾		mm ²	0.25 – 1.5	
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	
Potential isolation				

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		SL4-SWD	SL7-SWD
From supply voltage U_{AUX} From device supply voltage for SmartWire-DT modules U_{SWD}		Yes	
From the light/acoustic modules		no	
Light and acoustic modules			
Max. quantity		5	
Max. current per module	mA	300	
Short-circuit / overload proof		yes, with diagnostics	
1) Minimum length 8 mm			

14.8.11 NZM circuit-breakers-...

		NZM-XSWD-704	PXR-RCAM-SWD
General			
Standards		IEC/EN 61131-2; EN 50178	IEC/EN 61131-2; EN 50178
Dimensions W x H x D	mm	35 x 90 x 101	35 x 90 x 101
Weight	kg	0.1	0.087
Mounting		DIN-rail IEC/EN 60715, 35 mm	DIN-rail IEC/EN 60715, 35 mm
Mounting position		vertical	vertical
Ambient mechanical conditions			
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
Electromagnetic compatibility (EMC)			
Overvoltage category		II	III
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)			
Supply cables	kV	2	2
Signal cables	kV	1	–
Modbus RTU	kV	–	1
SmartWire-DT cables	kV	1	1
Surge (IEC/EN 61131-2:2008, Level 1)		–	–
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V	10	10
Ambient climatic conditions			
Operating ambient temperature (IEC 60068-2)	°C	–25 - +55	–25 - +55
Condensation		Must be prevented with suitable measures	Must be prevented with suitable measures
Storage	°C	–40 - +70	–40 - +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95	5 - 95
SmartWire-DT interface			
Module type		SmartWire-DT module (slave)	SmartWire-DT module (slave)
Baud rate setting		Automatic	Automatic
Status SmartWire-DT	LED	Green	Green

1) Minimum length 8 mm

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14.8 Technical data

			NZM-XSWD-704	PXR-RCAM-SWD
Connection			Plug, 8-pole Connection plug: External device plug SWD4-8SF2-5	Plug, 8-pole Connection plug: External device plug SWD4-8SF2-5
Device supply voltage SWD module	U _{SWD}	V DC, (%)	14.5 (±3)	14.5 (±3)
Current consumption at U _{SWD}			→ Page 275	→ Page 275
Modbus RTU interface				
Module type				Modbus RTU slave
Baud rate setting		Baud		Manual • 9600 • 19200 (default) • 38400 • 57600
Modbus slave address				1...247, 2 (default)
Parity				Even (default), Odd, None
Stop bits				1(default), 2
Slave response Timeout		ms		100...6000, 3000(default)
Cyclic requests Delay		ms		0...1275, 10(default)
Status Modbus RTU		LED		Green
Connection				see → Chapter 12 "Interface PXR-RCAM-SWD for NZM compact circuit-breakers", page 247
Connection supply and I/O				
Connection type			Push-In	Push-In
solid		mm ²	0.2 - 1.5 (AWG24 - AWG16)	0.2 - 1.5 (AWG24 - AWG16)
flexible with ferrule ¹⁾		mm ²	0.25 - 1.5	0.25 - 1.5
24 V DC supply for output supply				
Rated operating voltage	U _e	V	—	—
Residual ripple of input voltage		%	—	—
Protection against polarity reversal			—	—

1) Minimum length 8 mm

			NZM-XSWD-704
Digital inputs			
Qty.			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			
Qty.			2
Output current		A	0.2 at 24 V DC
Short-circuit detection threshold		A	
lamp load	R _{LL}	W	
Overload proof			yes, with diagnostics
Switching capacity			EN 60947-5-1 utilization category DC-13
Relay outputs			
Qty.			—
Contact type			—
c (contacts)			

		NZM-XSWD-704
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
Semi-conductor outputs for SmartWire-DT		Yes
Semi-conductor outputs for inputs		–
Relays for SmartWire-DT		–
Relays for inputs		–
Relays for relays		–

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