Manual

05/11 MN05006001Z-EN
replaces AWB2723-1613en

SmartWire-DT
Units

Powering Business Worldwide

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

Translation of the original operating manual
All editions of this document other than those in German language are translations of the original German manual.

1st edition 2009, edition date 02/09
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3rd edition 2010, edition date 03/10
4th edition 2010, edition date 05/10
5th edition 2011, edition date 02/11
6th edition 2011, edition date 05/11
See revision protocol in the "About this manual" chapter

Production: René Wiegand, Jutta Kremer
Translation: globaldocs GmbH

Danger!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth 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) must be connected to the protective earth (PE) or to the potential equalisation. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does 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 volt supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, 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-stop devices must not cause restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- 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-stop 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.).

Contents

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Contents

0 About This Manual

As of publication date 05/10 this manual AWB2723-1613g has been renamed to MN05006001Z-EN.

0.1 List of revisions

The following significant amendments have been introduced since previous issue:

Publication date	Page	Subject	New	Change	Deleted
03/10	71	Chapter "Connection for motor-starter combination with PKE12/32, PKE-SWD-32"	/✓		
	179	Section "Maximum current consumption (15 V SWD voltage)"		✓	
	180	Section "Data requirement (bytes) SmartWire-DT modules"	✓		
	196	Section "Electronic motor-protective circuit-breaker PKE-SWD (-32)"		✓	
04/10	71	Modification to Chapter "Connection for motor-starter combination with PKE12/32, PKE-SWD-32" complete		✓	
	153	Modification Chapter "Interface for NZM compact circuit-breakers"	✓		
	179	Section "Maximum current consumption (15 V SWD voltage)"	✓		
	180	Section "Power consumption/current consumption 24 V SmartWire-DT control voltage UAUX"		✓	
	180	Section "Data requirement (bytes) SmartWire-DT modules"		✓	
	197	Section "NZM circuit-breakers-..."	✓		
10/10		Chapter 2 restructured New modules added		✓	
	181	Reference table Moeller vs. Eaton articles	✓		
02/11	171	Chapter "Connection for SmartWire-DT universal module M22-SWD-NOP(C)"	✓		
05/11	111	Chapter "Connection for motor-protective circuit-breaker PKE12/32/65"	✓		
	64	Chapter "Application for EN ISO13849-1 and EN 62061"		✓	
	91	Chapter "Application for EN ISO 13849-1 and EN 62061"		✓	

0.2 Overview System SmartWire-DT

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

Up to 99 modules can be connected to form a network by means of the SmartWire-DT system. The modules can be either SmartWire-DT modules for DILM, SmartWire-DT I/O modules or SmartWire-DT RMQ modules.

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

0.2.1 Planning and diagnostics software SWD-Assist

The SWD-Assist program provides valuable support in the engineering of your SmartWire-DT topology. SWD-Assist is software that runs on Windows 2000 (SP4), Windows XP, Windows Vista (32-bit), or Windows 7 and relieves you of the planning work required for an SWD topology. The software is available free of charge at:

http://downloadcenter.moeller.net

0.3 Additional device manuals

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

- MN05013002Z-EN (previously AWB2723-1612g) SmartWire-DT Gateways
- MN05006002Z-DE (previously AWB2723-1617de) SmartWire-DT The System
- MN05002002Z-EN (previously AWB2725-1452de) XIOC Signal modules (chapter "Diagnostics of the Profibus-DP modules")

The manuals are available for download on the Internet as PDF files. In order to find the document quickly go to http://www.eaton.com/moeller **Support** and enter the document number as a search term.

0.4 Target group

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

0.5 Writing conventions

Symbols used in this manual have the following meanings:

▶ indicates actions to be taken.

Indicates useful tips.

CAUTION

Warns about the possibility of material damage.

WARNING

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

DANGER

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

For greater clarity, the name of the current chapter and the name of the current section are shown in the page header.

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

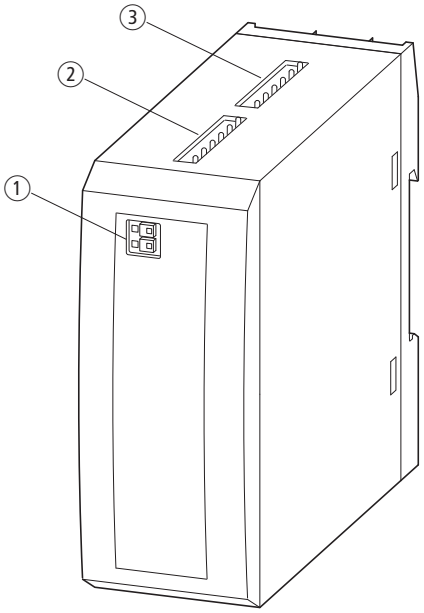


Figure 1: Connections of the EU5C-SWD-PF1-1 module

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.

1.2.2 Engineering

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

- The supply for the contactors installed in the SmartWire-DT network is no longer sufficient (power consumption of the contactors > 72 W / 3 A).
- A selective emergency shutdown of individual contactor groups or motor starter groups is required (→ section "3.3.3 Safety-related applications", page 59).

→ 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.

→ Detailed instructions on adapting the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8 pole SmartWire-DT cable are provided in chapter "Fitting external device plugs SWD4-8SF2-5" of the 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 mm^2.

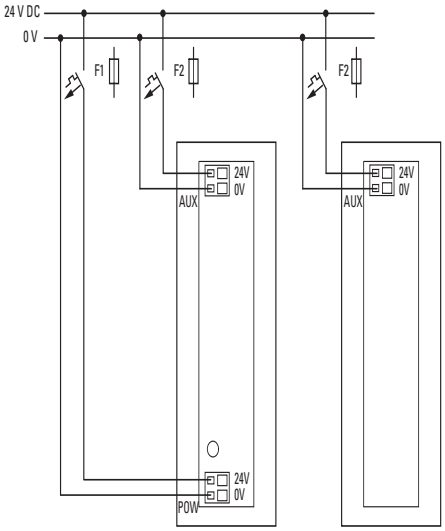


Figure 2: Terminal capacity

- 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 16

1.2.5 Diagnostics

The device does not report a diagnosis

1.3 EU5C-SWD-PF2-1

1.3.1 surface mounting

Connections/power supply

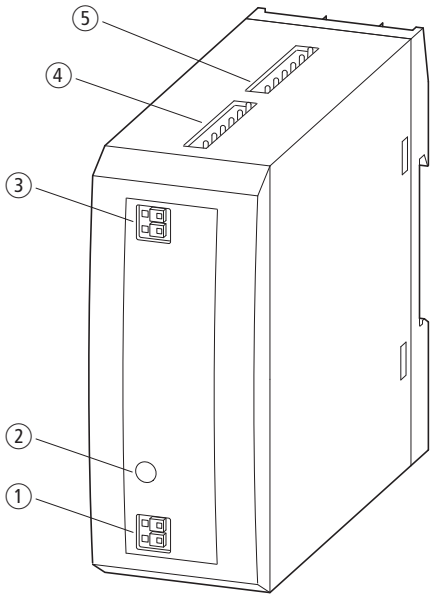


Figure 3: Connections of the EU5C-SWD-PF2-1 module

① SmartWire-DT module supply
② POW module 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 module 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 (→ section "3.3.3 Safety-related applications", page 59).

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

1.3.3 Installation

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

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

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

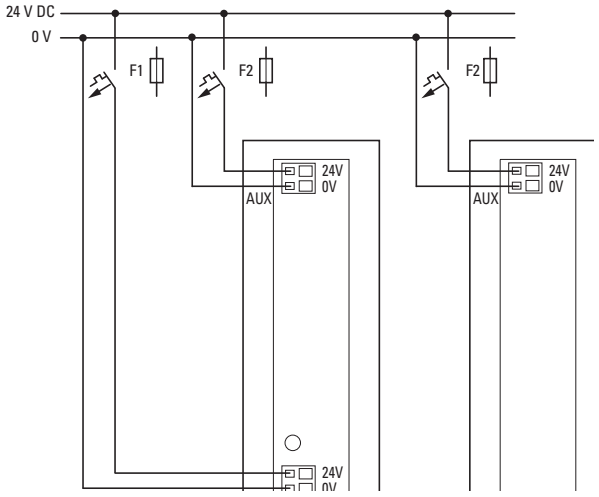


Figure 4: Terminal capacity

- flexible, cross-section 0.25 mm² to 1.5 mm², with the ferrule (minimum length 8 mm)
- 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 class gL/gG
  - Cable protection for cable AWG 24 in accordance with UL **508** and CSA-22.2 no. 14:
  - Miniature circuit-breaker 24 V DC rated operational current 2 A; tripping characteristics C or
  - Fuse 2 A
- Miniature circuit-breaker 24 V DC for **AUX**
  - Cable protection in accordance with DIN VDE 0641 Part 11, IEC/EN 60898:
  - Miniature circuit-breaker 24 V DC rated operational current 3 A; trip type **Z** or
  - Fuse 3 A, utilization class gL/gG
  - Cable protection for cable AWG 24 in accordance with UL **508** and CSA-22.2 no. 14:
  - Miniature circuit-breaker 24 V DC rated operational current 2 A; ripping characteristics Z or
  - Fuse 2 A

1.3.5 Diagnostics

The device does not report a diagnosis

2 Inputs/outputs 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.

This section describes the I/O modules' general characteristics and provides information about their use. For further information about specific modules, see the module descriptions that follow this section.

2.2 surface mounting

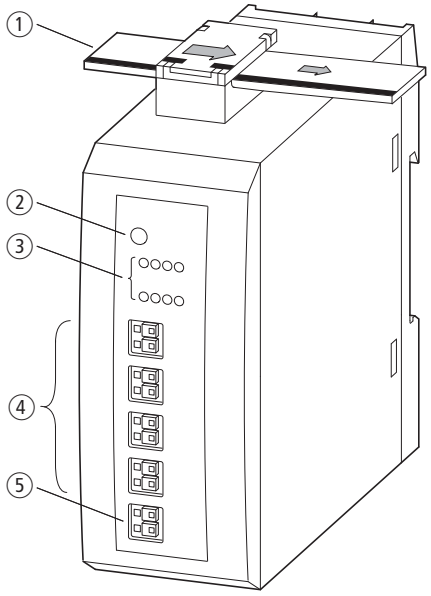


Figure 5: Connections of a SmartWire-DT I/O module

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

2.3 Engineering

The SmartWire-DT I/O modules are used for connecting other sensor and actuator devices without built-in SmartWire-DT technology. To reduce wiring, the modules are placed immediately next to the sensors/actuators. The signal and supply cables are connected to the SmartWire-DT ribbon cable through SmartWire-DT device plug SWD4-8SF2-5. The connection to the inputs and outputs and the optional power supply is implemented with push-in terminals.

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

→ 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 179.

2.4 Installation

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

▶ Mount the module on the top-hat rail.

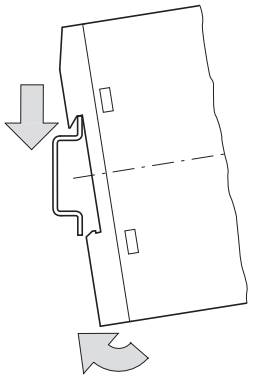


Figure 6: Mounting on top-hat rail

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

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

2.4.1 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.

2.4.1.1 Terminal capacity

- 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

2.4.2 Wiring analog sensors and actuators

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

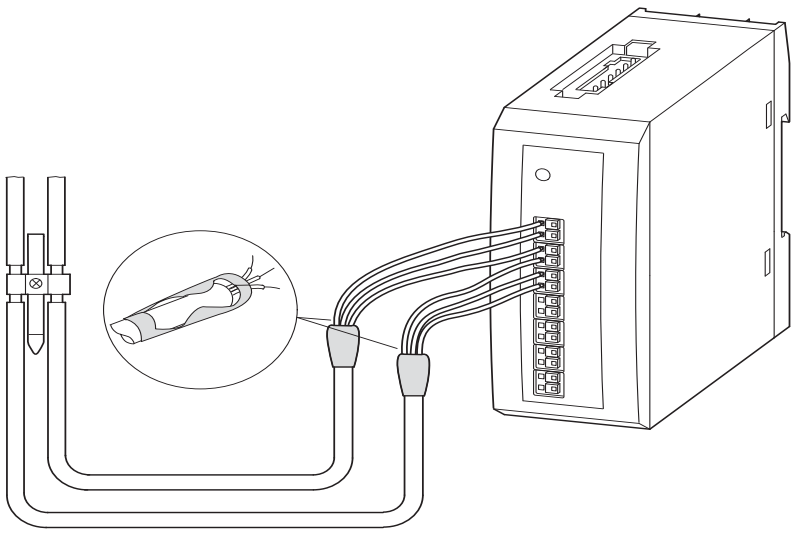


Figure 7: Wiring analog sensors and actuators

2.4.3 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.

2.4.4 Exchange of Modules

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

After replacement of the modules and connection of the voltage the configuration button must be pressed. The new module is assigned an address by this means.

> *CAUTION*
>
> The order of the SmartWire-DT modules must not be altered.

2.4.5 Device status

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

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

Designation	Color	Health	Message
SWD	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 part no.

		flashing (3 Hz)	Device reports a diagnosis (see section "Programming", subsection "Diagnostics").

2.4.6 Detailed descriptions

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

- EU5E-SWD-8DX → Page 21
- EU5E-SWD-4DX → Page 23
- EU5E-SWD-4D4D → Page 26
- EU5E-SWD-4D2R → Page 29
- EU5E-SWD-X8D → Page 33
- EU5E-SWD-4AX → Page 36
- EU5E-SWD-2A2A → Page 40
- EU5E-SWD-4PT → Page 45

2.5 EU5E-SWD-8DX

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

2.5.2 Surface mounting

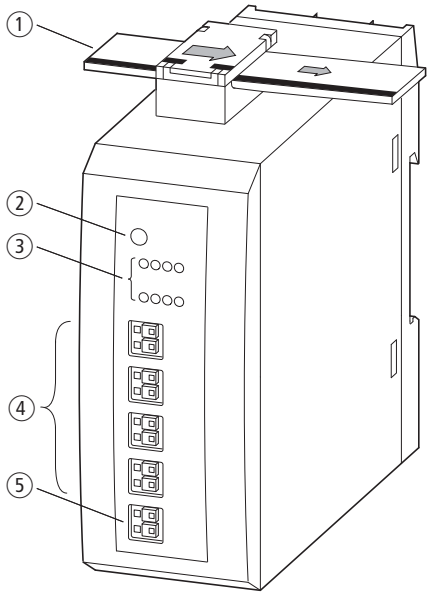


Figure 8: Connections of the modules EU5E-SWD-8DX

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

2.5.3 Engineering

There are no specific engineering notes for this device model.

2.5.4 Installation

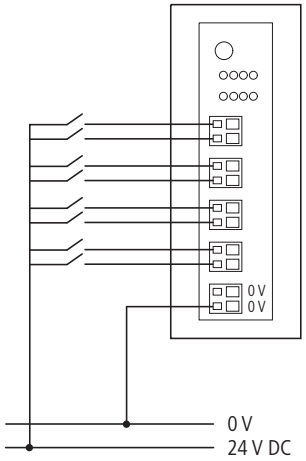


Figure 9: Connecting inputs and reference potential

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

2.5.5 Programming

The module has two input bytes at its disposal.

2.5.5.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: Diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
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	Meaning
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

2.5.5.2 Diagnostics

The module does not report a diagnosis.

2.6 EU5E-SWD-4DX

2.6.1 Introduction

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

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

2.6.1.1 Interoperability with SmartWire-DT gateways

The following or later firmware versions of the SmartWire-DT gateway used ensure interoperability with SmartWire-DT module EU5E-SWD-4DX.

Table 2: Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.20
EU5C-SWD-DP	V 1.20

→ The firmware of the SmartWire-DT gateway can be updated using the SWD-Assist program.

2.6.1.2 SWD-Assist

The SWD-Assist software can be used from version V 1.30 together with the EU5E-SWD-4DX SmartWire-DT module.

2.6.2 Surface mounting

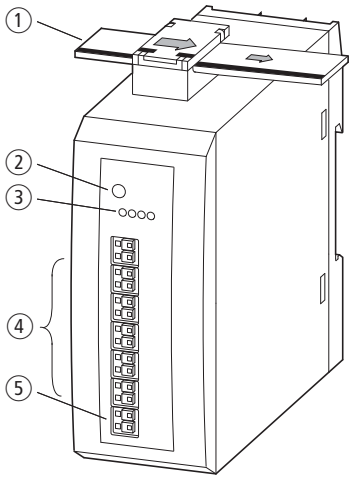


Figure 10: Layout of module EU5E-SWD-4DX

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

2.6.3 Engineering

The four inputs are of the three-wire type.

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

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

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

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

2.6.4 Installation

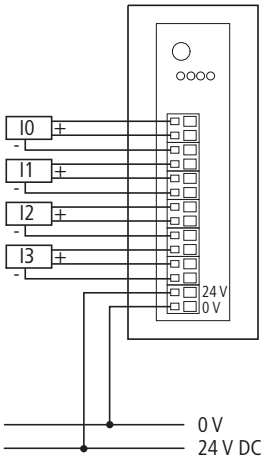


Figure 11: Connecting inputs and power supply

- 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 two-wire connections, connect the sensors to the corresponding inputs I0 to I3, and to I- (0 V).
- Connect the 24 V power supply for all modules.

2.6.5 Programming

The module has two input bytes at its disposal.

2.6.5.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: Diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

Byte 1:

7	6	5	4	3	2	1	0
–	–	–	–	I3	I2	I1	I0

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

2.6.5.2 Diagnostics

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

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

2.7 EU5E-SWD-4D4D

2.7.1 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 four inputs. The digital short-circuit proof outputs are used to drive actuators.

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

2.7.2 Surface mounting

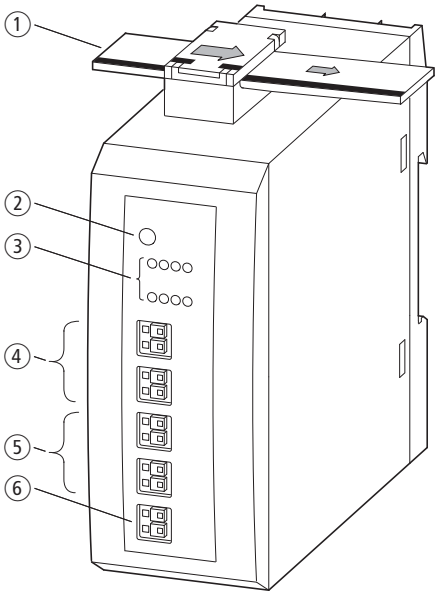


Figure 12: Connections of the modules EU5E-SWD-4D4D

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

2.7.3 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.

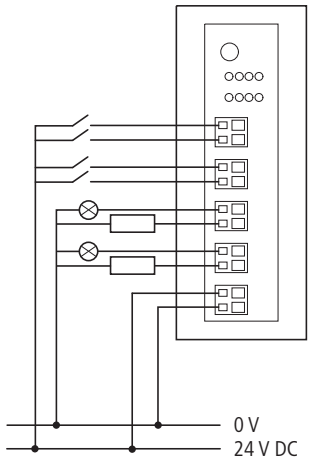


Figure 13: Connecting inputs/outputs and power supply

2.7.4 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

2.7.5 Programming

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

2.7.5.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: Diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

Byte 1:

7	6	5	4	3	2	1	0
–	–	–	–	I3	I2	I1	I0

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

2.7.5.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	Q3	Q2	Q1	Q0

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

2.7.5.3 Diagnostics

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

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

2.8 EU5E-SWD-4D2R

2.8.1 Introduction

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

2.8.2 Surface mounting

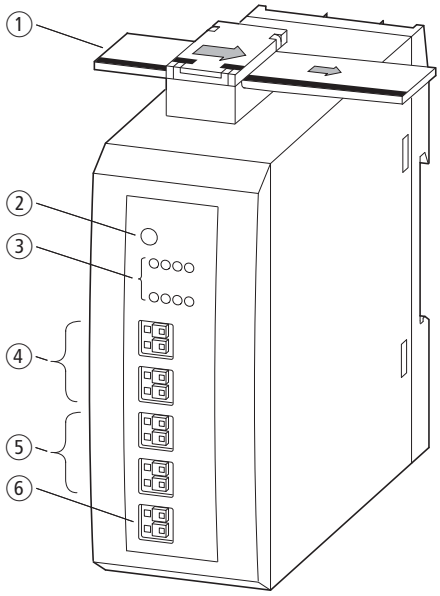


Figure 14: Connections of the modules EU5E-SWD-4D2R

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

2.8.3 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.

2.8.4 Installation

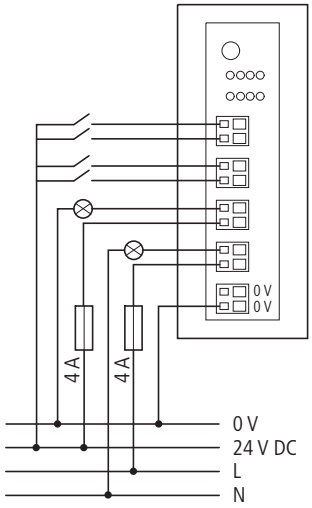


Figure 15: Connecting the inputs/outputs of module EU5E-SWD-4D2R

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

> *CAUTION*
>
> 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.

2.8.5 Programming

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

2.8.5.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: Diagnostic alarm

Bit	Designation	Meaning
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

Byte 1:

7	6	5	4	3	2	1	0
–	–	–	–	I3	I2	I1	I0

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

2.8.5.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	Q1	Q0

Bit	Designation	Meaning
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	–

2.8.5.3 Diagnostics

The module does not report a diagnosis.

2.9 EU5E-SWD-X8D

2.9.1 Introduction

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

2.9.1.1 Interoperability with SmartWire-DT gateways

The following or later firmware versions of the SmartWire-DT gateway used ensure interoperability with SmartWire-DT module EU5E-SWD-X8D.

Table 3: Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.20
EU5C-SWD-DP	V 1.20

→ The firmware of the SmartWire-DT gateway can be updated using the SWD-Assist program.

2.9.1.2 SWD-Assist

The SWD-Assist software can be used from version V 1.30 together with the EU5E-SWD-X8D SmartWire-DT module.

2.9.2 Surface mounting

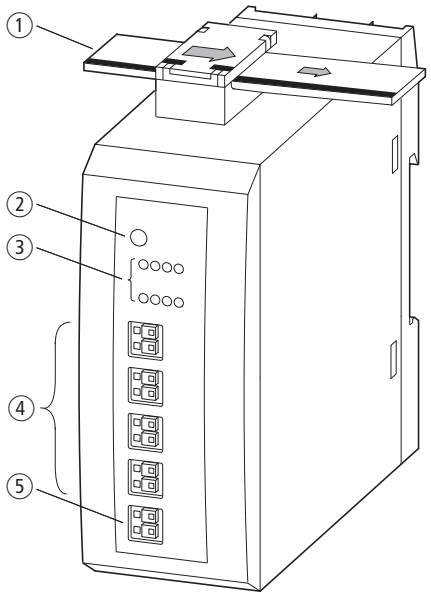


Figure 16: Layout of module EU5E-SWD-X8D

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

2.9.3 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 supply voltage is automatically applied again.

2.9.4 Installation

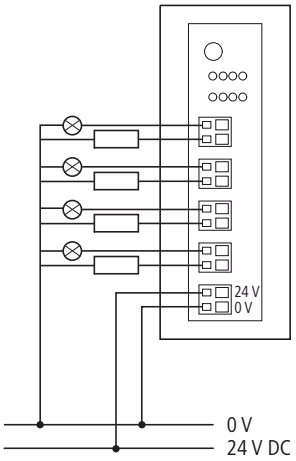


Figure 17: Connecting outputs and supply

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

2.9.5 Programming

The module has one input byte and one output byte.

2.9.5.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: Diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

2.9.5.2 Outputs

Byte 0:

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

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

2.9.5.3 Diagnostics

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

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

2.10 EU5E-SWD-4AX

2.10.1 Introduction

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

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

2.10.1.1 Interoperability with SmartWire-DT gateways

The following or later firmware versions of the SmartWire-DT gateway used ensure interoperability with SmartWire-DT module EU5E-SWD-4AX.

Table 4: Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.20
EU5C-SWD-DP	V 1.20

→ The firmware of the SmartWire-DT gateway can be updated using the SWD-Assist program.

2.10.1.2 SWD-Assist

The SWD-Assist software can be used from version V 1.30 together with the EU5E-SWD-4AX SmartWire-DT module.

2.10.2 Surface mounting

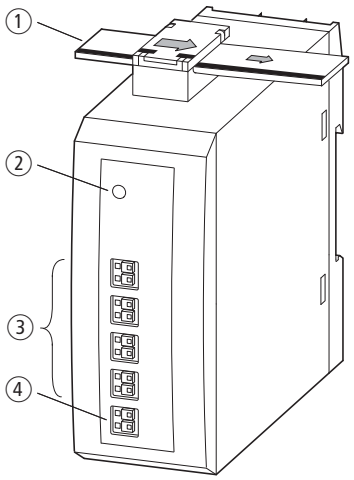


Figure 18: Layout of module EU5E-SWD-4AX

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

2.10.3 Engineering

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

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

2.10.4 Installation

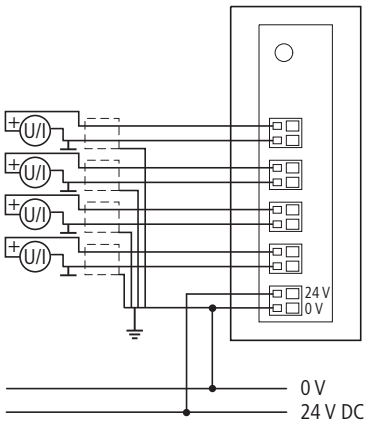


Figure 19: Connecting inputs and power supply

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

2.10.5 Parameter setting

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

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

Parameters	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.
This is the refresh rate to the SmartWire-DT network. Averaging can be enabled in addition to smooth out input signal fluctuations.

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

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	bit5 bit4 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.

2.10.6 Programming

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

2.10.6.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: Diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

The inputs each have a resolution of 12 bits. The analog values are transmitted as unsigned 16-bit value.

Data addressing depends on the chosen programming system.

Inputs

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

2.10.6.2 Diagnostics

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

0x13 overload on at least one analog current input (I > 23 mA)

2.11 EU5E-SWD-2A2A

2.11.1 Introduction

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

2.11.1.1 Interoperability with SmartWire-DT gateways

The following or later firmware versions of the SmartWire-DT gateway used ensure interoperability with SmartWire-DT module EU5E-SWD-2A2A.

Table 5: Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.20
EU5C-SWD-DP	V 1.20

→ The firmware of the SmartWire-DT gateway can be updated using the SWD-Assist program.

2.11.1.2 SWD-Assist

The SWD-Assist software can be used from version V 1.30 together with the EU5E-SWD-2A2A SmartWire-DT module.

2.11.2 Surface mounting

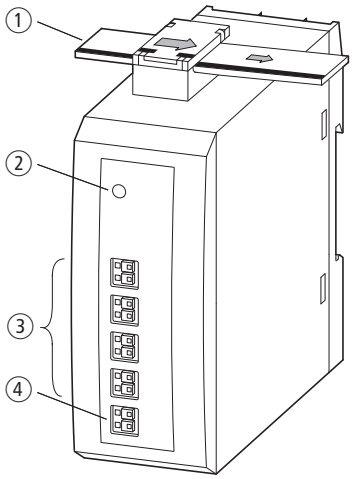


Figure 20: Layout of module EU5E-SWD-2A2A

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

2.11.3 Engineering

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

2.11.4 Installation

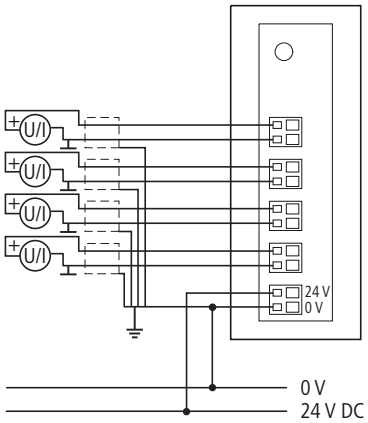


Figure 21: Connecting inputs and supply of module EU5E-SWD-2A2A

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

2.11.5 Parameter setting

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

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

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

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

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	bit5 bit4 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.

2.11.6 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.

2.11.6.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: Diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
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.

Inputs

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

Outputs

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

2.11.6.2 Diagnostics

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

- 0x13 overload or short circuit on at least one analog output
- 0x13 overload on at least one analog current input (I > 23 mA)

2.12 EU5E-SWD-4PT

2.12.1 Introduction

SmartWire-DT I/O module EU5E-SWD-4PT provides four analog temperature inputs for connection of Pt100, Pt1000 or Ni1000 RTDs in two-wire or 3-wire connections.
The module's network status is indicated by the SmartWire-DT diagnostics LED.

2.12.1.1 Interoperability with SmartWire-DT gateways

The following or later firmware versions of the SmartWire-DT gateway used ensure interoperability with SmartWire-DT module EU5E-SWD-4PT.

Table 6: Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.20
EU5C-SWD-DP	V 1.20

→ The firmware of the SmartWire-DT gateway can be updated using the SWD-Assist program.

2.12.1.2 SWD-Assist

The SWD-Assist software can be used from version V 1.30 together with the EU5E-SWD-4PT SmartWire-DT module.

2.12.2 Surface mounting

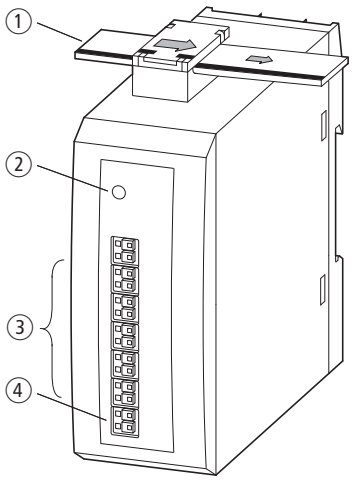


Figure 22: Layout of module EU5E-SWD-4PT

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

2.12.3 Engineering

The RTD (Pt100, Pt1000 or Ni1000) is selected in the programming system's control configurator. The temperature range is from –50 to +150 °C for Ni1000 sensors and –50 to +200 °C for PT100 and PT1000 sensors.

If the sensor is connected as a two-wire sensor, terminals Ax-ax (x = 0, 1, 2, 3) must be bridged. On unused inputs all three terminals must be bridged.

2.12.4 Installation

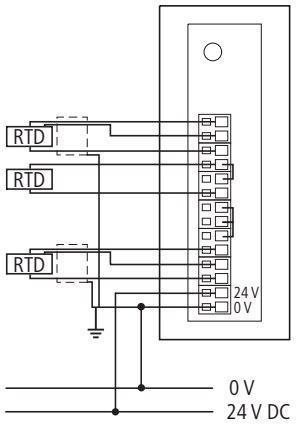


Figure 23: Connecting inputs and supply of module EU5E-SWD-4PT

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

2.12.5 Parameter setting

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

Parameters	Setting options	Default setting
Sensor type 1	Not used, PT100, PT1000, Ni1000	Not used
Sensor type 2	Not used, PT100, PT1000, Ni1000	Not used
Sensor type 3	Not used, PT100, PT1000, Ni1000	Not used
Sensor type 4	Not used, PT100, PT1000, Ni1000	Not used
Display	Degrees Celsius, degrees Fahrenheit, nonlinear value	Degrees Celsius

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

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

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

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	bit1 Bit 0 **0** **0** = **not used** 0 1 = PT100 1 0 = PT1000 1 1 = NI1000
2, 3	Sensor selection Input 2	Bit3 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	bit1 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.

→ 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.

2.12.6 Programming

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

2.12.6.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: Diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

Inputs

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

The content of inputs IW0 – IW3 depends on parameter "Representation". If °C (degrees Celsius) or °F (degrees Fahren-heit) is selected, the reading is displayed as prefixed 16-bit decimal value with a resolution of 0.1 degrees. Otherwise a binary value is passed.

Representation of sensor model	Temperature value in °C	Indicated value at selected representation		
		1/10 °C	1/10 °F	Nonlinear value
PT100, PT1000	–50 – +200	–500 – +2000	–580 – +3920	0 – 4095
NI1000	–50 – +150	–500 – +1500	–580 – +3020	0 – 4095

2.12.6.2 Diagnostics

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

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

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

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

3.1 Introduction

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

CAUTION

No additional auxiliary contact block can be snapped onto the contactor. The auxiliary contacts integrated in the contactor can be used, e.g. for safety interlocks.

CAUTION

In addition to the basic devices (contactors, motor-starter combinations, etc.) described in the individual sections, The SmartWire Device Technology (SmartWire-DT) function elements listed in this manual can also be combined with equivalent Eaton basic devices that use the Eaton catalog number as part number.
For a reference table, see the Appendix on page 181.

3.2 surface mounting

The following diagram shows the two modules.

DIL-SWD-32-001 **DIL-SWD-32-002**

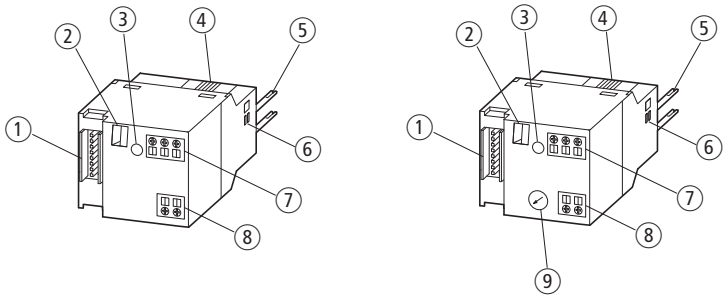


Figure 24: Structure of the SmartWire-DT modules DIL-SWD-32-001 and DIL-SWD-32-002 for DILM

① Connection of SmartWire-DT external device plug
② Mechanical switching position indicator
③ Diagnostics LED
④ Catch slider
⑤ Connection pins
⑥ Adjusting slide for contactor size
⑦ Connection terminal X0-X1-X2
⑧ Connection 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 .

→ Detailed instructions on adapting the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8 pole SmartWire-DT cable are provided in chapter "Fitting external device plugs SWD4-8SF2-5" of the 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 (→ section "3.7 Device status", page 67).

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 7: 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 consumption with a voltage of 24 V DC:

Table 8: Power consumptions of the contactor coils with a voltage of 24 V DC

Contactor	Pull-in power [W]	Pick-up current with 24 V DC [mA]	Sealing power [W]	Holding current with 24 V DC [mA]
DILA, DILM7 – DILM9	3	125	3	125
DILM12 – DILM15	4.5	188	4.5	188
DILM17 – DILM38	12	500	0.5	21

CAUTION

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 11)

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 179.

DIL-SWD-32-001 **DIL-SWD-32-002**

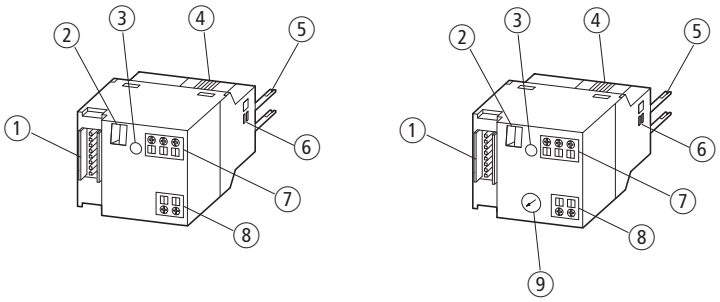


Figure 25: Connections of the SmartWire-DT module DIL-SWD-32-001 or DIL-SWD-32-002 for DILM

① Connection of SmartWire-DT external device plug
② Mechanical switching position indicator
③ Diagnostics LED
④ Catch slider
⑤ Connection pins
⑥ Adjusting slide for contactor size
⑦ Connection terminal X0-X1-X2
⑧ Connection 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.

CAUTION

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

The "Enable" ⑧ auxiliary contact h is factory fitted with a link. If electrical interlocks are envisaged in the application, the link 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 59).

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

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

CAUTION

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

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

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

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

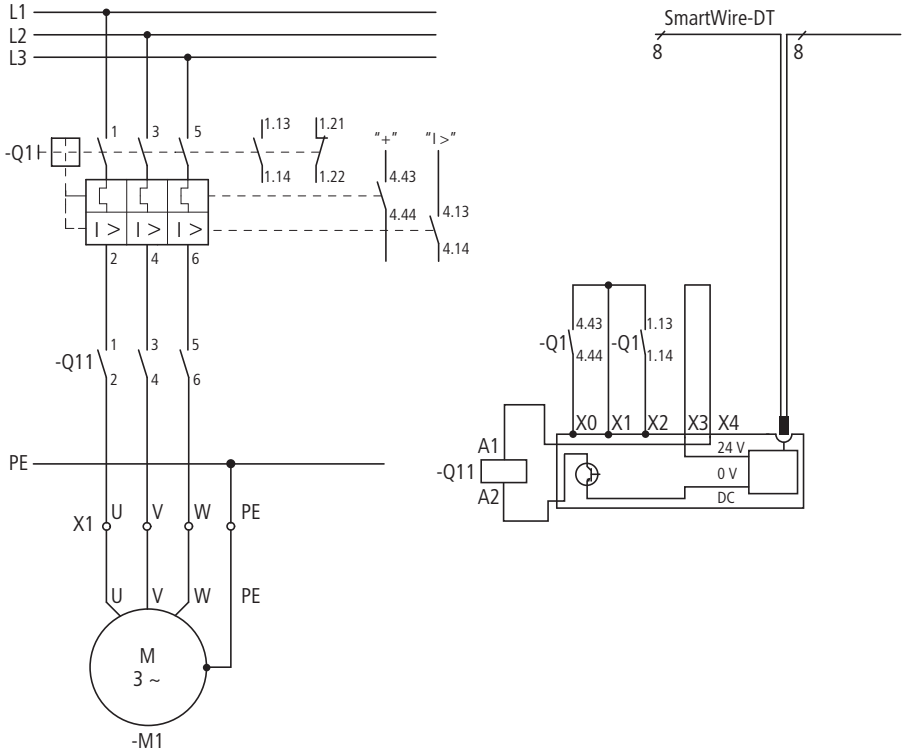


Figure 26: Circuit diagram of the DOL starter

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.

> *CAUTION*
>
> 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. For the electrical interlocking of the two contactors this bridge 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 59).

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

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

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

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

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

> *CAUTION*
>
> 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 9: 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 link DILM12-XEV the circuit Fig. 27 should be used. On the other hand, an electrical interlock with wire jumpers should be implemented according to the circuit Fig. 28.

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

The switch positions are as follows:

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

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

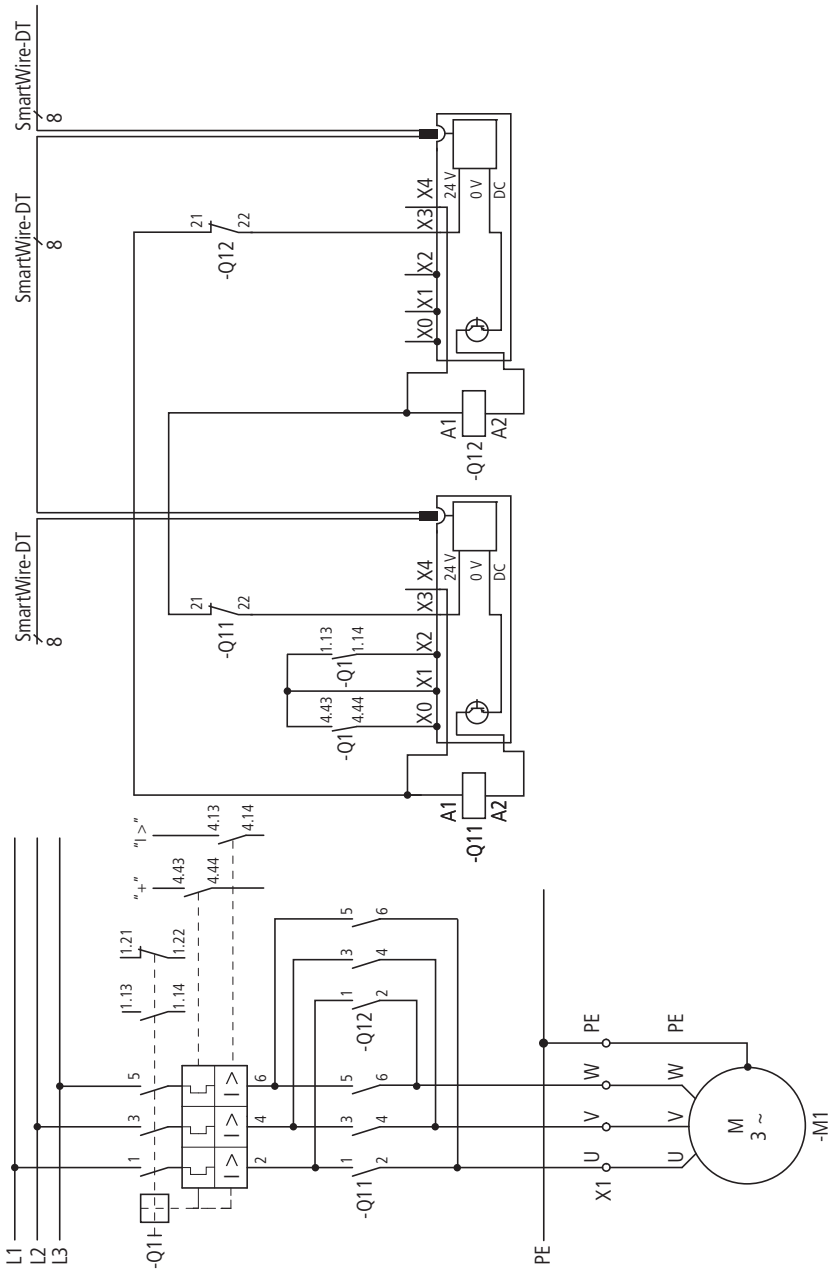


Figure 27: Circuit diagram of the reversing starter in combination with DILM12-XEV

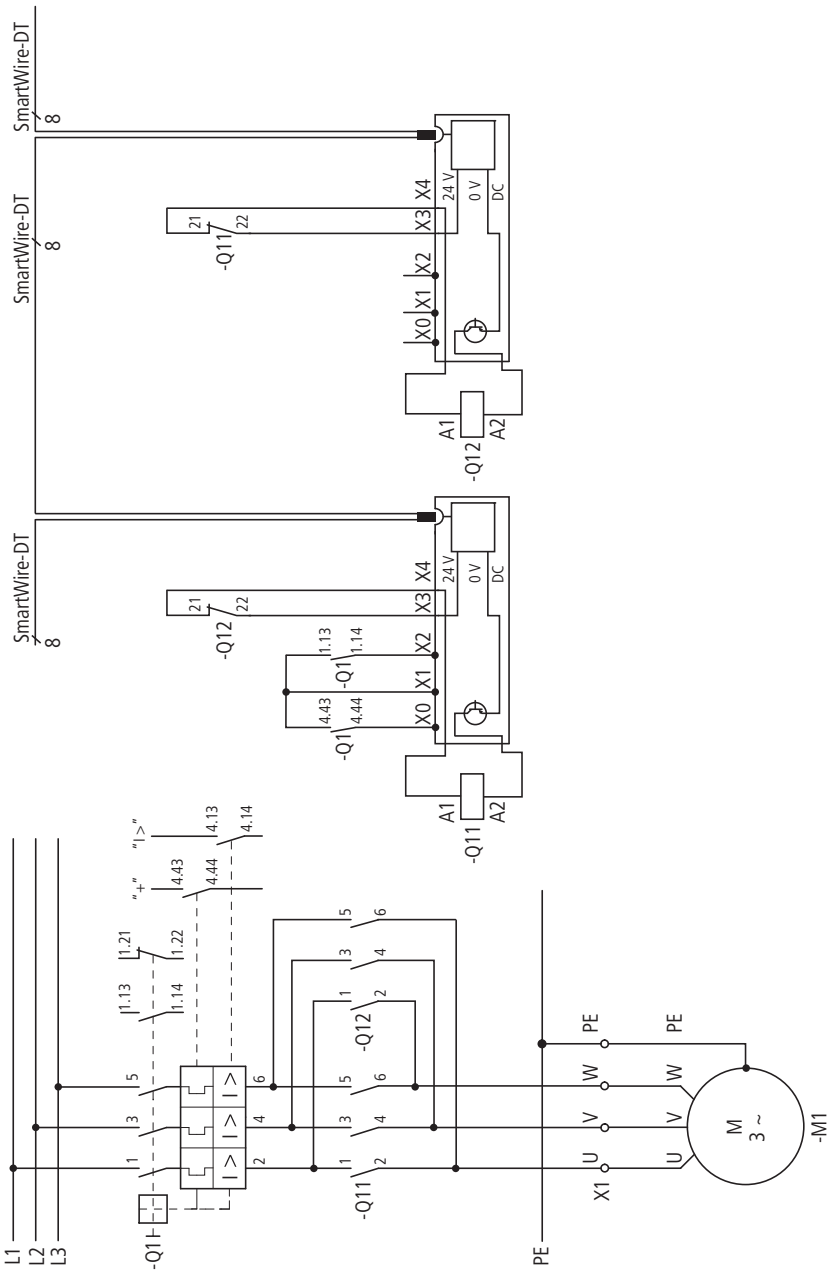


Figure 28: Circuit diagram of the reversing starter

3.3.3 Safety-related applications

For most applications, apart from normal operational switching also the switch-off in emergency or the switch-off by the opening of the protective doors is demanded.

The system SmartWire-DT 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 (protective extra low voltage).

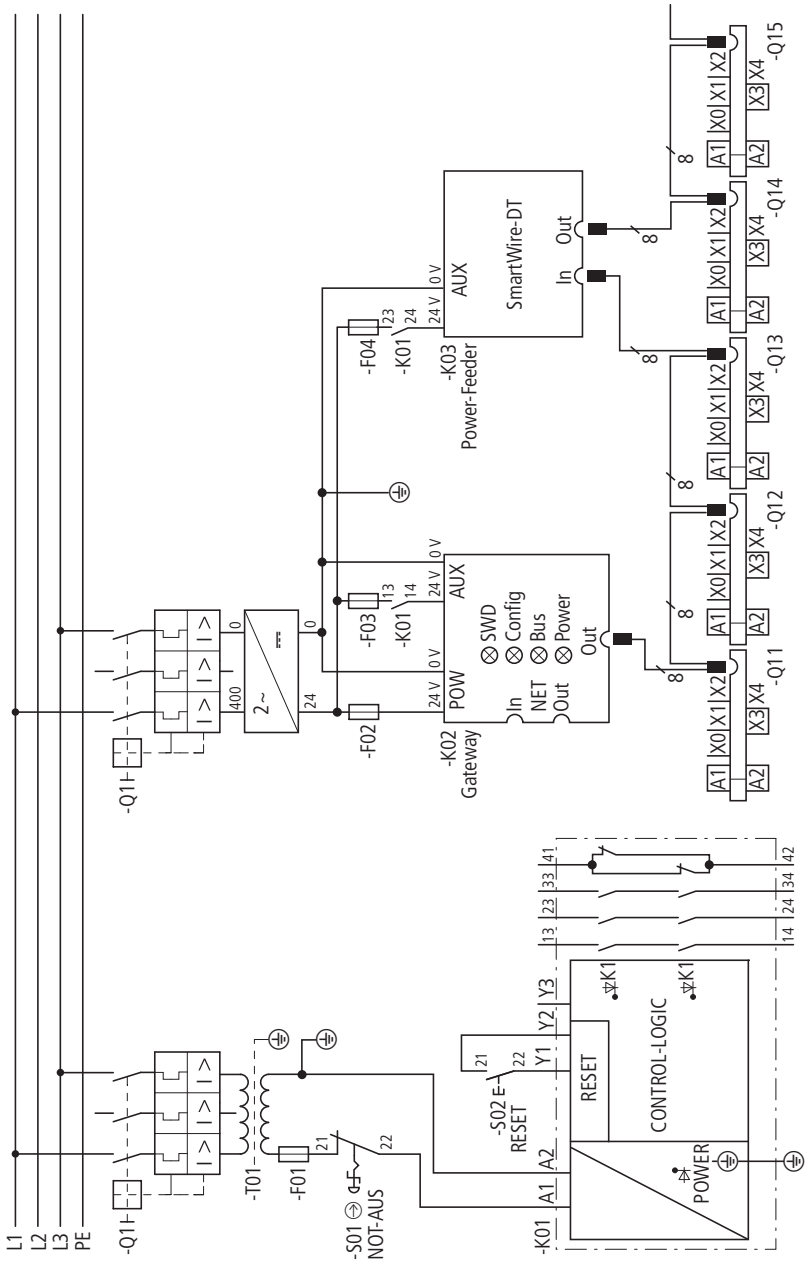


Figure 29: Actuating circuit for safety relevant switch-off

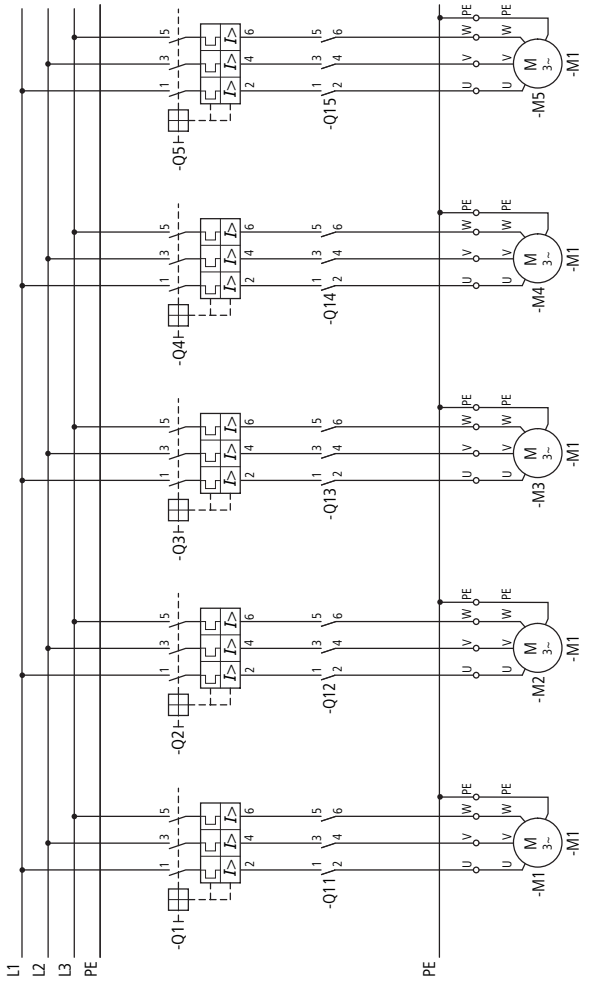


Figure 30: Main circuit for safety relevant switch-offs

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

3.3.4 Feedback circuit

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

3.3.5 Measures for higher safety categories

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

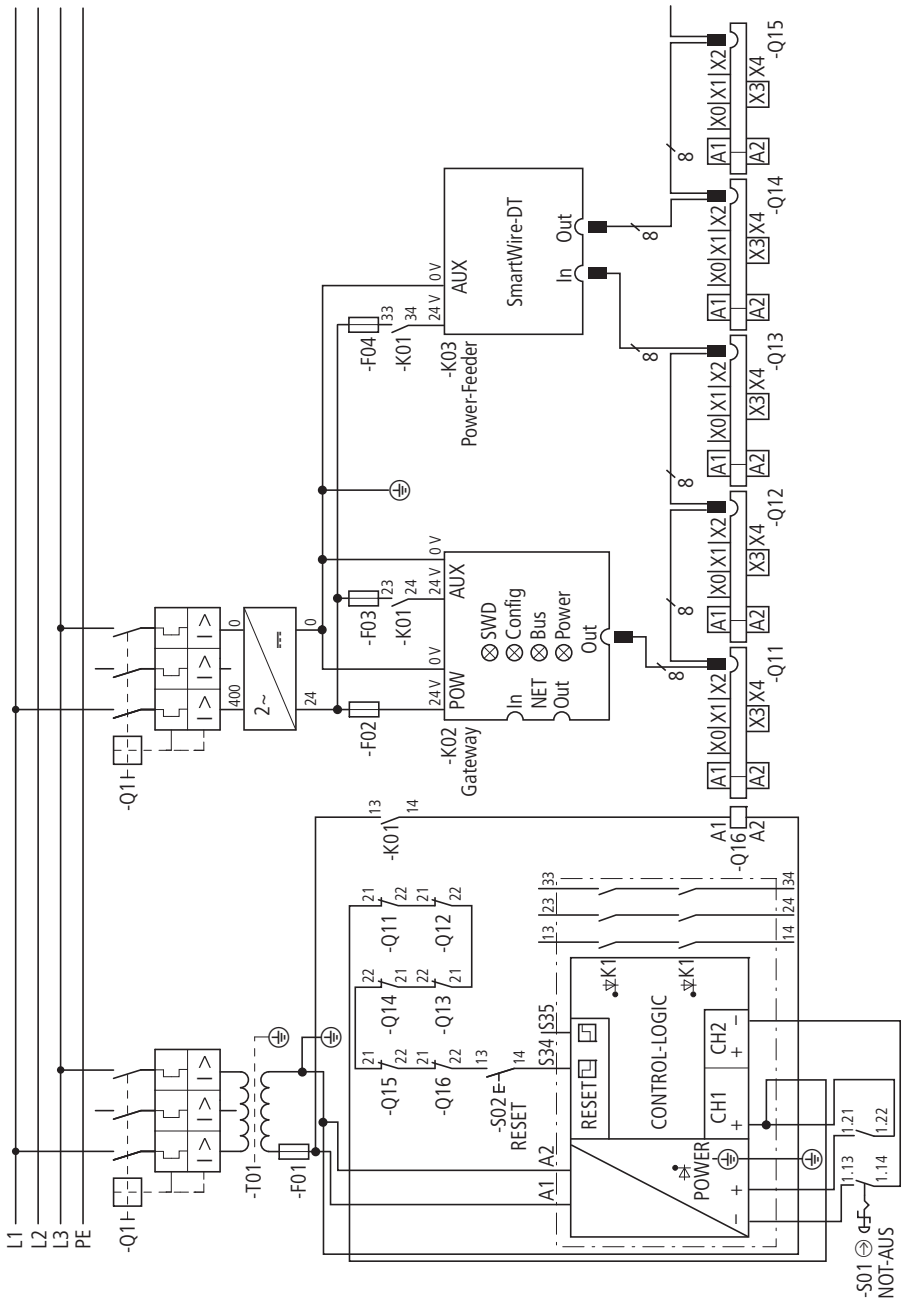


Figure 31: Actuating circuit for redundant switch-off

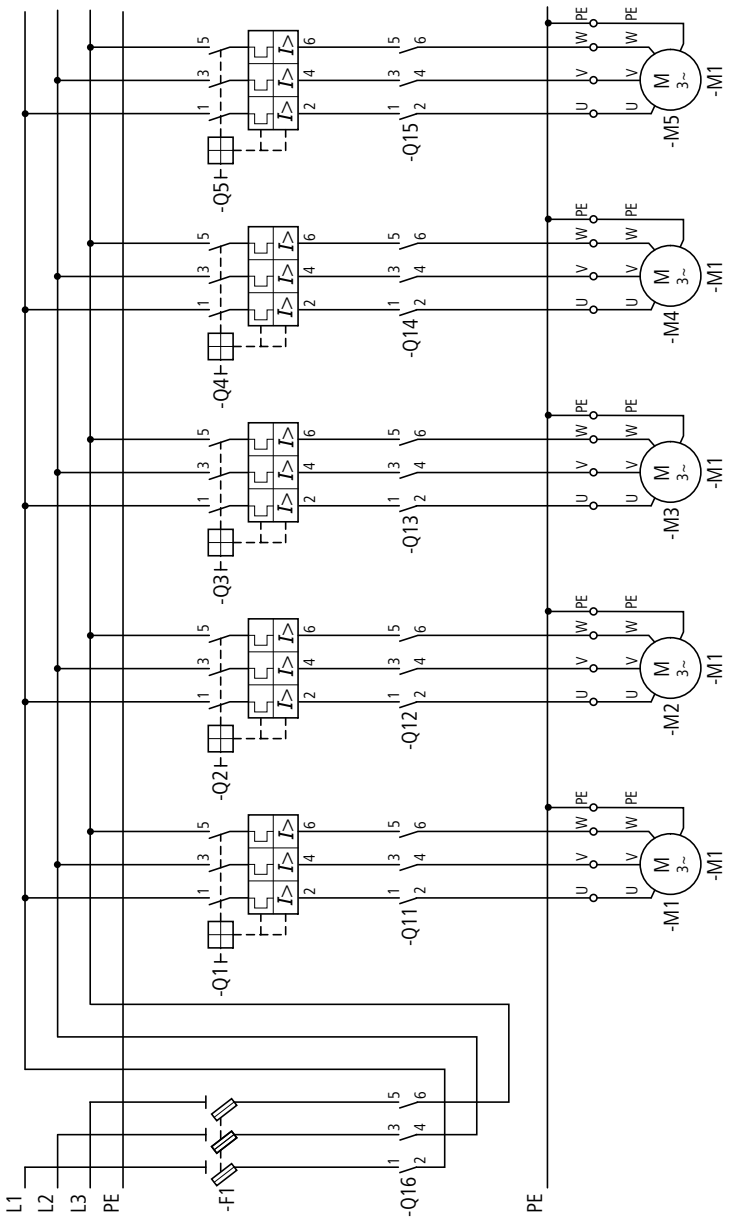


Figure 32: Mains circuit for redundant switch off.

3.3.6 Application for EN ISO13849-1 and EN 62061

The SmartWire-DT system is suitable in applications up to safety category 3, PL d in accordance with EN ISO 13849-1 and SIL CI2 in accordance with EN 62061.

DANGER

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

DANGER

The described circuit architectures for the redundant disconnection of drives in reference to the achievable safety categories are compliant with the usage of 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 NorthAmerica

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 11).

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 following Internet address:
http://www.moeller.net/de/company/news/publications/index.jsp

3.3.7.3 Reversing starter

Besides the special features described in the foregoing subsection "DOL starter", 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 interlocking is realized via the connection "Enable" ⑧ auxiliary contact.

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.

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

▶ Set the setting slider on the SmartWire-DT module for the corresponding contactor:

- **Bottom** position: DILA, DILM7, DILM9, DILM12, DILM15
- **Top** position: DILM17, DILM25, DILM32, DILM38

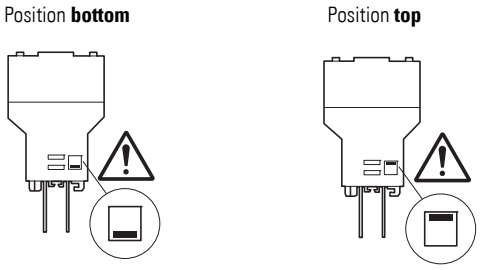


Figure 33: Adjustment of the adjusting slide on DIL-SWD-32-001 or DIL-SWD-32-002

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

DILA, DILM7, DILM9, DILM12, DILM15

DILM17, DILM25, DILM32, DILM38

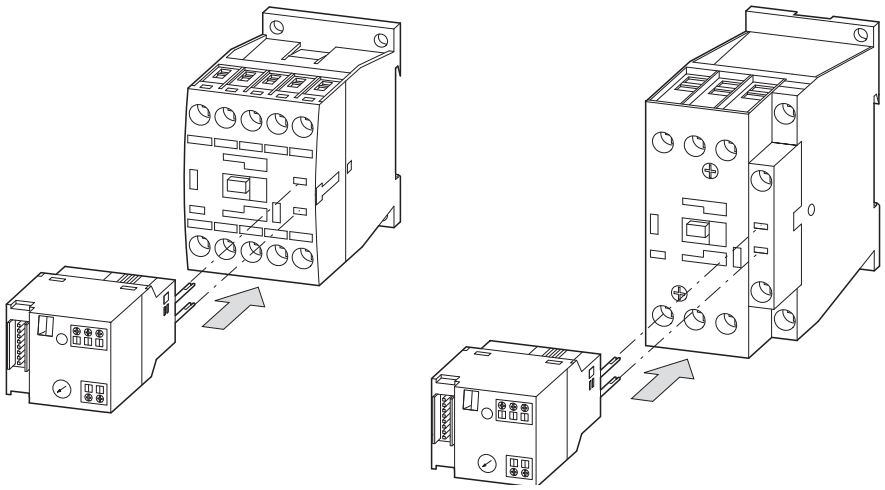


Figure 34: Placement of the DIL-SWD-32-001 or DIL-SWD-32-002 onto the contactor

▶ Lock the SmartWire-DT module for DILM.

DILA, DILM7, DILM9, DILM12, DILM15

DILM17, DILM25, DILM32, DILM38

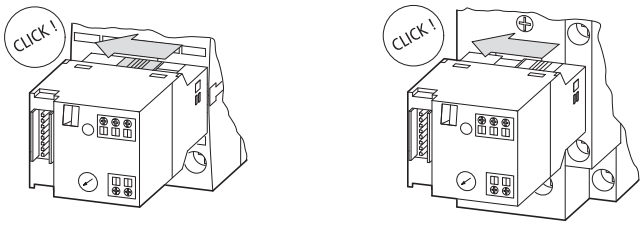


Figure 35: Locking of the DIL-SWD-32-001 or DIL-SWD32-002

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

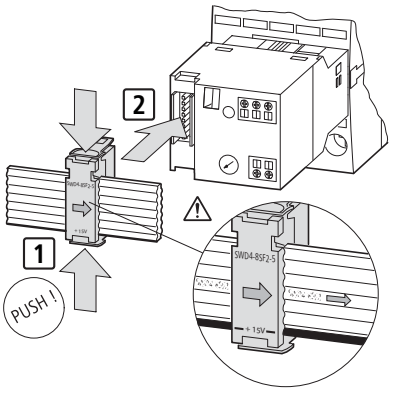


Figure 36: Connection of SmartWire-DT external device plug

3.5 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. The new module is assigned an address by this means.

CAUTION

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

Designation	Color	Health	Message
Ready	Orange	continuous light	Switching command for contactor 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 part no.

3.8 Programming

3.8.1 DIL-SWD-32-001

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

3.8.1.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	C = Contactor	0: contactor not tripped 1: contactor tripped
1	I0 (X1-X2)	0: Auxiliary contact for X1-X2 opened 1: Auxiliary contact for X1-X2 closed The meaning depends on the auxiliary contact 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 contact used.
3	not used	–
4	DIAG	0: No diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
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	Meaning
0	Q0	Contactor actuation
1	not used	–
2	not used	–
3	not used	–
4	not used	–
5	not used	–
6	not used	–
7	not used	–

3.8.1.3 Diagnostics

The module does not report a diagnosis.

3.8.2 DIL-SWD-32-002

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

3.8.2.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	C = Contactor	0: contactor not tripped 1: contactor tripped
1	I0 (X1-X2)	0: Auxiliary contact for X1-X2 opened 1: Auxiliary contact for X1-X2 closed The meaning depends on the auxiliary contact 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 contact used.
3	M = Manual	0: Automatic 1: Manual mode
4	DIAG	0: No diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
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	Meaning
0	Q0	Contactor actuation
1	not used	–
2	not used	–
3	not used	–
4	not used	–
5	not used	–
6	not used	–
7	not used	–

3.8.2.3 Diagnostics

The module does not report a diagnosis.

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

The operation and installation of electronic motor-protective circuit-breaker PKE are described in document MN03402004Z-EN (formerly AWB1210-1631).

CAUTION

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

CAUTION

No additional auxiliary contact block can be snapped onto the contactor. The auxiliary contacts integrated in the contactor can be used, e.g. for safety interlocks.

CAUTION

In addition to the basic devices (contactors, motor starter combinations, etc.) described in the individual sections, The SmartWire Device Technology (SmartWire-DT) function elements listed in this manual can also be combined with equivalent Eaton basic devices that use the Eaton catalog number as part number. For a reference table, see the Appendix on page 181.

4.2 Interoperability with SmartWire-DT gateways

The following and later firmware versions of the SmartWire-DT gateways ensure interoperability with SmartWire-DT card PKE-SWD-32:

Table 11: Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.10
EU5C-SWD-DP	V 1.10

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://downloadcenter.moeller.net

4.2.1 Fieldbus description files

The following versions of the fieldbus description file and above ensure the interoperability of the PKE-SWD-32 SmartWire-DT module:

Table 12: Compatible PKE-SWD-32 fieldbus description files

SmartWire-DT gateway	Description file
EU5C-SWD-CAN	EU5C-SWD-CAN_V110.eds
EU5C-SWD-DP (Intel-based central processing unit)	Moe4d14.gsd
EU5C-SWD-DP (Motorola-based central processing unit)	Moel4d14.gsd

4.3 SWD-Assist

SmartWire-DT module PKE-SWD-32 can be used in the SWD-Assist software as of version 1.10.

4.4 surface mounting

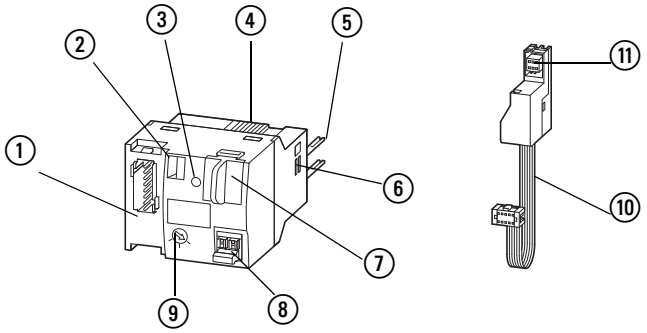


Figure 37: Connections PKE-SWD-32 and PKE32-COM-Module

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

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

→ Detailed instructions on adapting the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pole SmartWire-DT cable are provided in chapter "Fitting external device plugs SWD4-8SF2-5" of the 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 (⑲⑤③⑳⑨⑮⑭ ④⑤㉒⑨③⑤ ⑲⑳①⑳㉑⑲ ⑯①⑦⑤).

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.

4.5 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 51).

Table 13: 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 consumption with a voltage of 24 V DC:

Table 14: 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]
DILM7 - DILM9	3	125	3	125
DILM12 - DILM15	4.5	188	4.5	188
DILM17 - DILM38	12	500	0.5	21

CAUTION

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 11).

→ 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 consumption please refer to the table in „Appendix“ on page 179.

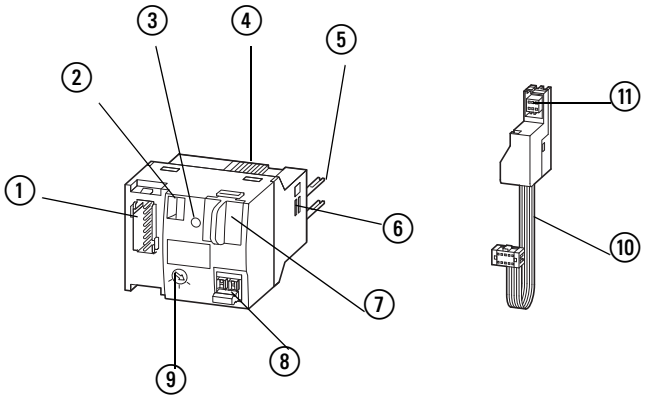


Figure 38: Connections PKE-SWD-32 and PKE32-COM-Module

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

4.5.1 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.

> *CAUTION*
>
> 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.

The auxiliary contact for the electrical enable ⑧ is connected at the factory with a link. If electrical interlocks are envisaged in the application, the link 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_SWD32 for safety-related control sections (→ section "4.5.3 Safety-related applications", page 81).

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

> *CAUTION*
> 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.

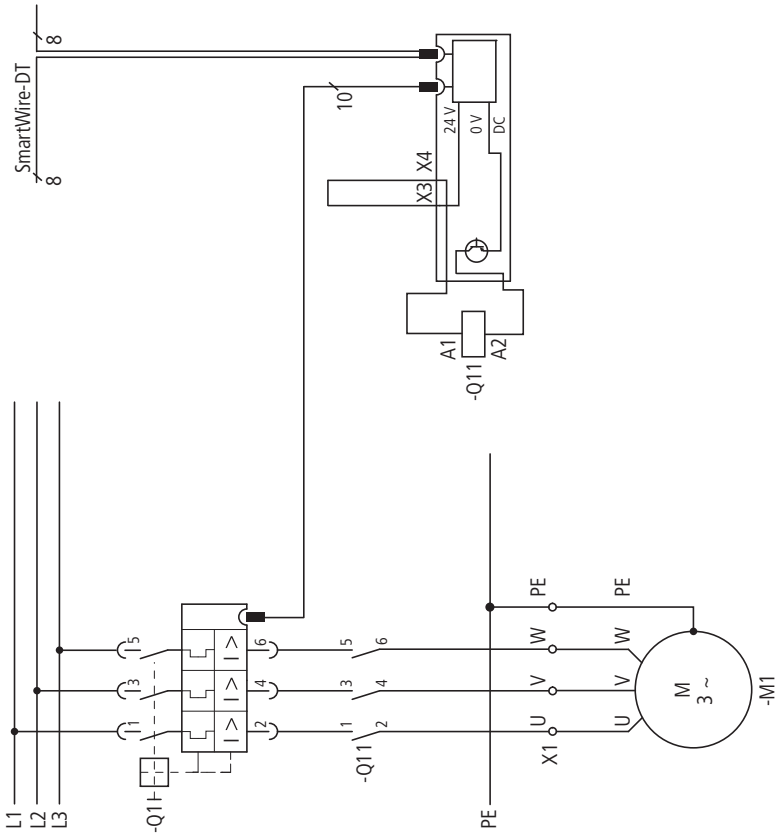


Figure 39: Circuit diagram of the DOL starter

4.5.2 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 to 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 "4.10.2 Overload relay function (ZMR)", page 102).

CAUTION

Both 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.

The "Enable" ⑧ auxiliary contact is factory fitted with a link. For the electrical interlocking of the two contactors this bridge 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 "4.5.3 Safety-related applications", page 81).

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

CAUTION

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

The connection terminals on the PKE-SWD-32 are suitable for AWG24 to AWG16 cables and for flexible cables with a cross-section of 0.25 to 1.5 mm^2.
When using ferrules it has to be ensured that the ferrule length is at least 8 mm.

CAUTION

The wiring sets DILM12-XRL and PKZM0-XRM12 must not be used for the surface mounting 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 link DILM12-XEV the circuit Figure40 should be used. On the other hand, an electrical interlock with wire links should be implemented according to the circuit Figure41.

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

The switch positions are as follows:

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

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

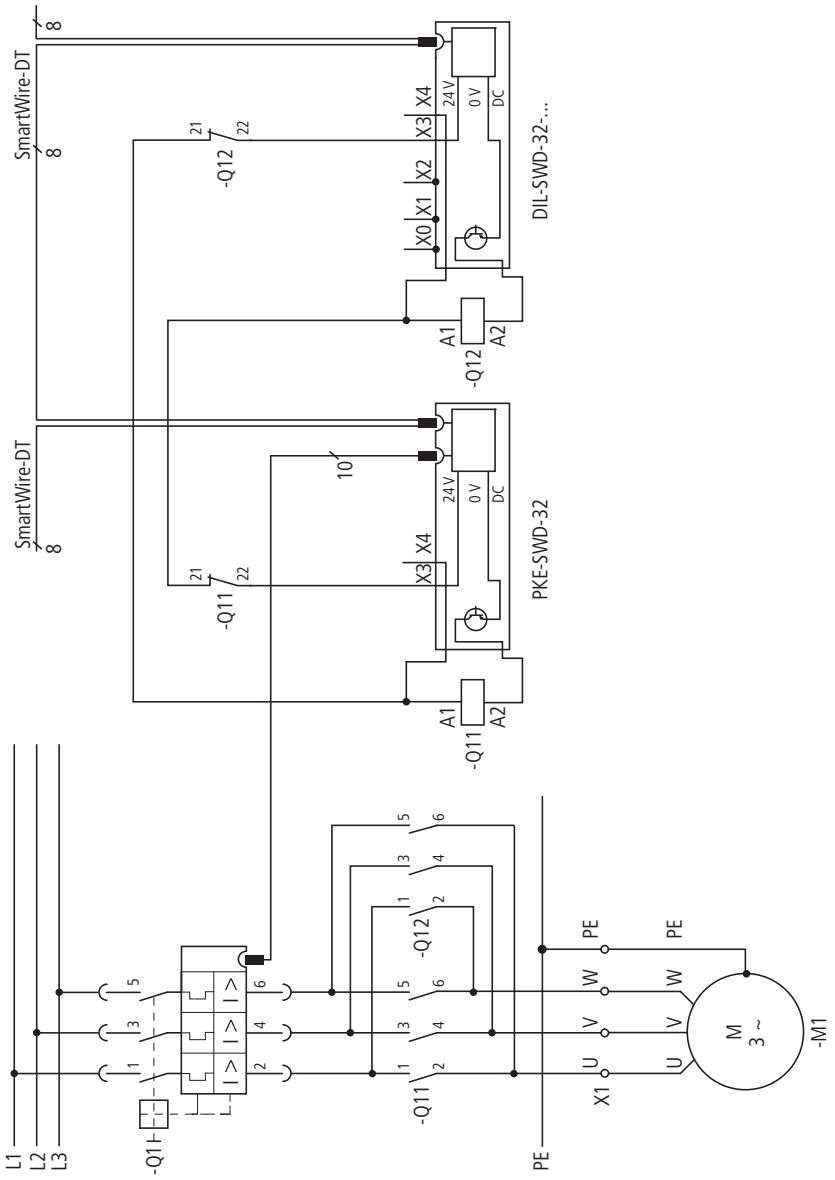


Figure 40: Circuit diagram of the reversing starter in combination with DILM12-XEV

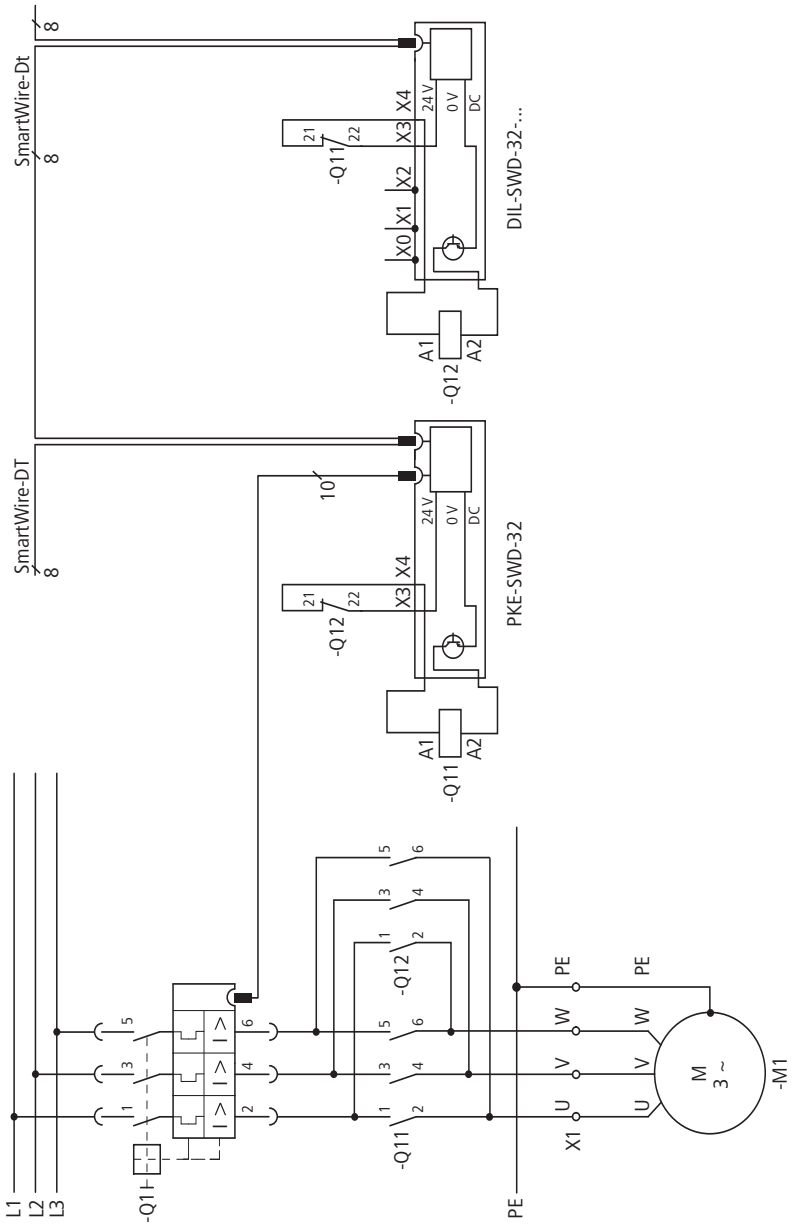


Figure 41: Circuit diagram of the reversing starter

4.5.3 Safety-related applications

For most applications, apart from normal operational switching also the switch-off in emergency or the switch-off by the opening of the protective doors is demanded.

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

DANGER

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

CAUTION

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.

4.5.3.1 Safety-related disconnection of a single drive

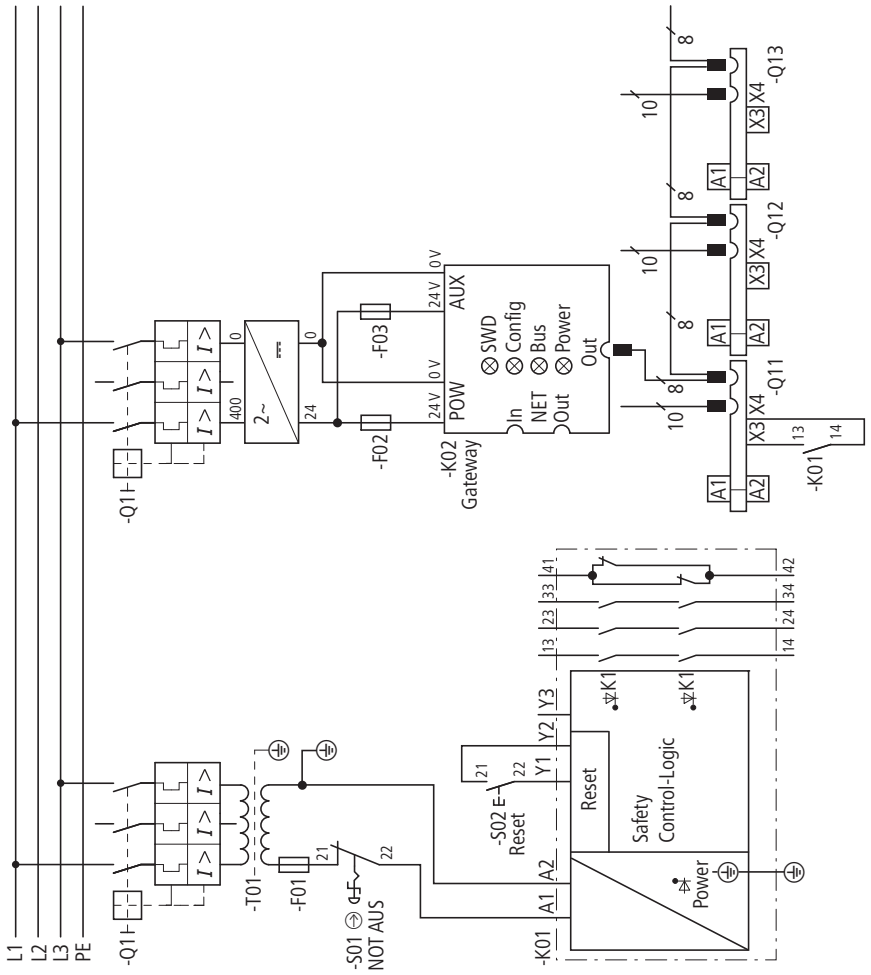


Figure 42: Actuating circuit for safety-related disconnection of a single drive

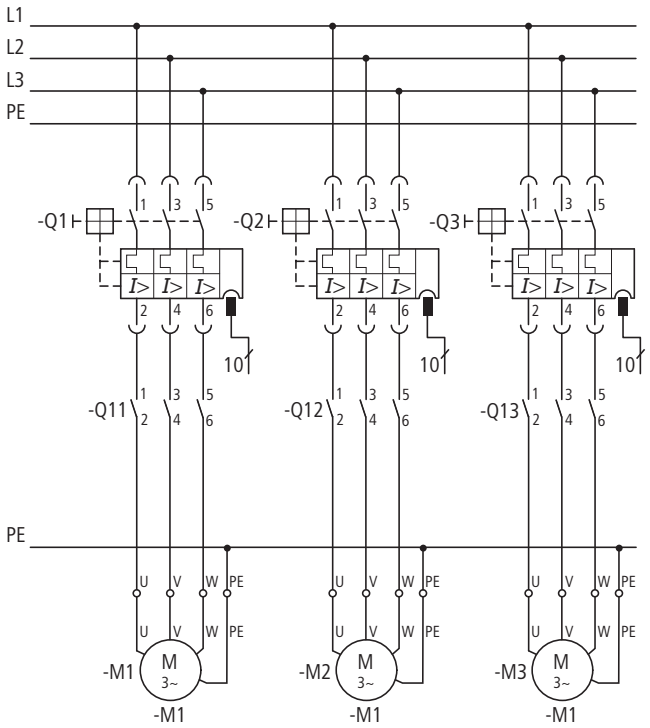


Figure 43: Mains circuit for safety-related disconnection of a single drive

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

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

4.5.3.2 Safety-related disconnection of drive groups

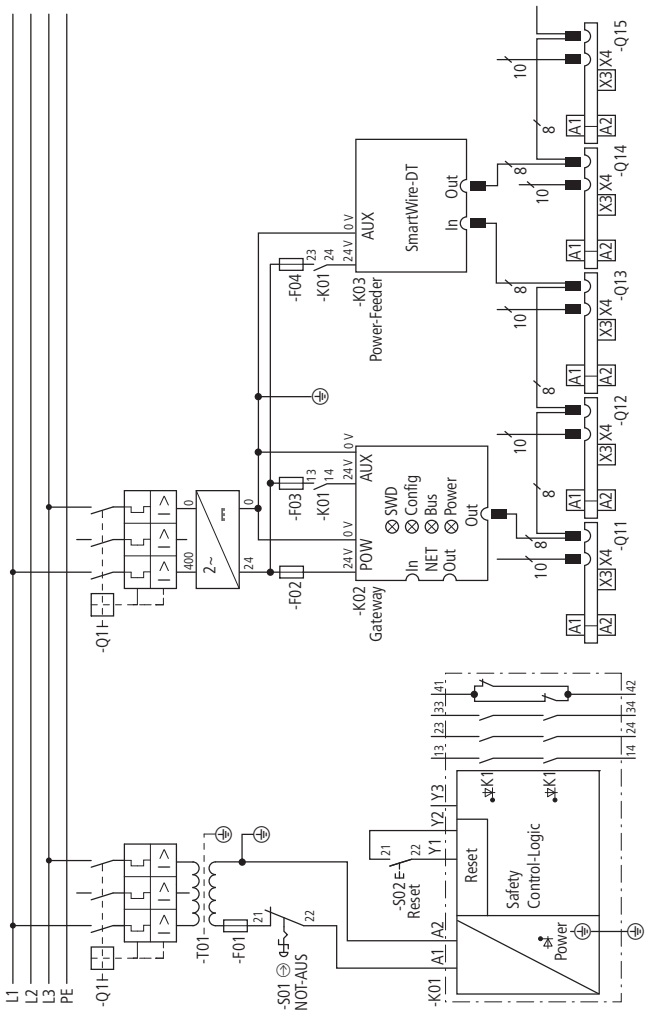


Figure 44: Actuating circuit for safety-related disconnection of drive groups

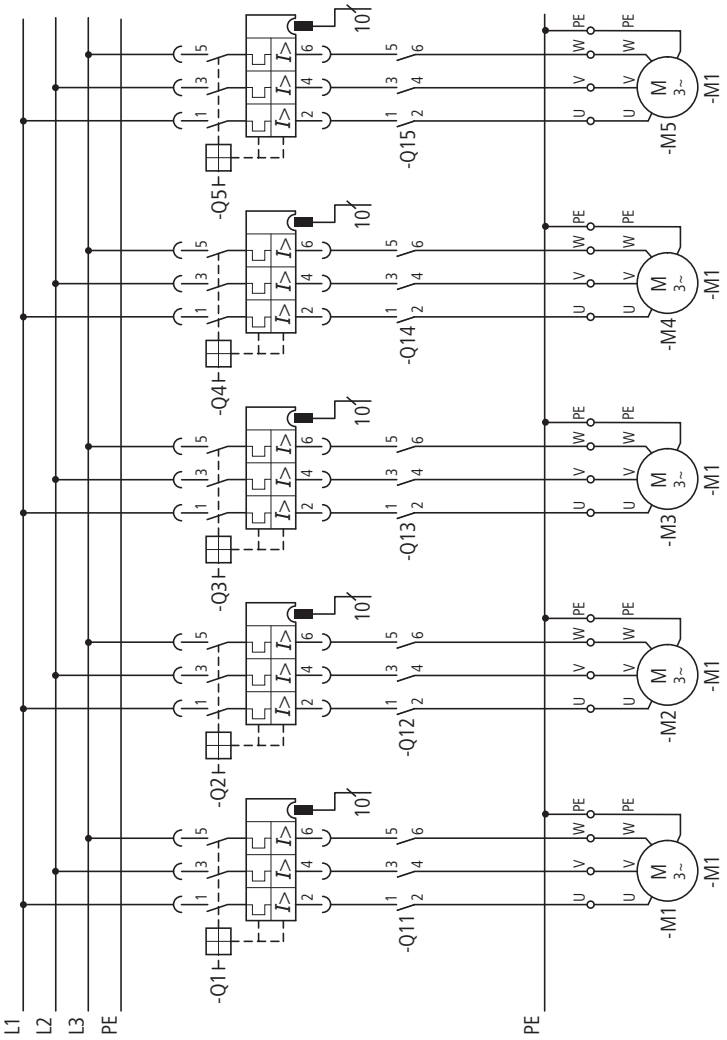


Figure 45: Main circuit for safety-related disconnection of drive groups

In an emergency the control voltage for the contactor coils can be switched off via the enabling paths 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.

4.5.4 Feedback Circuit

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

4.5.5 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

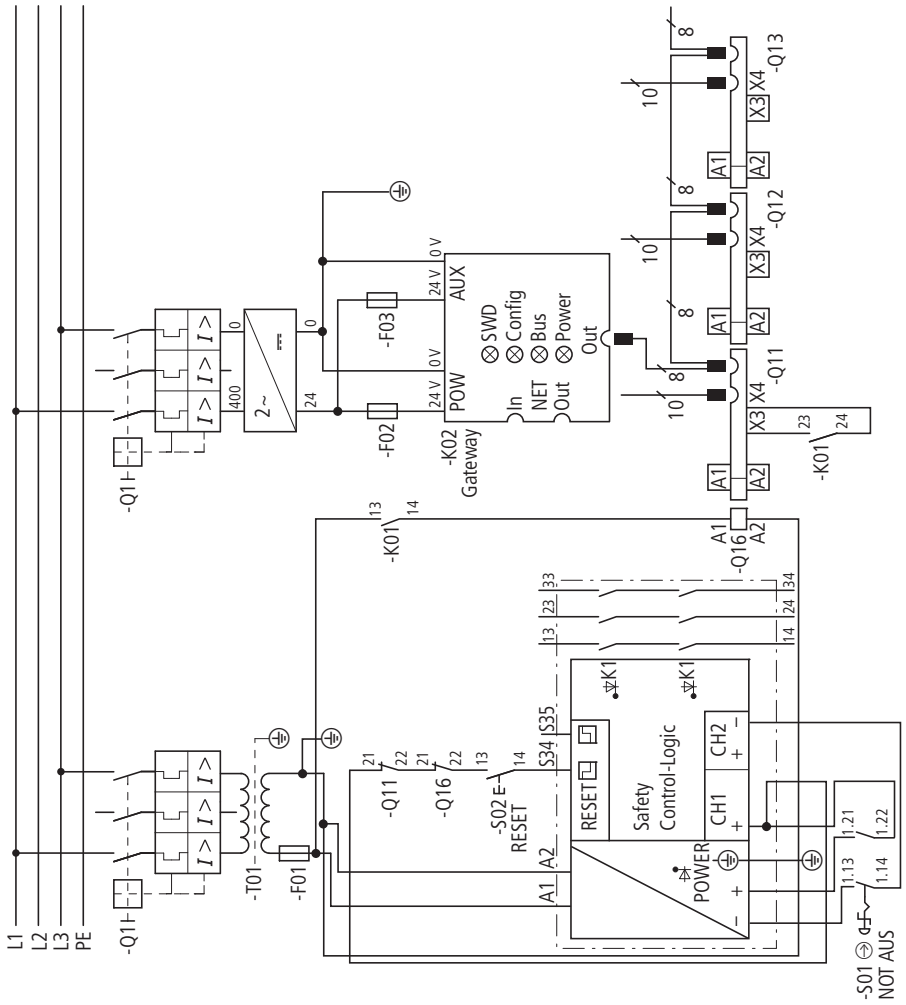


Figure 46: Actuating circuit for redundant disconnection of a single drive

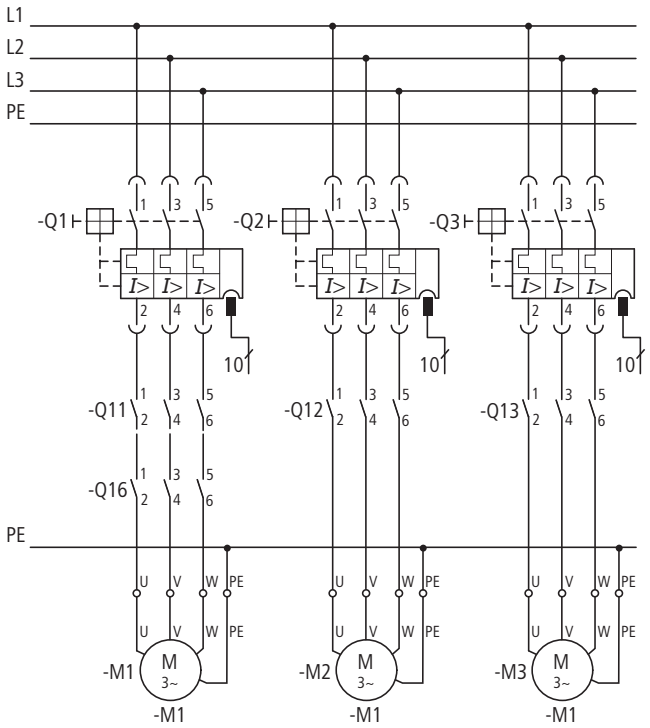


Figure 47: Main circuit for redundant disconnection of a single drive

4.5.5.1 Redundant disconnection of drive groups

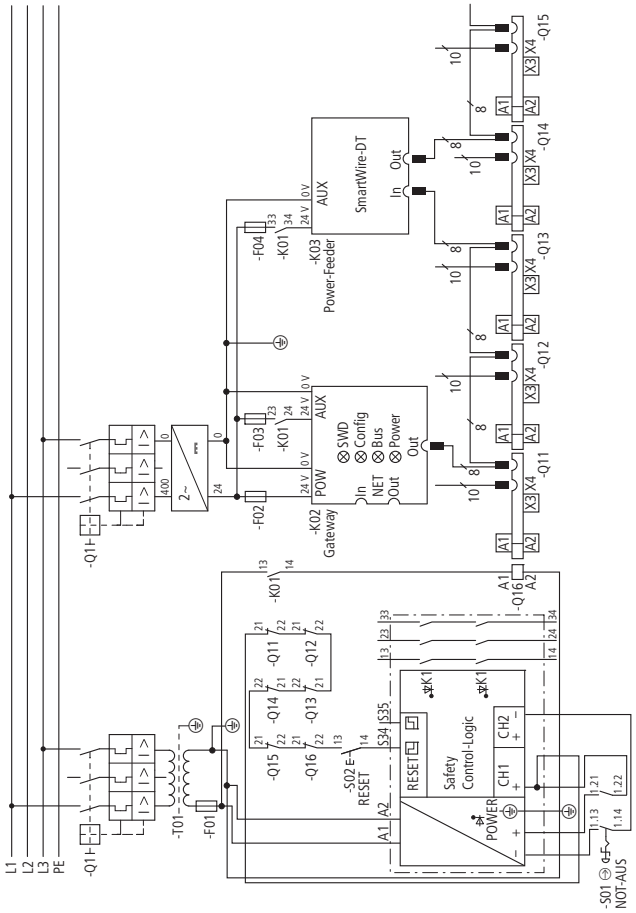


Figure 48: Actuating circuit for redundant disconnection of drive groups

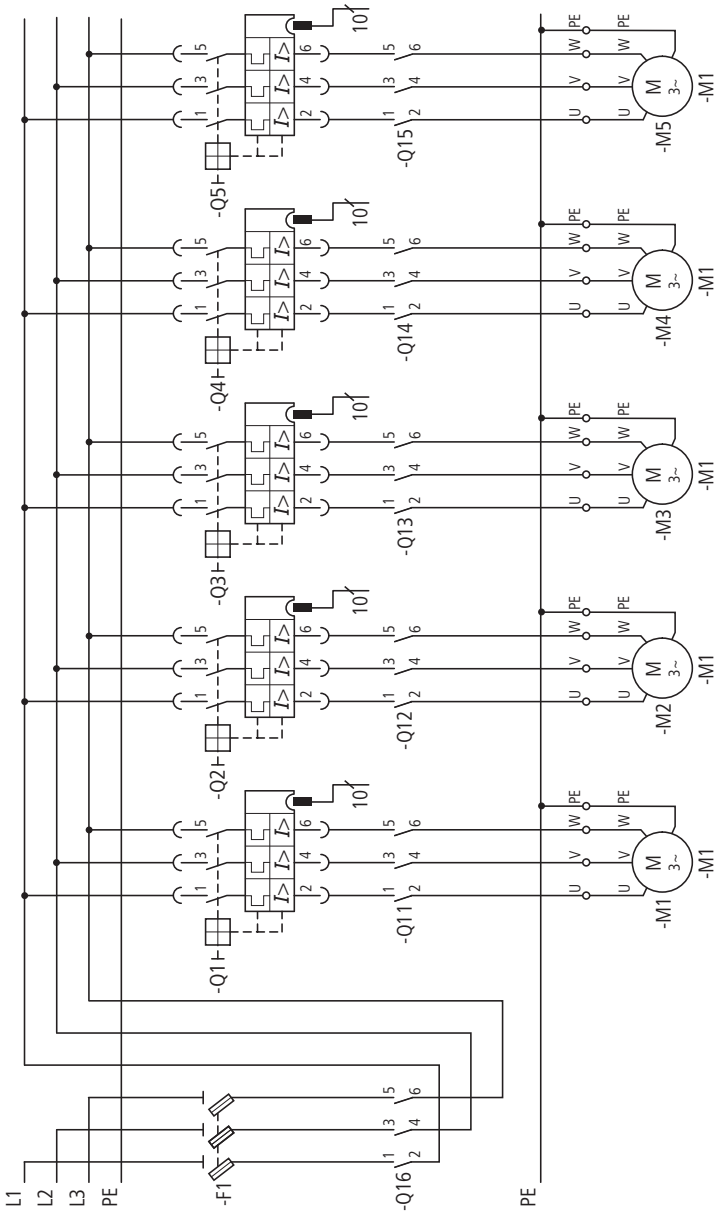


Figure 49: Main circuit for redundant disconnection of drive groups

4.5.6 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 CI2 in accordance with EN 62061.

DANGER

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

DANGER

The described circuit architectures for the redundant disconnection of drives in reference to the achievable safety categories are compliant with the usage of the following SmartWire-DT coordinators and SmartWire-DT components:

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

4.5.7 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.

4.5.7.1 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 11, page 11).

4.5.7.2 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.

4.5.7.3 Reversing starter

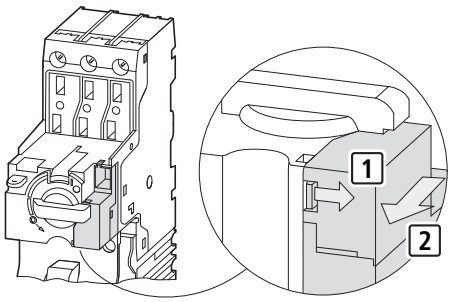
Apart from the special features described in Section "DOL starter" it must be taken into account that reversing starters in the North American market must be fitted additionally with a mechanical and electrical interlock. The electrical locking is realized via the connection "Enable" (8) auxiliary contact.

4.6 Installation

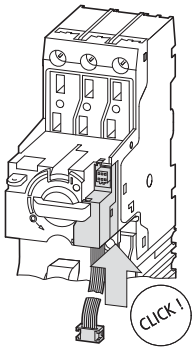
The installation of the PKE communication connection an SmartWire-DT is only possible with a DILM contactor or a part no. MSC-DEA-... electronic motor-starter combination. When using individual components (PKE and contactor separately on the top-hat rail) observe the maximum distance between the PKE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

4.6.1 Mounting PKE32-COM

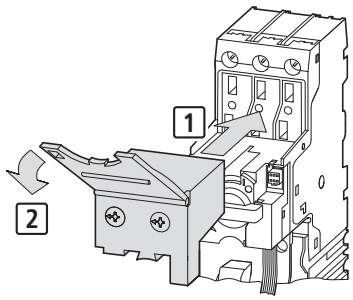
▶ Remove the empty module on the PKE basic device.



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



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



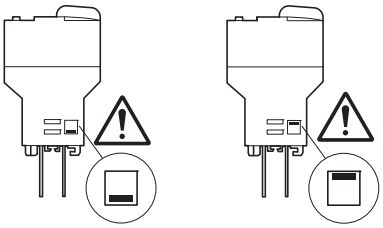
4.6.2 Mounting PKE-SWD-32

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.

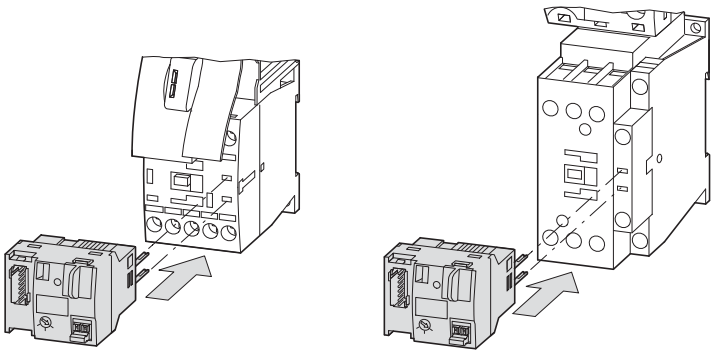
> *CAUTION*
>
> The PKE-SWD-32 may be installed and detached only after the control voltage and supply cable have been switched off.

▶ 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:

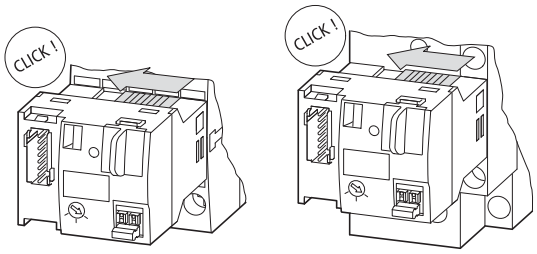
- Position **bottom**: DILM7, DILM9, DILM12, DILM15 (state of delivery)
- Position **top**: DILM17, DILM25 and DILM32



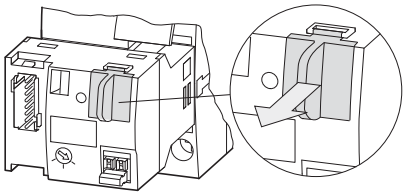
▶ Set the PKE-SWD-32 for the appropriate contactor.



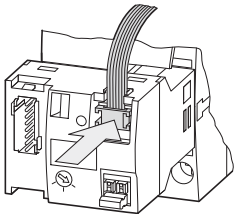
▶ Interlock the PKE-SWD-32.



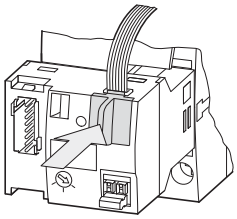
▶ Remove the cover of the communication interface.



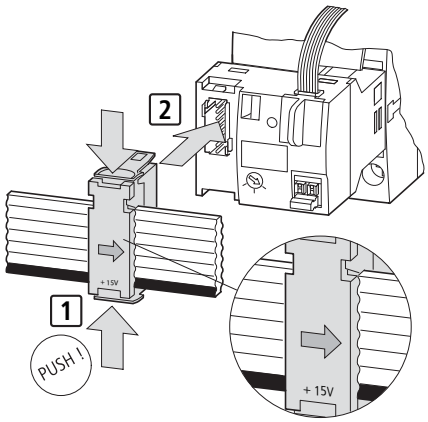
▶ Connect the PKE32-COM.



▶ Fit the cover of the communication interface.



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



4.7 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.

4.8 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. The new module is assigned an address by this means.

CAUTION

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.

4.9 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 15: diagnostic alarms of the SmartWire-DT status LED

Designation	Color	Health	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 part no.
		Flashing (3 Hz)	• Incorrect manual/automatic switch setting
			• Communication to PKE is interrupted

4.10 Programming

4.10.1 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 "4.10.3 Data profiles", page 107)

4.10.1.1 Inputs

Byte 0:

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

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

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

Data Bit	Designation	Meaning	Note
0 - 3	I_r	Set value I_r	→ section "4.10.1.4 Set value Ir", page 98
4 - 6	TRIPR = Trip reason	Trip reason	→ section "4.10.1.5 Trip reason (TRIPR)", page 99
7	ACKR = Acknowledge required	ZMR manual function acknowledgement required 0: No acknowledgement required 1: Acknowledgement of overload required	→ section "4.10.2.1 ZMR operating mode manual", page 103

Byte 2:

Motor current [%]

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

Data Bit	Designation	Meaning	Note
0 - 7	I-REL	Motor current [%]	→ section "4.10.1.6 Motor current [%] (I-REL)", page 100

Byte 3:

Thermal motor image [%]

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

Data Bit	Designation	Meaning	Note
0 - 7	TH	Thermal motor image [%]	→ section "4.10.1.7 Thermal motor image [TH]", page 101

Byte 4:

Type of trip block, set time-lag class

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

Data Bit	Designation	Meaning	Note
0 - 2	TYPE	Type of trip block	→ section "4.10.1.8 Type of trip block (TYPE)", page 101
3 - 5	CLASS	Set time lag	→ section "4.10.1.9 Time delay setting (CLASS)", page 102
6	not used	-	-
7	not used	-	-

4.10.1.2 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	Explanation	Note
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 "4.10.2 Overload relay function (ZMR)", page 102
3	ZMR H/A	Operating mode ZMR-Function 0: Manual function 1: Automatic function	

4.10.1.3 Diagnostics

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

Value	Meaning	Remedy	Note
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. The main circuits are isolated by the PKE in the event of an overload.
0x15	No unambiguous position of the 1-0-A switch for more than 4 seconds	• 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.

4.10.1.4 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, ..., 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:

Table 16: Set I_r current value of the overload release

Field	Value	PKE-XTUA-1.2 I_r [A]	PKE-XTUA-4 I_r [A]	PKE-XTUA-12 I_r [A]	PKE-XTUA-32 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

4.10.1.5 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 17: Bit field trip reason TRIPR

Field	Value	Explanation	Note
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	Contactor 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.

4.10.1.6 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 x 1 A = 0.8 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 "4.10.4 acyclic data", page 108).

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

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

4.10.1.8 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 and PKE32.

Table 18: Combination options of the PKE basic device with PKE trip block

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

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

Table 19: Bit field Type of trip block

Field	Value	Type of trip block
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 "4.10.4 acyclic data", page 108).

4.10.1.9 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 20: 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

4.10.2 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 %.

4.10.2.1 ZMR operating mode manual

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

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

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

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

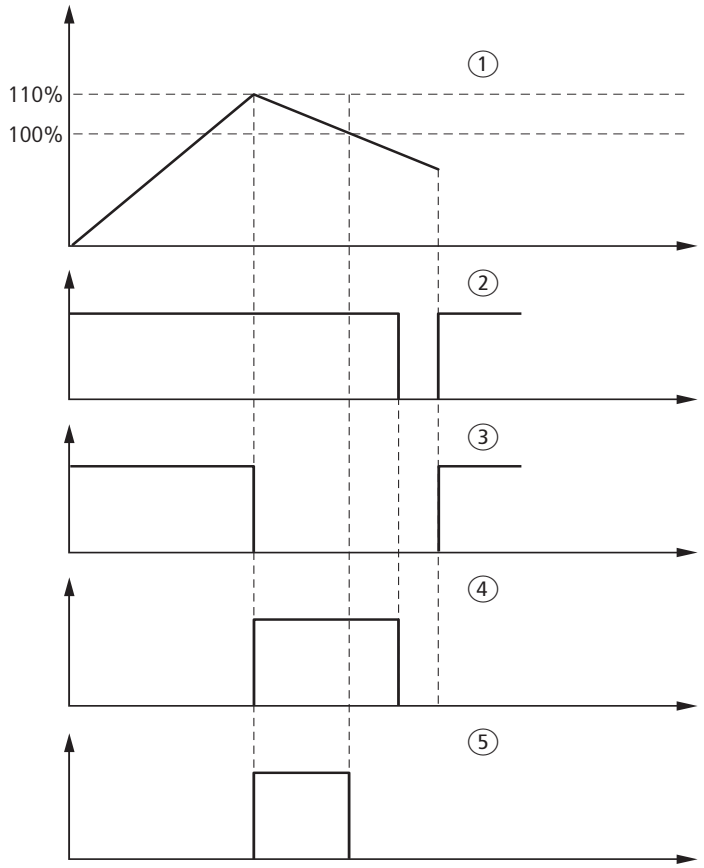


Figure 50: Acknowledgement of manual ZMR mode by "Contactor OFF" command

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

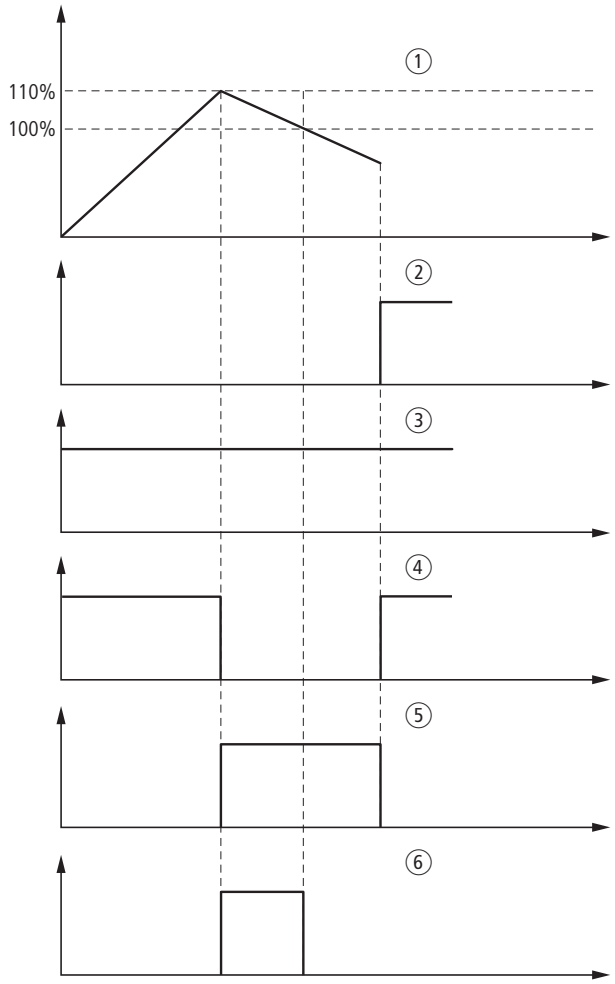


Figure 51: Acknowledgement of manual ZMR mode by changing the ZMR mode

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

CAUTION

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

4.10.2.2 ZMR operating mode automatic

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

DANGER

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

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

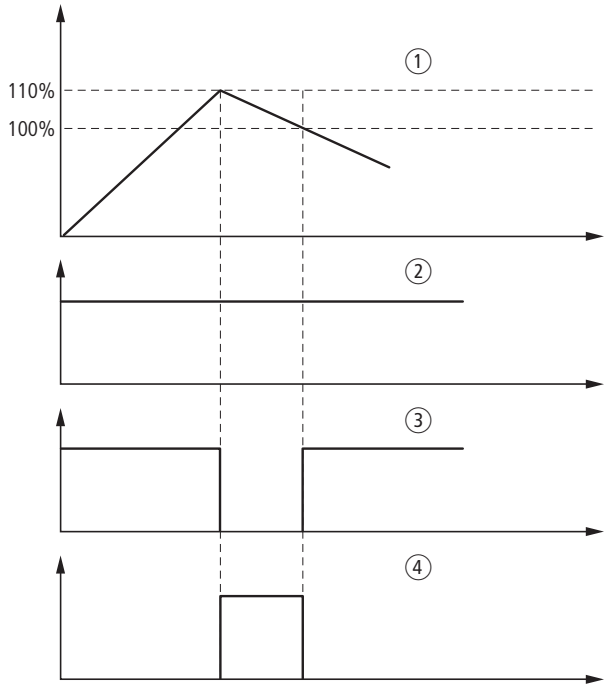


Figure 52: "Automatic" ZMR operating mode

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

4.10.3 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 21: 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)	✓	✓	✓	✓	✓

4.10.3.1 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 control configurator that does not allow automatic profile selection for SDO configuration, the corresponding SDO object 2102subx is added to the list of SDO objects and the required content transferred to use data profile 1 or 3.

Object 2102subx (x represents the position of the PKE-SWD-32 module in the SmartWire-DT line)Object 2102subx (x stands for the position of the PKE-SWD-32 in the SmartWire-DT line)	Content
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 "4.10.4 acyclic data", page 108).

4.10.4 acyclic data

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

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

Object 1 [Index 1]:

Byte 0:

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	Explanation	Note
0	0 - 7	I-REL	Motor current [%]	→ section "4.10.1.6 Motor current [%] (I-REL)", page 100

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	Explanation	Note
0	0 - 7	TH	Thermal motor image [%]	→ section "4.10.1.7 Thermal motor image [TH]", page 101

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	Explanation	Note
0	0 - 2	TYPE	Type of trip block	→ section "4.10.1.8 Type of trip block (TYPE)", page 101
	3 - 5	CLASS	Set time lag	→ section "4.10.1.9 Time delay setting (CLASS)", page 102
	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 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).

CAUTION

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

CAUTION

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 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 181.

5.2 Interoperability

5.2.1 Gateways

The following and later firmware versions of the SmartWire-DT gateways ensure interoperability with SmartWire-DT card PKE-SWD:

Table 22: Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.20
EU5C-SWD-DP	V 1.20
EU5C-SWD-EIP-MODTCP	V 1.01

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://downloadcenter.moeller.net

5.2.1.1 Fieldbus description files

The following versions of the fieldbus description file and above ensure the interoperability of the PKE-SWD SmartWire-DT module:

Table 23: Compatible PKE-SWD-32 fieldbus description files

SmartWire-DT gateway	Description file
EU5C-SWD-CAN	EU5C-SWD-CAN_V1.20.eds
EU5C-SWD-DP (Intel-based CPU)	Moeld14.gsd
EU5C-SWD-DP (Motorola-based CPU)	Moeld14.gsd

5.3 SWD-Assist

SmartWire-DT module PKE-SWD can be used in the SWD-Assist software as of version 1.40.

5.4 Surface mounting

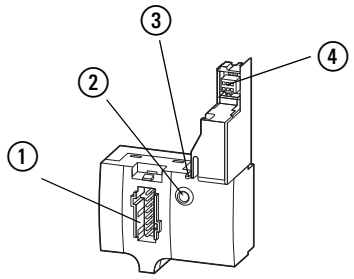


Figure 53: Figure 1: Connections PKE-SWD

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

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

Detailed instructions on adapting the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pole SmartWire-DT cable are provided in chapter "Fitting external device plugs SWD4-8SF2-5" of the manual MN05006002Z-EN (previously AWB2723-1617de).

Diagnostic LED ② indicates the module's communication status through the SmartWire-DT system and the communication state to the PKE trip block (→ section "5.9 Device status", page 117).

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.

5.5 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).

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

Table 24: 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

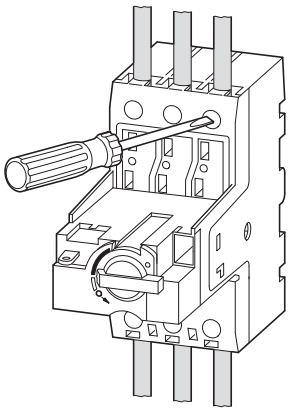
The PKE-SWD draws its energy for the communication electronics and for controlling the LED from the SmartWire-DT network supply.

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.

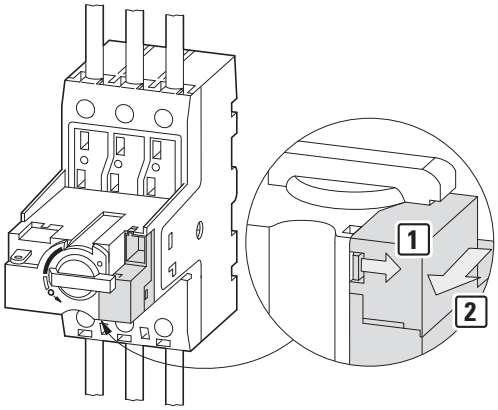
For data for the current consumption please refer to the table in „Appendix“ on page 179.

5.6 Installation

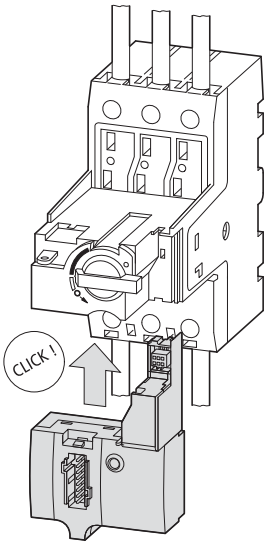
▶ Wire the main circuits of the PKE device



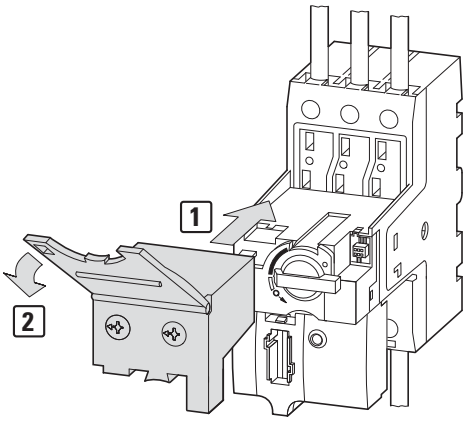
▶ Remove the empty module on the PKE basic device



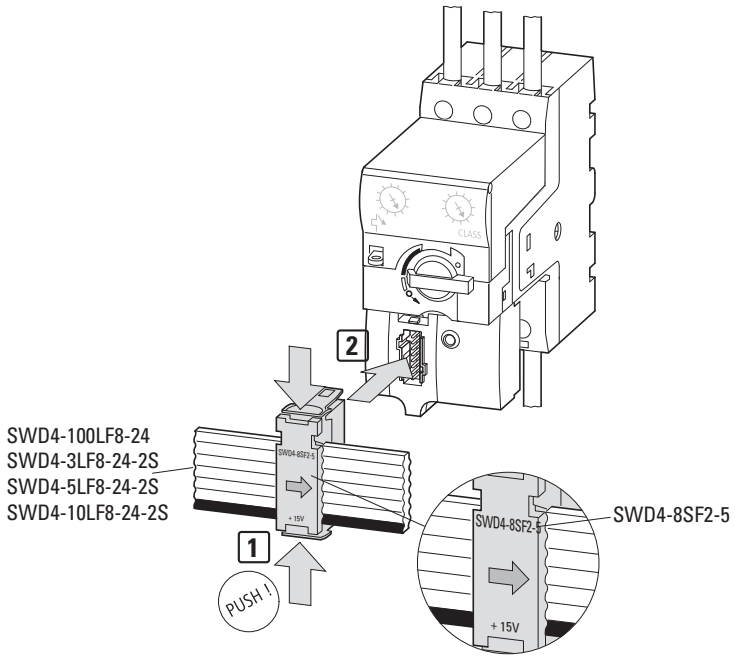
▶ Connect the PKE-SWD on the PKE basic device



▶ 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.



5.7 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.

5.8 Exchange of modules

After replacement of the modules and connection of the voltage the configuration button must be pressed. The new module is assigned an address by this means.

CAUTION

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.

5.9 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 25: Diagnostic alarms of the SmartWire-DT status LED

Designation	Color	Health	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 part no.

		Flashing (3 Hz)	• Communication to trip block PKE is interrupted

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 124).

5.10.1.1 Inputs

Byte 0:

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

Data Bit	Designation	Meaning
0	Not used	-
1	STAT	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 present 1: module present
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	Ir	Ir	Ir	Ir

Data Bit	Designation	Meaning	Notes
0-3	I_r	Set value I_r	→ section "5.10.1.4 Set value (Ir)", page 120
4-6	TRIPR = Trip reason	Trip reason	→ section "5.10.1.5 Differential trip indication (TRIPR)", page 120
7	Not used	-	-

Byte 2:

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

Data Bit	Designation	Meaning	Notes
0-7	I-REL	Relative current value	→ section "5.10.1.6 Relative current value (I-REL)", page 121

Byte 3:

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

Data Bit	Designation	Meaning	Notes
0 - 7	TH	Thermal motor image [%]	→ section "5.10.1.7 Thermal motor image [TH]", page 122

Byte 4:

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

Data Bit	Designation	Meaning	Notes
0 - 2	TYPE	Type of trip block	→ section "5.10.1.8 Type of trip block (TYPE)", page 122
3 - 5	CLASS	Set time lag	→ section "5.10.1.9 Time delay setting (CLASS)", page 123
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	Meaning	Notes
1	R-TRIP	Remote tripping, PKE basic device 0: no remote tripping 1: Remote tripping	

Remote tripping through output bit R_TRIP causes a trip if a phase current of at least 85 percent of the minimum mark of the variable overload release on the PKE trip block flows through all three main circuits (for example PKE-XTUA-4 → Imin = 0.85 × 1A = 0.85 A).

CAUTION.

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

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

5.10.1.3 Diagnostics

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

Value	Meaning	Remedy	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)A.	

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 26: Bit array Ir

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

5.10.1.5 Differential trip indication (TRIPR)

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

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

Table 27: 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 causes are reset when the main contacts of the PKE are closed again and a current 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 → Imin = 0.85 × 1 A = 0.85 A).

5.10.1.6 Relative current value (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 accuracy of the relative current indication depends on the measured phase current in relation to the current range of the PKE trip block. overload release. 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 x 1 A = 0.85 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 125).

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

5.10.1.8 Type of trip block (TYPE)

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

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

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

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

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

Table 29: Bit array XTUA

Field	Value	Type of trip block
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 likewise be read as an acyclical data object (→ section "5.10.3 acyclic data", page 125).

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 30: 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 × 1A = 0.85 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 31: Data profile for PKE-SWD-32

	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 stands for the position of the PKE-SWD-32 in the SmartWire-DT line)	Content
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 "5.10.3 acyclic data", page 125).

5.10.3 acyclic data

The following acyclical objects PKE-SWD 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". Parameter "Index" addresses the object. The first object is assigned number 1, the second 2 etc. For the PKE-SWD, object 1 supplies current value "I-REL".

Object 1 [Index 1]:

Byte 0:

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 121

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 122

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	Type of trip block	→ section "5.10.1.8 Type of trip block (TYPE)", page 122
	3 - 5	CLASS	Set time lag	→ section "5.10.1.9 Time delay setting (CLASS)", page 123
	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 Pilot devices M22-SWD…

6.1 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 lights takes place via the SmartWire-DT communication system. The following function elements are available.

Function element	Description
M22-SWD-K(C)11	a function element with a changeover contact
M22-SWD-K(C)22	a function element with two changeover contacts
M22-SWD-LED…	an LED function element in white (W), red (R), green (G) or blue (B)
M22-SWD-K11LED…	a function element with a changeover contact and an LED in white (W), red (R), green (G) or blue (B)
M22-SWD-K22LED…	a function element with two changeover contacts and an LED in white (W), red (R), green (G) or blue (B)

These function elements are each available in two versions for front or base fixing.

6.2 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 switch cabinet doors.

6.2.1 surface mounting

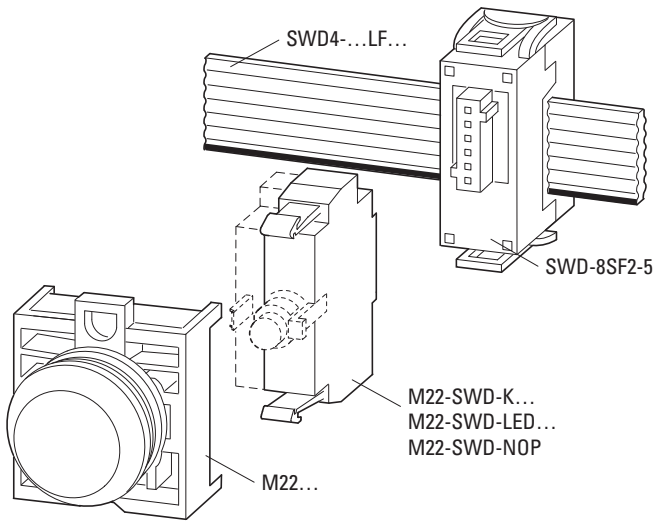


Figure 54: Surface mounting M22-SWD front mount

6.3 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 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 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-K11LED).

6.3.1 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 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.

6.3.2 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 actuators can be operator controlled with up to three-position indication.

6.3.3 M22-SWD-LED...

This function element is used in combination with the indicator lights M22-L.... White, blue, green and red are available as colours.

6.3.4 M22-SWD-K11LED...

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.

6.3.5 M22-SWD-K22LED...

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.

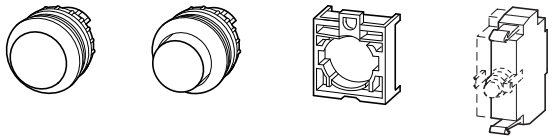


Figure 55: SmartWire-DT:Function elements

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

Front element	Adapters	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 179.
The software program SWD-Assist also supports you in doing this by automatically performing these calculations.

6.4 Installation

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

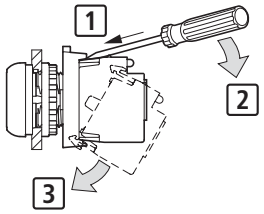


Figure 56: Connection to the adapter

The SmartWire-DT flat ribbon cable is to 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.

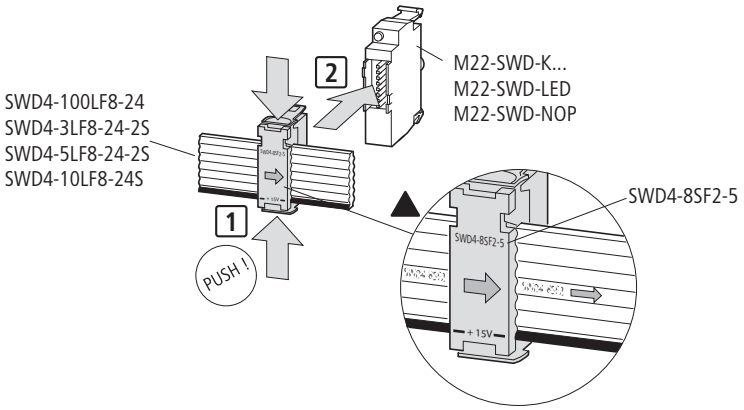


Figure 57: Connection of the function element to the SmartWire-DT flat ribbon cable

6.5 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 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.

6.6 Exchange of modules

> *CAUTION*
>
> 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. The new module is assigned an address by this means.

> *CAUTION*
>
> The order of the SmartWire-DT modules must not be altered.

6.7 Device status

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

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

Designation	Colour	Health	Message
SWD	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 part no.

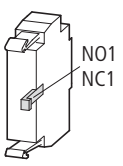
		flashing (3 Hz)	Device reports a diagnosis. (→ section "6.15 Programming", page 146, sub-point "Diagnostics".)

6.8 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.

6.8.1 M22-SWD-K11

The function element has one input byte at its disposal.



6.8.1.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	NO1	NC1

Bit	Designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: Contact not actuated
1	NO1 = Normally Open	0: Contact not actuated 1: contact actuated
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: diagnostics present
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.8.1.2 Outputs

None

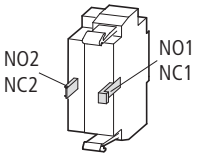
6.8.1.3 Diagnostics

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

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

6.8.2 M22-SWD-K22

The function element has one input byte at its disposal.



6.8.2.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	NO2	NC2	NO1	NC1

Bit	Designation	Meaning
0	NC1 = Normally Closed	0: contact 1 actuated 1: Contact 1 not actuated
1	NO1 = Normally Open	0: Contact 1 not actuated 1: contact 1 actuated
2	NC2 = Normally Closed	0: contact 2 actuated 1: Contact 2 not actuated
3	NO2 = Normally Open	0: Contact 2 not actuated 1: contact 2 actuated
4	DIAG	0: No diagnostic alarm 1: diagnostics present
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.8.2.2 Outputs

None

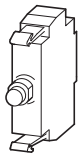
6.8.2.3 Diagnostics

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

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

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

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



6.8.3.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.8.3.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

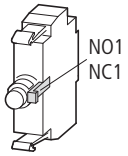
Bit	Designation	Meaning
0	Q0	Activation of the LED
1	not used	–
2	not used	–
3	not used	–
4	not used	–
5	not used	–
6	not used	–
7	not used	–

6.8.3.3 Diagnostics

The module does not report a diagnostics.

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

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



6.8.4.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	NO1	NC1

Bit	Designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: Contact not actuated
1	NO = Normally Open	0: Contact not actuated 1: contact actuated
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: diagnostics present
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.8.4.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

Bit	Designation	Meaning
0	Q0	Activation of the LED
1	not used	–
2	not used	–
3	not used	–
4	not used	–
5	not used	–
6	not used	–
7	not used	–

6.8.4.3 Outputs

None

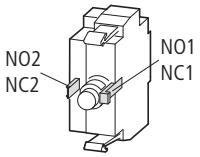
6.8.4.4 Diagnostics

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

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

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

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



6.8.5.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	NO2	NC2	NO1	NC1

Bit	Designation	Meaning
0	NC1 = Normally Closed	0: contact 1 actuated 1: Contact 1 not actuated
1	NO1 = Normally Open	0: Contact 1 not actuated 1: contact 1 actuated
2	NC2 = Normally Closed	0: contact 2 actuated 1: Contact 2 not actuated
3	NO2 = Normally Open	0: Contact 2 not actuated 1: contact 2 actuated
4	DIAG	0: No diagnostic alarm 1: diagnostics present
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.8.5.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

Bit	Designation	Meaning
0	Q0	Activation of the LED
1	not used	–
2	not used	–
3	not used	–
4	not used	–
5	not used	–
6	not used	–
7	not used	–

6.8.5.3 Outputs

None

6.8.5.4 Diagnostics

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

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

6.8.6 M22-SWD base fixing

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

6.9 surface mounting

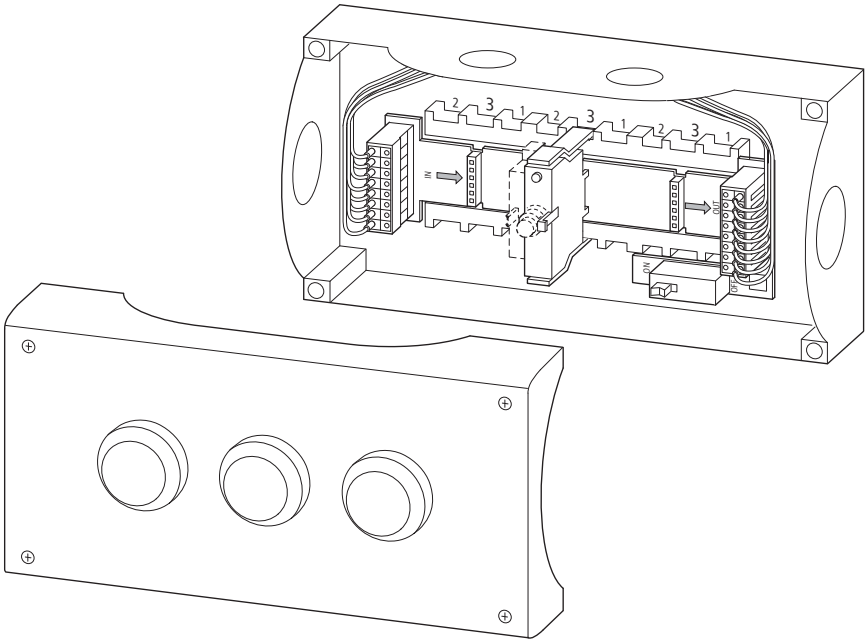


Figure 58: Base elements with enclosure

6.10 Engineering

The SmartWire-DT base function elements replace the previous M22-KC10 / KC01 contact elements and the corresponding M22 LEDC... elements. They are used in the surface mounting enclosures M22-I1 to M22-I6 in connection with the corresponding M22-SWD-ILP1-6 PCBs. Up to six operator control and indicator light functions can be realized with them. The cards create the connection with the SmartWire-DT network. The known M22 front elements for the control circuit function are used on the front.

The surface mounting enclosures are connected to the SmartWire-DT network via the SmartWire-DT round cable SWD4 50LR8-24.

The round cable can be connected directly by means of VM20 (metric cable gland) or plugged in.
8 pole enclosure bushings as plug/socket versions are used for the plug-in version.

6.10.1 Connection of the round cable to the cable gland

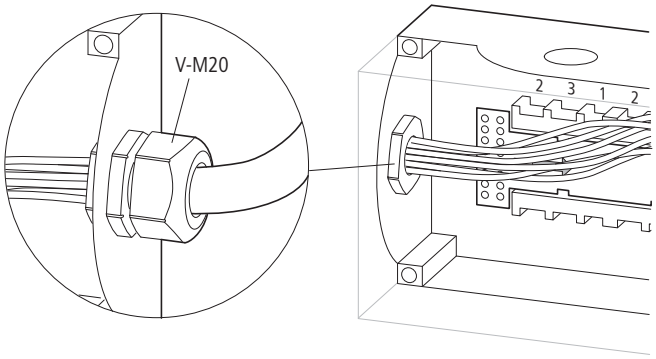


Figure 59: Connection with a cable gland

6.10.2 Connection of the round cable via a plug connection

The SmartWire-DT card is connected via 8 pole enclosure bushings executed as sockets or plugs.

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

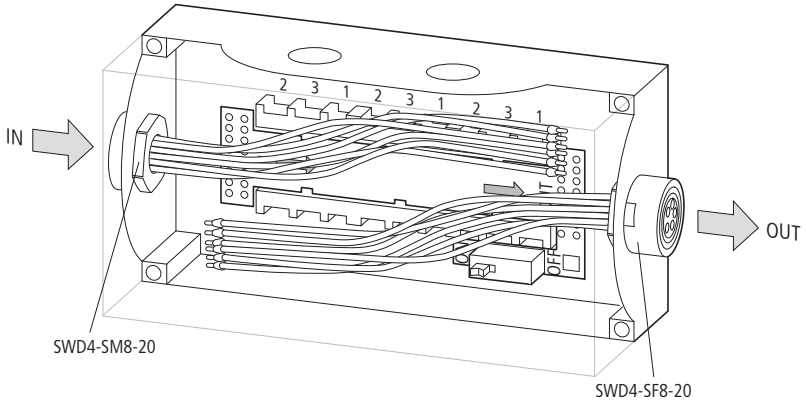


Figure 60: Plug connection

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

Housing bushing socket	SWD Element
Socket, straight, 8-pole	SWD4-SF8-67
Plug, straight, 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 module 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://downloadcenter.moeller.net

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).

6.10.2.1 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.

6.10.2.2 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 actuators can be operated with up to three-position indication.

6.10.2.3 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.

6.10.2.4 M22-SWD-K11LEDC... (Multiple Function Elements)

These functional elements contain a changeover contact and an LED element in the colours white, blue, green and red. They replace previous combinations consisting of a contact element M22-KC01 or -KC10 and an M22 LEDC... element. They are used in combination with illuminated pushbuttons or selector switch buttons.

6.10.2.5 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 35: 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

Front element	SWD function element (Base fixing)
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 36 shows what possibilities there are.

Table 36: Configuration in the M22-I... enclosure

Function element	M22-I... enclosure configuration (base fixing - viewed from the front while equipping the enclosure)		
Location on the card (marking on the enclosure base)	2	3	1
M22-SWD-KC11	O	X[1]	O[2]
M22-SWD-LEDC	O	X	O
M22-SWD-K11LEDC	O	X	O
M22-SWD-KC22	X	X	O
M22-SWD-K22LEDC	X	X	O
M22-SWD-SEL-8-10	O	X	O

1) X = occupied by SWD element
2) O = optional for an additional M22-KC10/ KC01 element

The function elements obtain the energy for communication electronics and driving the LEDs from the SmartWire-DT network supply.
So please take into consideration the total power consumption of your SmartWire-DT network and, if necessary, plan for an additional feeder module EU5E-SWD-PF2-1.
You can find information on the current consumption in the appendix on page 179.
For questions about current consumption the software program SWD-Assist also supports you in doing this by automatically performing these calculations.
http://downloadcenter.moeller.net

6.11 Installation

The functional elements are mounted on the PCB M22-SWD-ILP… in the surface mounting enclosure M22-I….

To do so, proceed as follows:

- Insert the printed circuit board into the surface mounting enclosure. Ensure that the PCB is pointing in the correct direction. The direction of the arrow defines the arrangement of the modules. (the gateway is to the left of the IN code.)

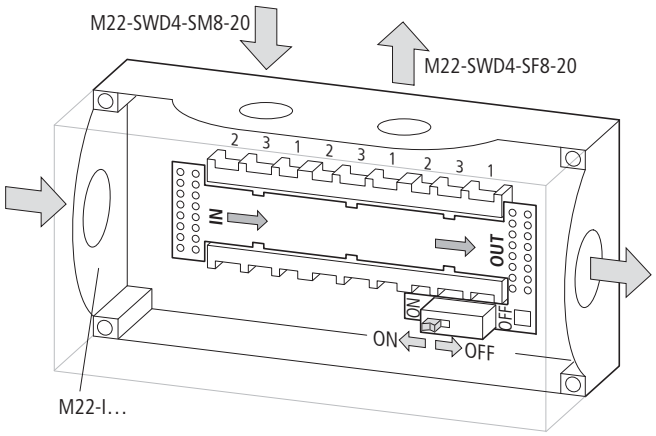


Figure 61: Surface mounting enclosure with PCB M22-SWD-ILP…

- Fix the SmartWire-DT cables to the PCB terminals. Ensure that the colour assignment is correct.
- If this is the last SmartWire-DT module, please switch on the terminating resistor.

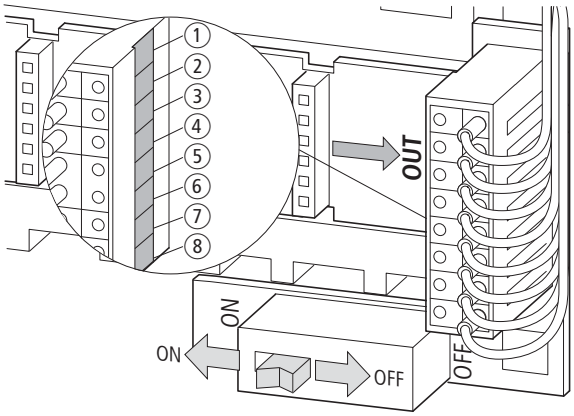


Figure 62: Terminating resistor

- Equip the slots with the M22-SWD…C… function elements. Ensure that the installation position is correct (status LED must be at the top). Unused slots must be equipped with the bridge M22-SWD-SEL8 10.

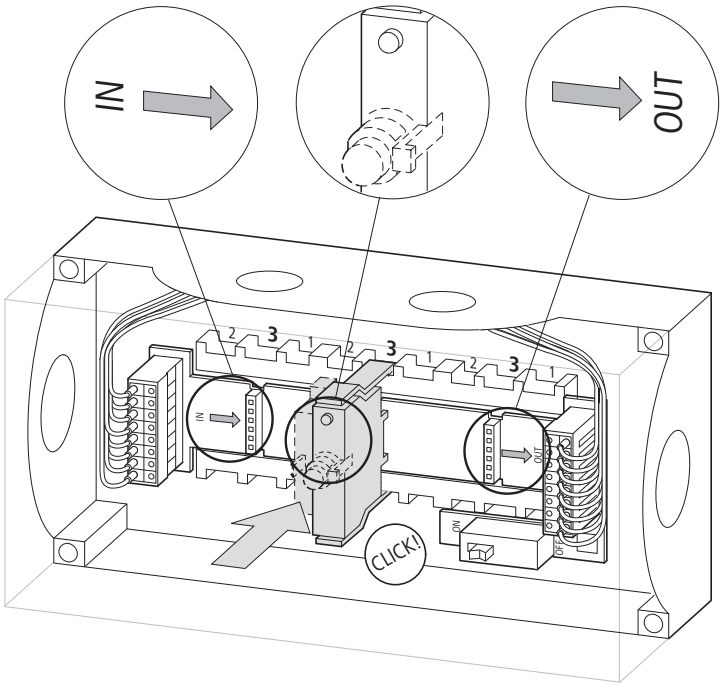


Figure 63: Equipping the enclosure slots

6.12 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.

6.13 Exchange of modules

CAUTION

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. The new module is assigned an address by this means.

CAUTION

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

6.14 Device status

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

Table 37: Diagnostic alarms of the SmartWire-DT status LED

Designation	Colour	Health	Message
SWD	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 part no.

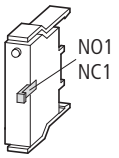
		flashing (3 Hz)	Device reports a diagnosis. (→ Section "6.15 Programming", sub-point "Diagnostics".)

6.15 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.

6.15.1 M22-SWD-KC11

The function element has one input byte at its disposal.



6.15.1.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	NO1	NC1

Bit	Designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: Contact not actuated
1	NO1 = Normally Open	0: Contact not actuated 1: contact actuated
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: diagnostics present
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.15.1.2 Outputs

None

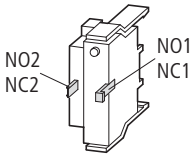
6.15.1.3 Diagnostics

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

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

6.15.2 M22-SWD-KC22

The function element has one input byte at its disposal.



6.15.2.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	NO2	NC2	NO1	NC1

Bit	Designation	Meaning
0	NC1 = Normally Closed	0: contact 1 actuated 1: Contact 1 not actuated
1	NO1 = Normally Open	0: Contact 1 not actuated 1: contact 1 actuated
2	NC2 = Normally Closed	0: contact 2 actuated 1: Contact 2 not actuated
3	NO2 = Normally Open	0: Contact 2 not actuated 1: contact 2 actuated
4	DIAG	0: No diagnostic alarm 1: diagnostics present
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.15.2.2 Outputs

None

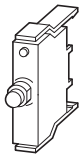
6.15.2.3 Diagnostics

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

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

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

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



6.15.3.1 Inputs

Byte 0:

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

Bit	Designation	Meaning
0	not used	–
1	not used	–
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.15.3.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

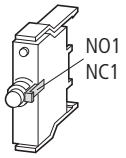
Bit	Designation	Meaning
0	Q0	Activation of the LED
1	not used	–
2	not used	–
3	not used	–
4	not used	–
5	not used	–
6	not used	–
7	not used	–

6.15.3.3 Diagnostics

The module does not report a diagnostics.

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

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



6.15.4.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	–	–	NO1	NC1

Bit	Designation	Meaning
0	NC1 = Normally Closed	0: contact actuated 1: Contact not actuated
1	NO1 = Normally Open	0: Contact not actuated 1: contact actuated
2	not used	–
3	not used	–
4	DIAG	0: No diagnostic alarm 1: diagnostics present
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.15.4.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

Bit	Designation	Meaning
0	Q0	Activation of the LED
1	not used	–
2	not used	–
3	not used	–
4	not used	–
5	not used	–
6	not used	–
7	not used	–

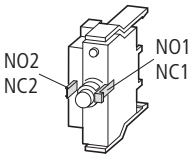
6.15.4.3 Diagnostics

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

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

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

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



6.15.5.1 Inputs

Byte 0:

7	6	5	4	3	2	1	0
SUBST	PRSNT	–	DIAG	NO2	NC2	NO1	NC1

Bit	Designation	Meaning
0	NC1 = Normally Closed	0: contact 1 actuated 1: Contact 1 not actuated
1	NO1 = Normally Open	0: Contact 1 not actuated 1: contact 1 actuated
2	NC2 = Normally Closed	0: contact 2 actuated 1: Contact 2 not actuated
3	NO2 = Normally Open	0: Contact 2 not actuated 1: contact 2 actuated
4	DIAG	0: No diagnostic alarm 1: diagnostics present
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	0: configured module present 1: universal module M22-SWD-NOP(C) present

6.15.5.2 Outputs

Byte 0:

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	Q0

Bit	Designation	Meaning
0	Q0	Activation of the LED
1	not used	–
2	not used	–
3	not used	–
4	not used	–
5	not used	–
6	not used	–
7	not used	–

6.15.5.3 Diagnostics

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

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

7 Interface for NZM compact circuit-breakers

7.1 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.

7.2 Interoperability with SmartWire-DT gateways

The following or later firmware versions of the SmartWire-DT gateway used ensure interoperability with SmartWire-DT module NZM-XSWD-704.

Table 38: Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.10
EU5C-SWD-DP	V 1.10

The firmware of the SmartWire-DT gateway can be updated using the SWD-Assist program.

7.2.1 SWD-Assist

The SWD-Assist software can be used from version V 1.11 together with the NZM-XSWD-704 SmartWire-DT module.

7.3 Surface mounting

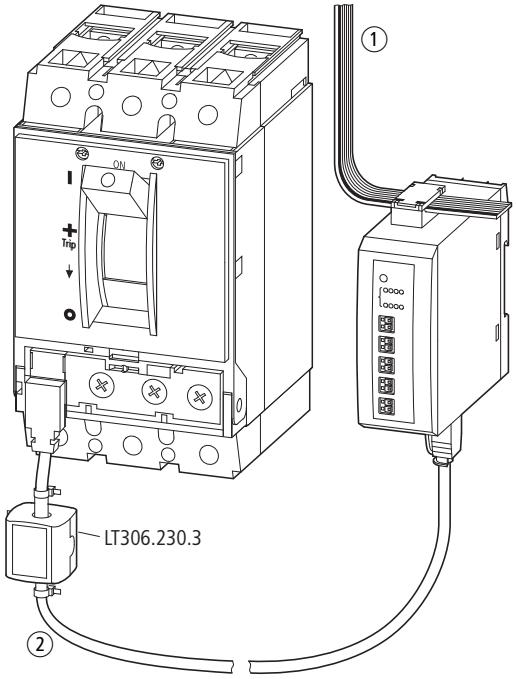


Figure 64: Fitting of NZM with NZM-XSWD-704

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

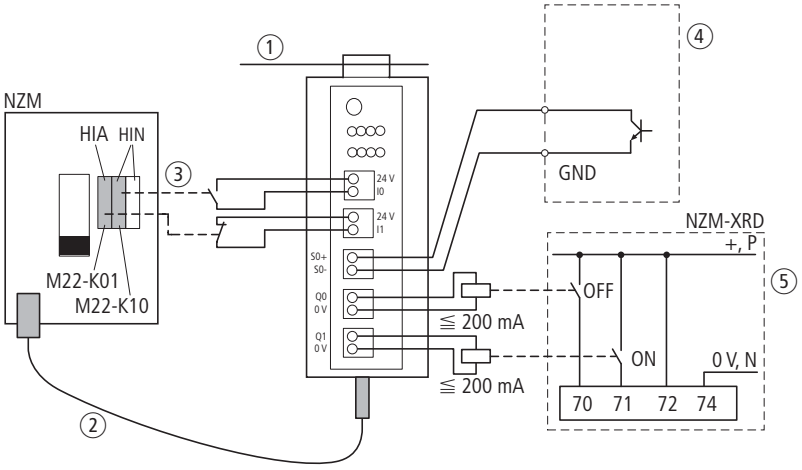


Figure 65: NZM-XSWD-704 connections to circuit-breaker

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.

Detailed instructions on adapting the SmartWire-DT external device plug (SWD4-8SF2-5) to the 8-pole SmartWire-DT cable are provided in chapter "Fitting external device plugs SWD4-8SF2-5" of the manual MN05006002Z-EN (previously AWB2723-1617de).

7.3.1 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 SWD
	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
Command	-	OFF	ON	-

7.3.2 Connections

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

7.3.3 Inputs

- I0
  The HIN slot (middle and right auxiliary contact socket of the NZM) is fitted with an N/O contact and wired between terminals 24V and I0. It is responsible for the "on" or "off" switch position.
- I1
  The HIA slot (left auxiliary contact socket of the NZM) is fitted with an N/C contact and wired between terminals 24V and I1. It is responsible for the trip indication.

The inputs I0 and I1 are shown in the following table according to the PNO profile for switchgear, and are mapped to the status data in byte 1:

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

7.3.3.1 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.

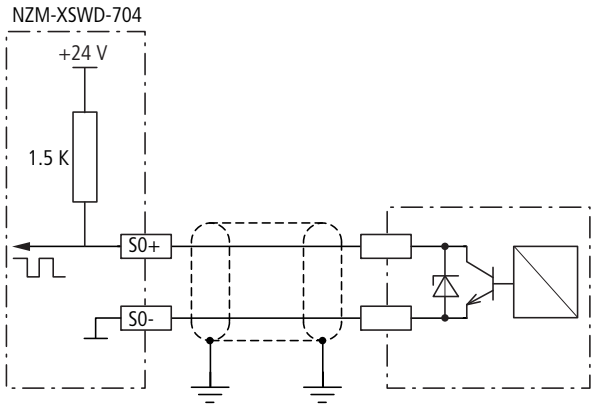


Figure 66: Connection of the S0 input

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.

7.3.4 Control outputs Q0 and Q1

The power supply of the control outputs for the remote operator is fed from the supply voltage of the SmartWire-DT bus. The outputs can carry up to max. 200 mA, and the DILA-22 contactors must always be used as an interface to the NZM remote operator. After a switch command, one output is always “1” and one output always “0”. Wiring according to Figure65 .

Output	Data output byte 0, bit 0 + 1			
	No change 00	Switch off 01	Switch on 10	No 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.

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.

CAUTION

Switch commands are only executed by NZM-XSWD-704 if inputs I0 and I1 are correctly connected to the NZM auxiliary contact.
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.

7.4 Engineering

The NZM-XSWD-704 is fed completely via the DT cable so that no additional power supply is required. The current requirement is:

- Current consumption for bus (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

CAUTION

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 11)

→ For data for the current consumption please refer to the table in „Appendix" on Seite 179.

The connection terminals on the NZM-XSWD-704 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.

The maximum number of NZM-XSWD-704 modules on a DT string depends on the field bus gateway used and the data profile selected.

PROFIBUS-DP: max. 58 modules possible
max. 242 byte/string

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

CANOpen: max. 99 modules possible
max. 128 byte/string

CANOpen	Data profile 1	Data profile 2	Data profile 3	Data profile 4
Maximum number NZM-XSWD-704/string	42	11	8	4

7.4.1 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.

7.4.2 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.

7.5 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.

7.6 Exchange of modules

DANGER

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

After replacement of the modules and connection of the voltage the configuration button must be pressed. The new module is assigned an address by this means.

CAUTION

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

7.7 Programming

7.7.1 Cyclic data

7.7.1.1 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 39: 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 (→ section "7.7.3 acyclic data", page 169).

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 40: Overview of the data profiles of the NZM-XSWD-704

Byte	Profile 1	Profile 2 (default)	Profile 3	Profile 4
0	SWD status byte	SWD status byte	SWD status byte	SWD status byte
1	Status byte 0 LVSG	Status byte 0 LVSG	Status byte 0 LVSG	Status byte 0 LVSG
2	Status byte 1 LVSG	Status byte 1 LVSG	Status byte 1 LVSG	Status byte 1 LVSG
3/4	–	Current I1	Current I1	Current I1
5/6	–	Current I2	Current I2	Current I2
7/8	–	Current I3	Current I3	Current I3
9/10	–	Current Imax	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

Byte	Profile 1	Profile 2 (default)	Profile 3	Profile 4
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^2t 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	–	–	–	Ground fault module
30	–	–	–	Free

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

When using data profile 1, 3 or 4 in conjunction with SmartWire gateway EU5C-SWD-CAN, entries in the setting range for associated service data objects (SDO) 2102subx must be changed in the PLC configuration program. With programming system CoDeSys, for example, change the default value from 0xA2D392 to 0xA2D592 to use PKE profile 3.

In programming systems with a controller configurator without automatic profile selection for SDO parameterization the corresponding SDO object 2102subx is inserted in the SDO object list and its content transferred when data profile 1, 3 or 4 is used.

Object 2102subx (x represents the position of the NZM module in the SWD line)	Content
Profile 1	0xA292
Profile 2 (default)	0xA2D392
Profile 3	0xA2D592
Profile 4	A29FD592

7.7.1.3 Digital status data: profile 1

Byte	Bit								Description	Note
	7	6	5	4	3	2	1	0		
0								X	1 = internal fault in NZM-XSWD-704	–
0							X		1 = Short-circuit output Q0 or Q1	–
0						X			1 = Power meters invalid	Fault found in FRAM
0					X				1 = Overload warning 2 > 120 %	I > 120 % I_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 trip1) 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).

7.7.1.4 Currents: profile 2

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

Byte	Bit								Description	Note
	7	6	5	4	3	2	1	0		
3	X	X	X	X	X	X	X	X	Current I1 [A]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)	

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

1)
- 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.
- Current values are measured from I > 0.05 × In. At smaller currents the value is zero.

7.7.1.5 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	Note
	7	6	5	4	3	2	1	0		
11	X	X	X	X	X	X	X	X	Energy value high section	S0 counter value 32 bit
12	X	X	X	X	X	X	X	X	Energy value high section	S0 counter value 32 bit
13	X	X	X	X	X	X	X	X	Energy value low section	S0 counter value 32 bit
14	X	X	X	X	X	X	X	X	Energy value low section	S0 counter value 32 bit

7.7.1.6 Actual parameters and circuit-breaker data: profile 4

Profile 4 contains the digital status data, the phase currents, the energy values as well as the circuit-breaker data with the currently set values.

Byte	Dec. value	Description	Note
15	0	$I_r = 0.5 \times I_n$	Set value for I_r
15	1	$I_r = 0.55 \times I_n$	
15	2	$I_r = 0.6 \times I_n$	
15	3	$I_r = 0.65 \times I_n$	
15	4	$I_r = 0.7 \times I_n$	
15	5	$I_r = 0.75 \times I_n$	
15	6	$I_r = 0.8 \times I_n$	
15	7	$I_r = 0.85 \times I_n$	
15	8	$I_r = 0.9 \times I_n$	
15	9	$I_r = 0.925 \times I_n$	
15	10	$I_r = 0.95 \times I_n$	
15	11	$I_r = 0.975 \times I_n$	
15	12	$I_r = 1.0 \times I_n$	

Byte	Dec. value	Description	Note
	• 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	$I_i = 8 \times I_n$	

Byte	Dec. value	Description	Note
	• 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 = infinite	
17	7	$t_r = 2$	
17	8	$t_r = 2$	

Byte	Dec. value	Description	Note
	All other		
17	0	t_r = 2	Set value for t_r [s]
17	1	t_r = 4	
17	2	t_r = 6	
17	3	t_r = 8	
17	4	t_r = 10	
17	5	t_r = 14	
17	6	t_r = 17	
17	7	t_r = 20	
17	8	t_r = 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 x I_r	Set value for I_{sd}
18	1	I_{sd} = 2 x I_r	
18	2	I_{sd} = 2.5 x I_r	
18	3	I_{sd} = 3 x I_r	
18	4	I_{sd} = 3.5 x I_r	
18	5	I_{sd} = 4 x I_r	
18	6	I_{sd} = 5 x I_r	
18	7	I_{sd} = 6 x I_r	
18	8	I_{sd} = 7 x I_r	
	• NZM4-VE2000		
18	0	I_{sd} = 2 x I_r	Set value for I_{sd}
18	1	I_{sd} = 2.5 x I_r	
18	2	I_{sd} = 3 x I_r	
18	3	I_{sd} = 3.5 x I_r	
18	4	I_{sd} = 4 x I_r	
18	5	I_{sd} = 4.5 x I_r	
18	6	I_{sd} = 5 x I_r	
18	7	I_{sd} = 5.5 x I_r	
18	8	I_{sd} = 6 x I_r	

Byte	Dec. value	Description	Note
18	0	$I_{sd} = 2 \times I_r$	Set value for I_{sd}
18	1	$I_{sd} = 3 \times I_r$	
18	2	$I_{sd} = 4 \times I_r$	
18	3	$I_{sd} = 5 \times I_r$	
18	4	$I_{sd} = 6 \times I_r$	
18	5	$I_{sd} = 7 \times I_r$	
18	6	$I_{sd} = 8 \times I_r$	
18	7	$I_{sd} = 9 \times I_r$	
18	8	$I_{sd} = 10 \times I_r$	
19	0	$t_{sd} = 0$	Set value for t_{sd} [ms]
19	1	$t_{sd} = 20$	
19	2	$t_{sd} = 60$	
19	3	$t_{sd} = 100$	
19	4	$t_{sd} = 200$	
19	5	$t_{sd} = 300$	
19	6	$t_{sd} = 500$	
19	7	$t_{sd} = 750$	
19	8	$t_{sd} = 1000$	
20	0	$I_g = 0.2 \times I_n$	Set value for I_g
20	1	$I_g = 0.35 \times In$	
20	2	$I_g = 0.4 \times In$	
20	3	$I_g = 0.5 \times In$	
20	4	$I_g = 0.6 \times In$	
20	5	$I_g = 0.7 \times In$	
20	6	$I_g = 0.8 \times In$	
20	7	$I_g = 0.9 \times In$	
20	8	$I_g = 1.0 \times In$	
21	0	$t_g = 0$	Set value for t_g [ms]
21	1	$t_g = 20$	
21	2	$t_g = 60$	
21	3	$t_g = 100$	
21	4	$t_g = 200$	
21	5	$t_g = 300$	
21	6	$t_g = 500$	
21	7	$t_g = 750$	
21	8	$t_g = 1000$	

Byte	Dec. value	Description	Note
22	1 = I^2t[A] activated 0 = I^2t[A] deactivated		
23	Serial number NZM H byte		
24	Serial number NZM M byte		
25	Serial number NZM L byte		
26	CB part no.		
27	LS function		
28	Main index, bit 7, 6		NZM firmware version
	Secondary index 1, bit 5 - 3		
	Secondary index 2, bit 2 - 0		
29	0 = NZM ground fault module not present		
29	16 = NZM ground fault module present		
30	Reserve		

7.7.1.7 Outputs

The data structure complies with the LVSG (Low Voltage Switchgear) profile of PNO (PROFIBUS User Organization) which defines 2 bytes of output data. All functions of the second byte are not supported. A dummy byte (byte 1) is therefore required to ensure that the device is compatible with the LVSG profile. An additional byte is provided for resetting the energy value.

Byte	Bit								Description	Note
	7	6	5	4	3	2	1	0		
0							0	0	Do not change status	–
0							0	1	Switch off	Switch command
0							1	0	Switch on	Switch command
0							1	1	Do not change status	–
1									Not used	–
2	1	0	0	0	0	0	0	0	Reset power meter to zero	Power meter

7.7.2 Decoding CB type and CB identification

A ready-to-use function block is provided since decoding is a complex operation on account of the range of different NZM types. A special description "Decoding CB types and CB identification" is also provided.

Both can be downloaded from the following internet page:

ftp://ftp.moeller.net/CIRCUIT_BREAKER/KOMMUNIKATION/NZM_XSWD_704/

7.7.2.1 Diagnostics

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

Value	Meaning	Remedy	Notes
0x03	No circuit-breaker connected	• 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.

7.7.3 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 41: 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 via data profile 2 and that the actual parameters and circuit-breaker is read acyclically as required. This strategy reduces the bus load.

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

8 Connection for SmartWire-DT universal module M22-SWD-NOP(C)

8.1 Introduction

When upgrading the functions of a plant, the changes in hardware configuration and additional programming required are usually very complex and time-consuming.

The two universal cards M22-SWD-NOP (front-mount) and M22-SWD-NOPC (base fixing) can be fitted as replacements for cards that are configured in the installation but physically fitted only for expansion.

The aim here is to engineer and program the full extent of envisaged expansion in the PLC's user program while not (yet) installing the corresponding hardware. The user program can detect the presence of a universal module (bits 4 and 7). At a later date the universal modules can be replaced with the intended device to extend system functionality without having to alter program or hardware configuration. To facilitate this functionality, the PLC's user software and control configuration must fulfil a number of prerequisites.

8.1.1 Procedure

- In the PLC's control configuration, program the SmartWire-DT modules that will be required at a later date in addition to the ones that will be installed and used immediately. In the hardware installation, fit a universal module in place of the software-configured SmartWire-DT module.
- In the user program scan whether the the configured SmartWire-DT station or a universal module is fitted. The program flow must be controlled according to this information.
- If a universal module is later replaced with the originally configured SmartWire-DT module, this module must be added to the SmartWire-DT network by pressing the "Config." button on the gateway.

8.1.1.1 Interoperability with SmartWire-DT gateways

The following firmware versions of the SmartWire-DT gateways ensure interoperability with the M22-SWD-NOP(C) SmartWire-DT universal module:

Tabelle 42: Firmware versions of SmartWire-DT gateways

SmartWire-DT gateway	Firmware Version
EU5C-SWD-CAN	V 1.20
EU5C-SWD-DP	V 1.20

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://downloadcenter.moeller.net

8.1.1.2 Fieldbus description files

The following versions of the fieldbus description file and above ensure the interoperability of the M22-SWD-NOP(C) SmartWire-DT universal module:

Tabelle 43: Compatible PKE-SWD-32 fieldbus description files

SmartWire-DT gateway	Description file
EU5C-SWD-CAN	EU5C-SWD-CAN_V120.eds
EU5C-SWD-DP (Intel-based central processing unit)	Moe4d14.gsd
EU5C-SWD-DP (Motorola-based central processing unit)	Moel4d14.gsd

8.1.1.3 SWD-Assist

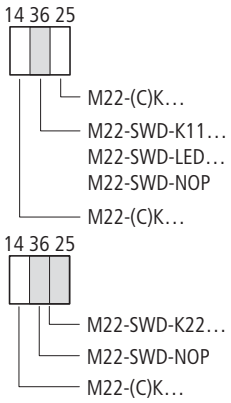
SmartWire-DT universal module M22-SWD-NOP(C) can be used in the SWD-Assist software as of version 1.30.

8.2 Setup

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

8.2.1 Front mount

Front-fixing universal modules M22-SWD are used as placeholders for pilot devices and contactors, motor-protective circuit-breakers in consoles, control panel doors or in control panels.



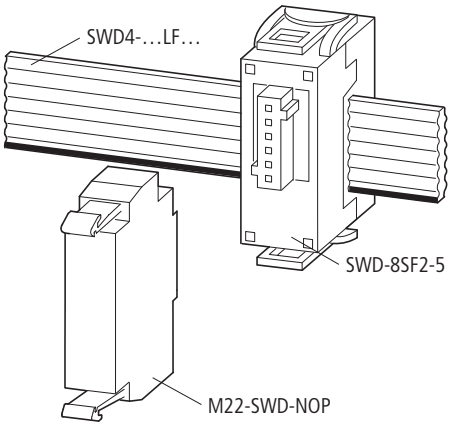


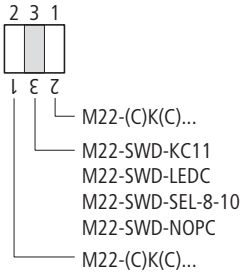
Figure 67: RMQ module as carrier element of a universal module for front mounting

8.2.1.1 Advantages

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

8.2.2 Base fixing

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



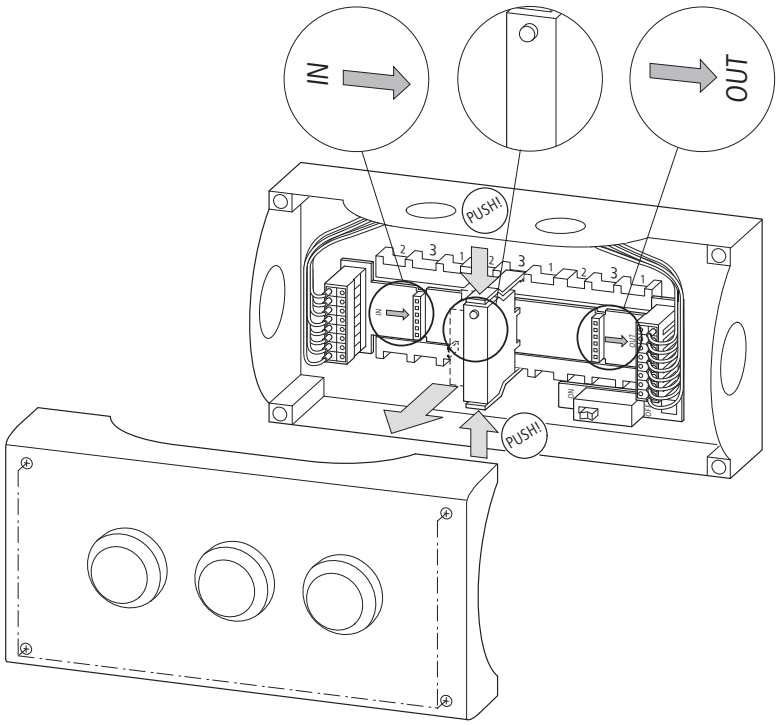


Figure 68: M22-SWD-NOPC in enclosure M22-I3

8.3 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 the configured SmartWire-DT module or a universal module is fitted. Bit 7 (SUBST) in the first input byte is set if a universal module is fitted in place of the software-configured module. The program flow must be controlled according to this information.

The input data from a universal module always has a zero value. If a universal module is later replaced with the originally configured SmartWire-DT module, add this module to the SmartWire-DT network by pressing the "Config." button on the gateway.

8.4 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…

8.4.1 Front mount

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

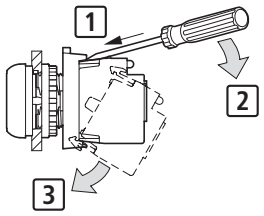


Figure 69: Connection to the adapter

The SmartWire-DT flat ribbon cable is to connected to the SmartWire-DT network. The external device plug SWD4-8SF2-5 is used for bonding with the M22-SWD function element. This completes installation.

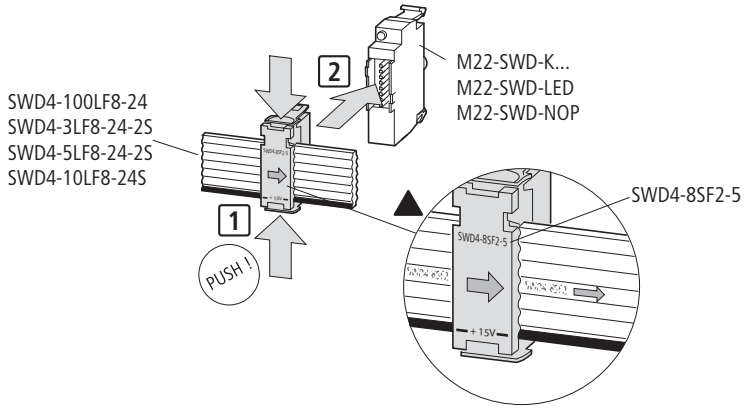


Figure 70: Connection of the universal module to the SmartWire-DT flat ribbon cable

8.4.2 Base fixing

Universal module M22-SWD-NOPC is fitted to card M22-SWD-ILP… in surface mounting enclosure M22-I….

To do so, proceed as follows:

▶ Insert the printed circuit board into the surface mounting enclosure. Ensure that the PCB is pointing in the correct direction. The direction of the arrow defines the arrangement of the modules. (the gateway is to the left of the IN code.)

▶ Equip the slots with the M22-SWD-NOPC universal module. Ensure that the mounting position is correct (status LED must be at the top). Unused slots must be equipped with the link M22-SWD-SEL8 10.

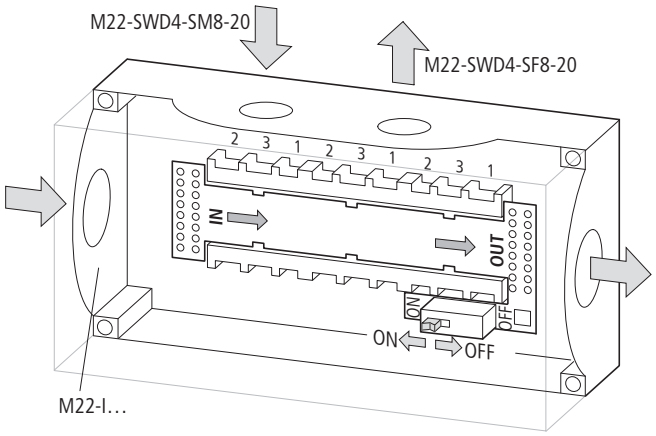


Figure 71: Universal module M22-SWD-NOPC in enclosure M22-I3

8.5 Commissioning

The automatic addressing of all modules in the SmartWire-DT network is performed via the gateway during commissioning. Press the configuration button on the gateway.

During the addressing process the SmartWire-DT diagnosis LED on the rear side of the M22-SWD universal module flashes. Once the addressing process is completed, the LED indicates a green continuous light.

8.5.1 Exchange of modules

CAUTION

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

After replacement of the modules and connection of the voltage the configuration button must be pressed. The new module is assigned an address by this means.

CAUTION

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

8.5.2 Device status

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

Tabelle 44: Diagnostic messages of the SmartWire-DT status LED

Designation	Colour	State	Message
SWD	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 part no.

		flashing (3 Hz)	Device reports a diagnosis. (see section “Programming”, subsection “Diagnostics”).

8.6 Programming

The universal modules contain specific information that the programming system processes. The function and scope of this information are described below.

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.

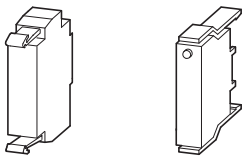


Figure 72: M22-SWD-NOP, M22-SWD-NOPC

Byte 0:

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

Bit	Designation	Meaning
0		0
1		0
2		0
3		0
4	DIAG	0: No diagnostic alarm
5	not used	–
6	PRSNT	0: module not present 1: module present
7	SUBST	1: universal module M22-SWD-NOP(C) present

8.6.0.1 Diagnostics

The module does not report a diagnosis.

9 Appendix

9.1 Maximum current consumption (15 V SWD voltage)

Part no.	Article no.	Current consumption [mA]	Notes
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	–
DIL-SWD-32-001	118560	40	–
DIL-SWD-32-002	118561	40	–
PKE-SWD	150613 150614	35	
PKE-SWD-32	126895	58	–
NZM-XSWD-704	135530	35	–
EU5E-SWD-8DX	116381	16	–
EU5E-SWD-4DX	144060	33	–
EU5E-SWD-4D4D	116382	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	–
M22-SWD-I1-LP01	115990	17	with terminating 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	
SWD4-RC8-10	116020	17	–

9.1.1 Power consumption/current consumption 24 V SmartWire-DT control voltage U_{AUX}

		DIL-SWD-32-…
Pull-in power		
at DILM7 – DILM9	W	3
at DILM12 – 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		
at DILM7 – DILM9	W	3
at DILM12 – DILM15	W	4.5
at DILM17 – DILM38	W	0.5
Holding current		
at DILM7 – DILM9	mA	125
at DILM12 – DILM15	mA	188
at DILM17 – DILM38	mA	21

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

9.1.2 Data requirement (bytes) SmartWire-DT modules

SmartWire-DT module	Input	Output
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-K11LEDC-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

SmartWire-DT module	Input	Output
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
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
EU5E-SWD-4DX	2	0
EU5E-SWD-8DX	2	0
EU5E-SWD-4D4D	1	1
EU5E-SWD-4D2R	1	1
EU5E-SWD-X8D	1	1
EU5E-SWD-4AX	9	0
EU5E-SWD-2A2A	5	4
EU5E-SWD-4PT	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
SWD4-RC8-10	0	0

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

Part no.	Eaton catalog number
DILM7(C)-…(24VDC)	XTCE(C)007B…TD
DILM9(C)-…(24VDC)	XTCE(C)009B…TD
DILM12(C)-…(24VDC)	XTCE(C)012B…TD
DILM15(C)-…(24VDC)	XTCE(C)015B…TD
DILM17(C)-…(24VDC)	XTCE(C)017C…TD
DILM25(C)-…(24VDC)	XTCE(C)025C…TD
DILM32(C)-…(24VDC)	XTCE(C)032C…TD
DILM38(C)-…(24VDC)	XTCE038C…TD
Contactor relay	
DILA(C)-…(24VDC)	XTRE(C)10B…TD
Motor-protective circuit-breaker	
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
Accessories for motor-protective circuit-breaker	
NHI-E-…-PKZ0	XTPAXFA…
NHI-…-PKZ0	XTPAXSA…
AGM2-…-PKZ0	XTPAXSATR…

Part no.	Eaton catalog number
Motor-starter combination	
MSC-D-…(24VDC)	XTSE…TD…
MSC-DEA-…(24VDC)	XTNE…TD…
Wiring set	
DILM12-XRL	XTCEXRLB
DILM12-XP2	XTCEXPBB
DILM12-XR	XTCEXRBB-0A2
DILM12-XEV	XTCEXLBB
DILM32-XRL	XTCEXRLC
PKZM0-XRM12	XTPAXTPCRB

9.2 Technical data

9.2.1 Gateways, Power Feeder Modules

		EU5C-SWD-DP	EU5C-SWD-CAN	EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
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 127		35 x 90 x 124	
Weight	kg	0.16	0.16	0.11	0.17
Mounting		Top-hat rail IEC/EN 60715, 35 mm		Top-hat rail IEC/EN 60715, 35 mm	
Mounting position		vertical		vertical	
Ambient mechanical conditions					
Protection type (IEC/EN 60529, EN50178, VBG 4)		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
constant acceleration 1 g	Hz	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	Shocks	9	9	9	9
Drop to IEC/EN 60068-2-31 Drop height	mm	50	50	50	50
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	0.3	0.3	0.3
Electromagnetic compatibility (EMC)					
Overvoltage category		II	II	II	II
Pollution degree		2	2	2	2
Electrostatic discharge (IEC/EN 61131-2:2008)					
Air discharge (Level 3)	kV	8	8	8	8
Contact discharge (Level 2)	kV	4	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)					
80 - 1000 MHz	V/m	10	10	10	10
1.4 - 2 GHz	V/m	3	3	3	3
2 - 2.7 GHz	V/m	1	1	1	1
Radio interference suppression (SmartWire-DT)		EN 55011 Class A			
Burst (IEC/EN 61131-2:2008, Level 3)					
Supply cables	kV	2	2	2	2
CAN/DP bus cable	kV	1	1	–	–
SmartWire-DT cables	kV	1	1	1	1
Surge (IEC/EN 61131-2:2008, Level 1)					
Supply cables/CAN/DP bus cable		Supply cables 0.5 kV, CAN/DP bus cable 1 kV		Supply cables 0.5 kV	
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V	10	10	10	10

			EU5C-SWD-DP	EU5C-SWD-CAN	EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
Ambient climatic conditions						
Operating ambient temperature (IEC 60068-2)		°C	–25 - +55	–25 - +55	–25 - +55	–25 - +55
Condensation			prevent with suitable measures			
Storage		°C	–40 - 70	–40 - 70	–40 - 70	–40 - 70
relative humidity, non-condensing (IEC/EN 60068-2-30)		%	5 - 95	5 - 95	5 - 95	5 - 95
Supply voltage U_{AUX}						
Rated operational voltage		V	24 DC -15% +20%		24 DC -15% +20%	
Input voltage residual ripple		%	≦ 5	≦ 5	≦ 5	≦ 5
Protection against polarity reversal			Yes	Yes	Yes	Yes
max. current	I_{max}	A	3[1)]	3[1)]	3	3
Short-circuit strength			no, external fuse FAZ Z3		no, external fuse FAZ Z3	
Heat dissipation		W	Normally 1	Normally 1	Normally 1	Normally 1
Potential isolation			no	no	no	no
Rated operating voltage of 24-V-DC modules		V	typical U_{AUX} - 0.2	typical U_{AUX} - 0.2	typical U_{AUX} - 0.2	type. U_{Aux} - 0.2
Supply voltage U_{Pow}						
Supply voltage		V	24 DC -15 % + 20 %	24 DC -15 % + 20 %	–	24 DC -15 % + 20 %
Input voltage residual ripple		%	≦ 5	≦ 5	–	≦ 5
Protection against polarity reversal			Yes	Yes	–	Yes
Rated operational current	I	A	0.7	0.7	–	0.7
Overload proof			Yes	Yes	–	Yes
Inrush current and length		A	12.5 A/6 ms	12.5 A/6 ms	–	12.5 A/6 ms
Heat dissipation at 24 V DC		W	3.8	3.8	–	3.8
Potential isolation between U_{Pow} and 15 V SmartWire-DT supply voltage			no	no	–	Yes
Bridging voltage dips		ms	10	10	–	10
Repeat rate		s	1	1	–	1
Status display		LED	Yes	Yes	–	Yes
SmartWire-DT supply voltage						
Rated operational voltage	U_e	V	14.5 ± 3 %	14.5 ± 3 %	14.5 ± 3 %	14.5 ± 3 %
max. current	I_{max}	A	0.7[2)]	0.7[2)]	0.7	0.7
Short-circuit strength			Yes	Yes	–	Yes
Connection supply voltages						
Connection Type			Push in terminals		Push in terminals	
solid		mm^2	0.2 - 1.5 (AWG24 - 16)		0.2 - 1.5 (AWG24 - 16)	
flexible with ferrule		mm^2	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5
SmartWire-DT network						
Module type			SmartWire-DT master		–	–
Number of SmartWire-DT modules			58	99	–	–
Baud rate		kBd	125, 250	125.25	–	–
Address setting			automatic	automatic	–	–
Status display			SmartWire-DT master LED: green Configurations LED: red		–	–
Connections			Plug, 8-pole		2 x plug, 8 pole	
Plug connectors			Blade terminal SWD4-8MF2		2 blade terminals SWD4-8MF2	

		EU5C-SWD-DP	EU5C-SWD-CAN	EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
Field bus interface					
Function		PROFIBUS-DP module	CANopen module		
Bus protocol		PROFIBUS-DP V 1	CANopen		
Baud rate		up to 12 MB	up to 1 MB		
Baud rate detection		automatic	automatic		
Module address		2 - 125	2 - 32		
Address setting		DIP switches	DIP switches		
Status display field bus interface	LED	two-colored red/green	two-colored red/green		
Terminating resistor		switchable via plug	DIP switches		
Terminal type field bus		1 x SUB-D socket, 9-pole	1 x SUB-D plug, 9-pole		
potential isolation		Yes	Yes		

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.

9.2.2 I/O modules

		EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D	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		Top-hat rail IEC/EN 60715, 35 mm				
Mounting position		vertical				
Ambient mechanical conditions						
Protection type (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	Shocks	9	9	9	9	9
Drop to IEC/EN 60068-2-31 Drop height	mm	50	50	50	50	50
free fall, packaged Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	0.3	0.3	0.3	0.3

		EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D	EU5E-X8D
Electromagnetic compatibility (EMC)						
Overvoltage category		II	II	II	II	II
Pollution degree		2	2	2	2	2
Electrostatic discharge 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 Electromagnetic fields (IEC/EN 61131-2:2008)						
80 - 1000 MHz	V/m	10	10	10	10	10
1.4 - 2 GHz	V/m	3	3	3	3	3
2 - 2.7 GHz	V/m	1	1	1	1	1
Radio interference suppression (SmartWire-DT) EN55011		Class A	Class A	Class A	Class A	Class A
Burst (IEC/EN 61131-2:2008, Level 3)						
Supply cables	kV	2	2	2	2	2
Signal cables	kV	1	1	1	1	1
SmartWire-DT cables	kV	1	1	1	1	1
Surge (IEC/EN 61131-2:2008, Level 1)		–	Supply cables 0.5 kV	–	Supply cables 0.5 kV	Supply cables 0.5 kV
Radiated RFI Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V	10	10	10	10	10
Ambient climatic conditions						
Operating ambient temperature (IEC 60068-2)	°C	-25 - +55	-25 - +55	-25 - +55	-25 - +55	-25 - +55
Condensation		prevent with suitable measures				
Storage	°C	-40 - +70	-40 - +70	-40 - +70	-40 - +70	-40 - +70
relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95	5 - 95	5 - 95	5 - 95	5 - 95
SmartWire-DT interface						
Module type		SmartWire-DT module				
Baud rate setting		automatic	automatic	automatic	automatic	automatic
Status SmartWire-DT	LED	green	green	green	green	green
Connection		Pin contact strip, 8-pin; Connector: External device plug SWD4-8SF2-5				
Current consumption (15 V SWDT supply)		→ Page 179				
Connection supply and I/O						
Connection Type		Push-In	Push-In	Push-In	Push-In	Push-In
solid	mm^2	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5
flexible with ferrule[1)]	mm^2	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

			EU5E-SWD-8DX	EU5E-SWD-4DX	EU5E-SWD-4D2R	EU5E-SWD-4D4D	EU5E-X8D
24 V DC supply for output supply							
Rated operational voltage	U_e	V DC	–	24 -15 % / +20 %	–	24 -15 % / +20 %	24 -15 % / +20 %
Input voltage residual ripple		%	–	≦ 5		≦ 5	≦ 5
Protection against polarity reversal			no	Yes	no	Yes	Yes
Digital inputs							
Number			8	4 (three-wire connection with supply I+, I-)	4	4	
Input current		mA	Normally 4 at 24 V DC	Normally 4 at 24 V DC	Normally 4 at 24 V DC	Normally 4 at 24 V DC	–
Voltage level to IEC/EN 61131-2							
Limit value type 1			Low < 5 V DC; High > 15 V DC				
Input delay			High → Low typ. < 0.2 ms Low → High typ. < 0.2 ms				
Status display inputs		LED	yellow	yellow	yellow	yellow	yellow
Input supply I+, I-							
Supply voltage		V		U_e - 0.16 V			
Output current per input supply		A		≦ 0.5			
Overload proof				yes, with diagnostics			
Status display inputs		LED	yellow	yellow	yellow	yellow	
Digital semi-conductor outputs							
Number			–			4	8
Output current		A	–			typ. 0.5 on 24 V DC	typ. 0.5 on 24 V DC
Short-circuit tripping current		A	–			max. 1.2 over 3 ms	max. 1.2 over 3 ms
Lamp load	R_{LL}	W	–			≦ 3	≦ 3
Overload proof			–			yes, with diagnostics	yes, with diagnostics
Switching capacity			–			EN 60947-5-1 utilization category DC-13	EN 60947-5-1 utilization category DC-13
Relay outputs							
Number			–	–	2	–	–
Contact type			–	–	N/O	–	–
Operations							
Utilization category AC-1, 250 V, 6 A			–	–	> 6 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 isolation		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 protective device			–	–	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

9.2.3 Analog modules

			EU5E-SWD-4AX	EU5E-SWD-2A2A	EU5E-SWD-4PT
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			Top-hat rail IEC/EN 60715, 35 mm		
Mounting position			vertical	vertical	vertical
Ambient mechanical conditions					
Protection type (IEC/EN 60529, EN50178, VBG 4)			IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)					
Constant amplitude 3.5 mm		Hz	5 - 8.4	5 - 8.4	5 - 8.4
constant acceleration 1 g		Hz	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms		Shocks	9	9	9
Drop to IEC/EN 60068-2-31	Drop height	mm	50	50	50
free fall, packaged 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 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 Radiated RFI (IEC/EN 61131-2:2008, Level 3)		V	10	10	10
Ambient climatic conditions					
Operating ambient temperature (IEC 60068-2)		°C	-25 - +55	-25 - +55	-25 - +55
Condensation			prevent with suitable measures		
Storage		°C	-40 - +70	-40 - +70	-40 - +70
relative humidity, non-condensing (IEC/EN 60068-2-30)		%	5 - 95	5 - 95	5 - 95
SmartWire-DT interface					
Module type			SmartWire-DT module		
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		
Current consumption (15-V-SmartWire-DT supply)			→ Page 179		

			EU5E-SWD-4AX	EU5E-SWD-2A2A	EU5E-SWD-4PT
Connection supply and I/O					
Connection Type			Push-In	Push-In	Push-In
solid		mm^2	0.25 - 1.5 (AWG24-16)	0.25 - 1.5 (AWG24-16)	0.25 - 1.5 (AWG24-16)
flexible with ferrule[1)]		mm^2	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 operational voltage	U_e	V DC	24 -15 % / +20 %	24 -15 % / +20 %	24 -15 % / +20 %
Input voltage residual ripple		%	≦ 5	≦ 5	≦ 5
Current consumption		mA	< 10	< 50	
Protection against polarity reversal			Yes	Yes	Yes
Analog inputs					
Number			4 (two-wire connection, screened, length < 10 m)	2 (two-wire connection, screened, length < 10 m)	4
Parameter setting					
Part no.			Voltage, current	Voltage, current	
Averaging			adjustable	adjustable	
Voltage					
Input voltage		V	0 - 10	0 - 10	
Input resistance		kΩ	13.3	13.3	
Current					
Input current		mA	0 - 20	0 - 20	
Input resistance		Ω	< 250	< 250	
Resolution		Bit	12	12	
Conversion time		ms	20	20	
		%			
Accuracy		%			
Dielectric strength					
Analog outputs					
Number			–	2 (two-wire connection, screened)	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 %	
Repetition accuracy				±0.5 %	

			EU5E-SWD-4AX	EU5E-SWD-2A2A	EU5E-SWD-4PT
Temperature inputs					
Number					4 (two-, three-wire connection, screened, length < 10 m)
Parameter setting					
Temperature sensor					PT100, PT1000, Ni1000
Scan time/mean-value generation			adjustable	adjustable	adjustable
Temperature range	°C				PT100, PT1000: -50 to +200 Ni1000: -50 to +150
Resolution	°C				0.1
Display					°C, °F, nonlinear
Conversion time	ms				50
Cumulative error	%				±1
Repetition 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

9.2.4 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-…
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				
Protection type (IEC/EN 60529, EN50178, VBG 4)		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	Shocks	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

		M22-SWD-K11/ M22-SWD-KC11	M22-SWD-LED-.../ M22-SWD-LEDC-...	M22-SWD-K11LED-.../ M22-SWD-K11LEDC-...
Electromagnetic compatibility (EMC)				
Overvoltage category		Not applicable		
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)		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		prevent with suitable measures		
Storage	°C	–40 - 80	–40 - 80	–40 - 80
Relative humidity, no condensation (IEC/EN 60068-2-30)	%	9 - 95	9 - 95	9 - 95
SmartWire-DT network				
Module type		SmartWire-DT module		
Baud rate setting		automatic	automatic	automatic
Status SmartWire-DT LED		green	green	green
Connections		Plug, 8-pole	Plug, 8-pole	Plug, 8-pole
Plug connectors		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
Current consumption (15 V SWD supply)		→ Page 179		
Function element				
Contacts		1 changeover contact	–	1 changeover contact
Lifespan mechanical/ electrical (operations)		1 x 10^6	–	1 x 10^6
LED display		no	Yes	Yes
Diagnostics		Yes	no	Yes
Fixing		Front mount/ base fixing	front mount/ base fixing	front mount/ base fixing

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				
Protection type (IEC/EN 60529, EN50178, VBG 4)		IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
constant amplitude 3.5 mm	Hz	5 - 8.4	5 - 8.4	5 - 8.4
constant acceleration 1 g	Hz	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms	Shocks	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)				
Air discharge (Level 3)	kV	8	8	8
Contact discharge (Level 2)	kV	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)				
80-1000 MHz	V/m	10	10	10
1.4 - 2 GHz	V/m	3	3	3
2 - 2.7 GHz	V/m	1	1	1
Radio interference suppression (SmartWire-DT)				
Burst (IEC/EN 61131-2:2008, Level 3)				
Supply cables	kV	2	2	2
SmartWire-DT cables	kV	1	1	1
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V	10	10	10
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

	M22-SWD-K22/ M22-SWD-KC22	M22-SWD-K22LED-.../ M22-SWD-K22LEDC-...	M22-SWD-NOP(C)
SmartWire-DT network			
Module type			
Baud rate setting	automatic	automatic	automatic
Status SmartWire-DT LED	green	green	green
Connections	Plug, 8-pole	Plug, 8-pole	Plug, 8-pole
Plug connectors	SWD4-8SF2-5/ M22-SWD-I...LP	SWD4-8SF2-5/ M22-SWD-I...LP	SWD4-8SF2-5
Number of insertion cycles	50	50	50
Current consumption (15 V SWD supply)			
Function element			
Contacts	2 changeover contact	2 changeover contact	–
Lifespan mechanical/ electrical (operations)	1 x 10^6	1 x 10^6	–
LED display	no	Yes	–
Diagnostics	Yes	Yes	–
Fixing	front mount/ base fixing	front mount/ base fixing	–

9.2.5 Network termination, switch cabinet bushings

			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					
Protection type (IEC/EN 60529, EN50178, VBG 4)			IP20	IP67	IP67
Vibrations (IEC/EN 61131-2:2008)					
constant amplitude 3.5 mm		Hz	5 - 8.4	5 - 8.4	5 - 8.4
constant acceleration 1 g		Hz	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms		Shocks	9	9	9
Drop to IEC/EN 60068-2-31	Drop height	mm	50	–	–
free fall, packaged (IEC/EN 60068-2-32)		m	0.3	–	–
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

		SWD4-RC8-10	SWD4-SFL8-20	SWD4-SML8-20
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 Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V	10	10	10
Ambient climatic conditions				
Operating ambient temperature (IEC 60068-2)	°C	-25 - +55	-25 - +55	-25 - +55
Condensation		prevent with suitable measures		
Storage	°C	-40 - +70	-40 - +70	-40 - +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95	5 - 95	5 - 95
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 179		

9.2.6 Enclosure bushings: plug, socket

		SWD4-SF8-20	SWD4-SM8-20
General			
Standards		IEC/EN 61131-2 EN 50178	IEC/EN 61131-2 EN 50178
Dimensions (W x H x D)	mm	24 x 26 x 162	24 x 26 x 170
Weight	g	20	22.5
Mounting position		any	any
Ambient mechanical conditions			
Protection type (IEC/EN 60529, EN50178, VBG 4)		IP67	IP67
Ambient climatic conditions			
Operating ambient temperature (IEC 60068-2)	°C	-25 - +55	-25 - +55
Condensation		prevent with suitable measures	
Storage	°C	-40 - +70	-40 - +70
Relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95	5 - 95
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 179

9.2.7 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				
Protection type (IEC/EN 60529, EN50178, VBG 4)		IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)				
constant amplitude 3.5 mm	Hz	5 - 8.4	5 - 8.4	5 - 8.4
constant acceleration 1 g	Hz	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms	Shocks	9	9	9
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		prevent with suitable measures		
Storage	°C	-40 - +70	-40 - +70	-40 - +70
relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95	5 - 95	5 - 95
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 179		

9.2.8 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	

			DIL-SWD-32-001	DIL-SWD-32-002
Ambient mechanical conditions				
Protection type (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		Shocks	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)			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 - +60	-25 - +60
Condensation			prevent with suitable measures	
Storage		°C	-30 - +70	-30 - +70
relative humidity, non-condensing (IEC/EN 60068-2-30)		%	5 - 95	5 - 95
SmartWire-DT network				
Module type			SmartWire-DT module	
Baud rate setting			automatic	
Status SmartWire-DT		LED	green/orange	
Connections			Plug, 8-pole	
Plug connectors			External device plug SWD4-8SF2-5	
Current consumption (15-V-SmartWire-DT supply)			→ Page 179	
Operating Mode				
Manual/automatic mode			no	Yes
Setting			–	Rotary switch
Connection auxiliary contact				
Number			2	2
Rated voltage[1]	U_e	V DC	15	15
Input current at 1 signal, typical		mA	3	3
Potential isolation			no	no
Cable length		m	≦ 2.8	≦ 2.8
Connection Type			Push-In	Push-In
Terminal capacity				
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

9.2.9 Electronic motor-protective circuit-breaker PKE-SWD (-32)

		PKE-SWD-32	PKE-SWD
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			
Protection type (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	Shocks	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)			
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 - +60	-25 - +60
Condensation		prevent with suitable measures	prevent with suitable measures
Storage	°C	-30 - +70	-30 - +70
Relative humidity, non-condensing Free fall, packaged (IEC/EN 60068-2-30)	%	5 - 95	5 - 95
SmartWire-DT network			
Function		SmartWire-DT module	SmartWire-DT module
Baud rate setting		automatic	automatic
Status SmartWire-DT	LED	green/orange	green
Connection		Plug, 8-pole	Plug, 8-pole
Plug connectors		External device plug SWD4-8SF2-5	External device plug SWD4-8SF2-5
Current consumption (15 V bus voltage)	m A	→ Page 179	→ Page 179
Operating Mode			
Manual/automatic mode		Yes	
Setting		Rotary switch	

			PKE-SWD-32	PKE-SWD
Connection electrical enable				
Cable length		m	≦ 2.8	
Connection Type			Push-In	
Terminal capacity				
solid		mm^2	0.2 - 1.5 (AWG24 - 16)	
Flexible with ferrule (minimum section length 8 mm)		mm^2	0.25 - 1.5	

9.2.10 NZM circuit-breakers-...

			NZM-XSWD-704
General			
Standards			IEC/EN 61131-2; EN 50178
Dimensions (W x H x D)		mm	35 x 90 x 101
Weight		kg	0.1
Mounting			Top-hat rail IEC/EN 60715, 35 mm
Mounting position			vertical
Ambient mechanical conditions			
Protection type (IEC/EN 60529, EN50178, VBG 4)			IP20
Vibrations (IEC/EN 61131-2:2008)			
constant amplitude 3.5 mm		Hz	5 - 8.4
Constant acceleration, 1 g		Hz	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms		Shocks	9
Drop to IEC/EN 60068-2-31	Drop height	mm	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
Contact discharge (Level 2)		kV	4
Electromagnetic fields (IEC/EN 61131-2:2008)			
80-1000 MHz		V/m	10
1.4 - 2 GHz		V/m	3
2 - 2.7 GHz		V/m	1
Radio interference suppression (SmartWire-DT)			EN 55011 Class A
Burst (IEC/EN 61131-2:2008, Level 3)			
Supply cables		kV	2
Signal cables		kV	1
SmartWire-DT cables		kV	1
Surge (IEC/EN 61131-2:2008, Level 1)			–
Radiated RFI Radiated RFI (IEC/EN 61131-2:2008, Level 3)		V	10

			NZM-XSWD-704
Ambient climatic conditions			
Operating ambient temperature (IEC 60068-2)		°C	–25 - +55
Condensation			prevent with suitable measures
Storage		°C	–40 - +70
relative humidity, non-condensing (IEC/EN 60068-2-30)		%	5 - 95
SmartWire-DT interface			
Module type			SmartWire-DT module
Baud rate setting			automatic
Status SmartWire-DT		LED	green
Connection			Plug, 8-pole Connection plug: External device plug SWD4-8SF2-5
Current consumption (15-V-SmartWire-DT supply)			See separate table
Connection supply and I/O			
Connection type			Push-In
solid		mm^2	0.2 - 1.5 (AWG24 - AWG16)
flexible with ferrule[1)]		mm^2	0.25 - 1.5
24 V DC supply for output supply			
Rated operational voltage	U_e	V	–
Input voltage residual ripple		%	–
Protection against polarity reversal			–

1) Minimum length 8 mm

			NZM-XSWD-704
Digital inputs			
Number			2
Input current		m A	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 semi-conductor outputs			
Number			2
Output current		A	0.2 at 24 V DC
Short-circuit tripping current		A	
Lamp load	R_{LL}	W	
Overload proof			yes, with diagnostics
Switching capacity			EN 60947-5-1 utilization category DC-13
Relay outputs			
Number			–
Contact type			–
Operations			
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 isolation		V AC	–
minimum load current		m A	–
Response/reset time		ms	–
Bounce duration		ms	–
Short-circuit protective device			–
Status display outputs		LED	–
Potential isolation			
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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