PSR-UNI-L-1X4NO-1DO-24DC-..

Locally configurable safety relay for various safety equipment



Data sheet
111375_en_02

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1 Description

Intended Use

Safety relay for various safety equipment that can be configured via a rotary coding switch. The safety relay is used to monitor 1- or 2-channel signal generators and to control actuators. When the sensor circuit is interrupted, the safety relay initiates the safe state. The safety relay interrupts circuits in a safety-related way.

Possible signal generators

- Emergency stop button
- Light grids
- Magnetic switch
- Door locking mechanisms
- Two-hand controls in accordance with ISO 13851 type IIIA
- 4-wire control strips or safety shut-off mats in accordance with EN ISO 13856-1

Contact switching type

- 1 sensor circuit
- 4 undelayed, 2-channel enabling current paths
- 1 digital signal output

The enabling current paths drop out without delay as per stop category 0 in accordance with EN 60204-1.

The signal output transmits non-safety-related status information.

Control

- 1- or 2-channel
- Automatic or manual, monitored start

Achievable safety integrity

- Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN IEC 62061)

Additional features

- Locally configurable
- Configuration help via clipx ENGINEER dp
- Optional pluggable screw or Push-in terminal blocks
- 22.5 mm housing width

Approvals

c UL us LISTED

Observe these notes

WARNING: Risk of electric shock
Observe the safety regulations and installation notes in the corresponding section.

Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.com/products.

This document is valid for the products listed in the “Ordering data” chapter.
This document meets the same requirements as the original operating instructions with respect to the contents.

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3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Configurable safety relay, multi functions, up to SIL 3, Cat. 4, PL e, 1 sensor circuit, 1-/2-channel operation, automatic/manual, monitored start, 1x 4 enabling current paths, 1 signal output, U_S = 24 V DC, plug-in screw terminal block	PSR-UNI-L-1X4NO-1DO-24DC-SC	1487649	1
Configurable safety relay, multi functions, up to SIL 3, Cat. 4, PL e, 1 sensor circuit, 1-/2-channel operation, automatic/manual, monitored start, 1x 4 enabling current paths, 1 signal output, U_S = 24 V DC, plug-in Push-in terminal block	PSR-UNI-L-1X4NO-1DO-24DC-PI	1487648	1

Accessories	Type	Item no.	Pcs./Pkt.
Coding profile, is inserted into the slot on the plug or inverted header, red insulating material	CP-MSTB	1734634	100
Coding section, inserted into the recess in the header or the inverted plug, red insulating material	CR-MSTB	1734401	100
Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp	CRIMPFOX 6	1212034	1

4 Technical data

Hardware/firmware version	
HW/FW	≥ 00/100
The technical data and safety characteristics are valid as of the specified HW/FW version.	
Supply: A1/A2	
Rated control circuit supply voltage U_S	24 V DC -20 % / +25 %
Rated control supply current I_S	typ. 55 mA (When sensor circuit and start circuit are controlled internally) typ. 45 mA (When sensor circuit and start circuit are controlled externally)
Power consumption at U_S	typ. 1.32 W
Inrush current	typ. 35 A (Δt = 25 µs at U_s)
Filter time	1 ms (logic)
Protective circuit	Serial protection against polarity reversal, Suppressor diode
Digital inputs: Logic (I1.1, I1.2)	
Number of inputs	2
Description of the input	safety-related IEC 61131-2 type 3
Input voltage range "0" signal	0 V DC ... 5 V DC
Input current range "0" signal	0 mA ... 1.5 mA
Input voltage range "1" signal	11 V DC ... 30 V DC
Inrush current	< 45 mA (typ. with U_S, Δt <50 µs)
Current consumption	< 3.5 mA (typ. with U_S)
Filter time	max. 3 ms (Test pulse width of low test pulses) min. 50 ms (Test pulse rate for low test pulse) < 1 ms (High test pulses at >100 ms test pulse rate possible)
Max. permissible overall conductor resistance	150 Ω
Concurrence	∞ (2-channel wiring), 5 s (non-equivalent wiring), 0.5 s (two-hand control)
Limit frequency	min. 0 Hz max. 0.1 Hz
Protective circuit	Varistor

Digital inputs: Start circuit (S34)	
Number of inputs	1
Description of the input	non-safety-related IEC 61131-2 type 3
Input voltage range "0" signal	0 V DC ... 5 V DC
Input current range "0" signal	0 mA ... 1.5 mA
Input voltage range "1" signal	11 V DC ... 30 V DC
Inrush current	< 45 mA (typ. with U_S)
Current consumption	< 3.5 mA (typ. with U_S)
Filter time	max. 3 ms (Test pulse width of low test pulses) min. 50 ms (Test pulse rate for low test pulse)
Max. permissible overall conductor resistance	150 Ω
Limit frequency	min. 0 Hz max. 0.1 Hz
Protective circuit	Varistor

Relay outputs: Enabling current paths (13/14, 23/24, 33/34, 43/44)	
Number of outputs	4
Output description	safety-related
Contact material	$AgSnO_2$
Switching voltage (see section “Relay data”)	min. 10 V max. 250 V AC/DC
Limiting continuous current (see section “Relay data”)	6 A
Inrush current	min. 10 mA max. 6 A
Sq. Total current $I_{TH}^2 = I_1^2 + I_2^2 + ... + I_N^2$	100 A^2 (observe derating)
Switching capacity	min. 100 mW
Switching frequency	max. 0.1 Hz
Service life electrical	See section “Electrical service life”
Mechanical service life	10x 10^6 cycles
Switching capacity in accordance with IEC 60947-5-1	5 A (AC15) 5 A (DC13)
Output fuse	6 A gL/gG 4 A gL/gG (for low-demand applications)

Alarm outputs: M1	
Number of outputs	1
Output description	non-safety-related
Voltage	typ. (U_S - 2,5 V)
Current	max. 100 mA
Maximum inrush current	500 mA (Δt = 10 ms at U_s)
Ohmic load	min. 192 Ω (100 mA, maximum)
Switching frequency	max. 0.1 Hz
Protective circuit	Reverse polarity protection Suppressor diode
Short-circuit protection	Yes
Discharging circuit	no

Clock outputs: T1, T2	
Number of outputs	2
Output description	non-safety-related
Voltage	typ. (U_S - 2,5 V)
Current	max. 100 mA
Maximum inrush current	500 mA (Δt = 10 ms at U_s)
Cable length	See inputs
Protective circuit	Reverse polarity protection Suppressor diode
Short-circuit protection	Yes
Discharging circuit	no

Times	
Typical starting time with U_s	1 s (when controlled via A1; applicative control via A1/A2 is not permitted)
Typical response time at U_s	< 100 ms (Automatic/manual start) < 500 ms (Safety shut-off mat operation)
Typical release time with U_s	< 25 ms (on demand via the sensor circuit) < 85 ms (Safety shut-off mat operation) < 25 ms (When requested via A1; applicative deactivation via A1/A2 is not permitted)
Restart time	< 1 s (Boot time)
Recovery time	500 ms (following demand of the safety function) > 100 ms (Availability time after activating the sensor circuit during manual start) > 500 ms (Availability time after activating the sensor circuits during manual start in safety shut-off mat operation)
Start pulse length	min. 500 ms (manual start)

General data	
Relay type	Electromechanical relay with force-guided contacts in accordance with IEC/EN 61810-3
Nominal operating mode	100% operating factor
Degree of protection	IP20
Min. degree of protection of inst. location	IP54
Mounting type	DIN rail mounting
Mounting position	vertical or horizontal
Assembly note	See derating curve
Type of housing	Frianyl B63 V0 GV30 zinc yellow (RAL 1018)
Operating voltage display	1 x LED (green, yellow, red)
Status display	4 x LED (green, yellow, red)
Error indication	1 x LED (red)
Air clearances and creepage distances between the power circuits	according to IEC 60664-1
Rated insulation voltage	250 V
Rated surge voltage/insulation	See “Insulation coordination”
Degree of pollution	2
Overvoltage category	III (Between logic and enabling current paths)
Maximum power dissipation for nominal condition	21.65 W (At U_S = 30 V, I_L^2 = 100 A²)
Note on power dissipation	See “Calculating the power dissipation”

Dimensions	Screw connection	Push-in connection
W x H x D	22.5 x 112.2 x 114.5 mm	22.5 x 117.5 x 114.5 mm

Connection data	Screw connection	Push-in connection
Conductor cross section rigid	0.2 mm² … 2.5 mm²	0.2 mm² … 2.5 mm²
Conductor cross section flexible	0.2 mm² … 2.5 mm²	0.2 mm² … 2.5 mm²
Conductor cross-section AWG	24 … 12	24 … 14
Stripping length	7 mm	10 mm
Screw thread	M3	-
Tightening torque	0.5 Nm … 0.6 Nm	-

Ambient conditions	
Ambient temperature (operation)	-25 °C … 60 °C (observe derating)
Ambient temperature (storage/transport)	-40 °C … 85 °C
Max. permissible relative humidity (operation)	75 % (on average, 85% infrequently, non-condensing)
Max. permissible humidity (storage/transport)	75 % (on average, 85% infrequently, non-condensing)
Maximum altitude	≤ 2000 m (Above sea level)
Information on operating height	See the “Using PSR devices at altitudes greater than 2000 m above sea level” section
Shock	15g
Vibration (operation)	10 Hz … 150 Hz, 2g

Conformance/Approvals
Content of the EU Declaration of Conformity: The product conforms with the most important requirements of the following directive(s) and their modification directives: - 2006/42/EC Machinery Directive - 2014/30/EU Electromagnetic Compatibility Directive (EMC) The full EU Declaration of Conformity can be downloaded from the product page at www.phoenixcontact.com/products.
The latest approvals can be downloaded from the product page at www.phoenixcontact.com/products.

Safety data	
Stop category according to IEC 60204	0

Safety parameters according to IEC 61508 - high demand	
Equipment type	Type B
HFT	1
SIL	3
PFH_D	1.00×10^{-9} (5 A DC13; 5 A AC15; 8760 switching cycles/year)
Demand rate	< 12 Months
Proof test interval	240 Months
Duration of use	240 Months

Safety parameters according to IEC 61508 - low demand	
Equipment type	Type B
HFT	1
SIL	3
PFD_{avg}	3.67×10^{-5}
Proof test interval	36 Months
Duration of use	240 Months

Safety parameters according to EN ISO 13849-1	
Category	4 (5 A DC13; 5 A AC15; 4380 switching cycles/year)
Performance level	e
Duration of use	240 Months
For applications in PL e, the required demand rate for the safety function is once per month.	

Safety parameters according to EN IEC 62061	
SIL	3
For applications in SIL 3 the required demand rate for the safety function is once per month.	

5 Interface type (ZVEI classification)

Digital inputs : Logic (I1.1, I1.2)				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Destination	A	M	Source	A
Destination	C0	-	Source	C1, C2, C3

Interface type A - Destination			
Parameter	**min.**	**typ.**	**max.**
Input current I_i (in the ON-state)	1.8 mA	-	< 3.8 mA
Output voltage U_i	16.5 V	-	30 V
Input capacitance C_i	-	-	10 nF
Additional measure M	- T_G is T1 for I1.1 - T_G is T1 for I1.1		

Interface type C0 - Destination			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	-	-	3 ms
Test pulse interval T	50 ms	-	-
Input resistance R	7 kΩ	-	-
Input capacitance C_L	-	-	15 nF
Inductive load L_L	-	-	-
Additional measure M	-		

Digital inputs : Start circuit (S34)				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Destination	A	-	Source	A
Destination	C0	-	Source	C1, C2, C3

Interface type A - Destination			
Parameter	**min.**	**typ.**	**max.**
Input current I_i (in the ON-state)	> 2 mA	-	< 3.8 mA
Output voltage U_i	17.2 V	-	30 V
Input capacitance C_i	-	-	10 nF
Additional measure M	-		

Interface type C0 - Destination			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	-	-	3 ms
Test pulse interval T	50 ms	-	-
Input resistance R	7 kΩ	-	-
Input capacitance C_L	-	-	15 nF
Inductive load L_L	-	-	-
Additional measure M	-		

Relay outputs : Enabling current paths 13/14, 23/24, 33/34, 43/44				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Source	A	M	Destination	A
Source	C0	M	Destination	-

Interface type A - Source			
Parameter	**min.**	**typ.**	**max.**
Switching current I_i	10 mA	-	6 A
Switching voltage U_i	10 V	-	250 V AC
Internal resistance R_i (in the switched state)	Load ≥ 1 A ≤ 200 mΩ	-	Load ≥ 10 mA ≤ 40 Ω
Load capacitance C_L	-	-	-
Inductive load L_L	-	-	-
Electrical isolation	yes		
Additional measure M	- The outputs are not types in accordance with IEC 61131-2.		

Interface type C0 - Source			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	-	-	-
Test pulse interval T	-	-	-
Nominal current I_N	-	-	6 A
Load capacitance C_L	-	-	-
Inductive load L_L	-	-	-
Additional measure M	- The outputs are not types in accordance with IEC 61131-2. - No test pulses are emitted at the output.		

Alarm outputs : M1				
Source/destination	**Interface type**	**Additional measure**	**Source/destination**	**Suitable interface type**
Source	C0	M	Destination	-

Interface type C0 - Source			
Parameter	**min.**	**typ.**	**max.**
Test pulse duration t_i	-	-	-
Test pulse interval T	-	-	-
Nominal current I_N	-	-	100 mA
Leakage current $I_{Leakage}$	-	-	-
Load capacitance C_L	-	-	-
Inductive load L_L	-	-	-
Additional measure M	- The outputs are not types in accordance with IEC 61131-2. - No test pulses are emitted at M1. - No monitoring of the output by the source		

6 Notes regarding documentation

6.1 Identification of warning notes



This symbol indicates hazards that could lead to personal injury.

There are three signal words indicating the severity of a potential injury.

DANGER Indicates a hazard with a high risk level. If this hazardous situation is not avoided, it will result in death or serious injury.

WARNING Indicates a hazard with a medium risk level. If this hazardous situation is not avoided, it could result in death or serious injury.

CAUTION Indicates a hazard with a low risk level. If this hazardous situation is not avoided, it could result in minor or moderate injury.



This symbol together with the **NOTE** signal word warns the reader of actions that might cause property damage or a malfunction.



Here you will find additional information or detailed sources of information.

6.2 Validity

This data sheet is valid for the described product(s) from the hardware/firmware version specified in the technical data.

6.3 Target group

This data sheet is therefore aimed at:

– Qualified personnel who plan and design safety equipment for machines and systems and are familiar with regulations governing occupational safety and accident prevention.
– Qualified personnel who install and operate safety equipment in machines and systems.

Qualified personnel:

Qualified personnel are people who, because of their education, experience, and instruction and their knowledge of relevant standards, regulations, accident prevention, and service conditions, have been authorized by those responsible for the safety of the system to carry out any required operations and who are able to recognize and avoid any possible dangers.

Requirements:

Knowledge of the following topics is required:

– Handling safety components
– Valid EMC regulations
– Valid regulations governing occupational safety and accident prevention

7 Safety regulations and installation notes

WARNING: Death, serious personal injury or damage to equipment

Depending on the application, incorrect handling of the device may pose serious risks for the user or cause damage to equipment.

- Observe all the safety notes and warning instructions provided in this chapter and elsewhere in this document.

Safety notes for installation and mounting in other languages:
PACKB.SAFETY NOTES INSTALLATION MOUNTING
They can be downloaded from the product page at www.phoenixcontact.com/products.

Direct/indirect contact

- Protection against direct and indirect contact according to VDE 0100 Part 410 must be ensured for all components connected to the system.

In the event of an error, parasitic voltages must not occur (single-fault tolerance).

Power supply units for 24 V supply

- Only use power supply units with safe isolation and SELV/PELV.
- Protect the 24 V area with a suitable external fuse.
- Make sure that the power supply unit is able to supply **four times** the nominal current of the external fuse, to ensure that it trips in the event of an error.
- Make sure that the output voltage of the voltage supply does not exceed 32 V even in the event of error.

Startup, mounting, and modifications

Startup, mounting, modifications, and upgrades may only be carried out by qualified personnel.

- Before working on the device, disconnect the power.
- Ensure that the device is disconnected from the power supply.
- Carry out wiring according to the application. Refer to the “Application examples” section for this.

Reliable operation is only ensured if the device is installed in housing protected from dust and humidity.

- Install the device in housing protected from dust and humidity (min. IP54).

Mismatching and polarity reversal of connections

- Take measures to prevent mismatching, polarity reversal, and manipulation of connections.

In operation

During operation, parts of electrical switching devices carry hazardous voltages.

- Protective covers must not be removed when operating electrical switching devices.

For emergency stop applications, automatic startup of the machine can pose serious risks for the user.

- The machine must be prevented from restarting automatically by a higher-level controller.

With the manual, monitored reset device, a machine start may not be triggered in accordance with EN ISO 13849-1.

Inductive loads can lead to welded relay contacts.

- Connect a suitable and effective protective circuit to inductive loads.
- Implement the protective circuit parallel to the load and not parallel to the switch contact.

Magnetic fields can influence the device. The magnetic field strength of the environment must not exceed 30 A/m.

- Do not use the device in the vicinity of strong magnetic fields (e.g., caused by transformers or magnetic iron).

EMC notes

Noise emission may occur when operating relay modules. Wireless reception may be disrupted in residential areas.

The device is a Class A product.

- Observe the requirements for noise emission for electrical and electronic equipment (EN 61000-6-4).
- Implement appropriate precautions against noise emission.

Faulty devices

The devices may be damaged following an error. Correct operation can no longer be ensured.

- Replace any defective devices.

Only the manufacturer or their authorized representative may perform the following activities. Otherwise the warranty is invalidated.

– Repairs to the device
– Opening the housing

Replacing the device

- Dispose of the device in the following circumstances:

– At the end of its mission time

See “Technical data” section.

– At the end of its electrical service life

See section “Electrical service life”.

– In the event of a fault

7.1 Safety of machines or systems

Draw up and implement a safety concept

The machine or system manufacturer and the operator are responsible for the safety of the machine or system and the application in which the machine or system is used. In order to use the device described in this document, you must have drawn up an appropriate safety concept for your machine or system. This includes a risk assessment in accordance with the directives and standards specified in the EC Declaration of Conformity, as well as other standards.

Risk assessment, validation and function test

- Before using the device, perform a risk assessment on the machine or system.
- Validate your entire safety system.
- Carry out a new validation every time you make a safety-related modification.
- Perform a function test on a regular basis.

Achievable safety integrity

The functional safety is ensured for the device as a single component. However, this does not guarantee functional safety for the entire machine or system. In order to be able to achieve the desired safety level for the entire machine or system, define the safety requirements for the machine or system as well as how to implement them from both a technological and an organizational perspective.

8 Transport, storage, and unpacking

The device is delivered in cardboard packaging.

- Observe the instructions on how to handle the package indicated on the packaging.

Suitable transport packaging

- Only transport the device in its original packaging or in packaging suitable for transport.

Technical data and environmental conditions

- For transport, observe the humidity and air pressure specifications, and the temperature range.
  See Section “Technical data”.

8.1 Storage

Suitable storage location

The storage location must meet the following requirements:

– Dry
– Protected against unauthorized access
– Protected against harmful environmental influences such as UV light

Technical data and environmental conditions

- For storage, observe the humidity and air pressure specifications, and the temperature range.
  See Section “Technical data”.

8.2 Unpacking

The device is delivered in packaging together with a packing slip that provides installation instructions.

Observing the packing slip

- Read the entire packing slip carefully.
- Retain the packing slip.

Checking the delivery

- Check the delivery for damage and completeness.
- Submit any claims for transport damage immediately.

Scope of supply

Refer to the ordering data for the standard scope of supply for the product.
See Section “Ordering data”.

9 Function description

9.1 Configuration

The safety relay is configured via the rotary coding switch on the front of the device.

The following functions are possible:

– 1-channel operation
– 2-channel operation without cross-circuit detection
– 2-channel operation with cross-circuit detection
– OSSD signal
– Safety mat operation
– Type IIIA two-hand control
– Non-equivalent operation
– Automatic start
– Manual, monitored start

See section “Configuration”.

The clipx ENGINEER dp software provides a configuration help.

9.2 Sensor circuit

The sensor circuit can be designed as a 1-channel or 2-channel circuit.

See “Signal generator connection versions” section.

Single-channel sensor circuit

The sensor circuit is not designed with redundancy.

The safety relay does not detect short and cross-circuits in the sensor circuit.

Two-channel sensor circuit

The connection of the 2-channel sensor circuit can be equivalent or non-equivalent.

With the corresponding wiring, the safety relay detects short and cross-circuits in the sensor circuit.

9.3 Startup behavior

The desired startup behavior is selected by setting the rotary coding switch and the corresponding wiring of the start input.

See section “Configuration”.

See “Start and feedback circuit connection versions” section.

Automatic start

The device starts automatically after the sensor circuit has been closed.

Manual, monitored start

When the sensor circuit is closed, the device starts once the start circuit has been closed and opened again by pressing and releasing the reset button.

A connected reset button is monitored.

9.4 Safe shutdown

When the sensor circuit opens, the enabling current paths open without delay.

When the enabling current paths are open, the device is in the safe state.

Signal output M1 is active.

The signal output transmits non-safety-related status information. Feedback of the signal output to external basic devices for reasons of functional safety is therefore not required.

9.5 Diagnostics

The safety relay indicates detected errors via the LEDs on the front.

See section “Diagnostics”.

10 Function and time diagrams

10.1 Notes on function and time diagrams

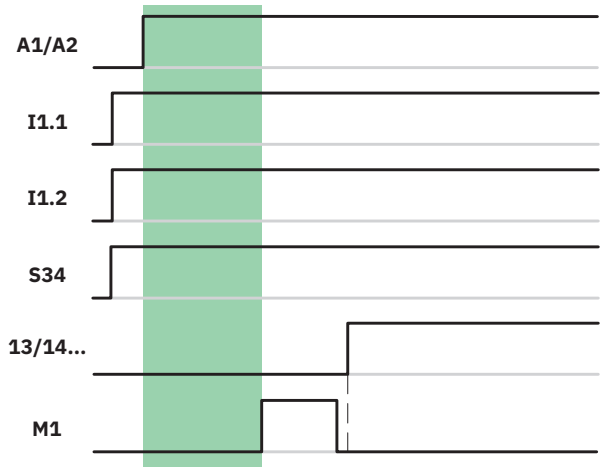
Key:

A1/A2	24 V DC power supply
T1, T2	Clock outputs
I1.1, I1.2	Sensor inputs
S34	Start circuit
13/14...	Undelayed enabling current paths
M1	Digital alarm output

Green area = boot phase

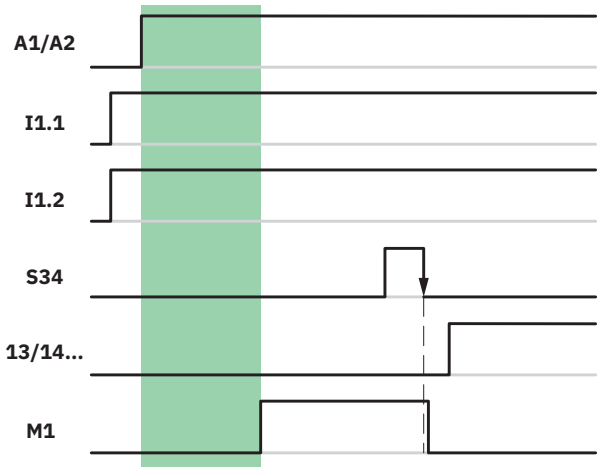
10.2 Power-up, autostart

Figure 1 Time diagram for power-up, automatic start



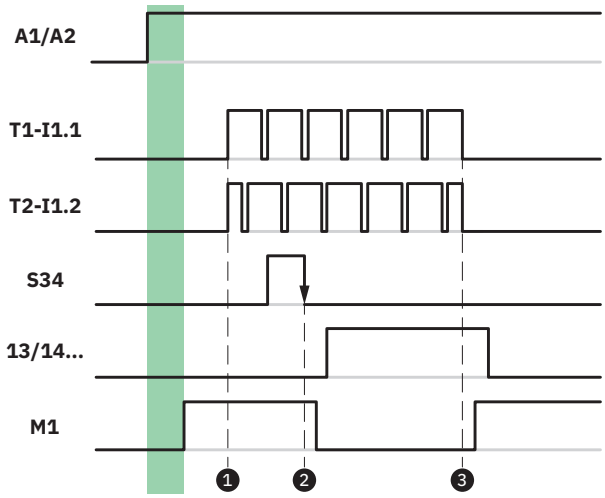
10.3 Power-up, manual start

Figure 2 Time diagram for power-up, manual start



10.4 Emergency stop monitoring with manual start (mode = 1)

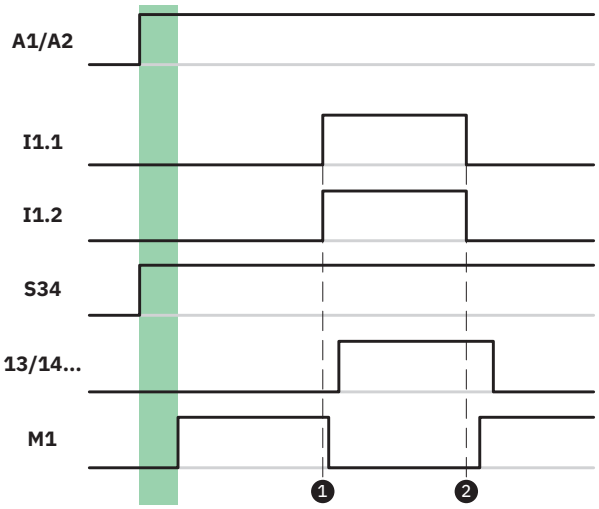
Figure 3 Emergency stop time diagram with manual start



1. Emergency stop is unlocked.
2. The start button has been pressed and is now released. The enabling current paths close. The signal output is deactivated.
3. Emergency stop is actuated. The enabling current paths open. The signal output is activated.

10.5 Safety door monitoring with autostart (mode = 4)

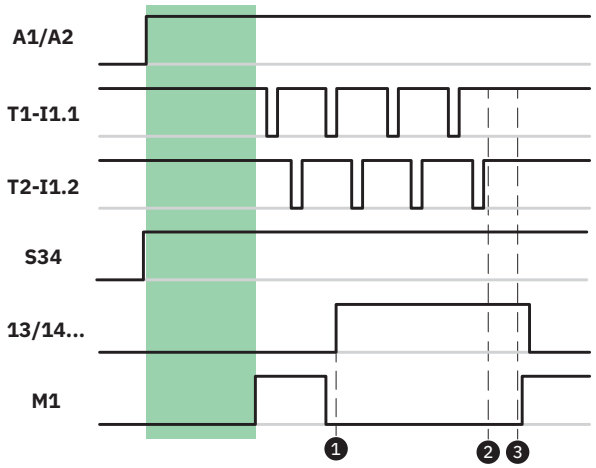
Figure 4 Safety door switch time diagram with autostart



1. The safety door is closed. The enabling current paths close. The signal output is deactivated.
2. The safety door is opened. The enabling current paths open. The signal output is activated.

10.6 Safety shut-off mat monitoring (mode = 6)

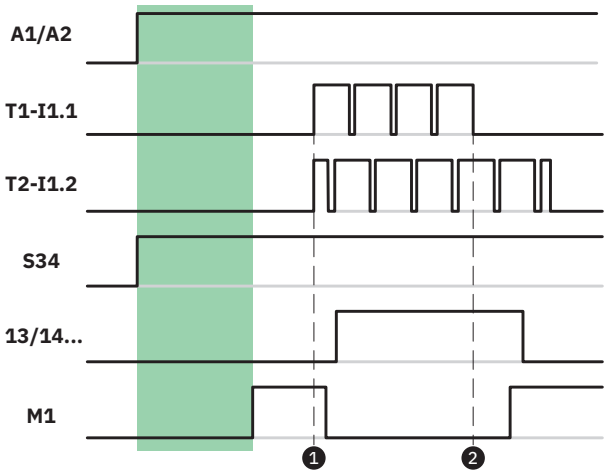
Figure 5 Time diagram for safety shut-off mat monitoring



1. Nobody has stepped on the safety shut-off mat. Therefore, startup is possible. The enabling current paths close. The signal output is deactivated.
2. Somebody steps on the safety shut-off mat.
3. There are no more test pulses when somebody steps on the safety shut-off mat. The enabling current paths open. The signal output is activated.

10.7 Two-hand monitoring (mode = 9)

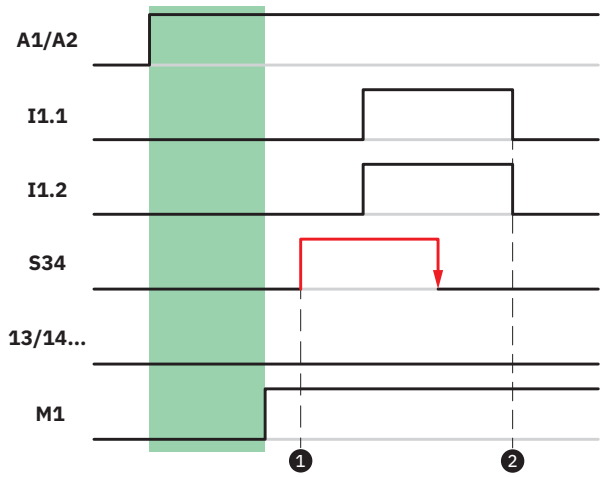
Figure 6 Time diagram for two-hand monitoring



1. Channel 1 (I1.1) and channel 2 (I1.2) are switched on within the time Δt < 0.5 s. The enabling current paths close. The signal output is deactivated.
2. At least one channel is switched off. The enabling current paths open. The signal output is activated.

10.8 Manual start error (mode = 3)

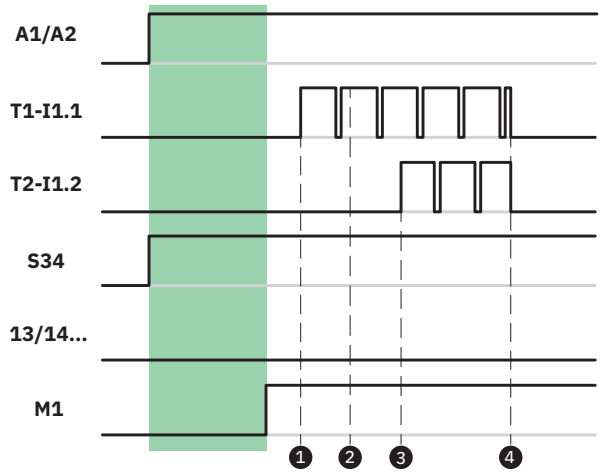
Figure 7 Time diagram for manual start error



1. The device indicates the error via the LEDs.
2. The error is reset.

10.9 Time violation error during two-hand monitoring (mode = 9)

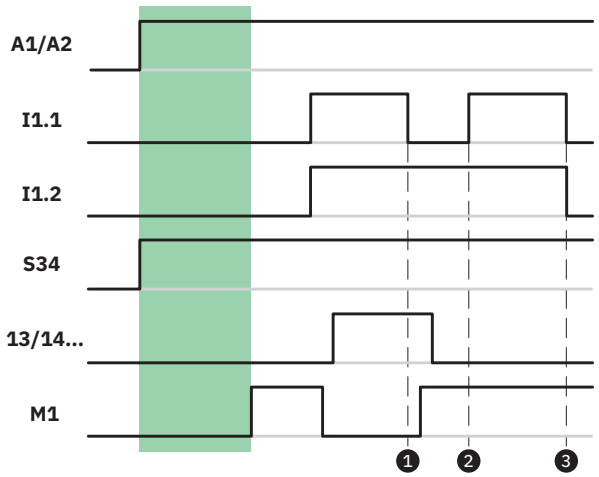
Figure 8 Time diagram for time violation error during two-hand monitoring



1. Channel 1 (I1.1) is switched on.
2. The time of 0.5 s is exceeded. The device indicates an error via the LEDs.
3. Channel 2 (I1.2) is switched on.
4. Both channels are switched off. The error is reset.

10.10 Plausibility error (mode = 4)

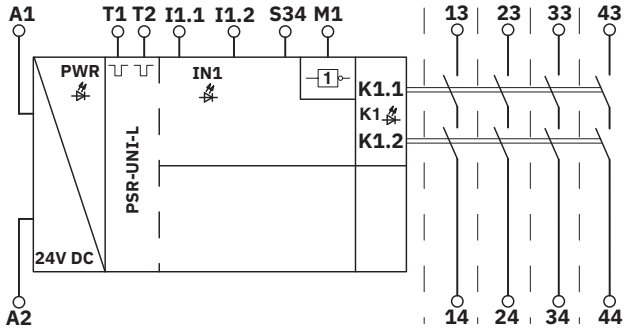
Figure 9 Time diagram for plausibility error



1. Channel 1 (I1.1) is switched off, channel 2 (I1.2) remains switched on.
2. Channel 1 (I1.1) is switched on again. The device indicates a plausibility error.
3. Channel 1 (I1.1) and channel 2 (I1.2) are switched off. The error is reset.

11 Block diagram

Figure 10 Block diagram



Key:

A1	24 V DC power supply
A2	0 V power supply
T1, T2	Clock outputs
I1.1	Input sensor circuit (channel 1)
I1.2	Input sensor circuit (channel 2)
S34	Start circuit
M1	Digital signal output, non-safety-related
13/14, 23/24, 33/34, 43/44	Undelayed enabling current paths

11.1 Insulation coordination

	A1/A2, logic	13/14	23/24	33/34	43/44	Housing
A1/A2, logic	-	6 kV ST	6 kV ST	6 kV ST	6 kV ST	4 kV BI
13/14	-	-	4 kV BI	4 kV BI	4 kV BI	4 kV BI
23/24	-	-	-	4 kV BI	4 kV BI	4 kV BI
33/34	-	-	-	-	4 kV BI	4 kV BI
43/44	-	-	-	-	-	4 kV BI

Key:

BI	Basic insulation
ST	Safe isolation
Logic	Sensor and start circuits, signal output

Basic insulation

(rated surge voltage of 4 kV)

A mixture of SELV and PELV is strictly prohibited. Only switch 250 V AC at one of the enable contacts if the adjacent contact/enabling current path carries the same potential.

Safe isolation/reinforced insulation

(rated surge voltage of 6 kV)

Reinforced insulation (e.g., thanks to greater air clearances and creepage distances between conductive paths) is designed for one overvoltage category higher than basic insulation. This means that SELV circuits of U ≤ 25 V AC or U ≤ 60 V DC and circuits with higher voltages can be mixed.

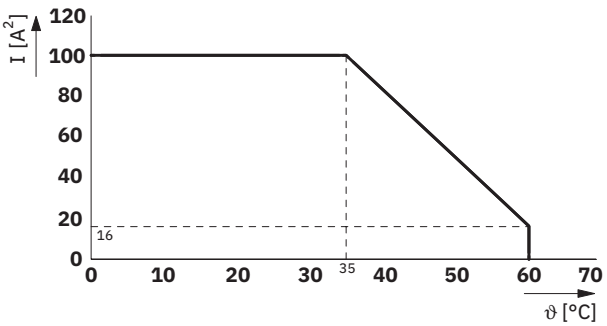
12 Derating

12.1 Horizontal mounting position

The derating curve applies for the following conditions:

- Mounting on a horizontal DIN rail
- Devices mounted next to each other without spacing
- at U_S up to max. 30 V DC
- $I_{max}^2 = I_1^2 + I_2^2 + I_3^2 + I_4^2$
- $I_{max}^2 = 100\ A^2$

Figure 11 Derating curve - horizontal mounting position, without spacing

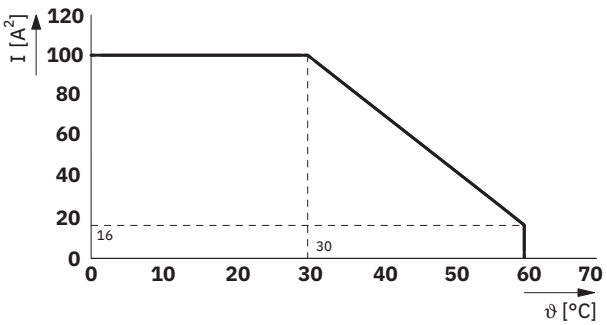


12.2 Vertical mounting position

The derating curve applies for the following conditions:

- Mounting on a vertical DIN rail
- Devices mounted next to each other without spacing
- at U_S up to max. 30 V DC
- $I_{max}^2 = I_1^2 + I_2^2 + I_3^2 + I_4^2$
- $I_{max}^2 = 100\ A^2$

Figure 12 Derating curve - vertical mounting position, without spacing



12.3 Examples

Example 1 for a **total current of 100 A²** with a distribution to **three N/O contacts**:

$I_1 = 5.77\ A$, $I_2 = 5.77\ A$, $I_3 = 5.77\ A$, $I_4 = 0\ A$

$100\ A^2 = (5.77\ A)^2 + (5.77\ A)^2 + (5.77\ A)^2 + (0\ A)^2$

Example 2 for a **total current of 16 A²** with a distribution to **three N/O contacts**:

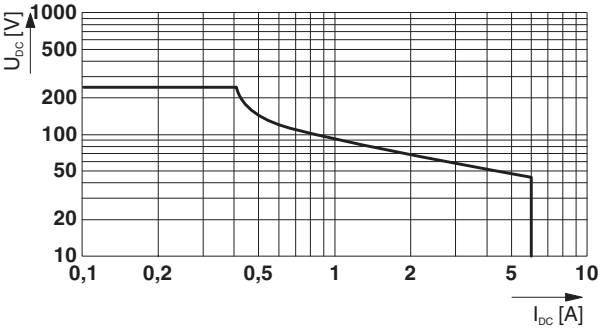
$I_1 = 2.31\ A$, $I_2 = 2.31\ A$, $I_3 = 2.31\ A$, $I_4 = 0\ A$

$16\ A^2 = (2.31\ A)^2 + (2.31\ A)^2 + (2.31\ A)^2 + (2.31\ A)^2$

13 Relay data

13.1 Load limit curve at DC load

Figure 13 Relay load limit curve – resistive load



13.2 Electrical service life

Figure 14 Number of switching cycles for AC-1

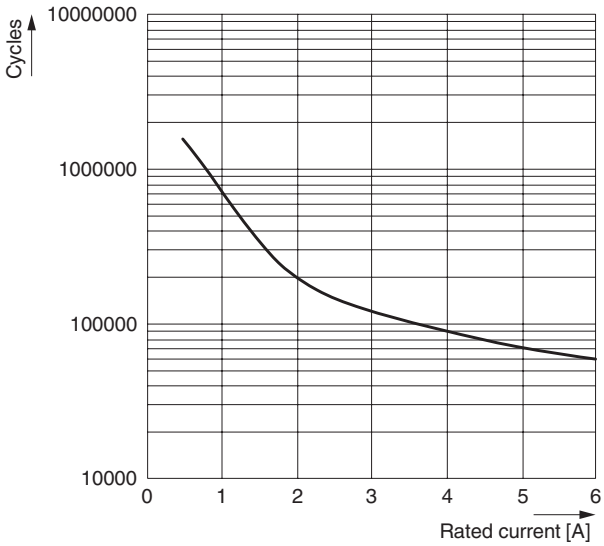


Figure 15 Number of switching cycles for AC-15

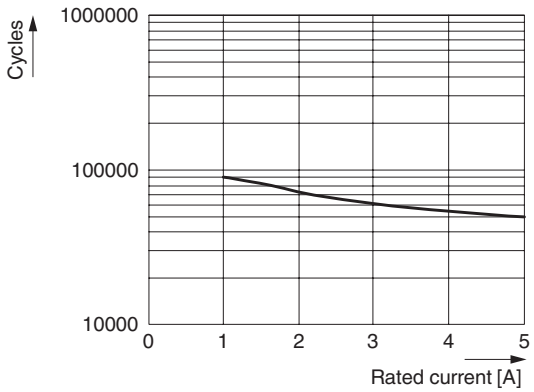


Figure 16 Number of switching cycles for DC-1

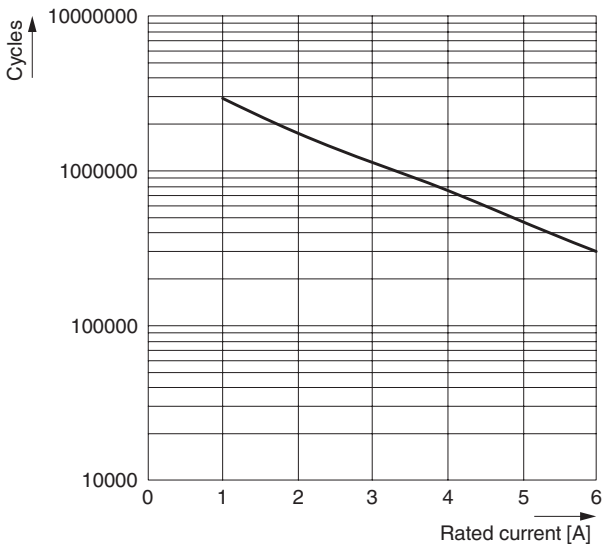
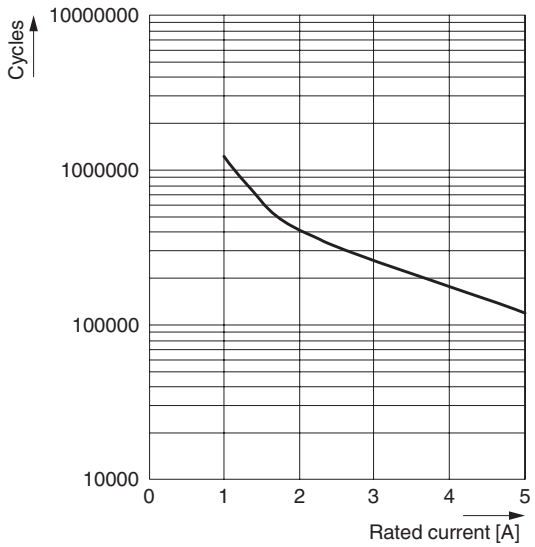


Figure 17 Number of switching cycles for DC-13



Behavior of the electrical service life

The service life curves indicate the number of switching cycles after which wear-related failures must be expected.

They depend on the utilization category and the expected load current.

Example:

Let's assume:

– Load = 2 A
– Utilization category = DC13

This results in a contact service life of about 400000 switching cycles.

WARNING: Loss of functional safety

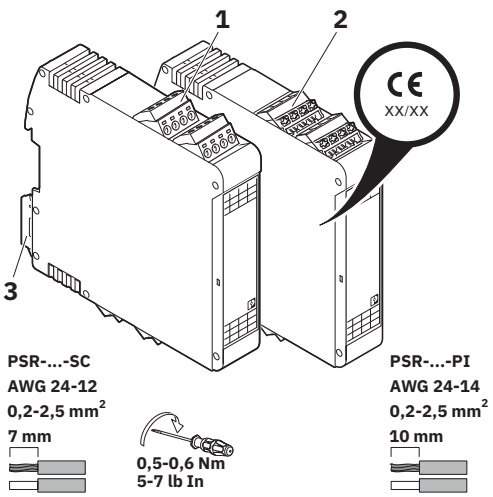
At the end of the electrical service life, there is an increased risk of loss of functional safety.

- Replace the device in good time before the end of the electrical service life.

14 Operating and indication elements

14.1 Connection versions

Figure 18 Connection versions



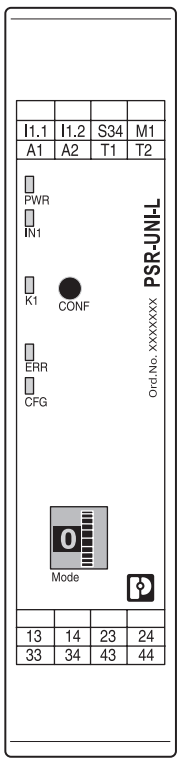
1 COMBICON plug-in screw terminal block
2 Pluggable COMBICON Push-in terminal block
3 Metal lock for fixing to DIN rail

See section "Optional terminal coding".

The year the device was constructed can be found underneath the CE designation on the housing.

XX/XX = Calendar week / year

14.2 Connection assignment



I1.1	Input sensor circuit (channel 1)
I1.2	Input sensor circuit (channel 2)
S34	Start circuit
M1	Digital signal output, non-safety-related
A1	24 V DC power supply
A2	0 V power supply
T1	Clock output 24 V for I1.1
T2	Clock output 24 V for I1.2
PWR	Power LED (red, yellow, green)
IN1	Status indicator sensor circuit; LED (red, yellow, green)
K1	Status indicator safety circuit; LED (red, yellow, green)
ERR	Error LED (red)
CFG	LED for indicating configuration mode
CONF	Button for starting configuration mode
Mode	Rotary switch for configuration
13/14	Enabling current path, undelayed
23/24	Enabling current path, undelayed
33/34	Enabling current path, undelayed
43/44	Enabling current path, undelayed

14.3 Optional terminal coding

The device connection terminal blocks are **not** coded as standard.

The optional coding accessories can provide you with increased safety against connection mismatching and reverse polarity.
See section “Ordering data”.

If you do not use the coding accessories, ensure that alternative validation measures are taken.

Coding system

The terminal blocks can be coded by using coding sections and coding profiles.

Coding sections are plugged onto the terminal block header in the device housing.

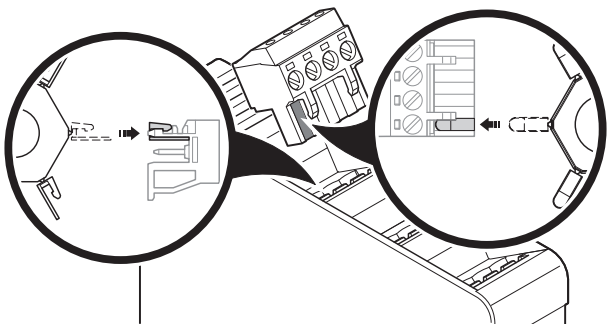
Coding profiles are plugged into the groove of the pluggable terminal block.

Various combinations can be used to create a coding system for the device terminal blocks.

Attaching coding elements

1. Push a coding section onto the terminal block header in the device housing.
   Remove the coding section from the coding star.
2. Push a coding profile into the groove of the terminal block.
   Remove the coding profile from the coding star.

Figure 19 Attach coding elements

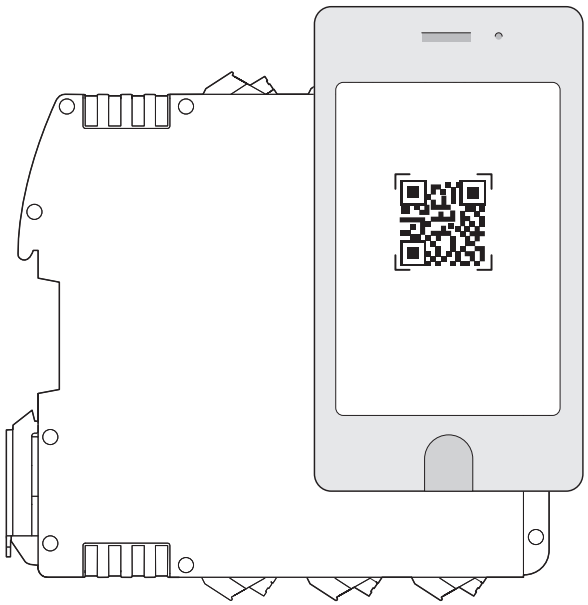


14.4 Digital nameplate

The digital nameplate provides the option of obtaining product-specific data related to a specific serial number.

If you scan the QR code (digital nameplate) on the device, you can, for example, retrieve documents on the production status as well as clearly identify the hardware and firmware status of the device at hand.

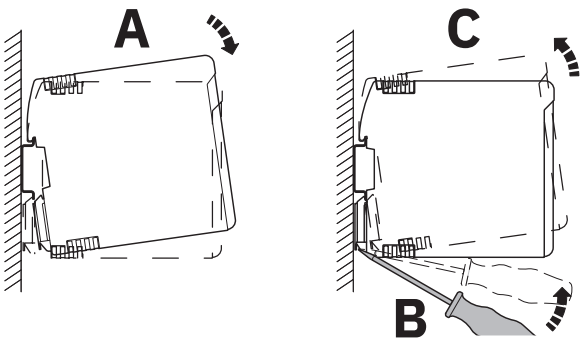
Figure 20 Scan QR code



15 Mounting and removing

- Mount the device on a 35 mm DIN rail in accordance with EN 60715.
- To remove the device, use a screwdriver to release the snap-on foot.

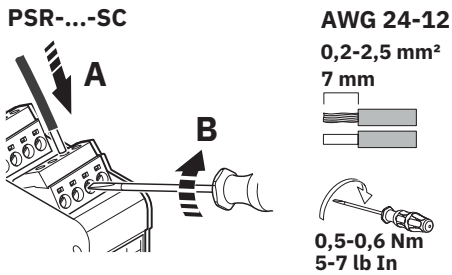
Figure 21 Mounting and removing



16 Wiring

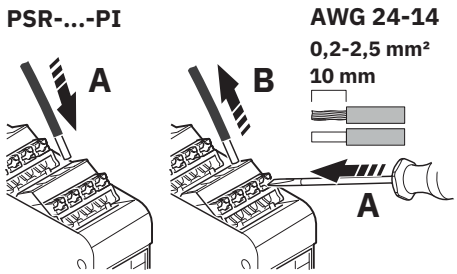
- Connect the cables to the connection terminal blocks using a screwdriver.

Figure 22 Connecting the cables for PSR-...-SC (screw terminal block)



- First open the springs using the pressure switch before connecting stranded conductors or disconnecting the cables for Push-in terminal blocks.

Figure 23 Connecting the cables for PSR-...-PI (Push-in terminal block)



It is recommended that ferrules are used to connect stranded cables.

Use the CRIMPFOX 6 crimping tool from Phoenix Contact.

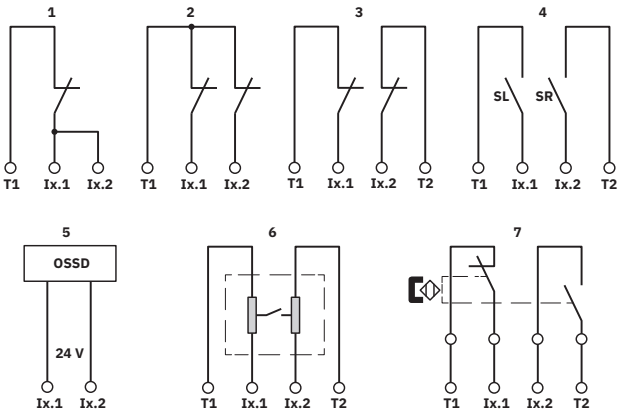
The tool enables the reliable processing of ferrules and easy removal of conductors with ferrules from the connection terminal blocks.

For compliance with UL approval, use copper wire that is approved up to 60°C/75°C.

16.1 Signal generator connection versions

- Connect suitable signal generators to the corresponding sensor inputs and clock outputs.

Figure 24 Signal generator connection versions



1 1-channel connection
2 2-channel connection without cross-circuit detection
3 2-channel connection with cross-circuit detection
4 Two-hand control connection
5 2-channel OSSD signal
6 2-channel connection for safety mat monitoring
7 2-channel, non-equivalent connection

If control is 1-channel via a PLC, the digital output of the PLC must satisfy the requirements in accordance with the required safety integrity.

16.2 Start and feedback circuit connection variants

Automatic start

- Bridge contacts T1/S34.

Manual, monitored start

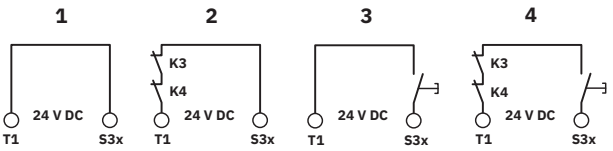
- Connect a reset button to contacts T1/S34.

A connected reset button is monitored.

Start and feedback circuit

- Place the relevant N/C contacts in path T1/S34 to monitor external contactors or extension devices with force-guided contacts.

Figure 25 Start and feedback circuit connection variants



1 Automatic start
2 Automatic start with monitored contact extension
3 Manual, monitored start
4 Manual, monitored start with monitored contact extension

K3/K4 Force-guided contactors

If you are using the two-hand control function, hard wire start input S34. Only use it for reading back actuators. Do not use a start button or similar.

17 Configuration

17.1 Important notes on configuration

WARNING: Danger due to incorrect setting

An incorrect configuration can result in dangerous machine or system states.

- Validate the configuration before starting up for the first time and every time a change is made.

WARNING: Risk of electric shock

Use a VDE-insulated screwdriver in accordance with EN 60900 to press the CONF button.

In configuration mode, the device is in the safe state.

Examples of applications with the corresponding configuration can be found in the application examples section.

17.2 Delivery state

Before being configured and started up for the first time, the device is in the following state:

– Mode = 1

The setting corresponds to the 2-channel wiring function with cross-circuit detection.

17.3 Preparation

Make sure the following preparations are made for configuration:

1. No one is present in the danger zone for the machine.
2. The safety relay module is connected in accordance with the specifications.
3. The power supply of the safety relay module (A1/A2) is switched on.
4. The selftest is completed without errors and the PWR LED is green.

17.4 Applying the configuration

Configuration is performed using the CONF button and the rotary coding switch on the front of the safety relay.

The LEDs indicate the configuration status.

The device functions to be configured are assigned to the rotary coding switch positions as follows.

Configurable functions

Mode	Function	Startup behavior
0	Invalid	Invalid
1	2-channel with cross-circuit detection (T1, T2)	Manual, monitored start
2	2-channel with cross-circuit detection (T1, T2)	Automatic start
3	2-channel without cross-circuit detection (1-channel sensor, OSSD sensor)	Manual, monitored start
4	2-channel without cross-circuit detection (1-channel sensor, OSSD sensor)	Automatic start
5	Safety mat sensor	Manual, monitored start
6	Safety mat sensor	Automatic start
7	Non-equivalent sensor with cross-circuit detection (T1, T2)	Manual, monitored start
8	Non-equivalent sensor with cross-circuit detection (T1, T2)	Automatic start
9	Type IIIA two-hand control with cross-circuit detection (T1, T2)	Automatic start

If an invalid setting is made during configuration mode, the CFG LED flashes yellow and configuration mode cannot be exited.

The device remains in the safe state.

- To continue with the configuration, set a valid combination.

Configuring

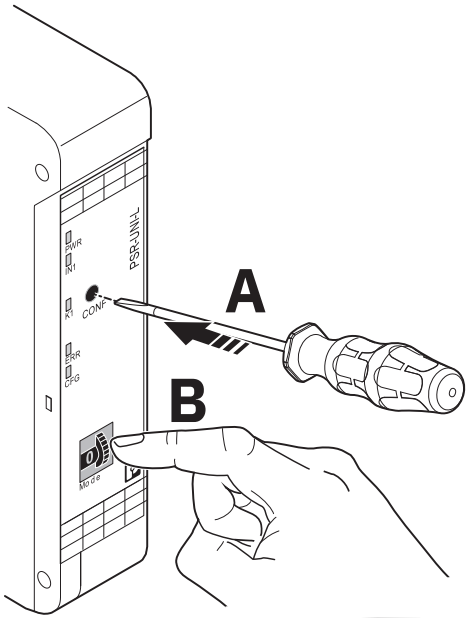
NOTE: Device defect

If the LED display of the device does not match the rotary coding switch setting in configuration mode, a device defect may be present.

- Replace the device.

1. Make sure that the supply voltage is connected and the device is active.
2. Press the CONF button for **2 s ... 5 s**.
3. Set the desired function via the rotary coding switch.
   See the “Configurable functions” table.
4. Compare the selected number on the rotary coding switch with the LED indicator of the device.
   See “LED display – configuration” table.
   If the selected number and the LED indicator match, complete the configuration.
5. Press the CONF button for **2 s ... 5 s**.
6. Validate the configured functions using the relevant startup.
   See Section “Startup”.

Figure 26 Configuration



LED display – configuration

Key:

○ LED OFF
✷ LED flashing
● LED permanently on
... Any state

LED					Mode	Function/startup behavior
PWR	**IN1**	**K1**	**ERR**	**CFG**		
...	...	...	...	✷ yel-low	Invalid configuration. The device remains in the safe state. To continue with the configuration, set a valid combination.	
● green	○	○	○	✷ green	1	2-channel with cross-circuit detection (T1, T2) Manual, monitored start
○	● green	○	○	✷ green	2	2-channel with cross-circuit detection (T1, T2) Autostart
● green	● green	○	○	✷ green	3	2-channel without cross-circuit detection (1-channel sensor, OSSD sensor) Manual, monitored start
○	○	● green	○	✷ green	4	2-channel without cross-circuit detection (1-channel sensor, OSSD sensor) Autostart
● green	○	● green	○	✷ green	5	Safety mat sensor Manual, monitored start
○	● green	● green	○	✷ green	6	Safety mat sensor Autostart
● green	● green	● green	○	✷ green	7	Non-equivalent sensor with cross-circuit detection (T1, T2) Manual, monitored start
○	○	○	● green	✷ green	8	Non-equivalent sensor with cross-circuit detection (T1, T2) Autostart
● green	○	○	● green	✷ green	9	Type IIIA two-hand control with cross-circuit detection (T1, T2) Autostart

17.5 Protection against manipulation

Operate the device in a locked control cabinet to protect the configuration against tampering.

17.6 Configuration help in clipx ENGINEER dp

clipx ENGINEER device parameterization (dp) is an intuitive and free parameterization software. It supports a variety of Phoenix Contact device types and, in addition to the parameterization function, also includes a device setting aid. It provides the user with clear step-by-step instructions for device configuration.

The device setting aid is available for all PSR-UNI-L products at:

www.phoenixcontact.com/qr/1371665

18 Startup

Startup includes checking the configured function.

- Apply the rated control circuit supply voltage (24 V DC) at terminal blocks A1/A2.

PWR LED lights up.

- Continue with startup and checking in accordance with the corresponding table for the configured function.

WARNING: Loss of functional safety due to malfunction

If executing startup does not result in the expected device response, this can lead to the loss of functional safety.

- In configuration mode, check whether the displayed LEDs reflect the correct function.
- Check whether the wiring is correct.
- If the response is still not as expected, replace the device.

Configured function: Mode = 1

Figure 27 Manual, monitored start

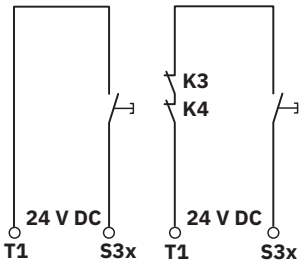
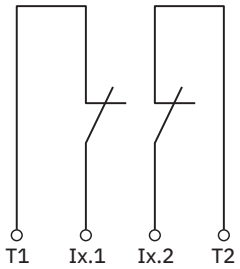


Figure 28 2-channel with cross-circuit detection



Configured function: Mode X = 1	Procedure	Expected response of the device
Manual, monitored start	**Error detection, start process**	
	• Press and hold down the start button. • Close the sensor circuit.	The device enters the error state. - K1 LED lights up yellow. - ERR LED flashes red.
	• Open the sensor circuit. • Release the start button. • Wait for at least 1 s. • Close the sensor circuit. • Press and hold down the start button.	The device does not start up but does **not** enter the error state.
	• Release the start button.	The device starts up. The enabling current paths close.
	Executing the safety function	
	• Open the sensor circuit.	The enabling current paths open.
2-channel with cross-circuit detection (T1, T2)	**Cross-circuit detection**	
	• Close the sensor circuit.	The device does not start up but does **not** enter the error state.
	• Press and release the start button.	The device starts up. The enabling current paths close.
	• Bridge channel 1 and channel 2 of the sensor circuit.	The device enters the error state. The enabling current paths open. - IN1 LED lights up yellow. - ERR LED flashes red.
	• Remove the bridge between channel 1 and channel 2 of the sensor circuit.	The error state persists.
	• Open the sensor circuit.	The error state is canceled.

Configured function: Mode = 2

Figure 29 Autostart

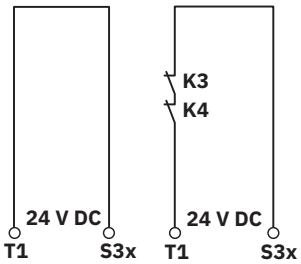
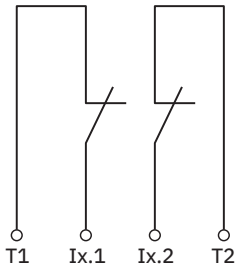


Figure 30 2-channel with cross-circuit detection



Configured function: Mode X = 2	Procedure	Expected response of the device
Automatic start	**Start process**	
	If the automatic startup input is not wired directly: • Close the start circuit. • Close the sensor circuit.	The device starts up. The enabling current paths close.
	Executing the safety function	
	• Open the sensor circuit.	The enabling current paths open.
2-channel with cross-circuit detection (T1, T2)	**Cross-circuit detection**	
	If the automatic startup input is not wired directly: • Close the start circuit.	The device does not start up but does **not** enter the error state.
	• Close the sensor circuit.	The device starts up. The enabling current paths close.
	• Bridge channel 1 and channel 2 of the sensor circuit.	The device enters the error state. The enabling current paths open. - IN1 LED lights up yellow. - ERR LED flashes red.
	• Remove the bridge between channel 1 and channel 2 of the sensor circuit.	The error state persists.
	• Open the sensor circuit.	The error state is canceled.

Configured function for circuit X: mode X = 3

Figure 31 Manual, monitored start

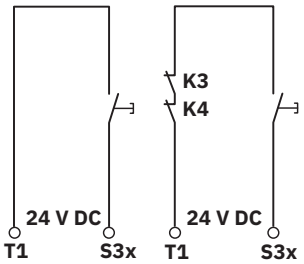


Figure 32 1-channel sensors

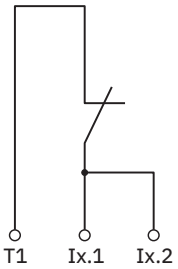


Figure 33 2-channel without cross-circuit detection

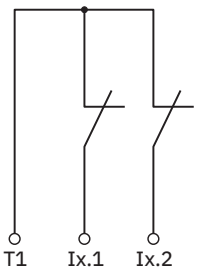
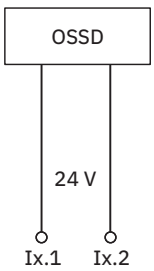


Figure 34 OSSD sensors



Configured function: Mode X = 3	**Procedure**	**Expected response of the device**
Manual, monitored start 2-channel without cross-circuit detection	**Error detection, start process**	
	• Press and hold down the start button. • Close the sensor circuit.	The device enters the error state. - K1 LED lights up yellow. - ERR LED flashes red.
	• Open the sensor circuit. • Release the start button. • Wait for at least 1 s. • Close the sensor circuit. • Press and hold down the start button.	The device does not start up but does **not** enter the error state.
	• Release the start button.	The device starts up. The enabling current paths close.
	Executing the safety function	
	• Open the sensor circuit.	The enabling current paths open.

Configured function: Mode = 4

Figure 35 Autostart

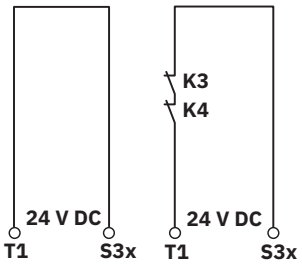


Figure 36 1-channel sensors

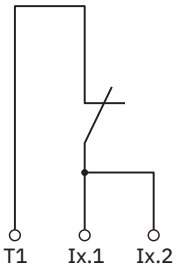


Figure 37 2-channel without cross-circuit detection

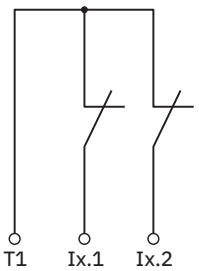
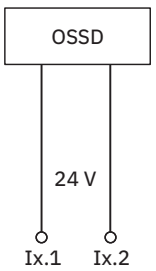


Figure 38 OSSD sensors



Configured function: Mode X = 4	Procedure	Expected response of the device
Autostart 2-channel without cross-circuit detection	**Start process**	
	If the automatic startup input is not wired directly: • Close the start circuit. • Close the sensor circuit.	The device starts up. The enabling current paths close.
	Executing the safety function	
	• Open the sensor circuit.	The enabling current paths open.

Configured function: Mode = 5

Figure 39 Manual, monitored start

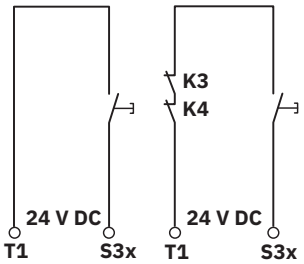
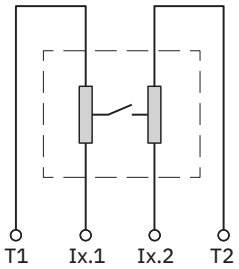


Figure 40 Safety shut-off mat sensor (T1, T2 required)



Configured function: Mode X = 5	Procedure	Expected response of the device
Manual, monitored start Safety mat sensor	**Error detection, start process**	
	• Step on the safety mat. • Press and hold down the start button. • Step off the safety mat.	The device enters the error state. - K1 LED lights up yellow. - ERR LED flashes red.
	• Step on the safety mat. • Release the start button. • Wait for at least 1 s. • Step off the safety mat. • Press and hold down the start button.	The device does not start up but does **not** enter the error state.
	• Release the start button.	The device starts up. The enabling current paths close.
	Executing the safety function	
	• Step on the safety mat.	The enabling current paths open.
	• Step off the safety mat.	The device does not start up but does **not** enter the error state.

Configured function: Mode = 6

Figure 41 Autostart

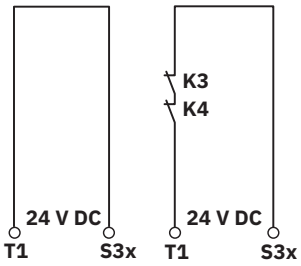
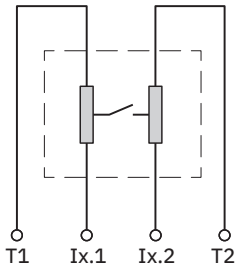


Figure 42 Safety shut-off mat sensor (T1, T2 required)



Configured function: Mode X = 6	Procedure	Expected response of the device
Autostart Safety mat sensor	**Start process**	
	If the automatic startup input is not wired directly: • Close the start circuit.	The device starts up. The enabling current paths close.
	Executing the safety function	
	• Step on the safety mat.	The enabling current paths open.
	• Step off the safety mat.	The device starts up. The enabling current paths close.

Configured function: Mode = 7

Figure 43 Manual, monitored start

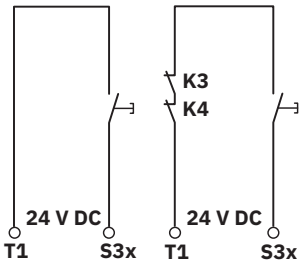
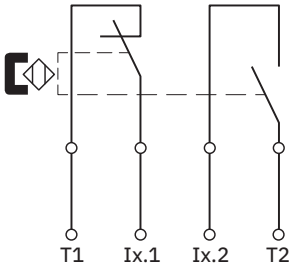


Figure 44 Non-equivalent sensor (symmetry monitoring <5 s) with cross-circuit detection



Configured function: Mode X = 7	Procedure	Expected response of the device
Manual, monitored start	**Error detection, start process**	
	• Press and hold down the start button. • Close the sensor circuit.	The device enters the error state. - K1 LED lights up yellow. - ERR LED flashes red.
	• Open the sensor circuit. • Release the start button. • Wait for at least 1 s. • Close the sensor circuit. • Press and hold down the start button.	The device does not start up but does **not** enter the error state.
	• Release the start button.	The device starts up. The enabling current paths close.
	Executing the safety function	
	• Open the sensor circuit.	The enabling current paths open.
Non-equivalent sensor with cross-circuit detection (T1, T2)	**Cross-circuit detection**	
	• Close the sensor circuit.	The device does not start up but does **not** enter the error state.
	• Press and release the start button.	The device starts up. The enabling current paths close.
	• Bridge channel 1 and channel 2 of the sensor circuit.	The device enters the error state. The enabling current paths open. - IN1 LED lights up yellow. - ERR LED flashes red.
	• Remove the bridge between channel 1 and channel 2 of the sensor circuit.	The device remains in the error state.
	• Open the sensor circuit.	The error state is canceled.

Configured function: Mode = 8

Figure 45 Autostart.

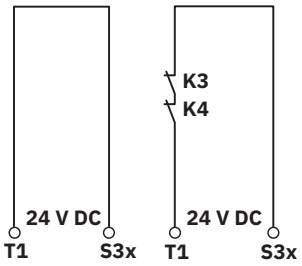
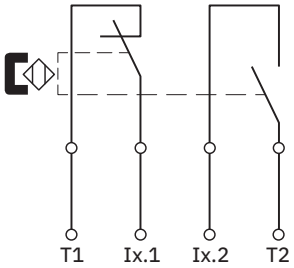


Figure 46 Non-equivalent sensor (symmetry monitoring <5 s) with cross-circuit detection



Configured function: Mode X = 8	Procedure	Expected response of the device
Automatic start	**Start process**	
	If the automatic startup input is not wired directly: • Close the start circuit. • Close the sensor circuit.	The device starts up. The enabling current paths close.
	Executing the safety function	
	• Open the sensor circuit.	The enabling current paths open.
Non-equivalent sensor with cross-circuit detection (T1, T2)	**Cross-circuit detection**	
	If the automatic startup input is not wired directly: • Close the start circuit.	The device does not start up but does **not** enter the error state.
	• Close the sensor circuit.	The device starts up. The enabling current paths close.
	• Bridge channel 1 and channel 2 of the sensor circuit.	The device enters the error state. The enabling current paths open. - IN1 LED lights up yellow. - ERR LED flashes red.
	• Remove the bridge between channel 1 and channel 2 of the sensor circuit.	The device remains in the error state.
	• Open the sensor circuit.	The error state is canceled.

Configured function: Mode = 9

Figure 47 Autostart

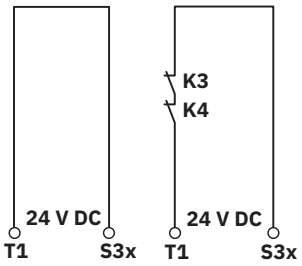
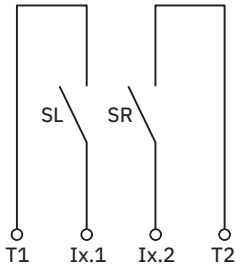


Figure 48 Two-hand control type IIIA (symmetry monitoring <0.5 s) with cross-circuit detection



Configured function: Mode X = 9	Procedure	Expected response of the device
Automatic start	**Start process**	
	• Close the sensor circuit (channel 1 and channel 2 <0.5 s).	The device starts up. The enabling current paths close.
	Executing the safety function	
	• Open the sensor circuit.	The enabling current paths open.
Type IIIA two-hand control with cross-circuit detection (T1, T2)	**Time-based plausibility check (<0.5 s)**	
	• Close channel 1 of the sensor circuit.	The device does not start up and enters the error state after >0.5 s. - IN1 LED flashes yellow. - ERR LED goes out.
	• Wait for 2 s. • Close channel 2 of the sensor circuit.	The error state persists.
	• Open the sensor circuit.	The error state is canceled.
	Cross-circuit detection	
	• Close the sensor circuit (channel 1 and channel 2 <0.5 s).	The device starts up. The enabling current paths close.
	• Bridge channel 1 and channel 2 of the sensor circuit.	The device enters the error state. The enabling current paths open. - IN1 LED lights up yellow. - ERR LED flashes red.
	• Remove the bridge between channel 1 and channel 2 of the sensor circuit.	The device remains in the error state.
	• Open both channels of the sensor circuit.	The error state is canceled.

19 Calculating the power dissipation

The total power dissipation of the safety relay module is based on the input power dissipation and the contact power dissipation for the same and for different load currents.

Input power dissipation

For **mode = 2:**

P_{Input} = 1.06 W (for 19.2 V DC)

P_{Input} = 1.32 W (for 24 V DC)

P_{Input} = 1.65 W (for 30 V DC)

Contact power dissipation

$P_{Contact} = (I_{L1}^{2} + I_{L2}^{2} + ... + I_{Ln}^{2}) \bullet 200\ m\Omega$

Total power dissipation

$P_{Total} = P_{Input} + P_{Sensor\ inputs} + P_{Contact}$

When the sensor inputs are supplied via T1 and T2:

$P_{Total} = P_{Input} + P_{Contact}$

$P_{Total} = P_{Input} + (I_{L1}^{2} + I_{L2}^{2} + ... + I_{Ln}^{2}) \bullet 200\ m\Omega$

Key:

P	Power dissipation in mW
$\mathbf{I_L}$	Contact load current

20 Function test/proof test

To verify the device function, proceed as follows:

- Demand the safety function by actuating the corresponding safety equipment.
- Check whether the safety function was executed correctly by switching the device on again.
- For each mode setting, perform the corresponding startup including check.

  See the section “Startup”.

If the device does not switch on again, the proof test failed.

WARNING: Loss of functional safety due to malfunction

If the proof test contains errors, the device no longer functions correctly.

- Replace the device.

21 Diagnostics

Plausibility errors are deleted when the supply voltage is switched off (power down reset).

In the event of an error or fault that is not listed, please contact Phoenix Contact.

21.1 General states

Key:

○ LED OFF
☀ LED flashing
● LED permanently on
... Any state

LED					State	Notes
PWR	**IN1**	**K1**	**ERR**	**CFG**		
● green	...	...	○	○	Supply voltage present	Permitted range: 19.2 V DC ... 30 V DC
● green	● green	...	○	○	The sensor circuit is active. Signals I1.1 and I1.2 are logically active.	Start is possible.
● green	...	● green	○	○	Relay path K1 is energized. Enabling current paths 13/14, 23/24, 33/34, and 43/44 are closed.	-
Indicator in accordance with configuration table.				☀ green	The device is in configuration mode.	See Section “Configuration”.

21.2 Error messages

Key:

○ LED OFF
☀ LED flashing
● LED permanently on
... Any state

LED					Error	Corrective
PWR	**IN1**	**K1**	**ERR**	**CFG**		
● red	...	...	○	○	**Supply voltage** outside the permissible range	Check the supply voltage. Make sure that the supply voltage is within the permissible range: 19.2 V DC ... 30 V DC
○	...	...	○	○	**PWR LED not active.** No supply voltage is present or the LED is defective.	Check the supply voltage.
● green	○	...	○	○	**IN1 LED not active.** The sensor circuit is not closed or the LED is defective. Or the clock assignment for safety shut-off mat operation is incorrect: signals at I1.1 and I1.2 are assigned to the wrong clock.	Check the connections and signals to inputs I1.1 and I1.2. Check the clock assignment: T1 -> I1.1 T2 -> I1.2
● green	...	○	○	○	**K1 LED not active.** Enabling paths 13/14, 23/24, 33/34, and 43/44 may not be closed or the LED is defective. The device may not start up correctly.	Deactivate and activate the sensor circuits. Perform startup.
● green	● yellow	...	☀ red	○	**Plausibility error** between I1.1 and I1.2 or **symmetry error** with non-equivalent wiring (both channels had the same logic state for Δt > 5 s)	Make sure that both channels have a zero crossing at the same time or are in the safe state.
					Cross-circuit error between I1.1 and I1.2	Fix the cross-circuit error. Make sure that both channels have a zero crossing at the same time or are in the safe state.
					Signal missing at I1.1 or I1.2 for safety mat operation	Check the cables and connections of the sensor path. Restart the device.
● green	☀ yellow	...	○	○	**Time violation or plausibility error** for two-hand control at I1.1 and I1.2 (t > 0.5 s)	Make sure that both channels have a zero crossing at the same time and are closed within t < 0.5 s.
● green	...	● yellow	☀ red	○	**Start error, manual start S34** The start circuit was closed before both sensor circuits I1.1 and I1.2 were closed.	Make sure that both channels and the startup input have a zero crossing at the same time or are in the safe state.

LED					Error	Corrective
PWR	IN1	K1	ERR	CFG		
○	○	○	● red	○	Internal error	Please get in touch with Phoenix Contact.
					External error The power supply does not provide enough power and collapses under load.	Design the power supply unit to match the power output.
● green	○	○	○	✷ red	**Invalid configuration**	Set a valid configuration. See Section “Configuration”.
...	...	...	○	✷ yel-low	**Invalid configuration** while the device is in configuration mode	Set a valid configuration. See Section “Configuration”.

22 Application examples

22.1 Single-channel emergency stop monitoring

Configuration:

– Mode = 4

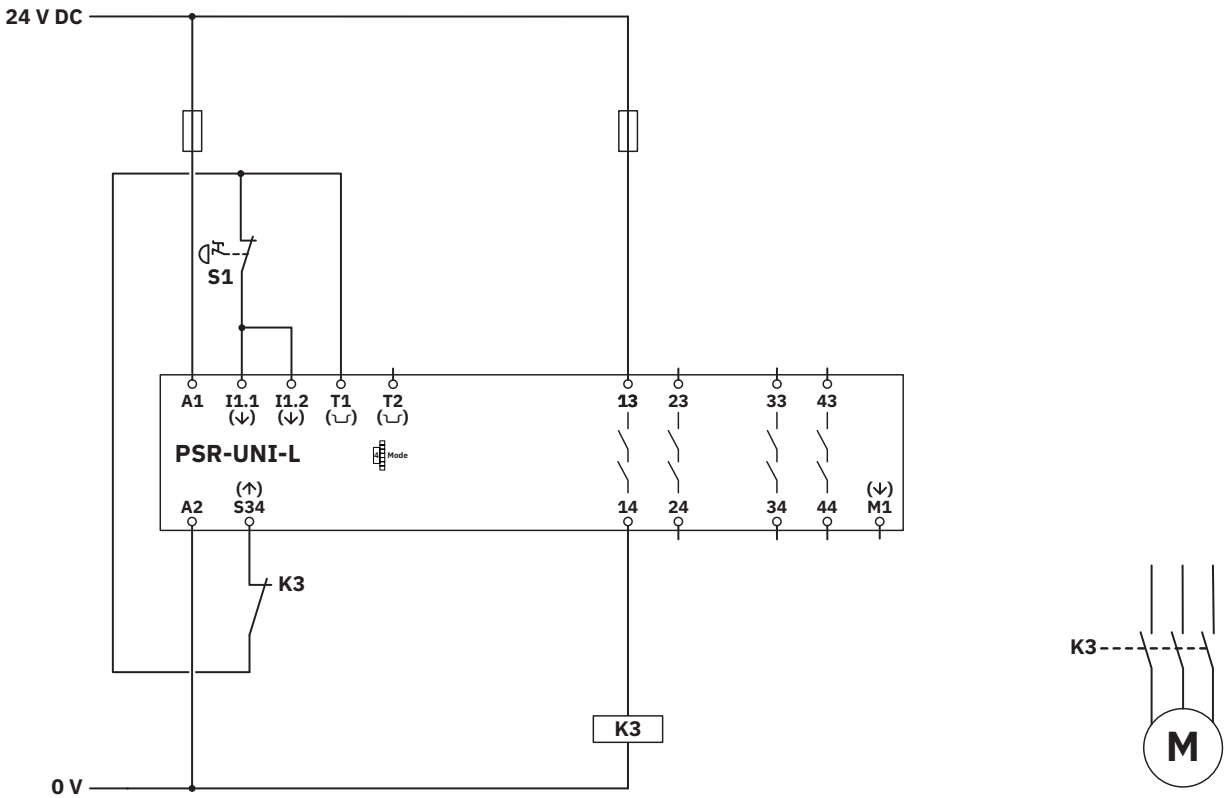
Application description:

– 1-channel emergency stop monitoring
– Automatic start
– Monitoring of external, force-guided contactor

Achievable safety integrity:

– Suitable up to category 1, PL c (EN ISO 13849-1), SIL 1 (EN IEC 62061)

Figure 49 1-channel emergency stop monitoring



Key:

S1	Emergency stop button
K3	Force-guided contactor

22.2 Magnetic switch monitoring

Configuration:

– Mode = 7

Application description:

– 2-channel, non-equivalent magnetic switch monitoring
– Manual, monitored start
– Monitoring of external, force-guided contactors

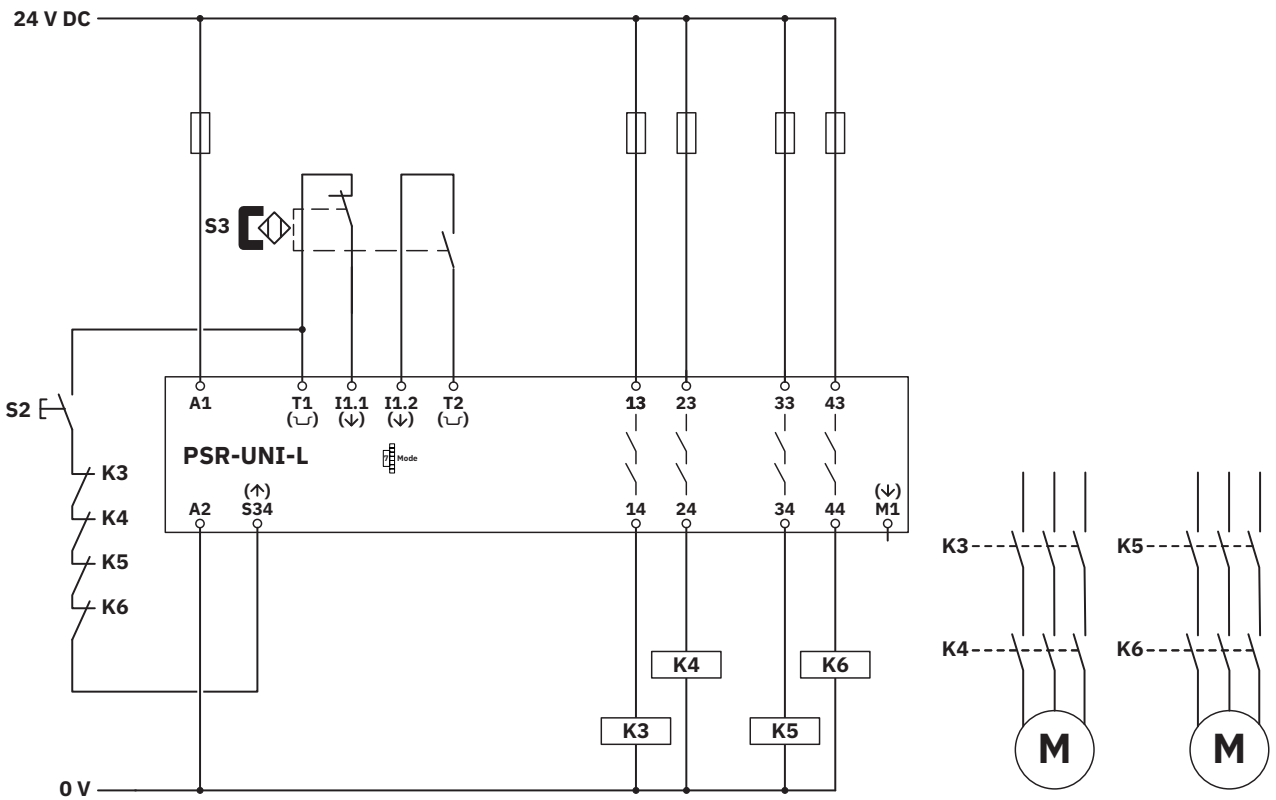
Achievable safety integrity:

– Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN IEC 62061), if cross-circuits in the control to the actuator can be ruled out

Notes:

Cross-circuits in the cable installation can be ruled out in the same electrical installation space or through mechanically protected cable installation.

Figure 50 Magnetic switch monitoring



Key:

S2	Manual reset device
S3	Magnetic switch
K3 ... K6	Force-guided contactors

22.3 Transponder monitoring

Configuration:

– Mode = 3

Application description:

– 2-channel transponder monitoring
– Manual, monitored start
– Monitoring of external, force-guided contactors

Achievable safety integrity:

– Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN IEC 62061), if cross-circuits in the control to the actuator can be ruled out

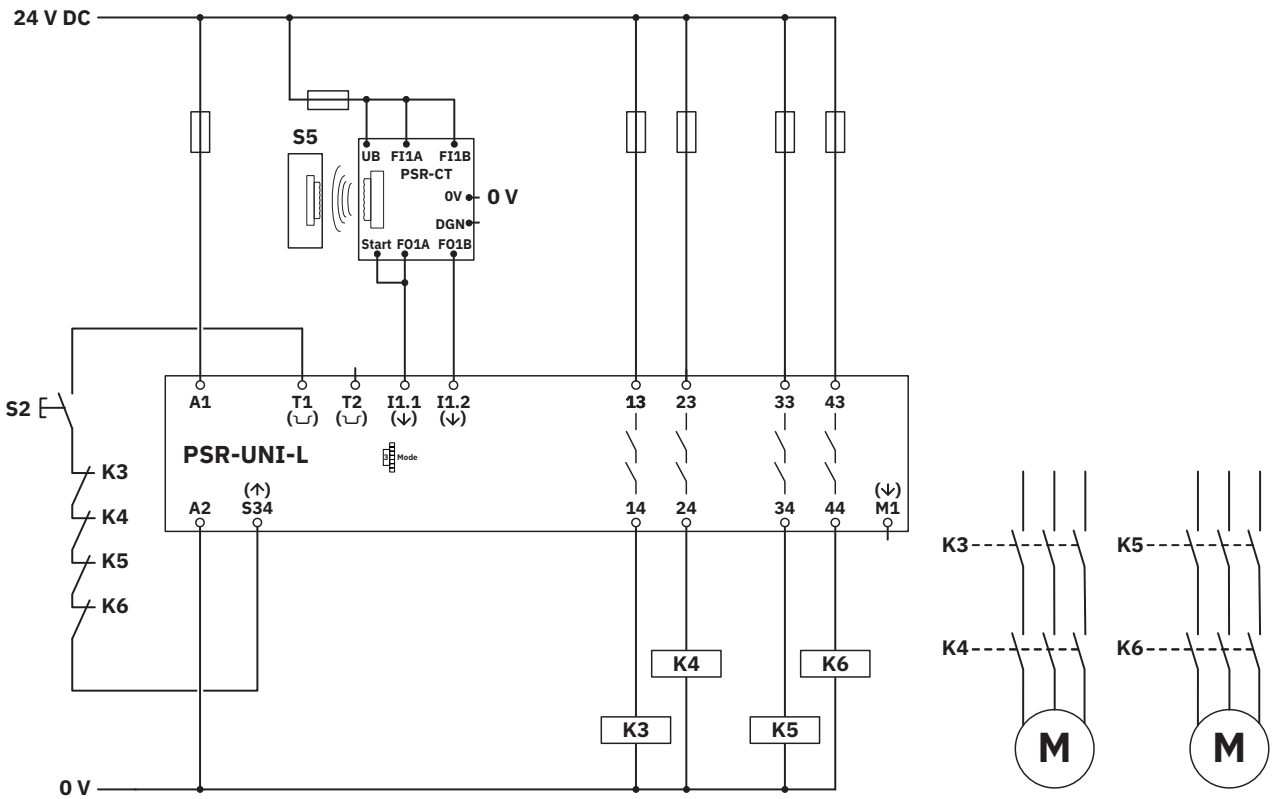
Notes:

WARNING: Loss of functional safety

- Make sure that the signal generator and the safety relay have the same ground potential.

Cross-circuits in the cable installation can be ruled out in the same electrical installation space or through mechanically protected cable installation.

Figure 51 Transponder monitoring



Key:

S2	Manual reset device
S5	Transponder switch
K3 ... K6	Force-guided contactors

22.4 Two-hand monitoring

Configuration:

– Mode = 9

Application description:

– Type IIIA two-hand control
– Synchronous activation monitoring < 0.5 s
– Automatic start
– Monitoring of external, force-guided contactors

Achievable safety integrity:

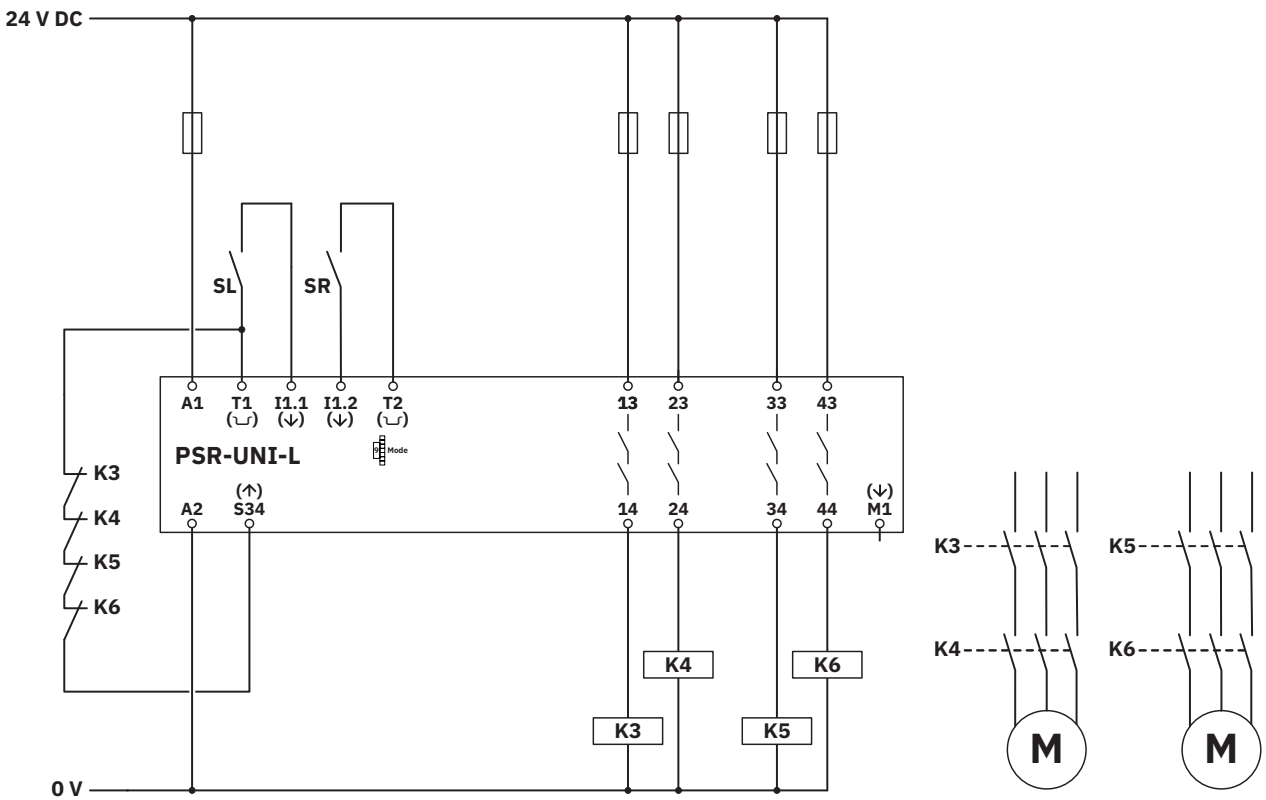
– Suitable up to category 1, PL c (EN ISO 13849-1), SIL 1 (EN IEC 62061), if cross-circuits in the control to the actuator can be ruled out

Notes:

If you are using the two-hand control function, hard wire start input S34. Only use it for reading back actuators. Do not use a start button or similar.

Cross-circuits in the cable installation can be ruled out in the same electrical installation space or through mechanically protected cable installation.

Figure 52 Two-hand monitoring



Key:

SL/SR	Two-hand buttons (left/right)
K3 ... K6	Force-guided contactors

22.5 Two-channel emergency stop monitoring

Configuration:

– Mode = 1

Application description:

– 2-channel emergency stop monitoring
– Manual, monitored start
– Monitoring of external, force-guided contactors

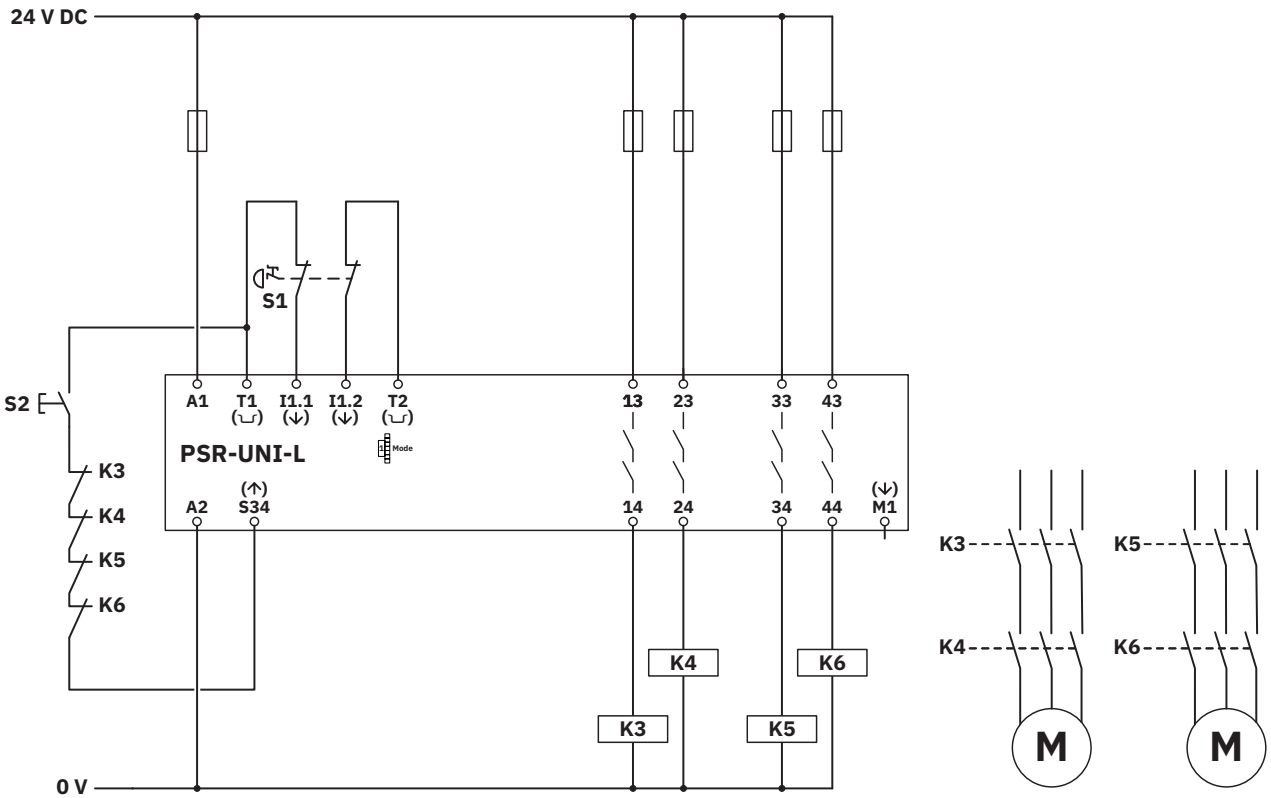
Achievable safety integrity:

– Suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (EN IEC 62061), if cross-circuits in the control to the actuator can be ruled out

Notes:

Cross-circuits in the cable installation can be ruled out in the same electrical installation space or through mechanically protected cable installation.

Figure 53 2-channel emergency stop monitoring



Key:

S1	Emergency stop button
S2	Manual reset device
K3 ... K6	Force-guided contactors

22.6 Safety shut-off mat monitoring

Configuration:

– Mode = 6

Application description:

– Switching strips or safety shut-off mats in accordance with EN ISO 13856-1 (short circuit principle)
– Automatic start
– Monitoring of external, force-guided contactors

Achievable safety integrity:

– Suitable up to PL d (EN ISO 13849-1), SIL 2 (EN IEC 62061), if cross-circuits in the control to the actuator can be ruled out

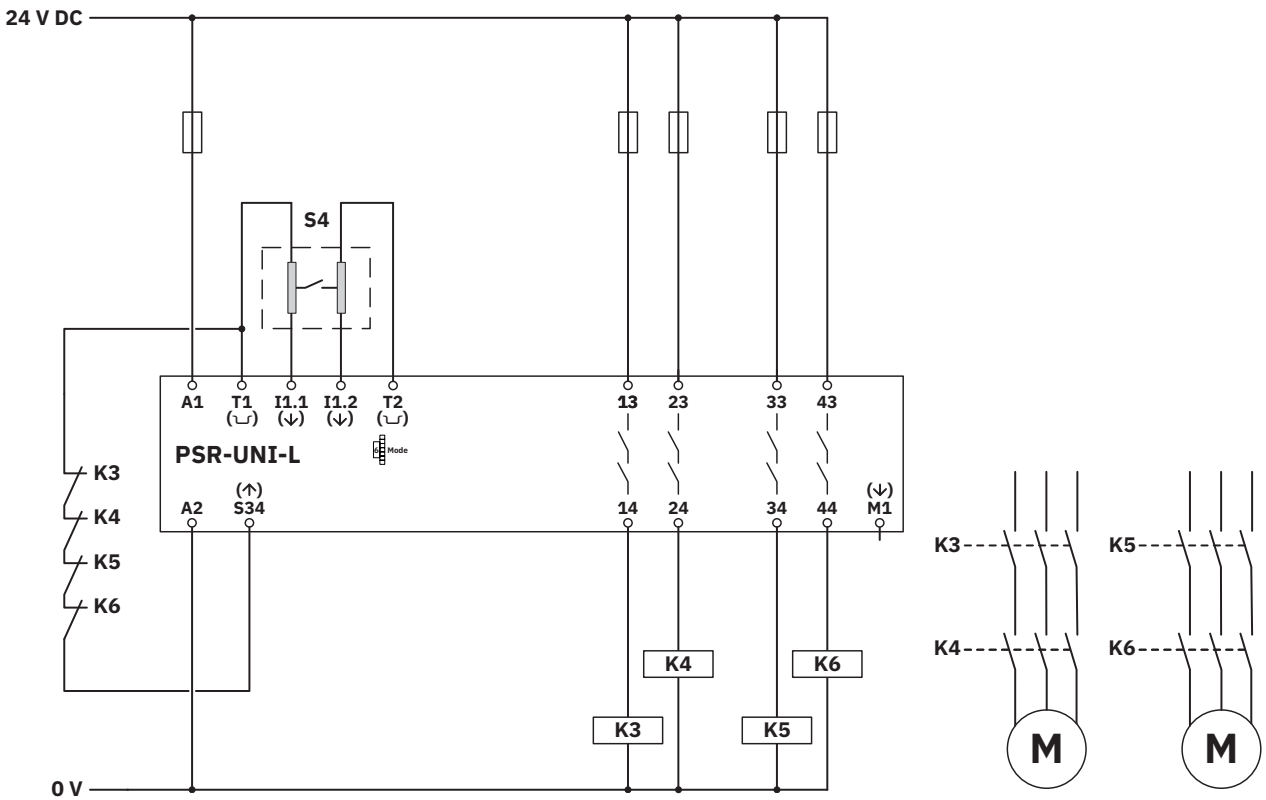
Notes:

WARNING: Danger caused by incorrectly implemented safety or overtravel distances

- Observe the requirements of EN ISO 13856-1 for determining the safety or overtravel distances.

Cross-circuits in the cable installation can be ruled out in the same electrical installation space or through mechanically protected cable installation.

Figure 54 Safety shut-off mat monitoring



Key:

S4	Safety mat
K3 ... K6	Force-guided contactors

23 Device replacement, device defect, and repair

23.1 Device replacement

The device can be replaced, if necessary.

If you need to replace the device, proceed as described in the following section:

– Mounting and removal
– Wiring
– Configuration

Observe the device type and version

The new device must meet the following requirements:

– Same device type
– Same or later version

23.2 Device defect and repair

Do not open the housing

Repairs may only be carried out by Phoenix Contact. Do not open the housing. If the housing is opened, the function of the device can no longer be ensured.

Faulty devices

- Please contact Phoenix Contact.

24 Maintenance, decommissioning, and disposal

24.1 Maintenance

The device requires no maintenance during the permissible mission time. Refer to the technical data for the mission time of the device.

If necessary, carry out proof tests within the specified proof test interval.

See “Technical data” section.

Depending on the application and connected I/O devices, you should test the function of the I/O devices and the safety chain regularly.

Observe the relevant manufacturer specifications for carrying out maintenance on connected I/O devices.

24.2 Decommissioning and disposal

Carry out decommissioning according to the requirements of the machine or system manufacturer.

When decommissioning the system or parts of the system, ensure the following for the devices used.

The device continues to be used only as intended:

- Observe the storage and transport requirements.

See “Transport, storage, and unpacking” section.

The device is not used any more:

The symbol with the crossed-out trash can indicates that this item must be collected and disposed of separately from other waste.
Phoenix Contact or public collection sites will take the item back for free disposal. For information on the available disposal options, visit www.phoenixcontact.com.

Packaging disposal

- Dispose of packaging materials that are no longer needed (cardboard packaging, paper, bubble wrap sheets, pillow bags, etc.) with household waste in accordance with the currently applicable national regulations.

25 Attachment

25.1 Using PSR devices at altitudes greater than 2000 m above sea level

The following section describes the special conditions for using PSR devices at altitudes greater than 2000 m above sea level.
Observe the relevant device-specific data (technical data, derating, etc.) according to the product documentation for the individual device.

Using the device at altitudes **greater than 2000 m above sea level up to max. 4500 m above sea level** is possible under the following conditions:

1. Limit the rated control circuit supply voltage (U_S) in accordance with the table below. Observe the technical data for the device.

U_S according to the technical data for the device	U_S when used at altitudes greater than 2000 m above sea level
< 150 V AC/DC	U_S according to the technical data for the device still valid
> 150 V AC/DC	Limited to max. 150 V AC/DC

2. Limit the maximum switching voltage in accordance with the table below. Observe the technical data for the device.

Max. switching voltage according to the technical data for the device	Max. switching voltage when used at altitudes greater than 2000 m above sea level
< 150 V AC/DC	Max. switching voltage according to the technical data for the device still valid
> 150 V AC/DC	Limited to max. 150 V AC/DC

3. Reduce the maximum ambient temperature for operation by the corresponding factor in accordance with the table below.
4. If derating is specified, offset all the points of the derating curve by the corresponding factor in accordance with the table below.

Altitude above sea level	Temperature derating factor
2000 m	1
2500 m	0.953
3000 m	0.906
3500 m	0.859
4000 m	0.813
4500 m	0.766

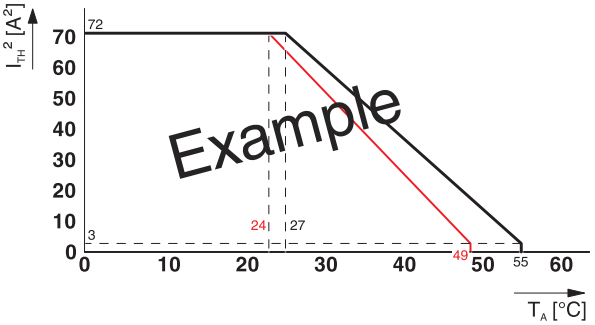
Example calculation for 3000 m

The following calculation and the illustrated derating curve are provided as examples.
Perform the actual calculation and offset the derating curve for the device used according to the technical data and the “Derating” section.

27 °C • 0.906 ≈ 24 °C

55 °C • 0.906 ≈ 49 °C

Figure 55 Example of a suspended derating curve (red)



25.2 Revision history

Version	Date	Contents
00	2024-11-20	First publication
01	2024-12-02	Correction in sect. Startup table Configured function for circuit X: mode X = 6
02	2024-12-17	Safety parameters: Duration of use inserted