SmartWire-Darwin Units

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Caution!
The manual AWB2723-1613en is renamed from edition 05/10 in MN05006001Z-EN.

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
See revision protocol in the “About this manual“ chapter

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Danger!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions (AWA) 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.).

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About This Manual

List of revisions

Publication date	Page	Subject	New	Change	omitted
03/10	107	Chapter "Interface for motor starter combination with PKE12/32 PKE-SWD-32"	✓		
	185	Section "Current consumption 15-V-SWD supply voltage"		✓	
	187	Section "Data requirement (bytes) of the SWD slaves"	✓		
	208	Section "Electronic motor protective circuit breaker PKE-SWD-32"		✓	
04/10	107	Modification to Chapter "Interface for motor starter combination with PKE12/32 PKE-SWD-32" complete		✓	
	159	Modification Chapter "Interface for NZM compact circuit-breakers"	✓		
	185	Section "Current consumption 15-V-SWD supply voltage"	✓		
	186	Section "Power consumption/current consumption 24 V SWD control voltage UAUX"		✓	
	187	Section "Data requirement (bytes) of the SWD slaves"		✓	
	210	Section "NZM-… circuit-breakers"	✓		

Overview of the SmartWire-Darwin System

The SmartWire-Darwin connection system is an intelligent bus system and makes possible the reliable and easy connection of switching devices, control circuit devices and I/O components with overriding bus systems.

The components that are connected with the SmartWire-Darwin system are linked, e.g. to PROFIBUS-DP or CANopen communication networks via gateways.

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

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

Additional device manuals

Further information concerning the SmartWire-Darwin can be found in the manuals:

- MN05013002Z-EN (previously AWB2723-1612en) SmartWire-Darwin Gateways
- MN05006002Z-EN (previously AWB2723-1617en) SmartWire-Darwin The System
- MN05002002Z-EN (previously AWB2725-1452en) XIOC Signal Modules (chapter "Diagnostics of the Profibus-DP slaves")

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

http://eaton.com/moeller/support

by entering the document number as the search term.

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-Darwin system.

Writing conventions

Symbols used in this manual have the following meanings:

▶ indicates actions to be taken.

Caution!
Warns of a hazardous situation that could result in damage to the product or components.

Warning!
Warns of the possibility of serious damage and slight injury.

Danger!
warns of the possibility of serious damage and slight injury or death.

Draws your attention to interesting tips and supplementary information.

For greater clarity, the name of the current chapter is shown in the header of the left-hand page and the name of the current section in the header of the right-hand page. This does not apply to pages at the start of a chapter and empty pages at the end of a chapter.

1 Power Module EU5C-SWD-PF1-1, EU5C-SWD-PF2-1

Introduction

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

EU5C-SWD-PF1-1

Surface mounting

Connections/power supply

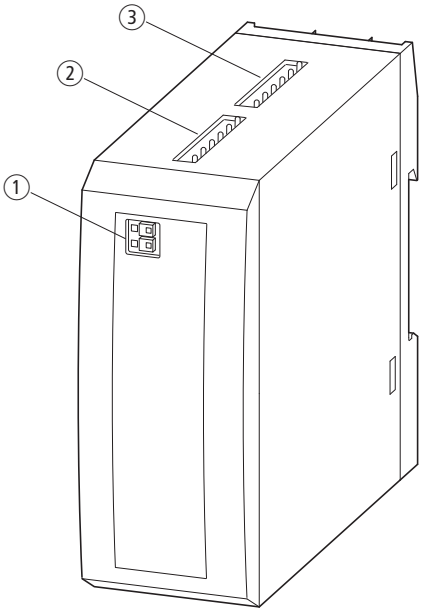


Figure 1: Connections of the EU5C-SWD-PF1-1 module

① Contactors power supply AUX
② SWD In
③ SWD Out

The SmartWire-Darwin power module EU5C-SWD-PF1 loops the 24 V DC contactor voltage back into the SmartWire-Darwin 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-Darwin network. A fault in the 24 V supply voltage is therefore ascertainable only via the missing voltage of the downstream contactors.

Engineering

Area of application of the SmartWire-Darwin power module EU5C-SWD-PF1-1

- The supply for the contactors installed in the SmartWire-Darwin 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 "Safety-related applications", page 49)

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

Installation

The SmartWire-Darwin 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-Darwin cable to the SWD In socket. The continuation to the next SmartWire-Darwin module is from the SWD Out socket.

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

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

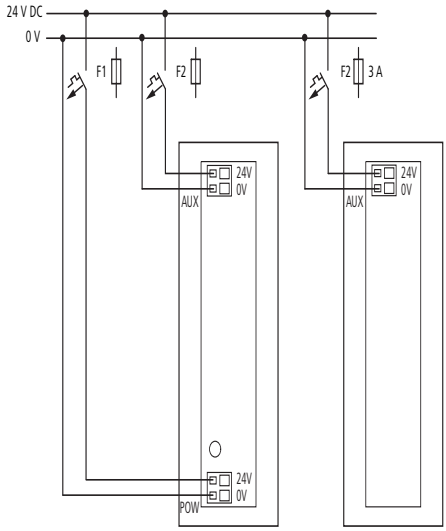


Figure 2: Terminal capacity

- fine wire, cross-section 0.25 mm² to 1.5 mm², with the ferrule (minimum length 8 mm.)
- Solid: 0.14 mm² to 1.5 mm²

→ Information on the cable protection is provided on page 18

Diagnostics

The device does not report a diagnosis.

EU5C-SWD-PF2-1

Surface mounting

Connections/power supply

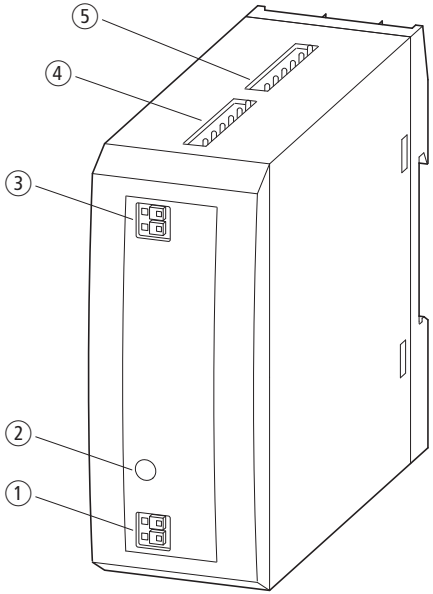


Figure 3: Connections of the EU5C-SWD-PF2-1 module

(1) SmartWire-Darwin slave supply
(2) POW slave supply display
(3) Contactors power supply AUX
(4) SWD In
(5) SWD Out

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

The SmartWire-Darwin cable is looped from the SmartWire-Darwin in-connection through to the SmartWire-Darwin out-connection. Only the 24 V DC contactor voltage and the 15 V DC slave supply are isolated and looped back in via the SmartWire-Darwin 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 slave supply is electrically isolated from the 24 V DC contactor voltage. Voltage dips are buffered up to at least 10 ms. There is voltage reversal and EMC protection.

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

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

Engineering

Area of application of the SmartWire-Darwin power module EU5C-SWD-PF2-1

- The supply for the slaves installed in the SmartWire-Darwin network is no longer sufficient (power consumption > 0.7 A).
- The supply for the contactors installed in the SmartWire-Darwin 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 "Safety-related applications", page 49).

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

Installation

The SmartWire-Darwin 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-Darwin cable to the SWD In socket. The continuation to the next SmartWire-Darwin module is from the SWD Out socket.

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

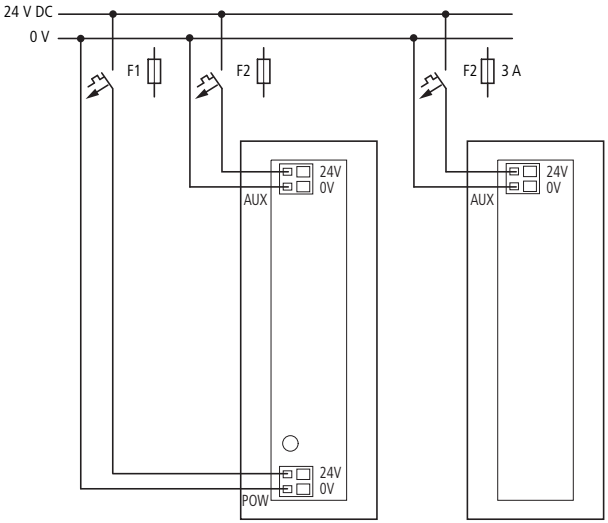


Figure 4: Terminal capacity

- flexible, cross-section 0.25 mm^2 to 1.5 mm^2, with the ferrule (minimum length 8 mm.)
- Solid: 0.14 mm^2 to 1.5 mm^2

Cable protection

▶ On the SWD 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

Diagnostics

The device does not report a diagnosis.

2 I/O Modules EU5E-SWD-8DX, EU5E-SWD-4D4D, EU5E-SWD-4D2R

Introduction

The SmartWire-Darwin input/output modules (abbreviated: I/O modules) are used for the connection of other sensor and actuator devices. These can be, for example, auxiliary contacts of additional switchgears that have integrated SmartWire-Darwin technology. The modules are placed in the immediate vicinity of the sensors/actuators, due to which the remaining wiring is markedly reduced. Diverse modules with digital inputs and outputs in the form of transistors and relays are available.

Surface mounting

EU5E-SWD-8DX

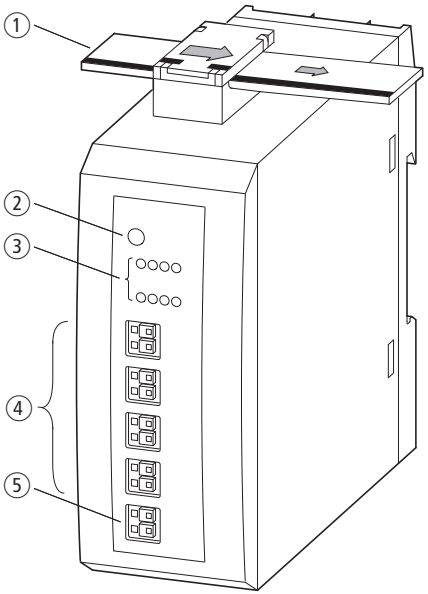


Figure 5: Connections of the modules EU5E-SWD-8DX

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

The SmartWire-Darwin I/O module EU5E-SWD-8DX provides eight digital inputs I0 to I7 with the help of which diverse sensors can be integrated into the SmartWire-Darwin network.

The status of the inputs is indicated with the help of LEDs. The network status of the module is signalled via the SmartWire-Darwin diagnostics LED ②.

EU5E-SWD-4D4D

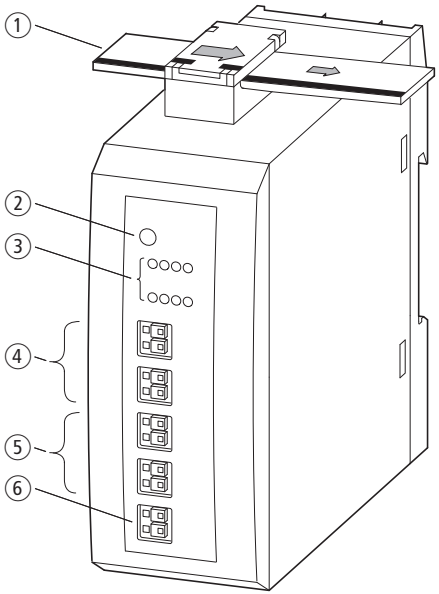


Figure 6: Connections of the modules EU5E-SWD-4D4D

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

The SmartWire-Darwin 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-Darwin network via the four inputs The four 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-Darwin diagnostics LED ②.

EU5E-SWD-4D2R

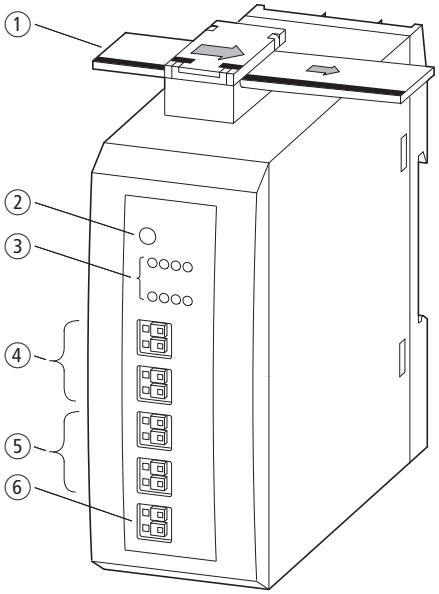


Figure 7: Connections of the modules EU5E-SWD-4D2R

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

The SmartWire-Darwin 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 are used for the activation of actuators up to a rated operational current of AC 15, 3 A 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-Darwin diagnostics LED ②.

Engineering

The SmartWire-Darwin input/output modules are used for the connection of other sensor and actuator devices without integrated SmartWire-Darwin technology. The modules are placed in the immediate vicinity of the sensors or actuators, which markedly reduces the remaining wiring. Three different modules are available.

EU5E-SWD-8DX
- eight digital inputs 24 V DC

EU5E-SWD-4D4D
- four digital inputs 24 V DC
- four digital outputs 24 V DC, 0.5 A

EU5E-SWD-4D2R
- four digital inputs 24 V DC
- two digital relay outputs 3 A

Via the two relay outputs Q0 and Q1 contactors can be activated with greater pull-in power, for example.

The I/O modules draw their energy for communication electronics, activation of the LEDs and of the I/O modules from the SmartWire-Darwin network supply. Please take into consideration the total current consumption of your SmartWire-Darwin 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 185.

Installation

The SmartWire-Darwin input/output modules are envisaged for top hat mounting.

▶ Mount the module on the top-hat rail.

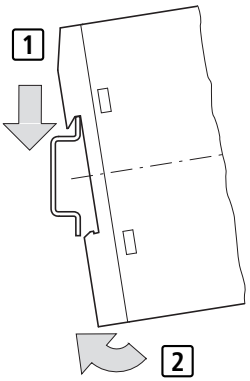


Figure 8: Mounting on top-hat rail

▶ Connect the 8-pole SmartWire-Darwin cable via the SWD socket to the top side of the device.

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

EU5E-SWD-8DX

▶ Connect the sensors to the corresponding input I0 to I7.

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

EU5E-SWD-4D4D

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

EU5E-SWD-4D2R

- ▶ Connect the sensors to the corresponding input I0 to I3.
- ▶ Connect the reference potential 0 V DC to connection 0 V.
- ▶ 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 AC-15, 3 A at 250 V. They must be protected with a 4 A fuse.

The terminals are suitable for cables AWG22 to AWG16 and flexible conductors with a cross section of 0.5 mm^2 to 1.5 mm^2.

Connections/power supply

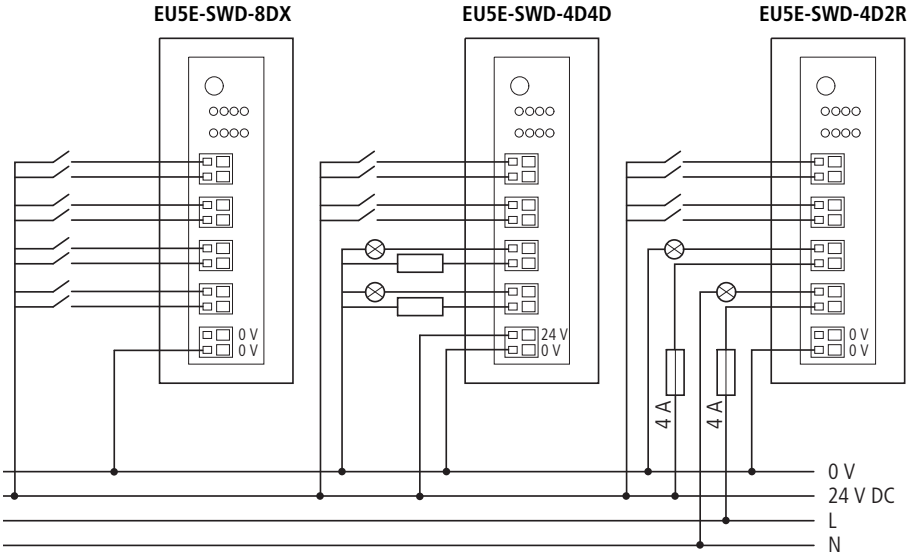


Figure 9: Wiring of the I/O modules

Terminal capacity

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

Placing into operation

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

Exchange of Modules

Caution!
Replacement of the SmartWire-Darwin input/output modules is not permitted until the entire SmartWire-Darwin 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-Darwin units must not be altered.

Device status

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

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

Designation	Colour	Health	Message
SWD	green	continuous light	Device is operating fault-free.
		flashing (1 Hz)	• addressing process in progress – after gateway power On – after actuation of the configuration button on the gateway • slave not in current configuration • invalid part no.
		flashing (3 Hz)	Device reports a diagnosis. (see section "Programming", sub-point "Diagnostics")

Programming

EU5E-SWD-8DX

The module has two input bytes at its disposal.

Inputs
Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	-	-	-	-

Bit	Designation	Meaning
0	not used	-
1	not used	-
2	not used	-
3	not used	-
4	F = Failure	0: No diagnostic alarm
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

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

Diagnostics

The module does not report a diagnosis.

EU5E-SWD-4D4D

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

Inputs
Byte 0:

7	6	5	4	3	2	1	0
	P		F				

Bit	Designation	Meaning
0	not used	-
1	not used	-
2	not used	-
3	not used	-
4	F = Failure	0: No diagnostic alarm 1: Module diagnostics present
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

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	-

Bit	Designation	Meaning
5	not used	-
6	not used	-
7	not used	-

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	-

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 one output at least

EU5E-SWD-4D2R

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

Inputs

Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	-	-	-	-

Bit	Designation	Meaning
0	not used	-
1	not used	-
2	not used	-
3	not used	-
4	F = Failure	0: No diagnostic alarm
5	not used	-
6	P = Modules present	0: module not present 1: module present
7	not used	-

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	

Bit	Designation	Meaning
5	not used	
6	not used	
7	not used	

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	-

Diagnostics
The module does not report a diagnosis.

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

Introduction

The SmartWire-Darwin modules DIL-SWD-32-001 and DIL-SWD-32-002 for DILM are snapped directly onto either a contactor type DILM 7 to DILM 38, 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.

Surface mounting

The following diagram shows the two modules.

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

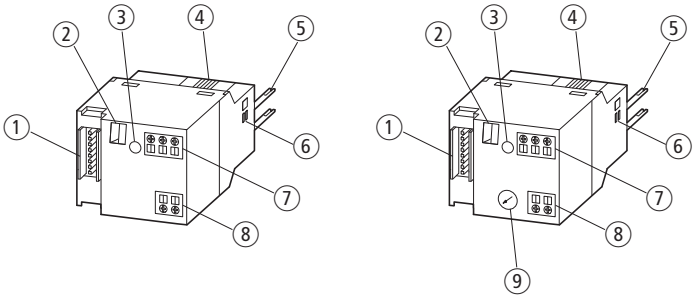


Figure 10: Structure of the SmartWire-Darwin modules DIL-SWD-32-001 and DIL-SWD-32-002 for DILM

① Connection of SmartWire-Darwin 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-Darwin connecting cable is connected to the contactor module DIL-SWD via connection ①.

→ Detailed instructions on adapting the SmartWire-Darwin external device plug (SWD4-8SF2-5) to the 8-pole SmartWire-Darwin 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-Darwin system are indicated by way of a two-colour diagnostics LED ③ (→ section "Device status", page 60).

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

The SmartWire-Darwin module for DILM is connected to the contact bridge of the contactor by way of a ratchet slide 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-Darwin module for DILM to the respective contactor size is performed via the adjusting slide for the contactor size ⑥.

Engineering

The SmartWire-Darwin modules DIL-SWD-32-001 and DIL-SWD-32-002 can be combined with contactors DILM7 to DILM 38. Due to this, motor starters consisting of a motor protective circuit breaker PKZ and a contactor DILM can also be combined with the SmartWire-Darwin system.

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

Table 2: Combination options

Application	Number of SmartWire-Darwin 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-Darwin 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-Darwin system with a DILA as a coupling relay or SmartWire-Darwin I/O module.

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

Table 3: 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]
DIL7 - DIL9	3	125	3	125
DIL12 - DIL15	4.5	188	4.5	188
DIL17 - DIL38	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-Darwin 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 "Power Module EU5C-SWD-PF1-1, EU5C-SWD-PF2-1")

The DIL modules draw their energy for the communication electronics and for activation of the LEDs and of the auxiliary contacts from the SmartWire-Darwin network supply. Please take into consideration the total current consumption of your SmartWire-Darwin 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 185.

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

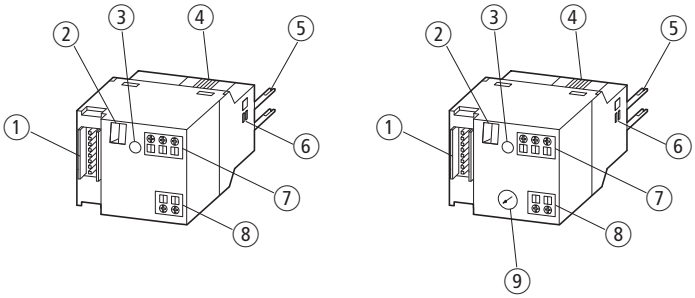


Figure 11: Connections of the SmartWire-Darwin module DIL-SWD-32-001 or DIL-SWD-32-002 for DILM

① Connection of SmartWire-Darwin 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

DOL starter

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

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

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

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

Danger!
The auxiliary contact enable must not be used for safety-related controller parts (→ section "Safety-related applications", page 49).

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

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

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 auxiliary contact enable may have a maximum length of 2.8 m.

The terminals on the SmartWire-Darwin 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-Darwin

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

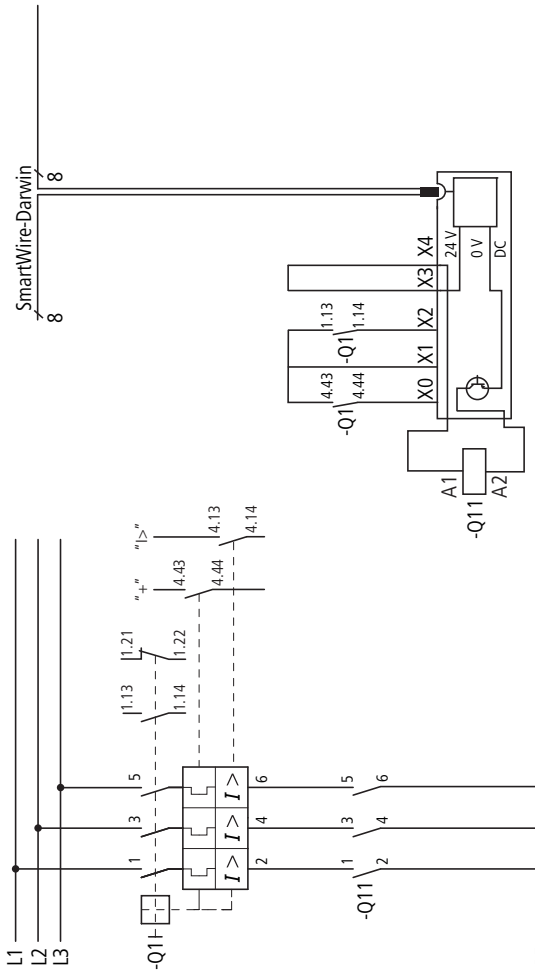


Figure 12: Circuit diagram of the DOL starter

Reversing starter

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

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

Caution!
The SmartWire-Darwin 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 auxiliary contact ⑧ 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 auxiliary contact enable ⑧ must not be used for safety-related controller parts (→ section "Safety-related applications", page 49).

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 protective motor switch 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 auxiliary contact enable may have a maximum length of 2.8 m.

The terminals on the SmartWire-Darwin 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 4: Jumpers 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 jumper DILM12-XEV the circuit Fig. 13 should be used. On the other hand, an electrical interlock with wire jumpers should be implemented according to the circuit Fig. 14.

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-Darwin

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

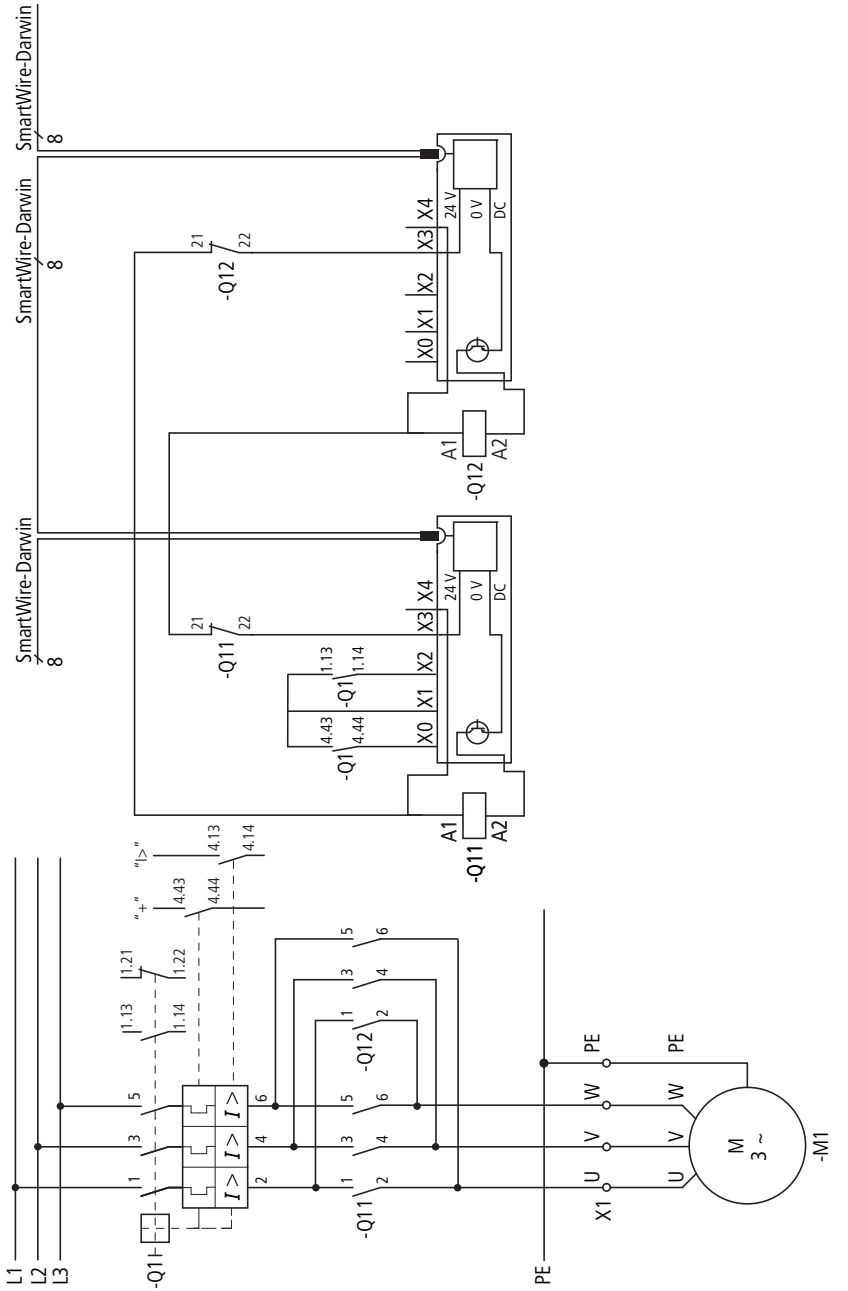


Figure 13: Circuit diagram of the reversing starter in combination with DILM12-XEV

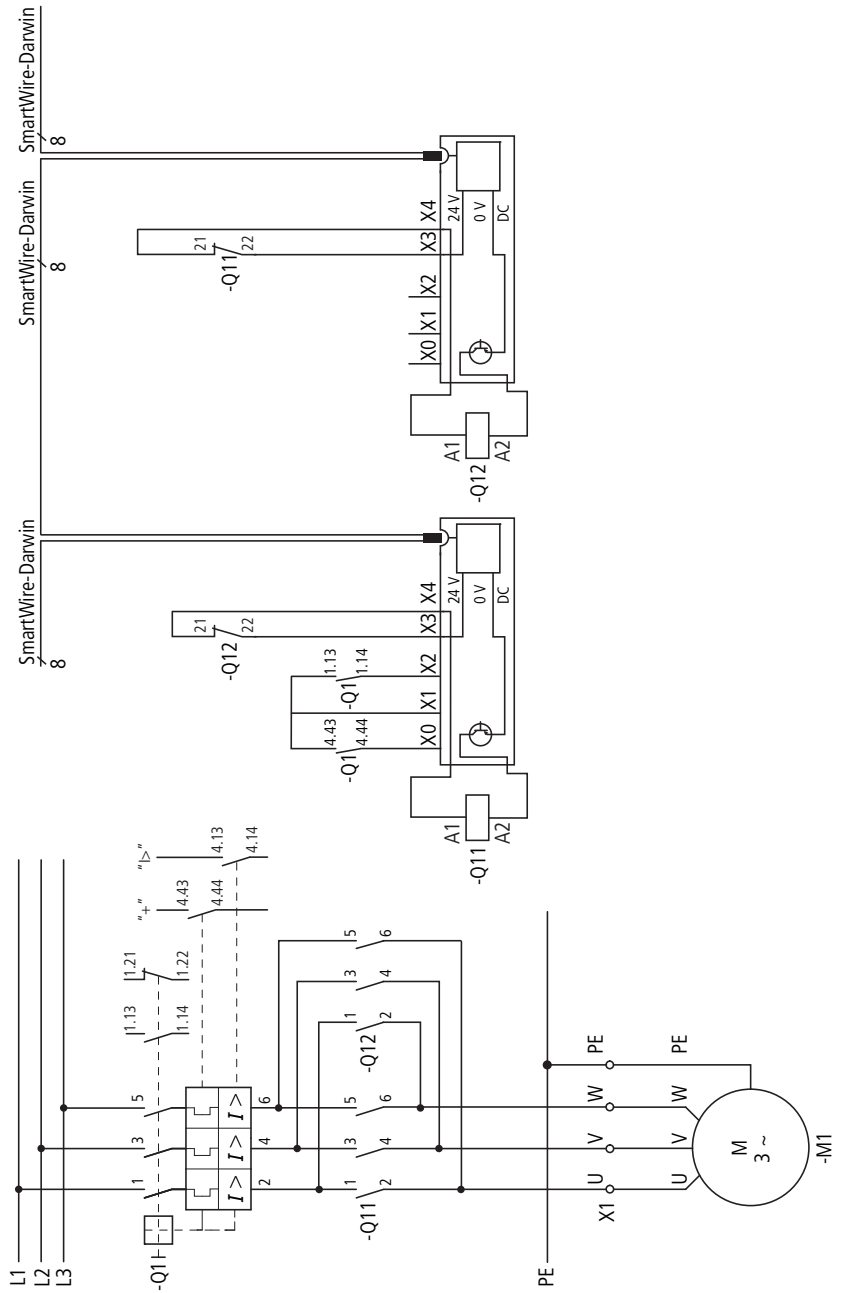


Figure 14: Circuit diagram of the reversing starter

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

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

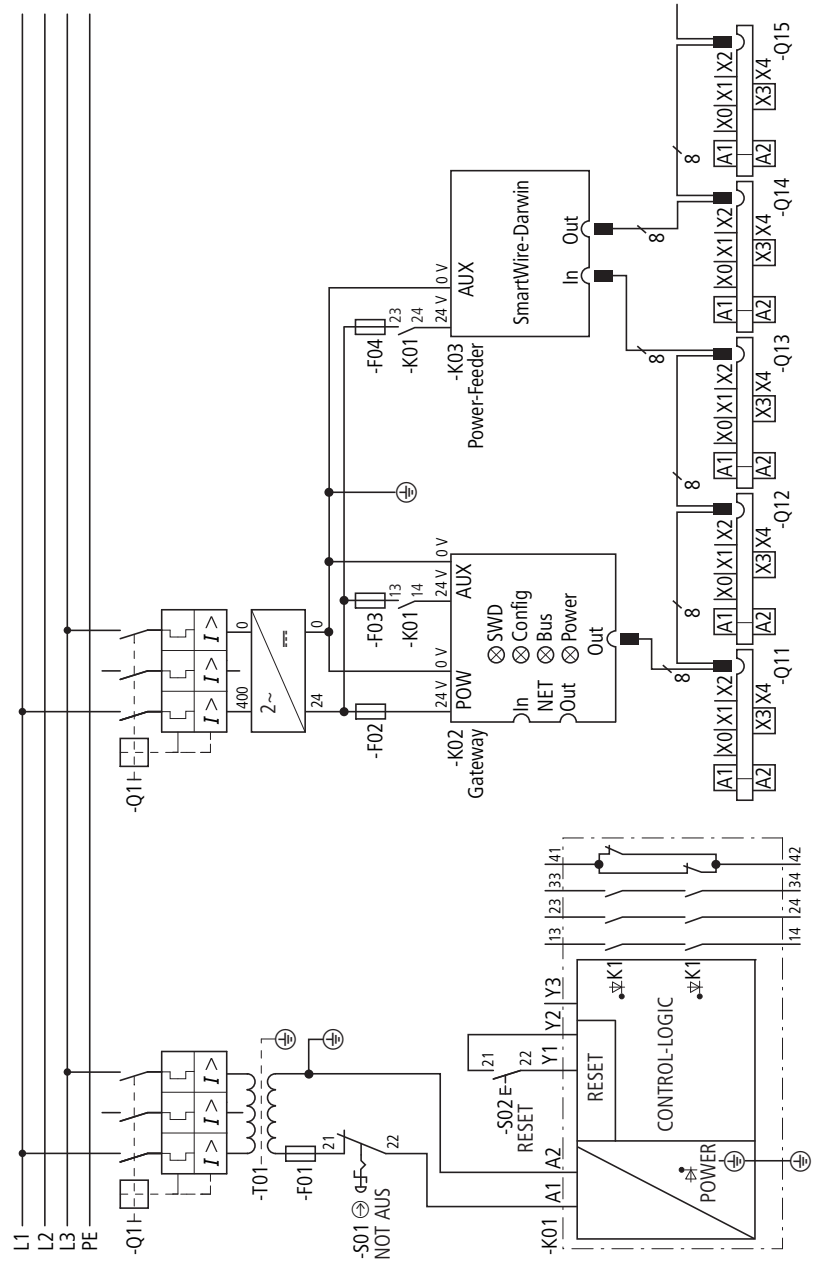


Figure 15: Actuating circuit for safety relevant switch-off

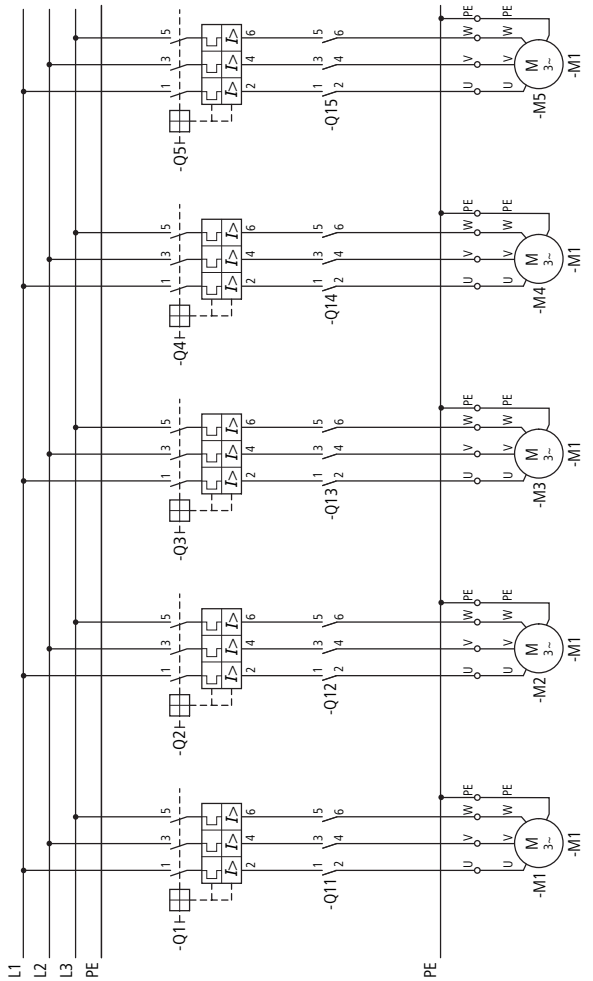


Figure 16: Main circuit for safety relevant switch-offs

In an emergency, the power for the contactor coils can be switched off using the enable circuit of the safety relay. By the use of extra SmartWire-Darwin 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. ESR4-NO-31) in this example.

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.

Measures for higher safety categories

In many applications, safety category 3 or 4 control systems are required in accordance with EN 954-1. Controllers of category 3 can be set up by means of an additional group contactor which is connected in series upstream of the motor feeders. 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. ESR4-NOE-31) to attain this safety category.

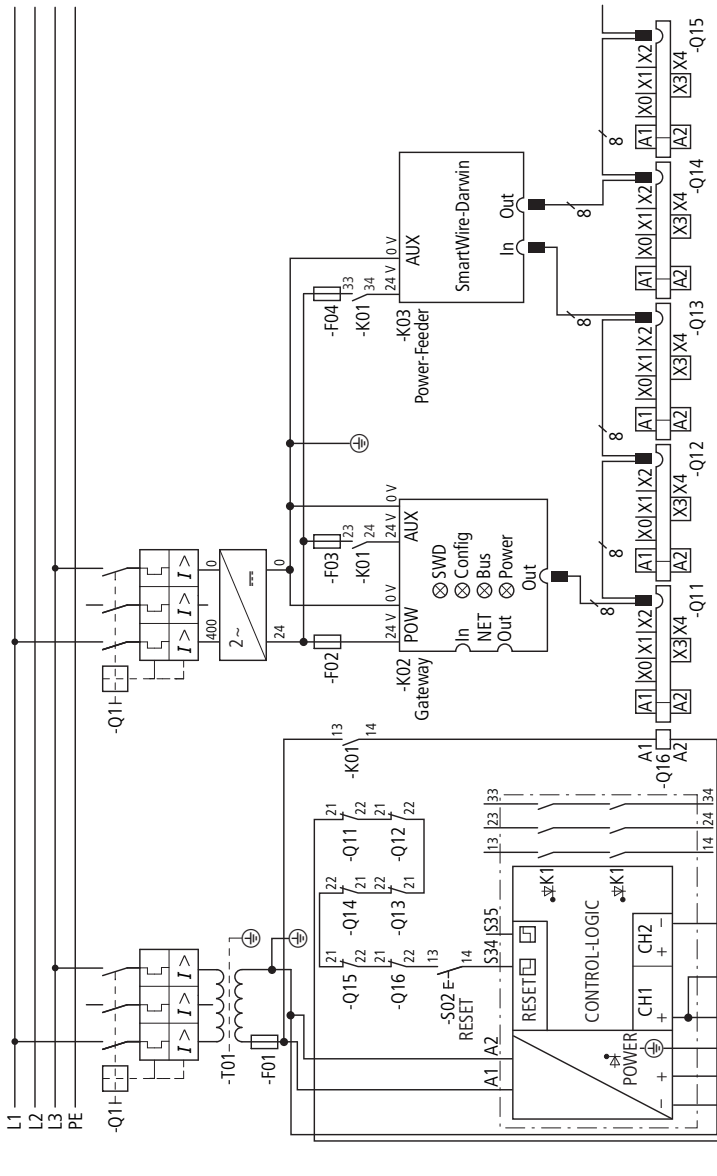


Figure 17: Actuating circuit for redundant switch-off

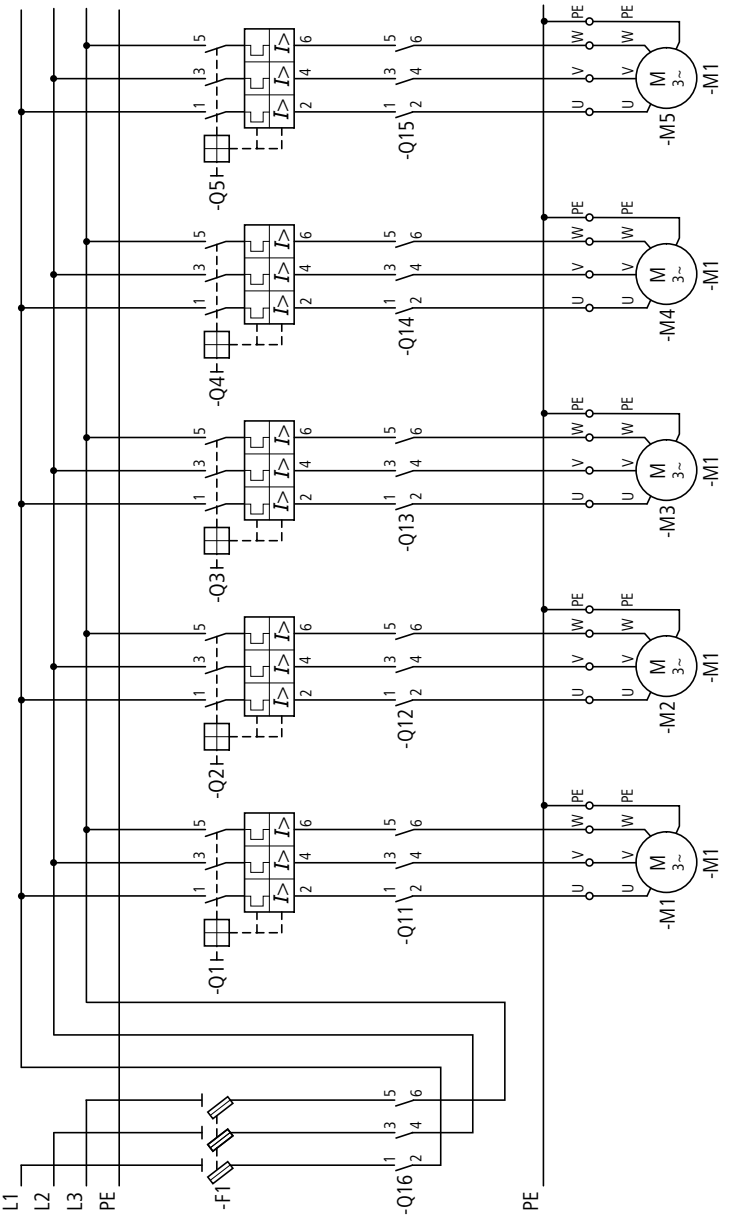


Figure 18: Mains circuit for redundant switch off.

Application for EN ISO13849-1 and EN 62061

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

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

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-Darwin.

Current carrying capacity of the SmartWire-Darwin connecting cable in accordance with NFPA 79
If the SmartWire-Darwin connection system is used for applications in North America, the maximum current carrying capacity of the SmartWire-Darwin connecting cable is reduced from 3 A to 2 A.

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

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 Eaton publication "Special Conditions for the Use of Protective Motor Switches and Motor Starters in North America", VER1210+1280-928. You can find this in the form of a PDF document at the following Internet address:

http://www.moeller.net/en/company/news/publications/index.jsp

Reversing starter

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

Installation

The SmartWire-Darwin 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-Darwin module for DILM.

Caution!
The SmartWire-Darwin 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-Darwin module for the corresponding contactor.

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

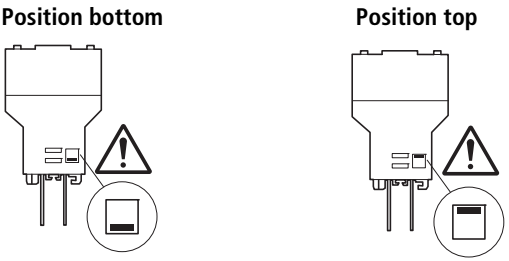


Figure 19: Adjustment of the adjusting slide on DIL-SWD-32-001 or DIL-SWD-32-002

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

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

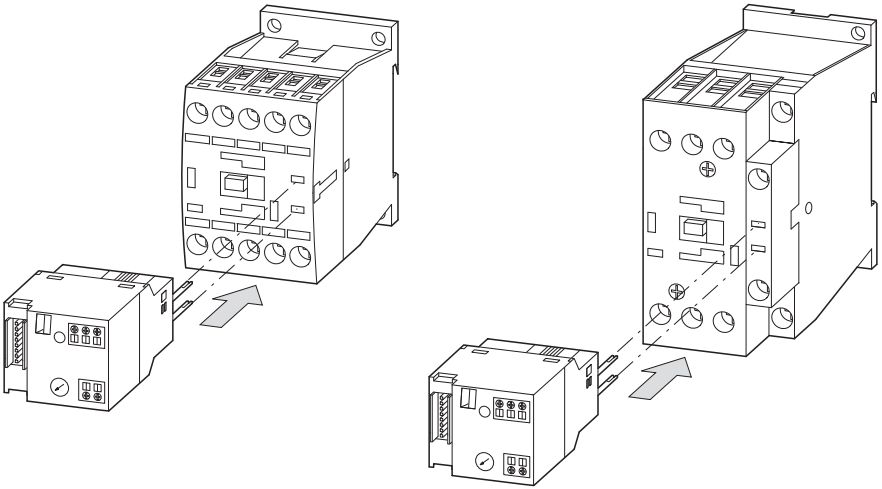


Figure 20: Placement of the DIL-SWD-32-001 or DIL-SWD-32-002 onto the contactor

▶ Lock the SmartWire-Darwin module for DILM

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

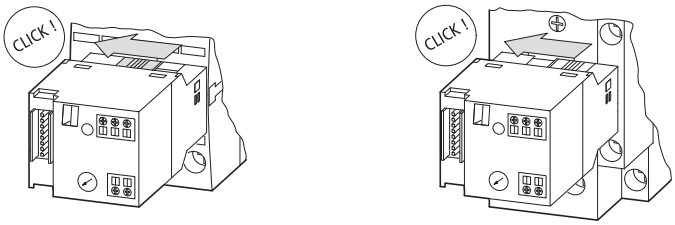


Figure 21: Locking of the DIL-SWD-32-001 or DIL-SWD-32-002

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

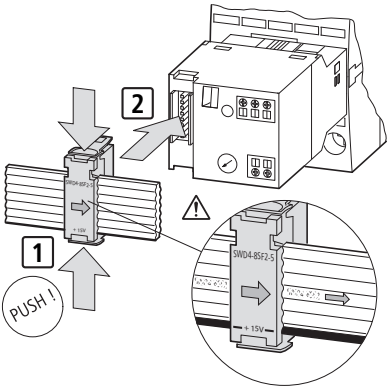


Figure 22: Connection of SmartWire-Darwin external device plug

Placing into operation

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

Exchange of Modules

Danger!
The exchange of the SmartWire-Darwin 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 sequence of the SmartWire-Darwin slaves must not be altered.

Motor starter or contactor

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

Device status

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

Table 5: Diagnostic messages of the SmartWire-Darwin module for DILM (LED indicator)

Designation	Colour	Health	Message
Ready	Orange	continuous light	Switching command for contactor via SmartWire-Darwin
	Green	continuous light	Device is operating fault-free.
		flashing (1 Hz)	• addressing process in progress – after gateway power On – after actuation of the configuration button on the gateway • slave not in current configuration • invalid part no.

Programming

DIL-SWD-32-001

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

Inputs
Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	-	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	F = Failure	0: No diagnostic alarm
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

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	-

Diagnostics

The module does not report a diagnosis.

DIL-SWD-32-002

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

Inputs
Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	M	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	M = Manual	0: Automatic 1: Manual mode
4	F = Failure	0: No diagnostic alarm
5	not used	–
6	P = Module present	0: module not present 1: module present
7	not used	–

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	-

Diagnostics

The module does not report a diagnosis.

4 Control Circuit Devices M22-SWD…

Introduction

The function elements M22-SWD… are combined together with front elements of the RMQ Titan system to form control circuit 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-Darwin 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.

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.

Surface mounting

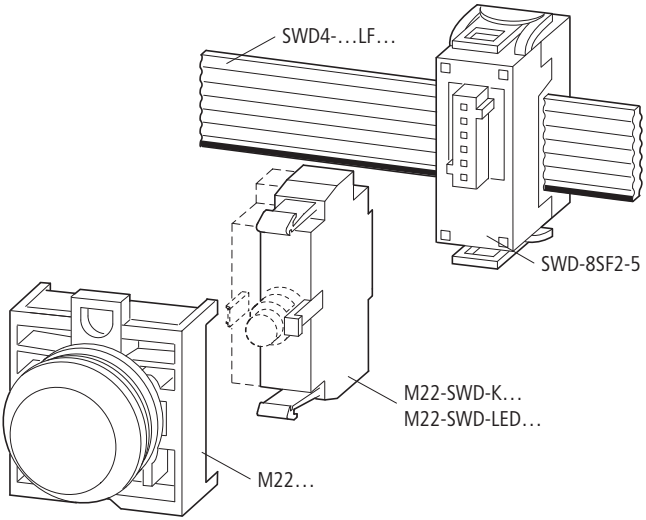


Figure 23: Layout M22-SWD front mount

Engineering

The SmartWire-Darwin front function elements are used instead of the previous M22-K10-/K01 contact elements and the corresponding M22 LED… indication elements. The previous elements for the control circuit function are used on the front.

One SmartWire function element is used per M22-A adapter. Mounting is always performed in the middle position. Correspondingly more efficient function elements are used for the combined functions of a luminous command device or for the realization of a multi-step switch. 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-K11LED).

M22-SWD-K11
This function element replaces the previous contact elements M22-K10/K01. It provides a changeover contact by means of which both a breaker and maker function can be realized. The previously possible "piggy-back" combination consisting of an M22-K01 and -K10 element can also be replaced by a single M22-SWD-K11 element. The function element is used in combination with M22 (pushbutton) actuators.

Further M22-K10-/01 contact elements can be installed here in the free location of the M22-A adapter.

A possible application is, for example, conventional switching via an M22-K… contact element and the reporting of this process to the PLC via the M22-SWD-K11 function element.

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.

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.

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.

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 possibilities of combining M22 front elements with SmartWire-Darwin function elements for front mount are listed in the following table.

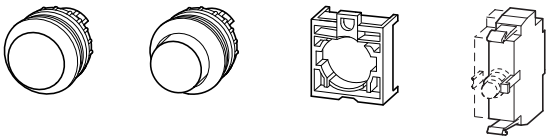


Figure 24: SWD function elements

Table 6: Possibilities of combining the M22 front element with SWD function elements

Front element	Adapters	SmartWire-Darwin 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-Darwin 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 7: 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	O	X[1)]	O[2)]
M22-SWD-LED	O	X	O
M22-SWD-K11LED	O	X	O
M22-SWD-K22	O	X	X
M22-SWD-K22LED	O	X	X

1) X = occupied by SWD element

2) O = optional for an additional M22-K10/K01 element

→ The function elements obtain the energy for communication electronics and driving the LED from the SmartWire-Darwin network supply.

Please take into consideration the total current 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 185.

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

Installation

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

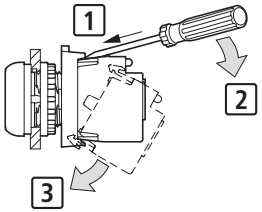


Figure 25: Connection to the adapter

The SmartWire-Darwin flat ribbon cable is to connected to the SmartWire-Darwin network.

The external device plug SWD4-8SF2-5 is used for bonding with the M22-SWD function element. This completes installation.

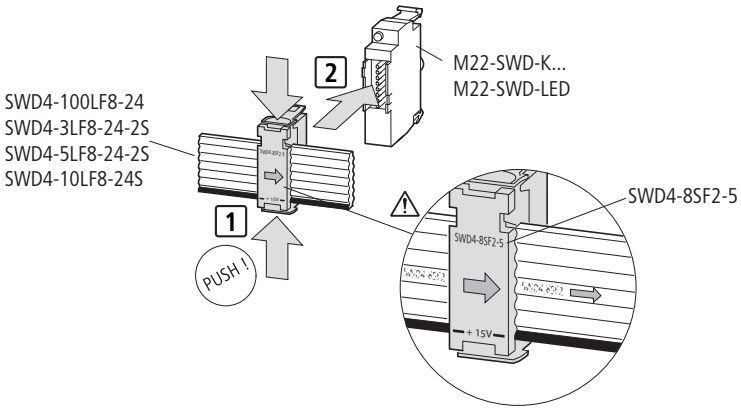


Figure 26: Connection of the function element to the SWD flat ribbon cable

Placing into operation

The automatic addressing of all slaves in the SmartWire-Darwin network is performed via the gateway (actuation of the configuration pushbutton on the gateway) during commissioning. During the addressing process the SmartWire-Darwin 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.

Exchange of Modules

Caution!
Replacement of the SmartWire-Darwin function elements is not permitted until the entire SmartWire-Darwin 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 sequence of the SmartWire-Darwin slaves must not be altered.

Device status

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

Table 8: Diagnostic messages of the SmartWire-Darwin status LED

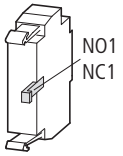
Designation	Colour	Health	Message
SWD	Green	continuous light	Device is operating fault-free.
		flashing (1 Hz)	• addressing process in progress – after gateway power On – after actuation of the configuration button on the gateway • slave not in current configuration • invalid part no.
		flashing (3 Hz)	Device reports a diagnostics. (→ section "Programming", sub-point "Diagnostics".)

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.

M22-SWD-K11

The function element has one input byte at its disposal.



Inputs
Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	-	-	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	F = Failure	0: No diagnostic alarm 1: diagnosis present
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

Outputs

None

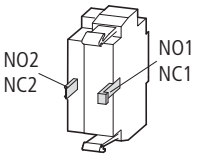
Diagnostics

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

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

M22-SWD-K22

The function element has one input byte at its disposal.



Inputs
Byte 0:

7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
-	P	-	F	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	F = Failure	0: No diagnostic alarm 1: diagnosis present
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

Outputs

None

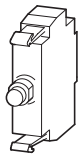
Diagnostics

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

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

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

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



Inputs
Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	-	-	-	-

Bit	Designation	Meaning
0	not used	-
1	not used	-
2	not used	-
3	not used	-
4	F = Failure	0: No diagnostic alarm
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

Outputs

Byte 0:

7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	Q0

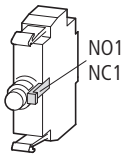
Bit	Designation	Meaning
0	Q0	Activation of the LED
1	not used	-
2	not used	-
3	not used	-
4	not used	-
5	not used	-
6	not used	-
7	not used	-

Diagnostics

The module does not report a diagnosis.

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

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



Inputs

Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	-	-	NC1	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	F = Failure	0: No diagnostic alarm 1: diagnosis present
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

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	-

Outputs

None

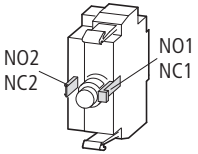
Diagnostics

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

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

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

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



Inputs
Byte 0:

7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
-	P	-	F	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	F = Failure	0: No diagnostic alarm 1: diagnosis present
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

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	-

Outputs

None

Diagnostics

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

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

M22-SWD base fixing

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

Surface mounting

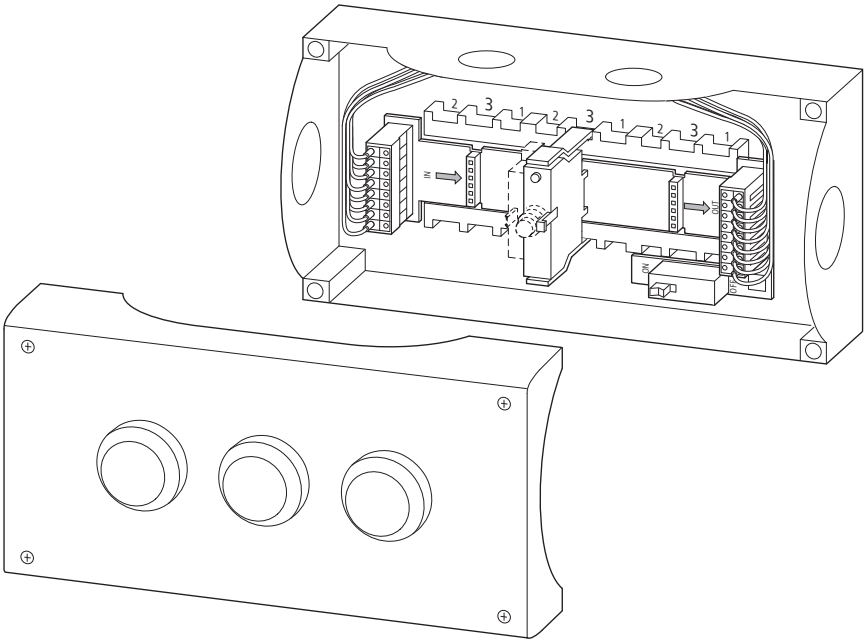


Figure 27: Base elements with enclosure

Engineering

The SmartWire-Darwin 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 printed circuit boards create the connection with the SmartWire-Darwin 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-Darwin network via the SmartWire-Darwin 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.

Connection of the round cable to the cable gland

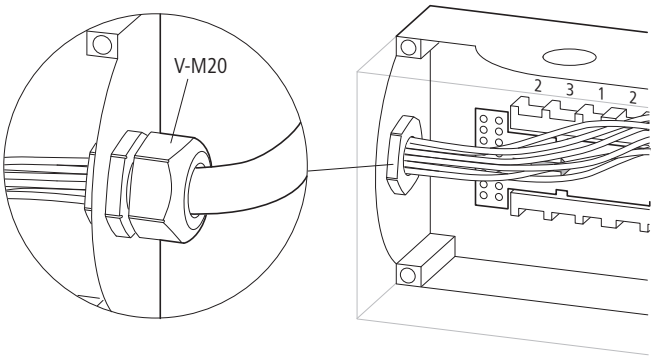


Figure 28: Connection with a cable gland

Connection of the round cable via a plug connection

The SmartWire-Darwin PCB 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

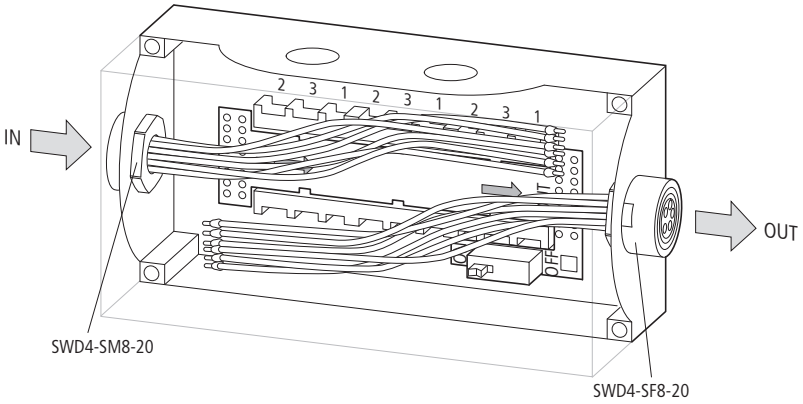


Figure 29: Plug connection

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-Darwin bridge M22-SWD-SEL8-10, otherwise the SmartWire-Darwin network will be interrupted.

The PCBs contain a switchable terminating resistor for the SmartWire-Darwin network. If the surface mounting enclosure is the last slave in the network, the terminating resistor must be switched on.

You can also obtain information about terminating resistors and on the use of the SWD link via the software program SWD-Assist.

http://downloadcenter.moeller.net

One SmartWire-Darwin function element is used per slot. Correspondingly more efficient function elements are used for the combined function of a luminous command device or for the realization of a multi-step switch.

A luminous pushbutton, which previously had to be realized as a combination of several elements, can now be realized simply by means of one combination element (LED indicator + contact element = M22-SWD-K11LEDC).

M22-SWD-KC11
This function element replaces the previous contact elements M22-KC10/KC01. It provides a changeover contact by means of which both a breaker and maker function can be realized. The function element is used in combination with M22 (pushbutton) actuators.

Further M22-KC10-/KC01 contact elements can be installed here in the free locations in the surface mounting enclosure.

A possible application is, for example, conventional switching via an M22-K… contact element and the reporting of this process to the PLC via the M22-SWD-K11 function element.

M22-SWD-KC22
This function element replaces multiple combinations of the previous contact elements M22-KC10/KC01. It provides two changeover contacts, by means of which control switches can be operated with up to three-position indication.

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

→ Further M22-KC… contact elements can be installed here in the free locations in the surface mounting enclosure.

M22-SWD-K11LEDC… (Multiple Function Elements)
These functional elements contain a changeover contact and an LED element in the colours white, blue, green and red. They replace previous combinations consisting of a contact element M22-KC01 or -KC10 and an M22 LEDC… element. They are used in combination with illuminated pushbuttons or selector switch buttons.

M22-SWD-K22LEDC… (Multiple Function Elements)
These functional elements contain two changeover contacts and an LED element in the colours white, blue, green and red. They replace previous combinations consisting of several contact elements M22-KC01 or -KC10 and an M22-LEDC… element. They are used in combination with luminous 3-position selector switches.

→ There is no possibility of connecting an M22S-WJ4 joystick element.

All possibilities of combining M22 front elements with SmartWire-Darwin base function elements are listed in the following table.

Front element	SWD function element (Base fixing)
M22(S)-PV(T)	M22-SWD-KC11
M22(S)-PVL(T)	M22-SWD-K11LEDC
M22(S)-DDL	M22-SWD-K22LEDC
M22(S)-D(R)(H)	M22-SWD-KC11
M22(S)-D(R)P	M22-SWD-KC11
M22(S)-W(R)K	M22-SWD-KC11
M22(S)-WKV	M22-SWD-KC11
M22(S)-W(R)K3	M22-SWD-KC22
M22(S)-W(R)S-(SA)	M22-SWD-KC11
M22(S)-W(R)S3-(SA)	M22-SWD-KC22
M22(S)-L(H)	M22-SWD-LEDC
M22(S)-D(R)L(H)	M22-SWD-K11LEDC
M22(S)-W(R)LK	M22-SWD-K11LEDC
M22(S)-W(R)LK-3	M22-SWD-K22LEDC
M22(S)-WLKV-3	M22-SWD-K22LEDC

The SmartWire-Darwin 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 shows what possibilities there are.

Table 9: 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-Darwin network supply. So please take into consideration the total current consumption of your SmartWire-Darwin 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 185.

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

http://downloadcenter.moeller.net

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 slaves. (the gateway is to the left of the IN code.)

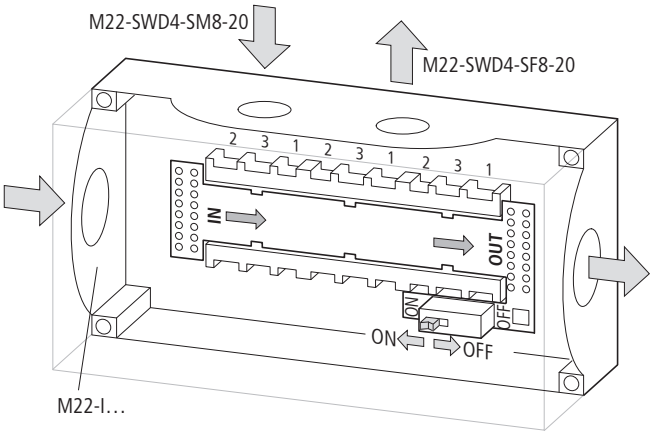


Figure 30: Surface mounting enclosure with PCB M22-SWD-ILP…

▶ Fix the SWD cables to the PCB terminals. Ensure that the colour assignment is correct.

▶ If this is the last SWD slave, please switch on the terminating resistor.

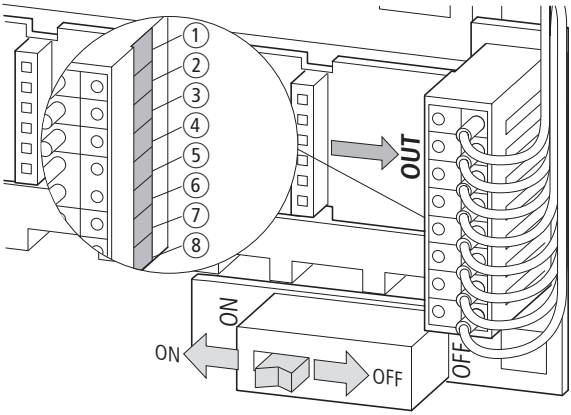


Figure 31: Terminating resistor

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

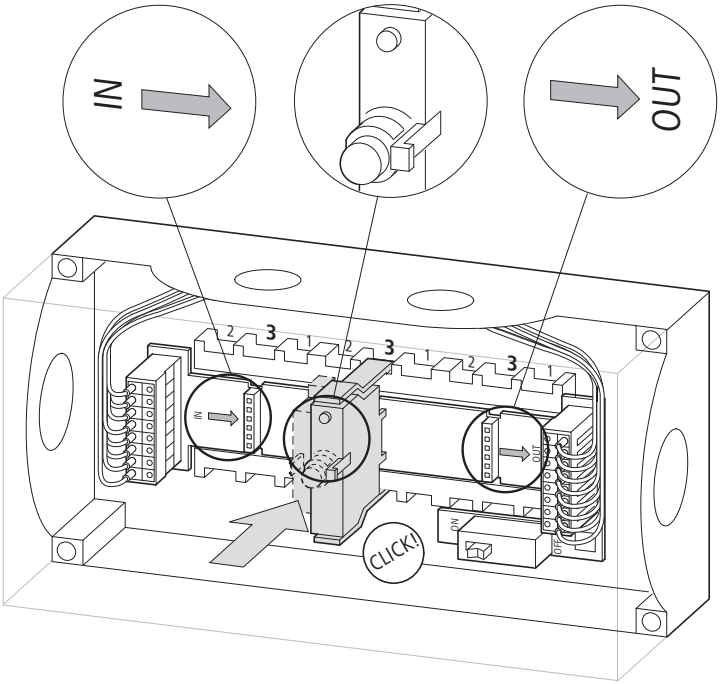


Figure 32: Equipping the enclosure slots

Placing into operation

The automatic addressing of all slaves in the SmartWire-Darwin network is performed via the gateway (actuation of the configuration pushbutton on the gateway) during commissioning. During the addressing process the SmartWire-Darwin diagnostics LED on the top side of the M22 SmartWire-Darwin base function element flashes. Once the addressing process is completed, the LED indicates a green continuous light.

Exchange of Modules

Caution!
Replacement of the SmartWire-Darwin function elements is not permitted until the entire SmartWire-Darwin 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 sequence of the SmartWire-Darwin slaves must not be altered.

Device status

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

Table 10: Diagnostic messages of the SmartWire-Darwin status LED

Designation	Colour	Health	Message
SWD	Green	continuous light	Device is operating fault-free.
		flashing (1 Hz)	• addressing process in progress – after gateway power On – after actuation of the configuration button on the gateway • slave not in current configuration • invalid part no.
		flashing (3 Hz)	Device reports a diagnostics. (→ section "Programming", sub-point "Diagnostics".)

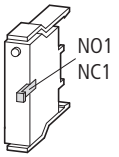
Designation	Colour	Health	Message
SWD	green	continuous light	Device is operating fault-free.
		Flashing	Device is not in the configuration, first faulty device in the series – no communication
		pulsating flash	The SmartWire-Darwin module is carrying a voltage, the previous device has caused an error – no communication pending

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.

M22-SWD-KC11

The function element has one input byte at its disposal.



Inputs

Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	-	-	NC1	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	F = Failure	0: No diagnostic alarm 1: diagnosis present
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

Outputs

None

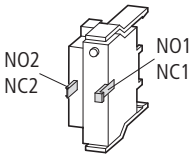
Diagnostics

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

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

M22-SWD-KC22

The function element has one input byte at its disposal.



Inputs

Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	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	F = Failure	0: No diagnostic alarm 1: diagnosis present
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

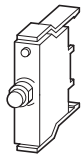
Outputs
None

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

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

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

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



Inputs
Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	-	-	-	-

Bit	Designation	Meaning
0	not used	-
1	not used	-
2	not used	-
3	not used	-
4	F = Failure	0: No diagnostic alarm
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

Outputs

Byte 0:

7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	Q0

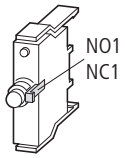
Bit	Designation	Meaning
0	Q0	Activation of the LED
1	not used	-
2	not used	-
3	not used	-
4	not used	-
5	not used	-
6	not used	-
7	not used	-

Diagnostics

The module does not report a diagnosis.

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

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



Inputs
Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	-	-	NC1	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	F = Failure	0: No diagnostic alarm 1: diagnosis present
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

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	-

Outputs

None

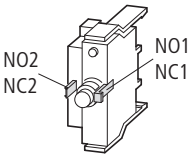
Diagnostics

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

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

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

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



Inputs

Byte 0:

7	6	5	4	3	2	1	0
-	P	-	F	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	F = Failure	0: No diagnostic alarm 1: diagnosis present
5	not used	-
6	P = Module present	0: module not present 1: module present
7	not used	-

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	-

Outputs

None

Diagnostics

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

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

5 Interface for motor starter combination with PKE12/32 PKE-SWD-32

Introduction

The PKE-SWD-32 SmartWire-Darwin 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 the PKE electronic motor protective circuit breaker are described in 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.

Interoperability with SmartWire-Darwin gateways

The following firmware versions of the SmartWire-Darwin gateways ensure interoperability with the PKE-SWD-32 SmartWire-Darwin module:

Table 11: Firmware versions SmartWire-Darwin gateways

SmartWire-Darwin gateway	Firmware version
EU5C-SWD-CAN	V 1.10
EU5C-SWD-DP	V 1.10

The firmware of the SmartWire-Darwin gateway can be updated using the SWD-Assist program. This program and firmware versions are available for free at:

http://downloadcenter.moeller.net

Fieldbus description files

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

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

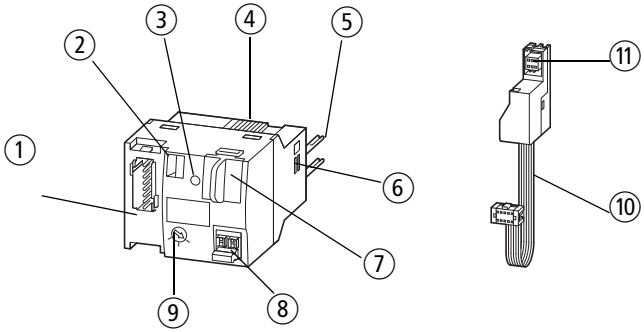
SmartWire-Darwin gateway	Description file
EU5C-SWD-CAN	EU5C-SWD-CAN_V110.eps
EU5C-SWD-DP (Intel-based CPU)	Moe4d14.gsd
EU5C-SWD-DP (Motorola-based CPU)	Moel4d14.gsd

SWD-Assist

The SWD-Assist planning and ordering help system provides valuable support in the project planning of your SWD topology. SWD-Assist is software that runs on Windows 2000 (SP 4), XP or Vista (32-bit) and relieves you of the planning work required for an SWD topology. The SWD-Assist software can be used from version V 1.10 together with the PKE-SWD-32 SmartWire-Darwin module. The software is available free of charge at:

http://downloadcenter.moeller.net

Surface mounting



PKE-SWD-32 PKE32-COM

Figure 33: Connections PKE-SWD-32 and PKE32-COM-Module

① Connection of SmartWire-Darwin 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-Darwin-external device plug with an adapted SmartWire-Darwin connecting cable is connected to the module PKE-SWD-32 via connection (a).

→ Detailed instructions on adapting the SmartWire-Darwin external device plug (SWD4-8SF2-5) to the 8-pole SmartWire-Darwin 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-Darwin system (→ section "Device status", page 139).

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

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 indicator 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-Darwin network.

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

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-Darwin contactor modules (→ chapter "Switching on Contactors DIL-SWD-32-001, DIL-SWD-32-002", page 35).

Table 13: Combination possibilities

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-Darwin 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 pick-up power of the simultaneously tripping contactors and the sum of the holding power of the tripped contactors for each SmartWire-Darwin 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 "Power Module EU5C-SWD-PF1-1, EU5C-SWD-PF2-1", page 11).

The PKE-SWD-32 draws its energy for the communication electronics and for controlling the LED from the SmartWire-Darwin network supply. Please take into consideration the total current consumption of your SmartWire-Darwin 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 185.

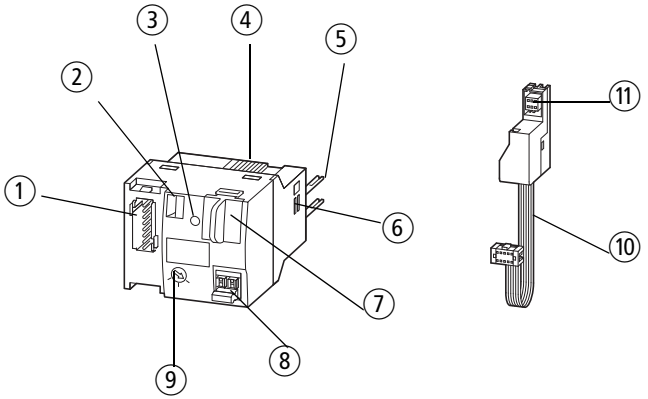


Figure 34: Connections PKE-SWD-32 and PKE32-COM-Module

① Connection of SmartWire-Darwin 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…

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-Darwin network.

The PKE32-COM is mounted to the PKE basic unit (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 locks are envisaged in the application, the bridge can be removed and a potential-free contact can be connected.

The auxiliary contact for the electrical enable ⑧ can be used on the PKE_SWD32 for safety-related control sections (→ section "Safety-related applications", page 122).

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-Darwin

→ 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-Darwin connecting cable.

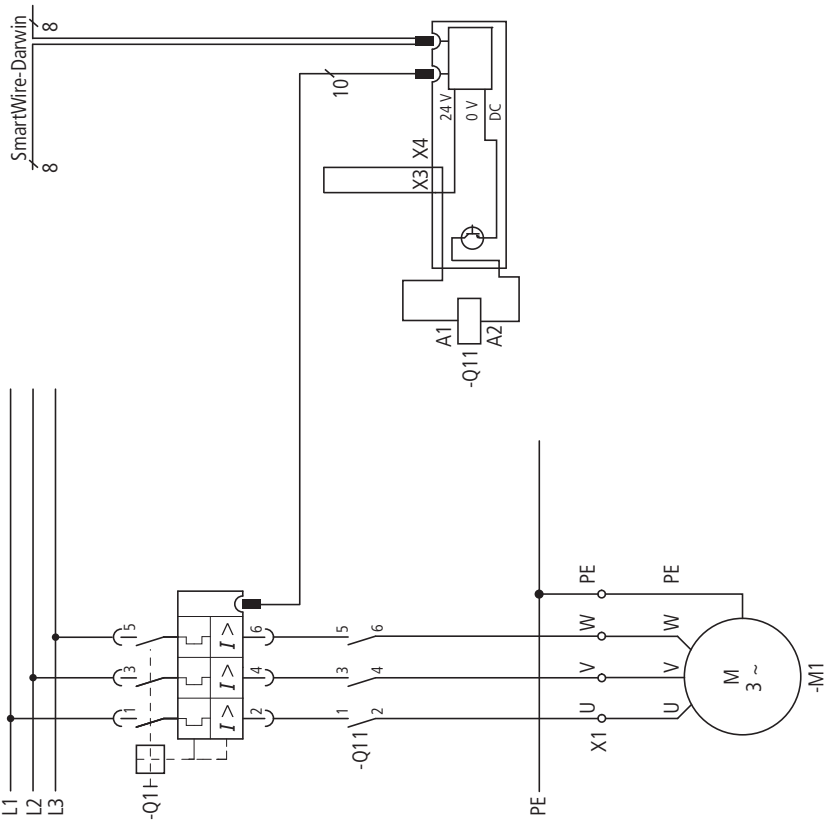


Figure 35: Circuit diagram of the DOL starter

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-Darwin contactor module (DIL-SWD-32-…).

Danger!
With reversing starters, the ZMR function must not be activated as this does not ensure the switching off of the second contactor in the event of an overload (→ section "Overload relay function (ZMR)", page 149).

Caution!
The SmartWire-Darwin-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 auxiliary contact ⑧ 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 "Safety-related applications", page 122).

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 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:

	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 jumper DILM12-XEV the circuit Figure36 should be used. On the other hand, an electrical interlock with wire jumpers should be implemented according to the circuit Figure37.

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-Darwin

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-Darwin connecting cable.

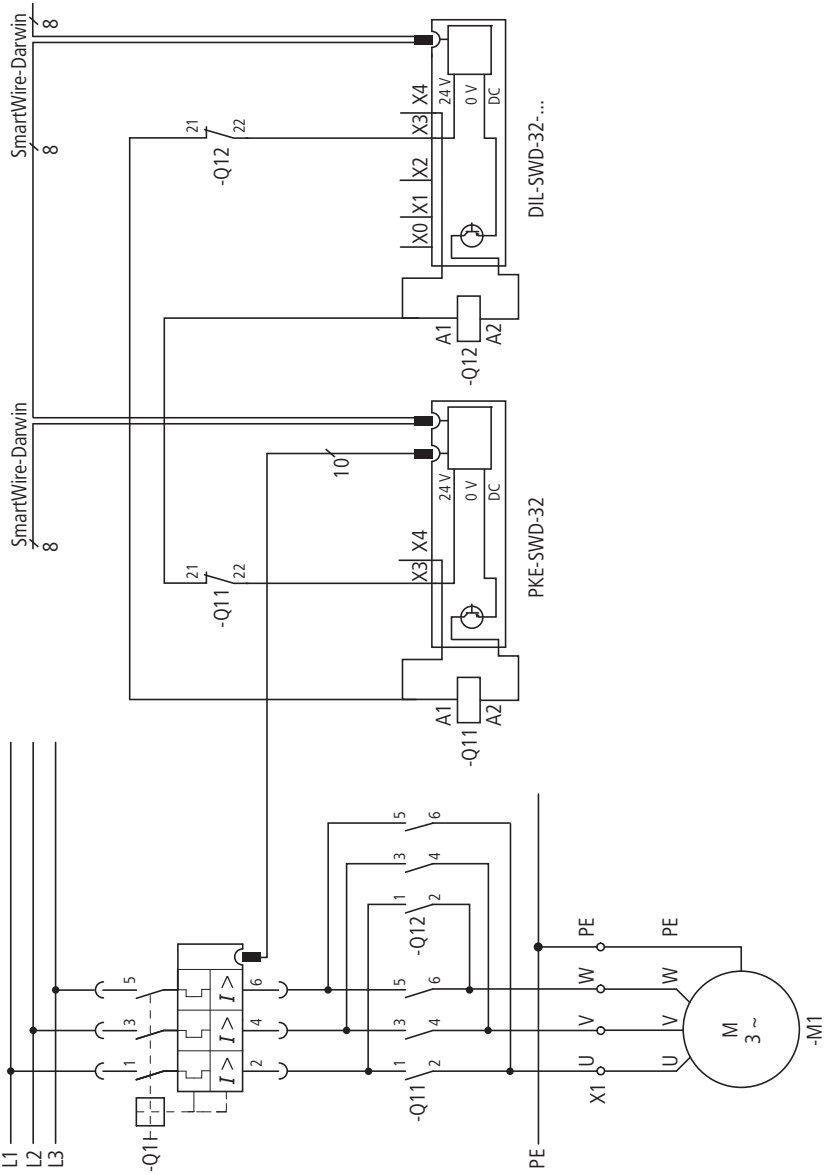


Figure 36: Circuit diagram of the reversing starter in combination with DILM12-XEV

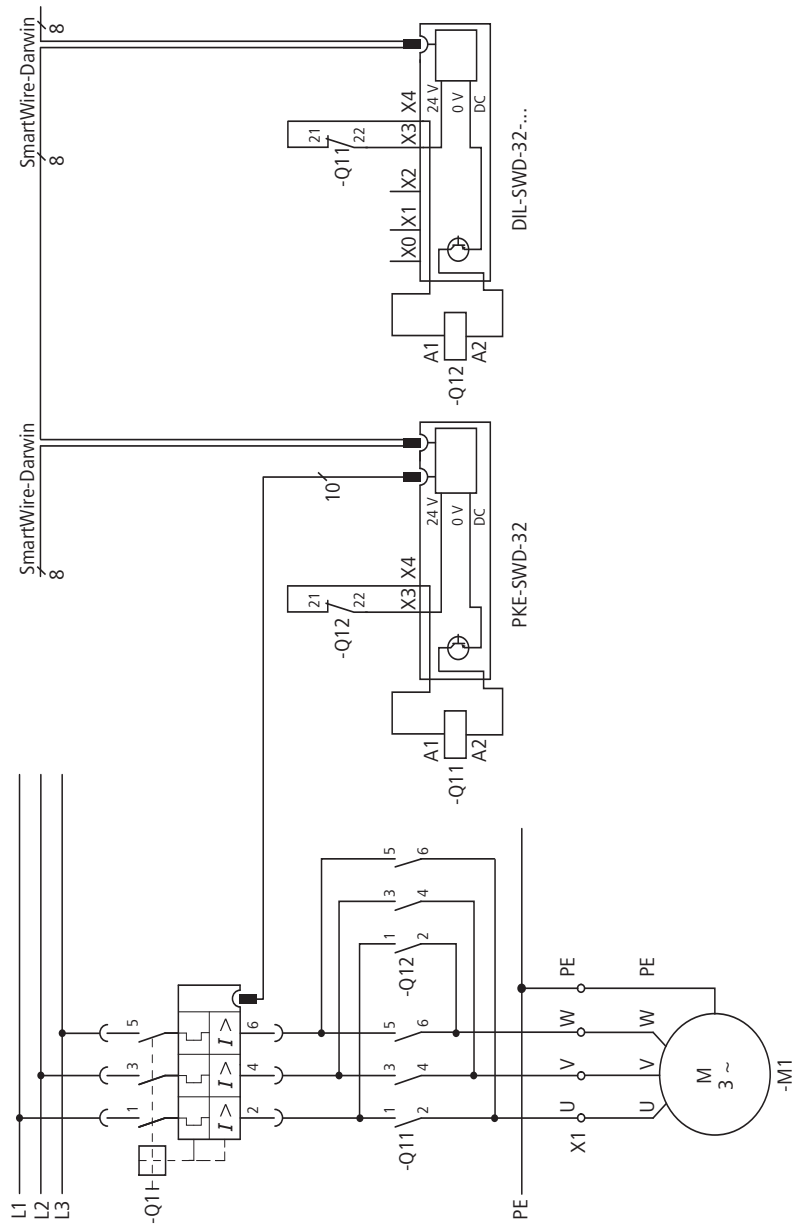


Figure 37: Circuit diagram of the reversing starter

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

Danger!
In safety-relevant applications the power supply providing power to the SmartWire-Darwin system must feature a PELV power supply unit

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 cables (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).
- Cables are provided as various non-metallic-sheathed cables.
- Cables are located inside an electrical mounting area (e.g. switch cabinet).
- Cables are protected by a ground connection.

Safety-related disconnection of a single drive

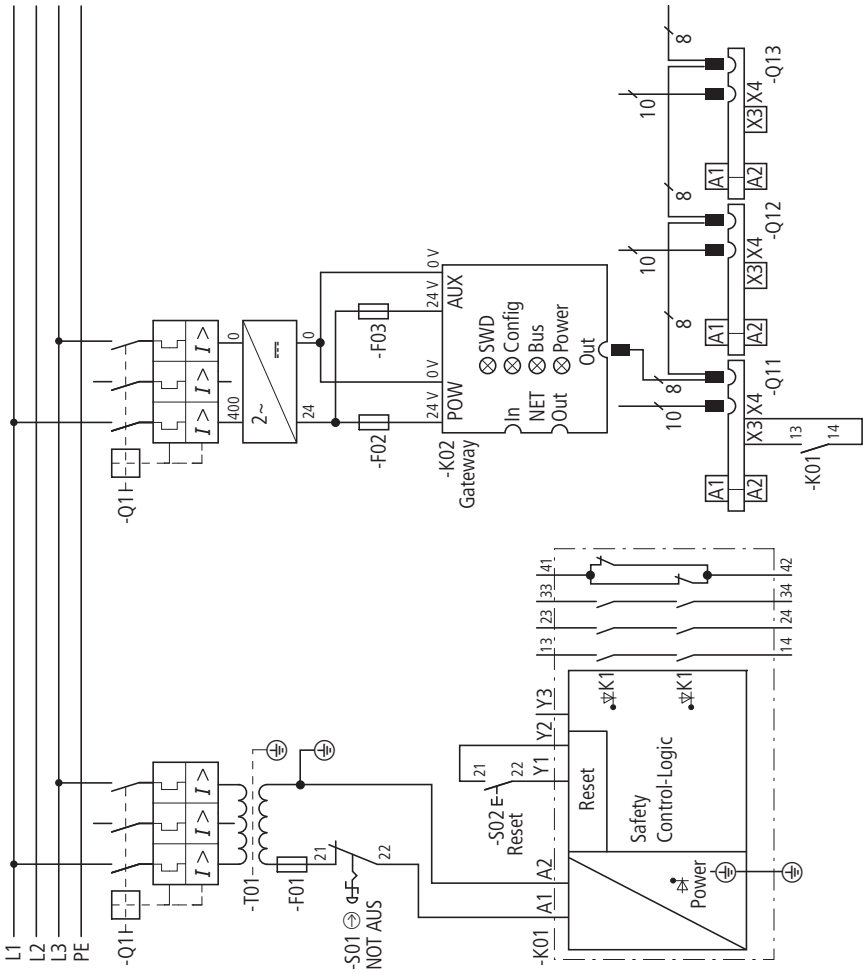


Figure 38: Control circuit for safety-related disconnection of a single drive

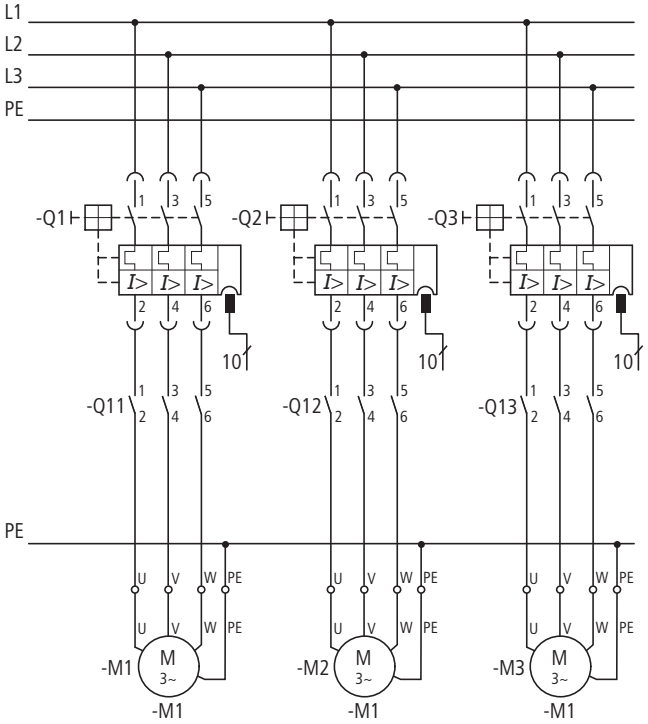


Figure 39: Mains circuit for safety-related disconnection of a single drive

The safety disconnection of a single drive can be implemented on the PKE-SWD-32 via the Enable auxiliary contact (terminal X3-X4). In the event of an emergency, the control voltage is interrupted by including the Enable path of a safety relay or a positively driven NC contact of an emergency-stop switch. This type of circuit allows the creation of control circuits up to Safety Category 1 to EN 954-1. In this example, the safety relay must comply with category 1 or higher (e.g. ESR4-NO-31).

Safety-related disconnection of drive groups

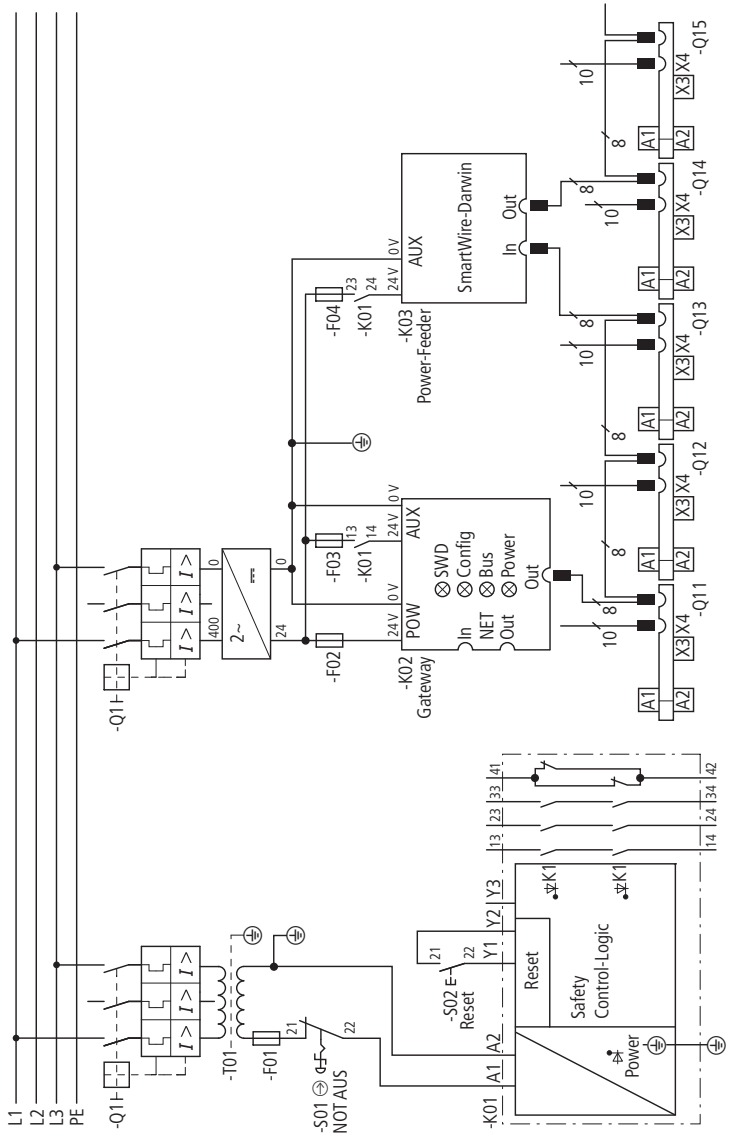


Figure 40: Control circuit for safety-related disconnection of drive groups

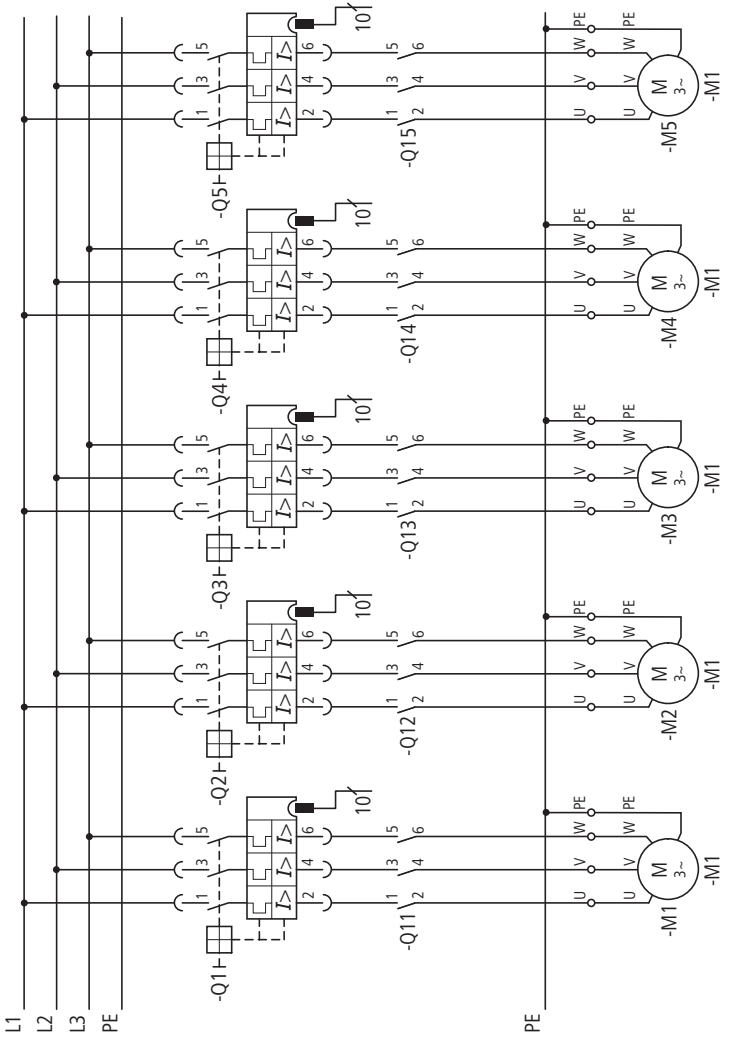


Figure 41: Main circuit for safety-related disconnection of drive groups

In an emergency, the power for the contactor coils can be switched off using the enable circuit of the safety relay. By the use of extra SmartWire-Darwin 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. ESR4-NO-31) in this example.

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.

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. ESR4-NOE-31) to attain this safety category.

Redundant disconnection of a single drive

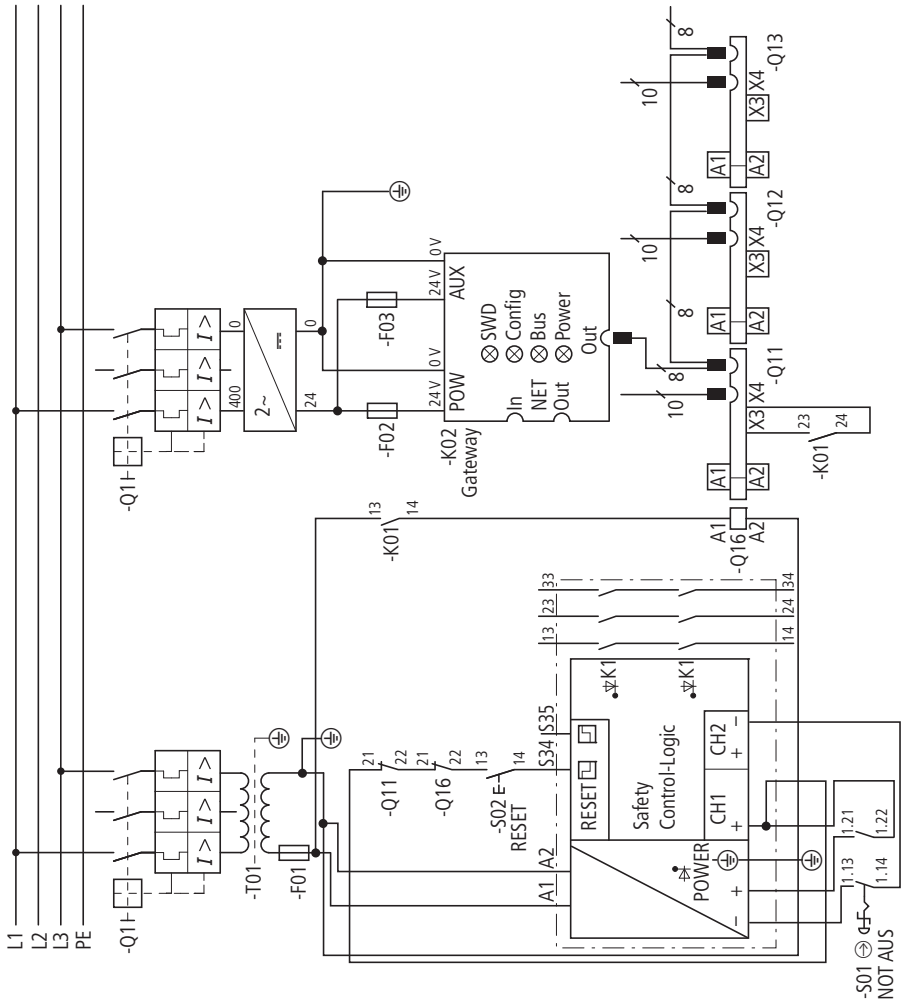


Figure 42: Control circuit for redundant disconnection of a single drive

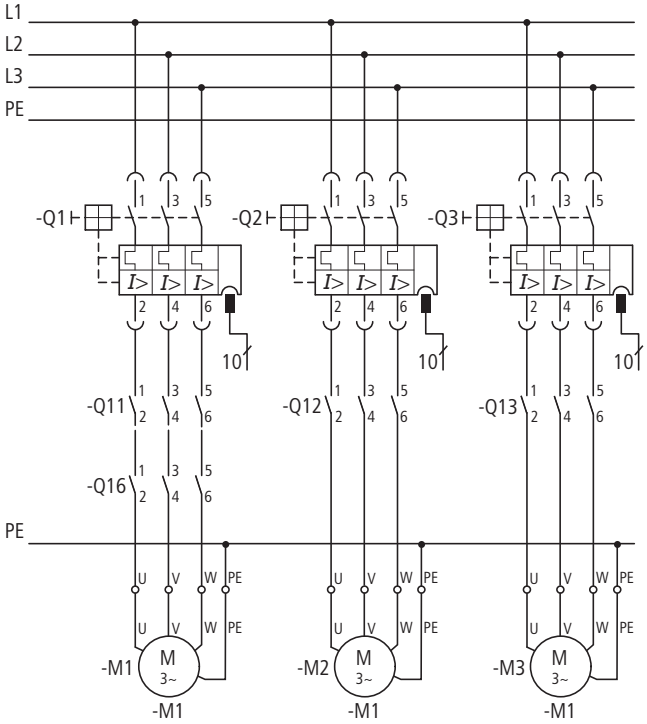


Figure 43: Main circuit for redundant disconnection of a single drive

Redundant disconnection of drive groups

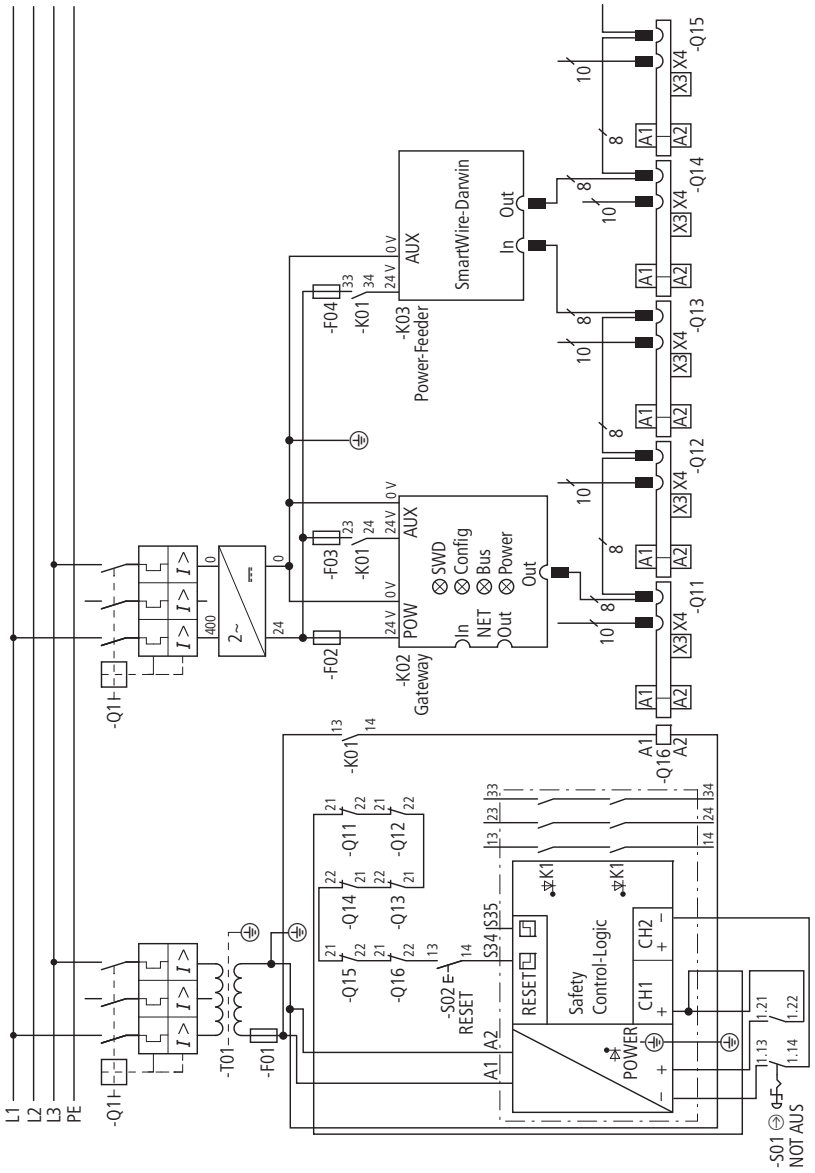


Figure 44: Control circuit for redundant disconnection of drive groups

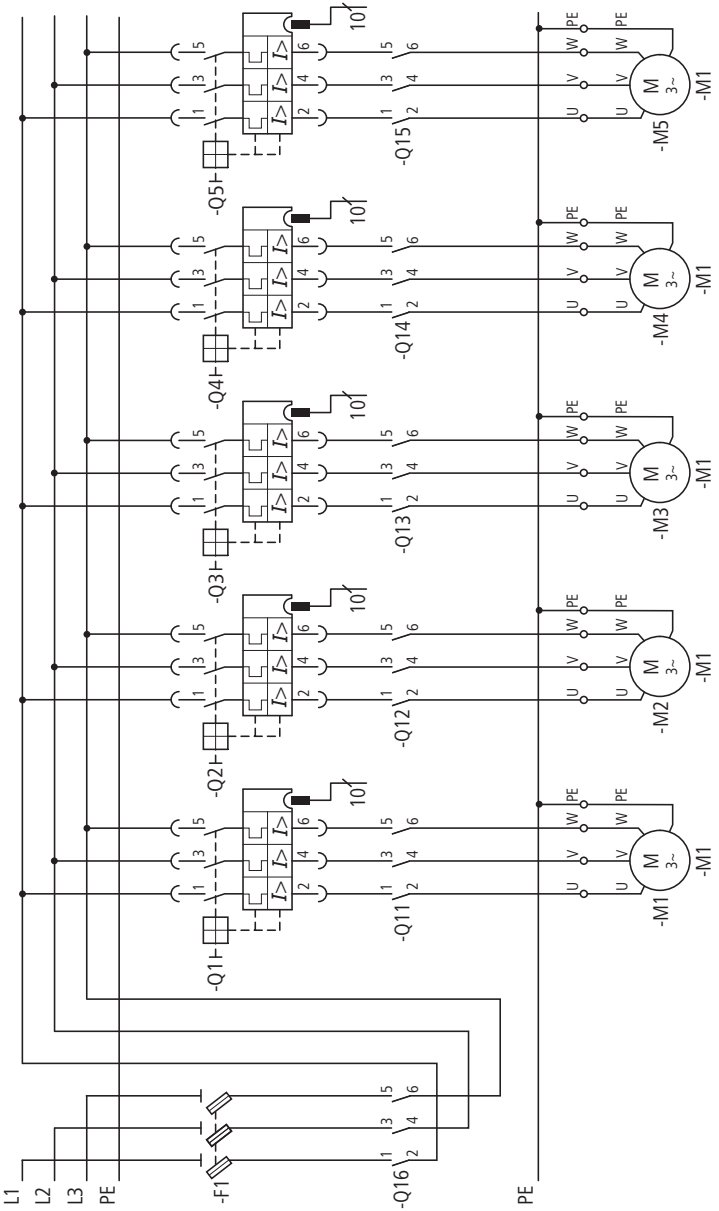


Figure 45: Main circuit for redundant disconnection of drive groups

Application for EN ISO 13849-1 and EN 62061

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

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

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-Darwin.

Current carrying capacity of the SmartWire-Darwin connecting cable in accordance with NFPA 79
If the SmartWire-Darwin connection system is used for applications in North America, the maximum current carrying capacity of the SmartWire-Darwin connecting cable is reduced from 3 A to 2 A.

If, due to the application, the maximum current carrying capacity of the SmartWire-Darwin connecting cable exceeds the value 2 A, this can be compensated by means of additional SmartWire-Darwin power feeder modules (→ chapter "Power Module EU5C-SWD-PF1-1, EU5C-SWD-PF2-1", page 11).

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.

Reversing starter

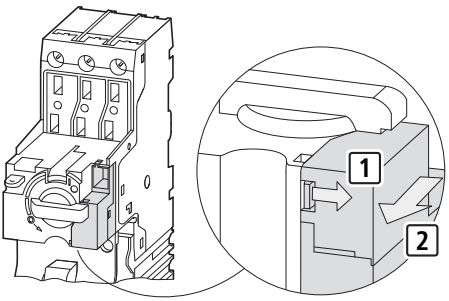
Apart from the special features described in Section "DOL starter" it must be taken into account that reversing starters in the North American market must be fitted additionally with a mechanical and electrical interlock. The electrical locking is realized via the connection auxiliary contact enable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

Installation

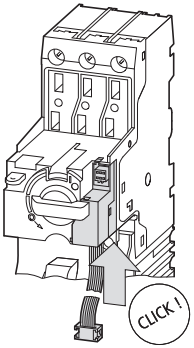
The installation of the PKE communication connection an SmartWire-Darwin is only possible with a DILM contactor or a part no. MSC-DEA-… electronic motor starter combination. When using individual components (PKE and contactor separately on the top-hat rail) observe the maximum distance between the PKE 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.

Mounting PKE-32-COM

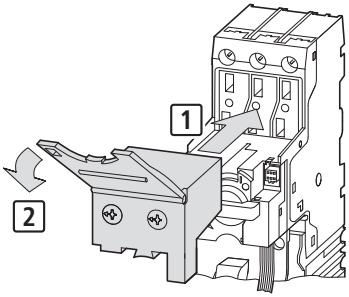
▶ Remove the empty module on the PKE basic unit.



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



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



Mounting PKE-SWD32

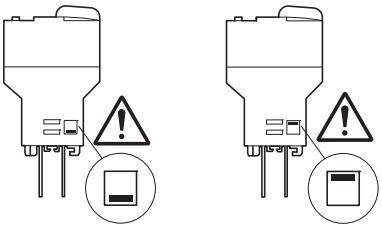
The PKE-SWD-32 must be adapted to the relevant contactor size before it is fitted. The necessary settings are made via the slide adjuster of the PKE-SWD-32.

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

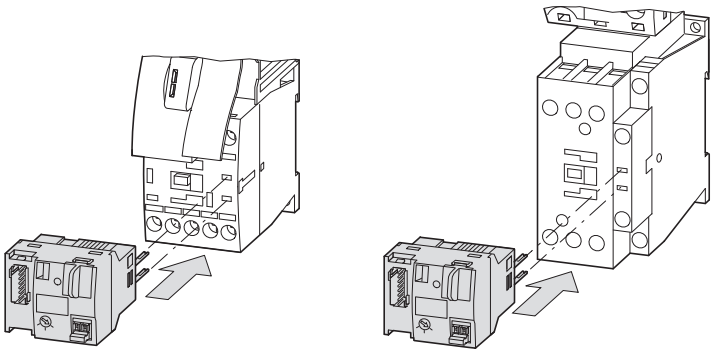
▶ Set the slide adjuster of the PKE-SWD-32 for the appropriate contactor.

The settings of the slide adjuster have the following settings for different contactor sizes:

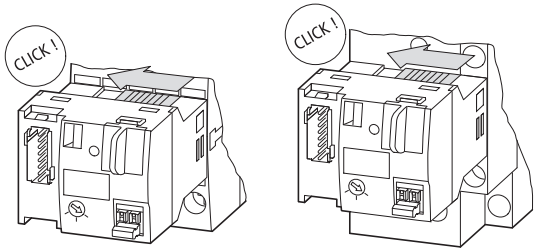
- Bottom position: DILM7, DILM9, DILM12, DILM15 (state of delivery)
- Position top: DILM17, DILM25 and DILM32



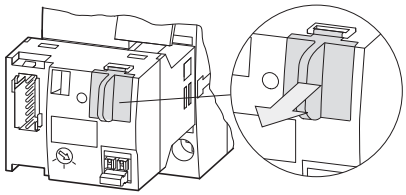
▶ Set the PKE-SWD32 for the appropriate contactor.



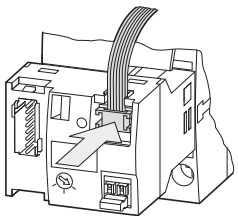
▶ Interlock the PKE-SWD32.



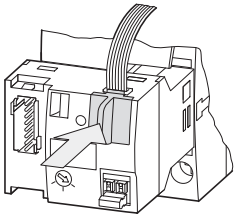
▶ Remove the cover of the communication interface.



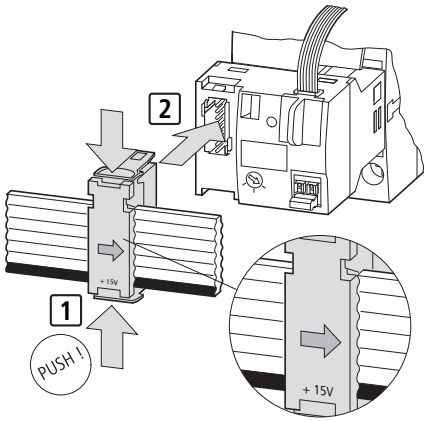
▶ Connect the PKE32-COM.



▶ Fit the cover of the communication interface.



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



Placing into operation

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

Exchange of Modules

Danger!
The exchange of the SmartWire-Darwin 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 sequence of the SmartWire-Darwin slaves must not be altered.

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

Device status

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

Table 15: Diagnostic messages of the SmartWire-Darwin status LED

Designation	Colour	Health	Message
Ready	Orange	continuous light	Switching command for contactor via SmartWire-Darwin
		Flashing	Communication to the PKE is interrupted, switch command for contact is present via SmartWire-Darwin
	Green	continuous light	Device is operating error-free.
		Flashing (1 Hz)	• Addressing process in progress – after gateway power On – after pressing the configuration button on the gateway • slave not in current configuration • invalid part no.
		Flashing (3 Hz)	• Incorrect manual/automatic switch setting
			• Communication to PKE is interrupted

Programming

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 "Data profiles", page 156)

Inputs
Byte 0:

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

7	6	5	4	3	2	1	0
-	P	-	F	A2	A1	P	C

Data Bit	Designation	Meaning
0	C = Contactor	Switch position 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	F = Failure	0: No diagnostic alarm 1: Module signals diagnostics
6	P = Module present	0: module not present 1: module present

Byte 1:

Set value I_r, causes of trip, 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	Notes
0 - 3	I_r	Set value I_r	→ section "Set value Ir (Ir)"
4 - 6	TRIPR = Trip reason	Cause of trip	→ section "Cause of trip (TRIPR)"
7	ACKR = Acknowledge required	ZMR manual function acknowledgement required 0: No acknowledgement required 1: Acknowledgement of overload required	→ section "ZMR-Manual mode"

Byte 2:

Motor current [%]

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

Data Bit	Designation	Meaning	Notes
0 - 7	I-REL	Motor current [%]	→ section "Motor current [%] (I-REL)"

Byte 3:

Thermal motor image [%]

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

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

Byte 4:

Type of trip block, set time lag

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 "Type of trip block (TYPE)", page 148
3 - 5	CLASS	Set time lag	→ section "Time delay setting (CLASS)",page 149
6	not used	-	-
7	not used	-	-

Outputs

Byte 0:

Contactor activation, ZMR, ZMR mode

7	6	5	4	3	2	1	0
-	-	-	-	ZMR H/A	ZMR	-	Q0

Data Bit	Designation	Explanation	Notes
0	Q0	Contactor actuation 0: Contactor OFF 1: Contactor ON	-
2	ZMR	Activation of ZMR function 0: Deactivation of ZMR function 1: Activation of ZMR function	→ section "Overload relay function (ZMR)"
3	ZMR H/A	Operating mode ZMR function 0: Manual function 1: Automatic function	

Diagnostics

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

Value	Meaning	Remedy	Notes
0x03	No communication between PKE-SWD-32 and PKE trip block	• Check whether the PKE trip block used is of part no. PKE-XTUA-… • Check the terminals of the PKE32-COM and connect the PKE32-COM if necessary.	During this state, the module can be still used for activating the connected contactor. 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. The value 0x00 is output via bit array A1, A2.

Set value I_r (I_r)

The overload release value set on the PKE basic unit 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: Bit field Set value I_r

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

Cause of trip (TRIPR)

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

Table 17: Bit field Cause of trip TRIPR

Field	Value	Explanation	Notes
TRIPR	0x0	Not defined	-
	0x1	Overload	PKE has switched off
	0x2	Short-circuit	PKE has switched off
	0x3	Phase loss/Phase unbalance	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 cause of tripping 0x5 "Overload with activated ZMR function", the transferred causes of tripping are then reset if the main contacts of the PKE are reclosed and a current flow is sensed through the PKE trip block.

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

The message 0x3 "Phase loss/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 losss/phase unbalance" does not force the interruption of the main circuits. In order to protect the connected motor in the event of phase loss/phase unbalance, the trip 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.

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 80 % 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 "acyclic data", page 157).

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 loss/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 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.

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 unit depending on the current range required. The following trip blocks of the type "Advanced" can be combined with the two PKE basic units PKE12 and PKE32.

Table 18: Combination options of the PKE basic unit and PKE trip block

	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 block (→ section "acyclic data", page 157).

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

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-23 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 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 readiness to reclose is restored when the value falls below 100 %.

ZMR-Manual mode

In manual ZMR 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 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 mode to automatic ZMR mode by setting bit ZMR M/A (output byte 0, Bit 3)

The following diagrams illustrate the acknowledgement options for overloads with manual ZMR mode activated.

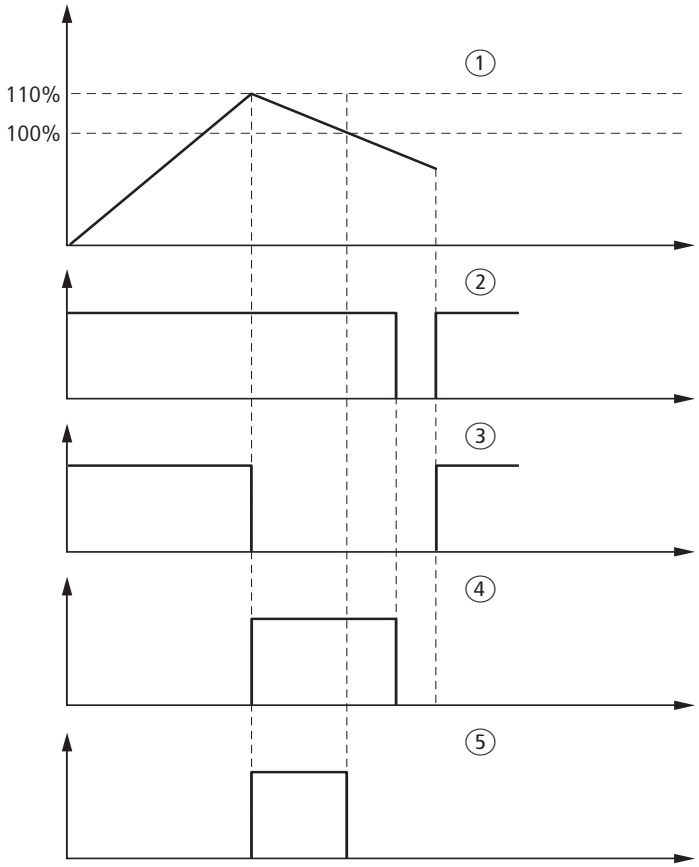


Figure 46: Acknowledgement of manual ZMR mode by "Contactor OFF" command

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

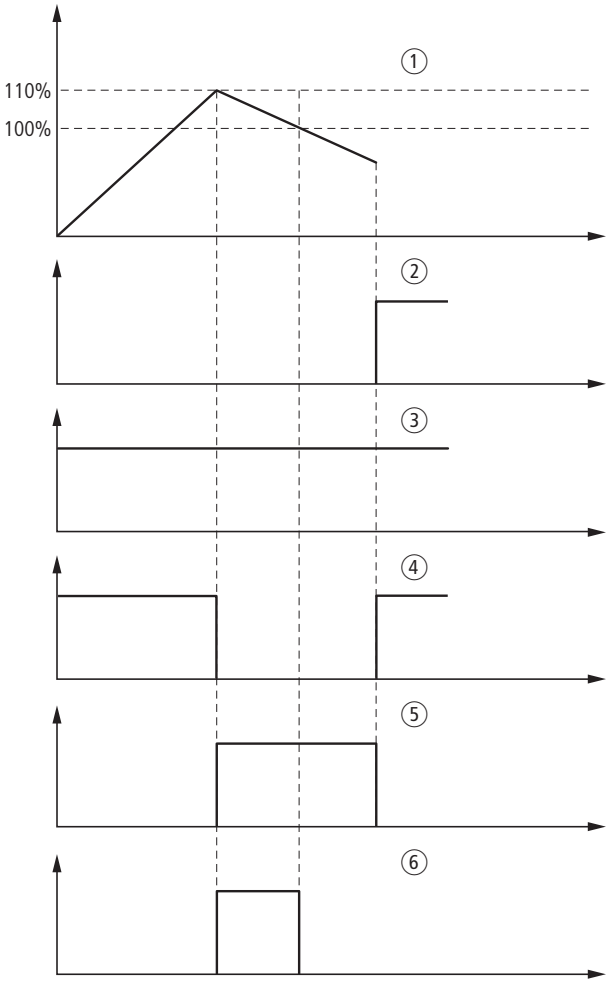


Figure 47: Acknowledgement of manual ZMR mode by changing the ZMR mode

① Thermal motor image
② ZMR M/A bit field status
③ Switch command for contactor
④ Switch status Contactor
⑤ Status of ACKR bit field
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.

Automatic ZMR mode
In automatic ZMR mode, the contactor is ready to reclose immediately after the thermal image drops below 100 % mark. The automatic ZMR 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 mode, the motor starts up automatically after the thermal motor image falls below 100 %.

The following diagram illustrates the switching behavior of the contactor after an overload with the automatic ZMR mode active.

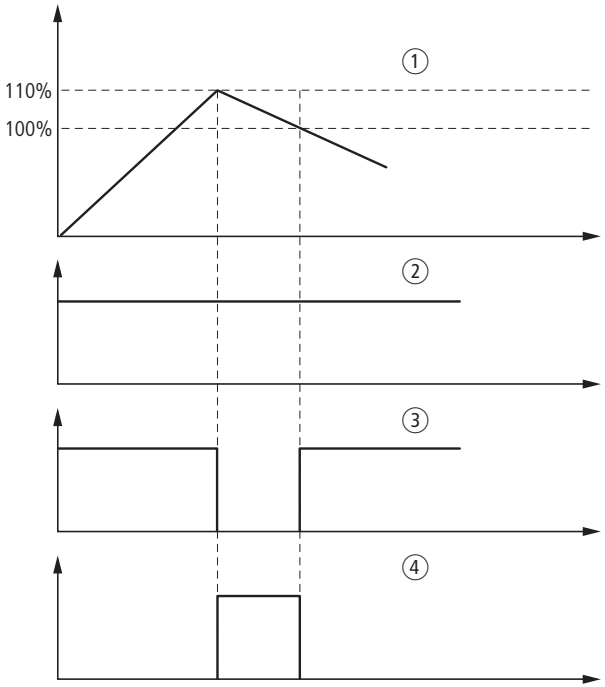


Figure 48: ZMR-operating mode Automatic

① Thermal motor model
② Switch command for contactor
③ Switch status Contactor
④ Cause of trip: Overload with activated ZMR function

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 PKE-SWD-32

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

When using the data profile PKE-SWD-32 Profile 1 (Moeller) or PKE-SWD-32 Profile 3 (Moeller) in conjunction with the EU5C-SWD-CAN SmartWire gateway, additional entries must be carried out in the setting range for Service Data Objects (SDO) in the PLC configuration program.

Data bytes that are not transferred cyclically in certain profiles can still be read as acyclical data objects (→ section "acyclic data", page 157).

acyclic data

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

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	Notes
0	0 - 7	I-REL	Motor current [%]	→ Section "Motor current [%] (I-REL)", page 146

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	Notes
0	0 - 7	TH	Thermal motor image [%]	→ section "Thermal motor image [TH]"

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	Notes
0	0 - 2	TYPE	Type of trip block	→ section "Type of trip block (TYPE)", page 148
	3 - 5	CLASS	Set time lag	→ section "Time delay setting (CLASS)"
	6	not used	-	-
	7	not used	-	-

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

6 Interface for NZM compact circuit-breakers

Introduction

The NZM-XSWD-704 SmartWire-Darwin 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 (switch cabinet) and is connected to the NZM via a 2.0 m data cable. The auxiliary contacts and the remote operator are wired separately.

Interoperability with SmartWire-Darwin gateways

The interoperability of the NZM-XSWD-704 SmartWire-Darwin module is only possible with a suitable firmware version of the SmartWire-Darwin gateway used. The following firmware versions of the SmartWire-Darwin gateways guarantee interoperability with the NZM-XSWD-704 SmartWire-Darwin module:

Table 22: Firmware versions SmartWire-Darwin gateways

SmartWire-Darwin gateway	Firmware version
EU5C-SWD-CAN	V 1.10
EU5C-SWD-DP	V 1.10

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

SWD-Assist

The SWD-Assist planning and ordering help system provides valuable support with the project planning of your SWD topology. SWD-Assist is software that runs on Windows 2000 (SP 4), XP or Vista (32-bit) and relieves you of the planning work required for an SWD topology. The SWD-Assist software from version V 1.11 can be used conjunction with the NZM-XSWD-704 SmartWire-Darwin module.
The software is available free of charge at:

http://downloadcenter.moeller.net

Surface mounting

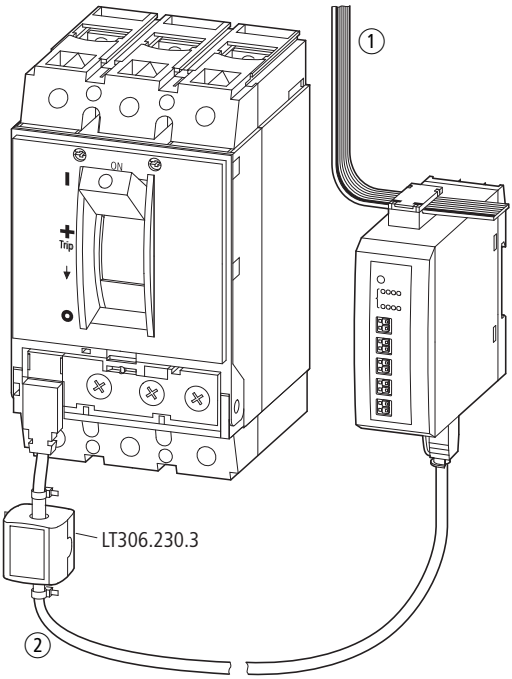


Figure 49: Fitting of NZM with NZM-XSWD-704

① Connection SmartWire-Darwin
② Data cable NZM with NZM-XSWD-704

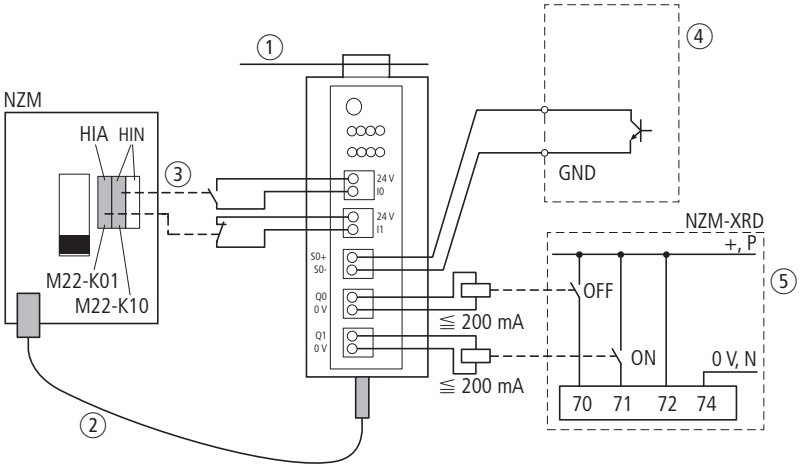


Figure 50: NZM-XSWD-704 connections to circuit-breaker

① Connection SmartWire-Darwin

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-Darwin- external device plug with an adapted SmartWire-Darwin connecting cable is NZM-XSWD-704 via connection ①.

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

Indication and connection elements

The network status of the module is signalled via the SmartWire-Darwin 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	-

Connections

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

Inputs:

- I0
  The HIN socket (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

Energy signal inputs S0+ and S0-

These inputs are wired to an external energy measuring module such as the NZM…XMC-S0 range. The measuring module supplies an S0 pulse for a certain measure of energy, which is incremented by a retentive counter on the NZM-SWD-704. This counter value thus represents the used energy, and is 32 bits in length.

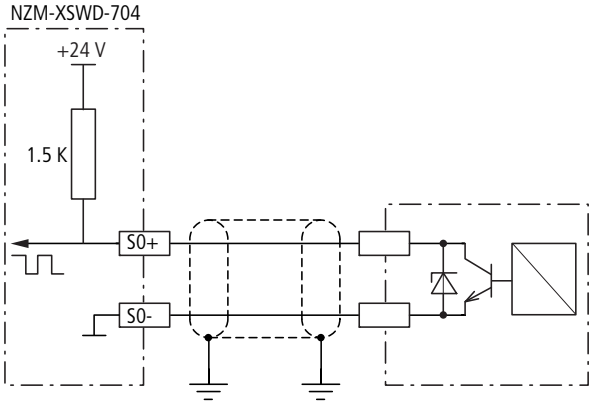


Figure 51: Connection of the S0 input

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.

Control outputs Q0 and Q1

The power supply of the control outputs for the remote operator is fed from the power supply of the SWD 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 Figure50.

Outputs	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:

Health	Permissible command
on	OFF (switch off)
off	ON (switch on)
Trip	OFF (switch off)

In addition to the communication signal, the 8-pole SmartWire-Darwin connection 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.

Engineering

The NZM-XSWD-704 is fed completely via the Darwin 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 pickup and sealing 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 pick-up power of the simultaneously tripping contactors and the sum of the holding power of the tripped contactors for each SmartWire-Darwin 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 "Power Module EU5C-SWD-PF1-1, EU5C-SWD-PF2-1", page 11).

For data for the current consumption please refer to the table in „Appendix" on page 185.

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 slaves on a Darwin line depends on the fieldbus gateway used and the data profile selected.

PROFIBUS-DP: max. 58 slaves possible
max. 242 byte/line

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

CANOpen: max. 99 slaves possible
max. 256 byte/line

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

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.

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.

Placing into operation

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

Exchange of Modules

Danger!
The exchange of the SmartWire-Darwin 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 sequence of the SmartWire-Darwin slaves must not be altered.

Programming

Cyclic data

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 23: 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

Data bytes that are not transferred cyclically in certain profiles can still be read as acyclical data objects (→ section "acyclic data", page 183).

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

Byte	Profile 1	Profile 2	Profile 3	Profile 4
0	SWD status byte	SWD status byte	SWD status byte	SWD status byte
1	Status byte 0 LVSG	Status byte 0 LVSG	Status byte 0 LVSG	Status byte 0 LVSG
2	Status byte 1 LVSG	Status byte 1 LVSG	Status byte 1 LVSG	Status byte 1 LVSG
3/4	-	Current I1	Current I1	Current I1
5/6	-	Current I2	Current I2	Current I2
7/8	-	Current I3	Current I3	Current I3
9/10	-	Current I_{max}	Current I_{max}	Current I_{max}
11	-	-	S0 value high section	S0 value high section
12	-	-	S0 value high section	S0 value high section
13	-	-	S0 value low section	S0 value low section
14	-	-	S0 value low section	S0 value low section
15	-	-		Set value LS for I_r
16	-	-	-	Set value I_i
17	-	-	-	Set value t_r
18	-	-	-	Set value I_{sd}
19	-	-	-	Set value t_{sd}
20	-	-	-	Set value I_g
21	-	-	-	Set value t_g
22	-	-	-	I^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.

Byte	Profile 1	Profile 2	Profile 3	Profile 4
27	-	-	-	LS function
28	-	-	-	NZM version
29	-	-	-	Ground fault module
30	-	-	-	Free

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 = Diagnostics signal present	from XSWD-704
0		X							1 = XSWD-704 present 0 = XSWD-704 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

Byte	Bit								Description	Note
	7	6	5	4	3	2	1	0		
2							X		Group warning	Load warning or overload warning 1 or overload warning 2
2		X	X	X					000 = OK 001 = Trip I_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 30 s before the cause of tripping is displayed. After a trip, the last current values measured are displayed (rms values).

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)	
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 (Moel4d14.gsd), the currents are stated in the order High byte, Low byte, With an Intel-based GSD (Moe4d14.gsd) the currents are stated as word values.

Energy values: profile 3

In addition to the data of profile 2, profile 3 contains the energy values as 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

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	$I_r = 1.0 \times I_n$	
	• 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	$I_i = 12 \times I_n$	

Byte	Dec. value	Description	Note
	• 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	$t_r = 20$	

Byte	Dec. value	Description	Note
	• 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	
	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	

Byte	Dec. value	Description	Note
	• 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	$I_g = 1.0 \times In$	

Byte	Dec. value	Description	Note
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	$t_g = 1000$	
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		

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 energy counter to zero	Power meter

Decoding CB part no. 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 loaded from the following page:

ftp://ftp.moeller.net/CIRKUIT-BREAKER/KOMMUNIKATION/NZM_XSWD_704/

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 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.

acyclic data

In addition to the cyclical data traffic, 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 - 22 of data profile 4.

Object 2 contains the circuit-breaker data of the NZM. The data is the same as bytes 23 - 30 of data profile 4.

Table 25: Object description

Object name	Slot Number	Index	Length [byte]	Access
Actual parameters	Darwin address of the XSWD-704	1	8	R
Circuit-breaker data	Darwin 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 AWB2723-1612g).

Appendix

Maximum current consumption

The following table shows the maximum current consumption of the individual function elements.

Current consumption 15-V-SWD supply voltage

Part no.	Article no.	Current consumption mA	Instructions
M22-SWD-K11	115964	7	–
M22-SWD-K22	115965	7	–
M22-SWD-LED-W	115966	19	–
M22-SWD-LED-B	115967	19	–
M22-SWD-LED-G	115968	19	–
M22-SWD-LED-R	115969	19	–
M22-SWD-K11LED-W	115972	19	–
M22-SWD-K11LED-B	115973	19	–
M22-SWD-K11LED-G	115974	19	–
M22-SWD-K11LED-R	115975	19	–
M22-SWD-K22LED-W	115978	19	–
M22-SWD-K22LED-B	115979	19	–
M22-SWD-K22LED-G	115980	19	–
M22-SWD-K22LED-R	115981	19	–
M22-SWD-KC11	115995	7	–
M22-SWD-KC22	115996	7	–
M22-SWD-LEDC-W	115997	19	–
M22-SWD-LEDC-B	115998	19	–
M22-SWD-LEDC-G	115999	19	–
M22-SWD-LEDC-R	116000	19	–
M22-SWD-K11LEDC-W	116003	19	–
M22-SWD-K11LEDC-B	116004	19	–
M22-SWD-K11LEDC-G	116005	19	–
M22-SWD-K11LEDC-R	116006	19	–
M22-SWD-K22LEDC-W	116009	19	–
M22-SWD-K22LEDC-B	116010	19	–
M22-SWD-K22LEDC-G	116011	19	–
M22-SWD-K22LEDC-R	116012	19	–
DIL-SWD-32-001	118560	40	–
DIL-SWD-32-002	118561	40	–
PKE-SWD-32	126895	58	–

Part no.	Article no.	Current consumption mA	Instructions
NZM-XSWD-704	135530	35	–
EU5E-SWD-8DX	116381	12	–
EU5E-SWD-4D4D	116382	45	–
EU5E-SWD-4D2R	116383	45	–
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	–

Power consumption/current consumption 24 V SWD control voltage U_{AUX}

		DIL-SWD-32-…
Pull-in power		
for DILM 7-9	W	3
for DILM 12-15	W	4.5
for DILM 17-38	W	12
Pick-up current		
for DILM 7-9	mA	125
for DILM 12-15	mA	188
for DILM 17-38	mA	500
Sealing power		
for DILM 7-9	W	3
for DILM 12-15	W	4.5
for DILM 17-3	W	0.5
Holding current		
for DILM 7-9	mA	125
for DILM 12-15	mA	188
for DILM 17-38	mA	21

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

Data requirement (bytes) of the SWD slaves

SWD-Station	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
DIL-SWD-32-001	1	1
DIL-SWD-32-002	1	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-8DX	2	0
EU5E-SWD-4D4D	1	1
EU5E-SWD-4D2R	1	1

SWD-Station	Input	Output
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

			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)			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

		EU5C-SWD-DP	EU5C-SWD-CAN	EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
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-Darwin)		EN 55011 Class A		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-Darwin 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
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

			EU5C-SWD-DP	EU5C-SWD-CAN	EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
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 rating			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 slaves		V	type. U_{Aux} - 0.2	type. U_{Aux} - 0.2	type. 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-Darwin supply voltage			no	no	–	Yes
Bridging voltage dips		ms	10	10	–	10
Repeat rate		s	1	1	–	1
Status indicator		LED	Yes	Yes	–	Yes

			EU5C-SWD-DP	EU5C-SWD-CAN	EU5C-SWD-PF1-1	EU5C-SWD-PF2-1
SmartWire-Darwin 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 rating			Yes	Yes	–	Yes
Connection supply voltages						
Connection Type			Push in terminals		Push in terminals	
solid		mm^2	0.2 - 1.5 (AWG 24 - 16)		0.2 - 1.5 (AWG 24 - 16)	
flexible with ferrule		mm^2	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5
SmartWire-Darwin network						
Station type			SmartWire-Darwin master		–	–
Number of SmartWire-Darwin slaves			58	99	–	–
Baud rate		kBd	125	125	–	–
Address setting			automatic	automatic	–	–
Status indicator			SmartWire-Darwin 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 slave	CANopen slave		
Bus protocol		PROFIBUS-DP	CANopen		
Baud rate		up to 12 MB	up to 1 MB		
Address setting		automatic	automatic		
Station address		2 … 125	2 … 32		
Address setting		DIP switches	DIP switches		
Status display field bus interface	LED	Two-coloured red/green	Two-coloured 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		

Instructions

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.

I/O modules

			EU5E-SWD-8DX	EU5E-SWD-4D4D	EU5E-SWD-4D2R
General					
Standards			IEC/EN 61131-2, EN 50178		
Dimensions (W x H x D)		mm	35 x 90 x 101		
Weight		kg	0.1	0.1	0.11
Mounting			Top-hat rail IEC/EN 60715, 35 mm		
Mounting position			Vertical		
Ambient mechanical conditions					
Protection type (IEC/EN 60529)			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 (IEC/EN 60068-2-32)		m	0.3	0.3	0.3
Electromagnetic compatibility (EMC)					
Overvoltage category			II	II	II
Pollution degree			2	2	2
Electrostatic discharge (IEC/EN 61131-2:2008)					
Air discharge (Level 3)		kV	8	8	8
Contact discharge (Level 2)		kV	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)					
80-1000 MHz		V/m	10	10	10
1.4 - 2 GHz		V/m	3	3	3
2 - 2.7 GHz		V/m	1	1	1
Radio interference suppression (SmartWire-Darwin)			EN 55011 Class A		

			EU5E-SWD-8DX	EU5E-SWD-4D4D	EU5E-SWD-4D2R
Burst (IEC/EN 61131-2:2008, Level 3)					
Supply cables		kV	2	2	2
Signal cables		kV	1	1	1
SmartWire-Darwin cables		kV	1	1	1
Surge (IEC/EN 61131-2:2008, Level 1)			–	Supply cables 0.5 kV	–
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-Darwin interface					
Station type			SmartWire-Darwin station (slave)		
Baud rate setting			automatic		
SmartWire-Darwin status		LED	green		
Connection			Plug, 8-pole Connection plug: External device plug SWD4-8SF2-5		
Current consumption (15 V SWD supply)			→ page 185		
Connection supply and I/O					
Connection Type			Push-In		
solid		mm^2	0.2 - 1.5 (AWG 24 - 16)		
flexible with ferrule[1)]		mm^2	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5
24 V DC supply for output supply					
Rated operational voltage	U_e	V	–	24 DC -15 % / +20 %	–
Input voltage residual ripple		%	–	5	–
Protection against polarity reversal			–	Yes	–

			EU5E-SWD-8DX	EU5E-SWD-4D4D	EU5E-SWD-4D2R
Digital inputs					
Number			8	4	4
Input current		mA	Normally 4 at 24 V DC		
Voltage level to IEC/EN 61131-2					
Limit value type 1			Low < 5 V DC; High > 15 V DC		
Input delay			High → Low typ. < 0.2 ms Low → High typ. < 0.2 ms		
Status display inputs		LED	yellow		
Digital semiconductor outputs					
Number			–	4	–
Output current		A	–	typ. 0.5 at 24 V DC	–
Short-circuit tripping current		A	–	max. 1.2 over 3 ms	–
Lamp load	R_{LL}	W	–	3	–
Overload proof			–	yes, with diagnostics	–
Switching capacity			–	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 protection			–	–	external 4 A gL/gG
Status display outputs		LED	–	yellow	yellow

	EU5E-SWD-8DX	EU5E-SWD-4D4D	EU5E-SWD-4D2R
Potential isolation			
Inputs for SmartWire-Darwin	Yes	Yes	Yes
Semi-conductor outputs for SmartWire-Darwin	–	Yes	–
Semi-conductor outputs for inputs	–	no	–
Relays for SmartWire-Darwin	–	–	Yes
Relays for inputs	–	–	Yes
Relays for relays	–	–	Yes

Instructions 1) Minimum length 8 mm

M22-SWD connections

		M22-SWD-K11/ M22-SWD-KC11	M22-SWD-LED-.../ M22-SWD-LEDC-...	M22-SWD-K11LED-.../ M22-SWD-K11LEDC-...	M22-SWD-K22/ M22-SWD-KC22	M22-SWD-K22LED-.../ M22-SWD-K22LEDC-...
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	17 x 42 x 39/ 17 x 45 x 37	17 x 42 x 45/ 17 x 45 x 42
Weight	g	10	10	10	14	14
Mounting position		any				
Ambient mechanical conditions						
Protection type (IEC/EN 60529)		IP20	IP20	IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)						
Constant amplitude 3.5 mm	Hz	5	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 (IEC/EN 60068-2-31); drop height	mm	50	50	50	50	50
Free fall, packaged (IEC/EN 60068-2-32)	m	0.3	0.3	0.3	0.3	0.3

		M22-SWD-K11/ M22-SWD-KC11	M22-SWD-LED-.../ M22-SWD-LEDC-...	M22-SWD-K11LED-.../ M22-SWD-K11LEDC-...	M22-SWD-K22/ M22-SWD-KC22	M22-SWD-K22LED-.../ M22-SWD-K22LEDC-...
Electromagnetic compatibility (EMC)						
Overvoltage category		Not applicable				
Pollution degree		2	2	2	2	2
Electrostatic discharge (IEC/EN 61131-2:2008)						
Air discharge (Level 3)	kV	8	8	8	8	8
Contact discharge (Level 2)	kV	4	4	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)						
80-1000 MHz	V/m	10	10	10	10	10
1.4 - 2 GHz	V/m	3	3	3	3	3
2 - 2.7 GHz	V/m	1	1	1	1	1
Radio interference suppression (SmartWire-Darwin)		EN 55011 Class A				
Burst (IEC/EN 61131-2:2008, Level 3)						
Supply cables	kV	2	2	2	2	2
SmartWire-Darwin cables	kV	1	1	1	1	1
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	V	10	10	10	10	10

	M22-SWD-K11/ M22-SWD-KC11	M22-SWD-LED-…/ M22-SWD-LEDC-…	M22-SWD-K11LED-…/ M22-SWD-K11LEDC-…	M22-SWD-K22/ M22-SWD-KC22	M22-SWD-K22LED-…/ M22-SWD-K22LEDC-…
Ambient climatic conditions					
Operating ambient temperature (IEC 60068-2) °C	–30 … +55	–30 … +55	–30 … +55	–30 … +55	–30 … +55
Condensation	prevent with suitable measures				
Storage °C	–40…80	–40…80	–40…80	–40…80	–40…80
relative humidity, non-condensing (IEC/EN 60068-2-30) %	9 … 95	9 … 95	9 … 95	5 … 95	5 … 95
SmartWire-Darwin network					
Station type	SmartWire-Darwin station (slave)				
Baud rate setting	automatic				
SmartWire-Darwin status LED	green				
Connections	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	SWD4-8SF2-5/ M22-SWD-I…LP	SWD4-8SF2-5/ M22-SWD-I…LP
Number of insertion cycles	50	50	50	50	50
Current consumption (15 V SWD supply)	→ page 185				

	M22-SWD-K11/ M22-SWD-KC11	M22-SWD-LED-…/ M22-SWD-LEDC-…	M22-SWD-K11LED-…/ M22-SWD-K11LEDC-…	M22-SWD-K22/ M22-SWD-KC22	M22-SWD-K22LED-…/ M22-SWD-K22LEDC-…
Function element					
Contacts	1 changeover contact	–	1 changeover contact	2 changeover contact	2 changeover contact
Lifespan mechanical/ electrical (operations)	1 x 10^6	–	1 x 10^6	1 x 10^6	1 x 10^6
LED display	no	Yes	Yes	no	Yes
Diagnostics	Yes	no	Yes	Yes	Yes
Fixing	front mount/ base fixing	front mount/ base fixing	front mount base fixing	front mount base fixing	front mount base fixing

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)			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
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-Darwin)			EN 55011 Class A	–	–
Burst (IEC/EN 61131-2:2008, Level 3)				–	–
SmartWire-Darwin cables		kV	1	–	–
Radiated RFI (IEC/EN 61131-2:2008, Level 3)		V	10	10	10

		SWD4-RC8-10	SWD4-SFL8-20	SWD4-SML8-20
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, no condensation (IEC/EN 60068-2-30)	%	5 - 95	5 - 95	5 - 95
Connection options				
SWD-In		Socket, 8-pole	Plug, 8-pole	Plug, 8-pole
Number of insertion cycles		≥ 200	≥ 200	≥ 500
SWD-Out		–	Socket, 8-pole	Socket, 8-pole
Number of insertion cycles		–	≥ 500	≥ 200
Current consumption (15 V SWD supply)		→ page 185		

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)		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 SWD supply)			→ page 185

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)		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 SWD supply)		→ page 185		

DIL contactor modules

			DIL-SWD-32-001	DIL-SWD-32-002
General				
Standards			IEC/EN 61131-2, EN 50178, IEC/EN 60947	
Dimensions (W x H x D)		mm	45 x 38 x 76	45 x 38 x 76
Weight		kg	0.04	0.04
Mounting			on DILM7 - DILM38	
Mounting position			as DILM7 - DILM38	
Ambient mechanical conditions				
Protection type (IEC/EN 60529)			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-Darwin)			EN 55011 Class A	EN 55011 Class A
Burst (IEC/EN 61131-2:2008, Level 3)				
CAN/DP bus cable		kV	1	1
SmartWire-Darwin cables		kV	1	1
Radiated RFI (IEC/EN 61131-2:2008, Level 3)			10	10

			DIL-SWD-32-001	DIL-SWD-32-002
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-Darwin network				
Station type			SmartWire-Darwin station (slave)	
Baud rate setting			automatic	
SmartWire-Darwin status		LED	green/orange	
Connections			Plug, 8-pole	
Plug connectors			External device plug SWD4-8SF2-5	
Current consumption (15 V SWD supply)			→ page 185	
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 (AWG 24 - 16)	
flexible with ferrule[2)]		mm^2	0.25 - 1.5	0.25 - 1.5

Instructions

1) Own supply.

2) Minimum length 8 mm.

Electronic motor protective circuit breaker PKE-SWD-32

		PKE-SWD-32
General		
Standards		IEC/EN 61131-2, EN 50178, IEC/EN 60947
Dimensions (W x H x D)	mm	45 x 39 x 77.5
Weight	kg	0.04
Mounting		on DILM7 - DILM32
Mounting position		as DILM7 - DILM32
Ambient mechanical conditions		
Protection type (IEC/EN 60529)		IP20
Vibrations (IEC/EN 61131-2:2008)		
Constant amplitude 0.15 mm	Hz	5 - 8.4
Constant acceleration, 2 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	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-Darwin)		EN 55011 Class A
Burst (IEC/EN 61131-2:2008, Level 3)		
CAN/DP bus cable	kV	1
SmartWire-Darwin cables	kV	1
Radiated RFI (IEC/EN 61131-2:2008, Level 3)		10

		PKE-SWD-32
Ambient climatic conditions		
Operating ambient temperature (IEC 60068-2)	°C	-25 - 60
Condensation		prevent with suitable measures
Storage	°C	-30 - 70
relative humidity, non-condensing (IEC/EN 60068-2-30)	%	5 - 95
SmartWire-Darwin network		
Function		SmartWire-Darwin station (slave)
Baud rate setting		automatic
SmartWire-Darwin status	LED	green/orange
Connection		Plug, 8-pole
Plug connectors		External device plug SWD4-8SF2-5
Current consumption (15 V bus voltage)	mA	→ page 185
Operating Mode		
Manual/automatic mode		Yes
Setting		Rotary switch
Terminal capacity		
solid	mm^2	0.2 - 1.5 (AWG 24-16)
Flexible with ferrule (minimum section length 8 mm)	mm^2	0.25 - 1.5
Connection Type		Push-In

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)			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-Darwin)			EN 55011 Class A
Burst (IEC/EN 61131-2:2008, Level 3)			
Supply cables		kV	2

			NZM-XSWD-704
Signal cables		kV	1
SmartWire-Darwin cables		kV	1
Surge (IEC/EN 61131-2:2008, Level 1)			–
Radiated RFI (IEC/EN 61131-2:2008, Level 3)		V	10
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-Darwin interface			
Station type			SmartWire-Darwin station (slave)
Baud rate setting			automatic
SmartWire-Darwin status		LED	green
Connection			Plug, 8-pole Connection plug: External device plug SWD4-8SF2-5
Current consumption (15 V SWD supply)			See separate table
Connection supply and I/O			
Connection Type			Push-In
solid		mm^2	0.2 - 1.5 (AWG 24 - 16)
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			–
Instructions	Minimum length 8 mm.		

			NZM-XSWD-704
Digital inputs			
Number			2
Input current		mA	Normally 4 at 24 V DC
Voltage level to IEC/EN 61131-2			
Limit value type 1			Low < 5 V DC; High > 15 V DC
Input delay			High → Low typ. < 0.2 ms Low → High typ. < 0.2 ms
Status display inputs		LED	yellow
Digital semiconductor outputs			
Number			2
Output current		A	10.2 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		mA	–
Response/reset time		ms	–
Bounce duration		ms	–
Short-circuit protection			–
Status display outputs		LED	–

	NZM-XSWD-704
Potential isolation	
Inputs for SmartWire-Darwin	Yes
Semi-conductor outputs for SmartWire-Darwin	Yes
Semi-conductor outputs for inputs	–
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Relays for inputs	–
Relays for relays	–

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