

PSR-SCP- 24DC/SDC4/2X1/B PSR-SPP- 24DC/SDC4/2X1/B

Safety Relay for Emergency Stop and Safety Door Circuits



INTERFACE

Data Sheet
102858_02_en

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Description

The **PSR-...- 24DC/SDC4/2X1/B** safety relay can be used in safety circuits according to DIN EN 60204-1/VDE 0113-1 and EN 954-1.

Control is implemented via single or two-channel switches with N/O/N/C or N/C/N/C contacts (mechanical or electronic) or via light grids. The device has an interface for the T-BUS DIN rail connector. This interface can be used for single-channel control and monitoring of extension units. For this function, a T-BUS connector with switchable contacts is required.

Depending on the external wiring, the maximum safety category that can be achieved is safety category 2 or 4.

The device has two enable current paths and a 24 V alarm output (N/O contact function) with stop category 0 according to EN 60204-1/VDE 0113-1.



Observe the safety instructions on page 4.



Make sure you always use the latest documentation.
It can be downloaded at www.download.phoenixcontact.com.

A conversion table is available on the Internet at
http://www.download.phoenixcontact.com/general/7000_en_00.pdf.



This data sheet is valid for all products listed on the following page:

Ordering Data

Safety Relays

Description	Type	Order No.	Pcs./Pkt.
Safety relay for emergency stop and safety door circuits, with screw connection	PSR-SCP- 24DC/SDC4/2X1/B	2981486	1
Safety relay for emergency stop and safety door circuits, with spring-cage connection	PSR-SPP- 24DC/SDC4/2X1/B	2981499	1

Accessories

Description	Type	Order No.	Pcs./Pkt.
DIN rail connector, yellow, for PSR applications	PSR-TBUS	2890425	50
Dummy plug	PSR-TBUS-TP	2981716	50

Documentation

Description	Type	Order No.	Pcs./Pkt.
Application manual for PSR safety relays	UM EN SAFETY RELAY APPLICATION	2888712	1

Technical Data

Input Data

Nominal input voltage U_N	24 V DC
Permissible range	0.85 - 1.1 x U_N
Typical current consumption at U_N	70 mA
Typical response time	
Monitored/manual start	20 ms
Automatic start	150 ms
Typical release time	10 ms
Simultaneity between channel 1 and channel 2 when using the restart inhibit in the event of a mains failure	3 seconds, approximately
Status indicators	Green LED

Alarm Output Y30

Switching voltage	24 V DC
Limiting continuous current	100 mA

Output Data

Contact type	2 enable current paths		
Contact material	Silver tin oxide (AgSnO ₂)		
Maximum switching voltage	250 V AC/DC		
Minimum switching voltage	15 V AC/DC		
Limiting continuous current (N/O contact)	6 A		
Maximum inrush current (N/O contact)	6 A		
Minimum switching current	25 mA		
Maximum shutdown power	Ohmic load $\tau = 0$ ms	Inductive load $\tau = 40$ ms	
	24 V DC	144 W	48 W
	48 V DC	288 W	40 W
	110 V DC	77 W	35 W
	220 V DC	88 W	33 W
	250 V AC	1500 VA	
Minimum switching power	0.4 W		
Mechanical service life	10 ⁷ cycles, approximately		

Output Data (Continued)

Switching capacity according to DIN EN 60947-5-1/VDE 0660-200	Cycles		DC13	AC15
	360/h:	24 V:	6 A	–
		230 V:	–	5 A
	3600/h:	24 V:	3 A	–
		230 V:	–	3 A
	Short-circuit protection of the output circuits, external	NEOZED 10 A gL/gG		

General Data

Permissible ambient operating temperature	-20°C to +55°C
Nominal operating mode	100% operating factor
Degree of protection according to VDE 0470-1	
Housing	IP20
Connection terminal blocks	IP20
Installation location	IP54, minimum
Mounting position	Any
Air and creepage distances between circuits	
Basic insulation	According to DIN EN 50178:1998-04 ¹
Impulse voltage withstand level	4 kV ¹
Pollution degree	2
Surge voltage category	III
Dimensions (W x H x D)	
PSR-SCP- 24DC/SDC4/2X1/B	22.5 mm x 99 mm x 114.5 mm
PSR-SPP- 24DC/SDC4/2X1/B	22.5 mm x 112 mm x 114.5 mm
Conductor cross section	
PSR-SCP- 24DC/SDC4/2X1/B	0.2 mm ² ... 2.5 mm ²
PSR-SPP- 24DC/SDC4/2X1/B	0.2 mm ² ... 1.5 mm ²
Housing material	Polyamide PA, not reinforced

¹ Safe isolation, reinforced insulation, and 6 kV between the input circuit/N/C contacts and the enable contact current paths.

Tests/Approvals

BG/GS	
UL	applied for

Safety Instructions



- During operation, parts of electrical switching devices carry hazardous voltages.
- Before working on the device, disconnect the power.
- Please observe the safety regulations of electrical engineering and industrial safety and liability associations.
Disregarding these safety regulations may result in death, serious personal injury or damage to equipment.
- Startup, assembly, modifications, and upgrades may only be carried out by a skilled electrical engineer.



- For emergency stop applications, the machine must be prevented from restarting automatically by a higher-level control system.
- Protective covers must not be removed when operating electrical switching devices.

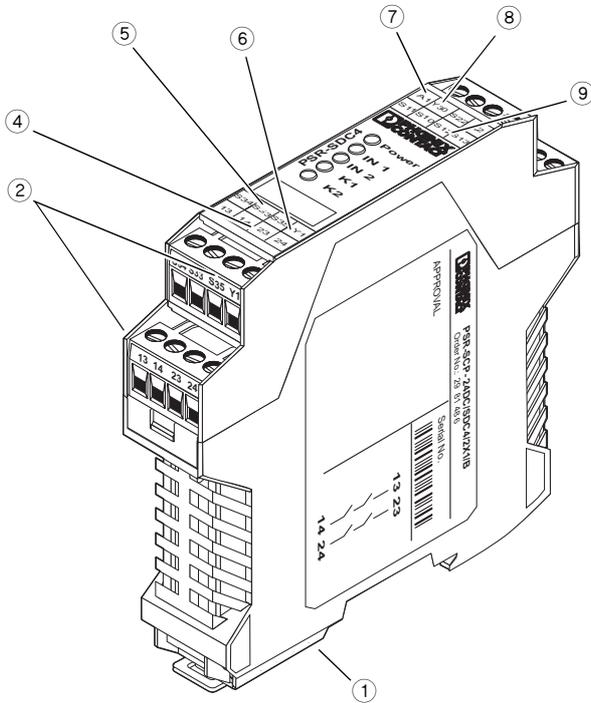


- In the event of an error, replace the device immediately.
- Repairs, especially if the housing must be opened, may only be carried out by the manufacturer or authorized persons. Otherwise the warranty is invalidated.

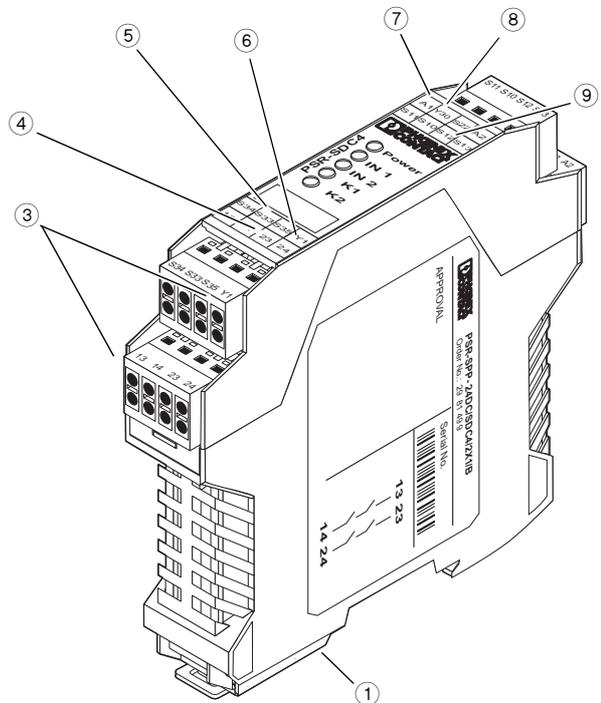


When operating relay modules the operator must meet the requirements for noise emission for electrical and electronic equipment (EN 61000-6-4) on the contact side and, if required, take appropriate measures.

Structure



PSR-SCP- 24DC/SDC4/2X1/B



PSR-SPP- 24DC/SDC4/2X1/B

Figure 1 Structure

- 1 Metal lock for mounting on the DIN rail
- 2 Plug-in COMBICON screw terminal blocks
- 3 Plug-in COMBICON spring-cage terminal blocks
- 4 13-14, 23-24: Enable current paths
- 5 S33, S34, S35: Start circuit (activating circuit)
- 6 Y1: Activating circuit
- 7 A1, A2: Supply voltage connection
- 8 Y30: 24 V alarm output
- 9 S10, S11, S12, S13: Input circuits

Block Diagram

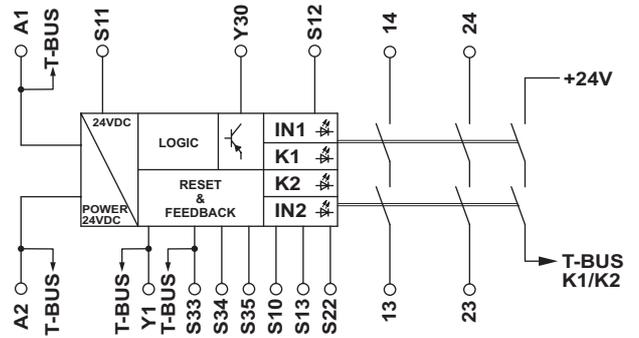


Figure 2 Block diagram

Function

When the operating voltage (24 V DC) is applied at A1 and A2, the "Power" LED lights up. Depending on the two N/C contacts connected, e.g., for the emergency stop button, the positive potential is at S11 and the negative potential at A2.

There must be a flow of current via contacts S33 and S34 (activating circuit) in order to activate the module. Contacts S33, Y1, and S35 must be jumpered for automatic activation. In this state, relays K1 and K2 are excited.

If one of the emergency stop N/C contacts opens, the relays drop and cannot be switched on again. They can only be switched back on when both N/C contacts are open.

In the event of a cross circuit between terminal blocks S11 and A2, this is detected and the relays drop. Operation without cross-circuit detection is also possible.

For additional connection examples, see page 7.

Connection Notes



- For PSR applications, only yellow PSR-TBUS connectors (Order No. 2890425) may be used. Connection with another T-BUS is not permitted.
- Devices may only be mounted on/removed from the T-BUS when the power is switched off.
- A T-BUS unit can contain a basic device (PSR-...-SDC...) and a maximum of 10 extension units (PSR-UR...). Extension units must be mounted to the right of the basic device.
- The feedback circuit must be closed at the last extension unit (on the right) by a cable jumper or by the PSR-TBUS-TP dummy plug (Order No. 2981716).
- The voltage supply can be provided at any PSR device or using a system power supply via the T-BUS.

When using T-BUS DIN rail connectors, connect together the required number of T-BUS connectors and push them onto the DIN rail. When attaching the safety relay to the DIN rail, ensure that it is aligned correctly with the T-BUS connector (see Figure 3).

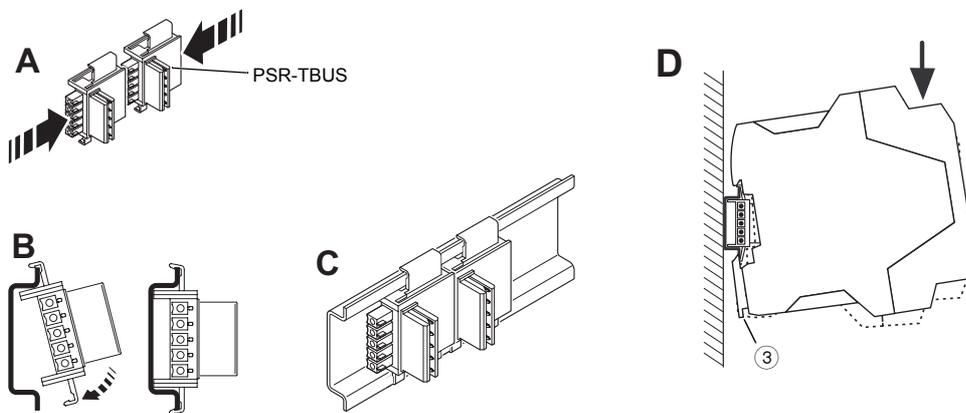


Figure 3 Using the T-BUS DIN rail connector

In order to comply with UL approval, use copper cables that are designed for operating temperatures > 75°C.

For reliable and safe-to-touch contacts, strip the cable ends as follows:

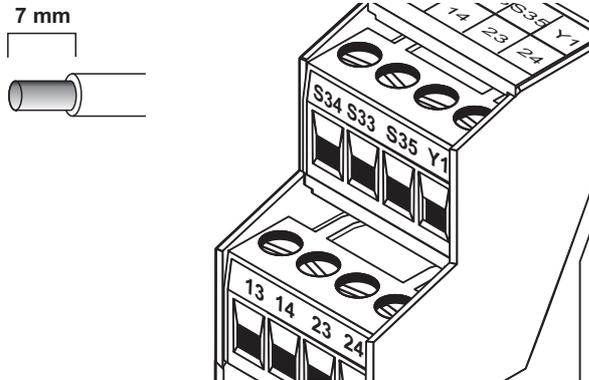


Figure 4 PSR-SCP- 24DC/SDC4/2X1/B

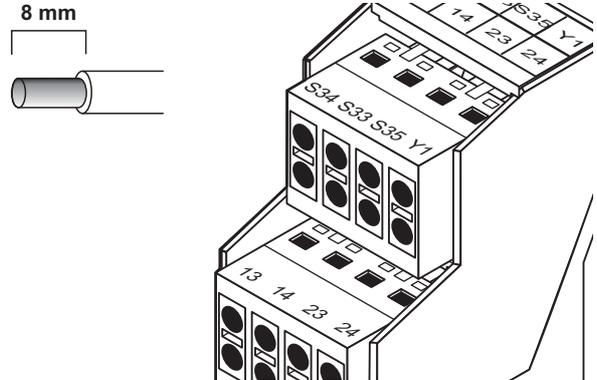
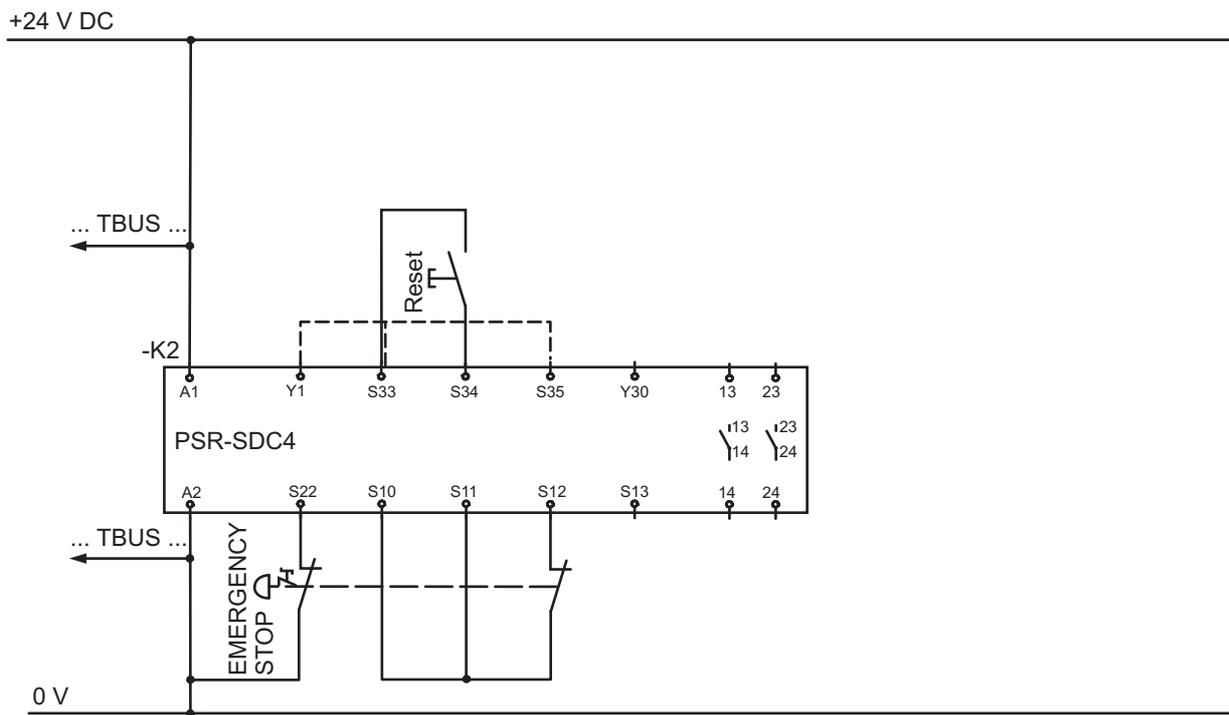


Figure 5 PSR-SPP- 24DC/SDC4/2X1/B

Connection Examples

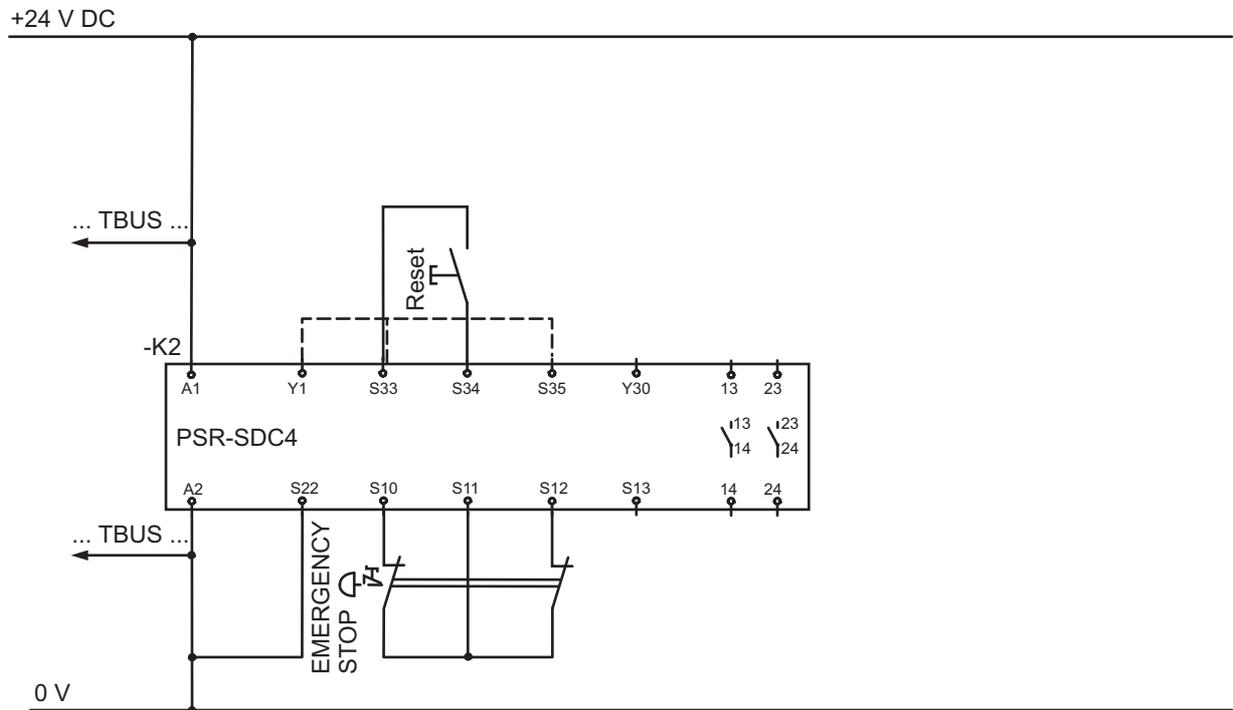
Circuits



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Figure 6 Two-channel emergency stop circuit (2 N/C contacts) with cross-circuit detection

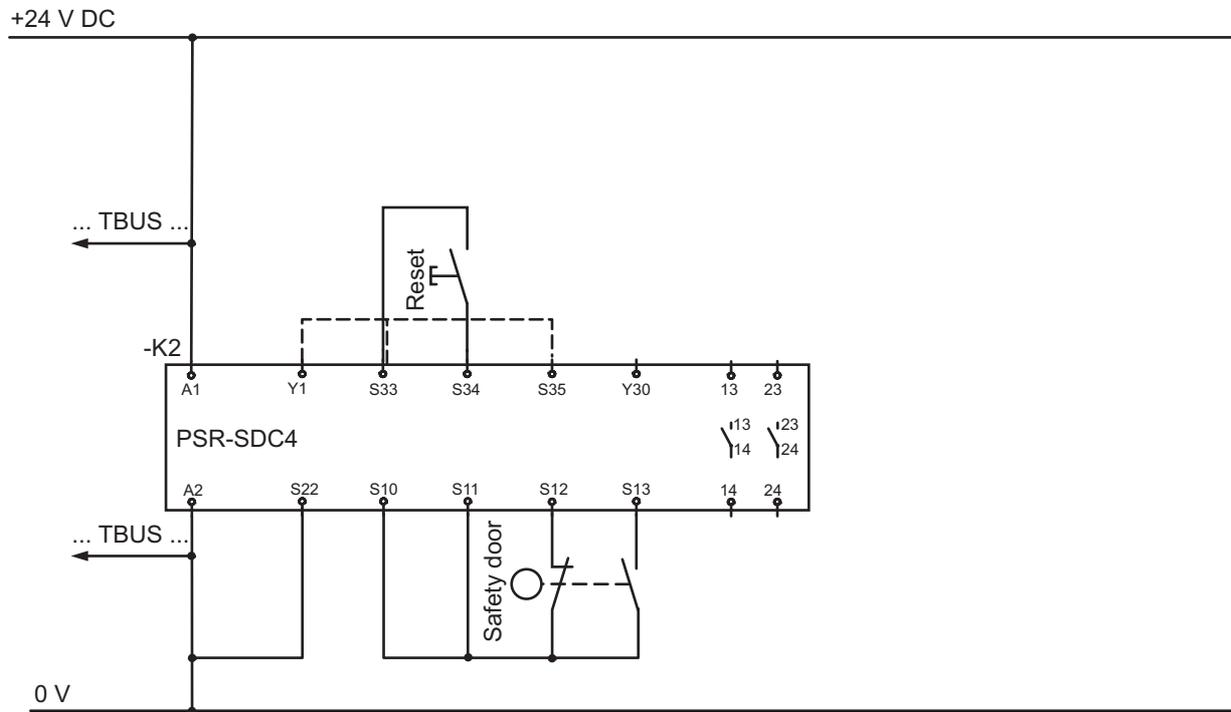
- Manual activation (monitored reset button at S33-S34)
- Automatic activation (jumper at Y1-S33-S35)
- Suitable up to safety category 4



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Figure 7 Two-channel emergency stop circuit without cross-circuit detection

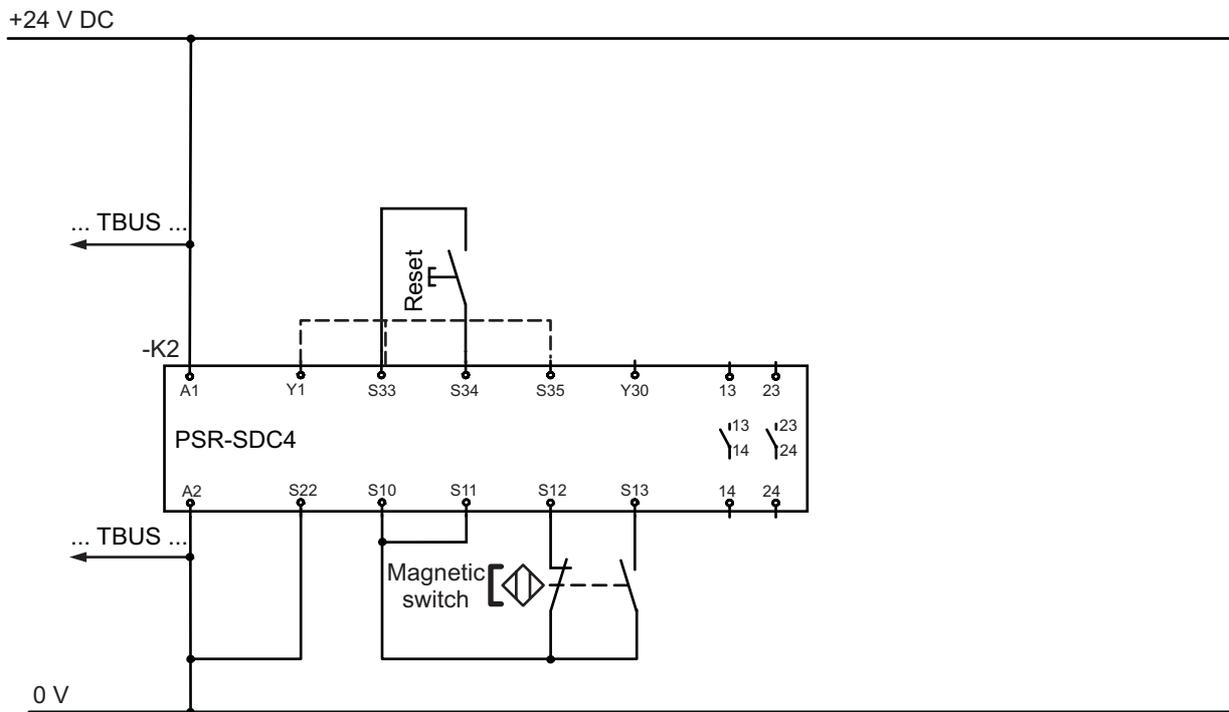
- Manual activation (monitored reset button at S33-S34)
- Automatic activation (jumper at Y1-S33-S35)
- Suitable up to safety category 3



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Figure 8 Two-channel safety door monitoring without cross-circuit detection, one N/C contact and one N/O contact

- Manual activation (monitored reset button at S33-S34)
- Automatic activation (jumper at Y1-S33-S35)
- Suitable up to safety category 2



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Figure 9 Monitoring with encoded magnetic switch without cross-circuit detection, with closed safety door

- Manual activation (monitored reset button at S33-S34)
- Automatic activation (jumper at Y1-S33-S35)
- Suitable up to safety category 3*

* Due to the high level of protection from errors and manipulation offered by magnetic switches, unlike monitoring using safety doors with position switches, only one switch is required for safety category 3 according to EN 954-1.

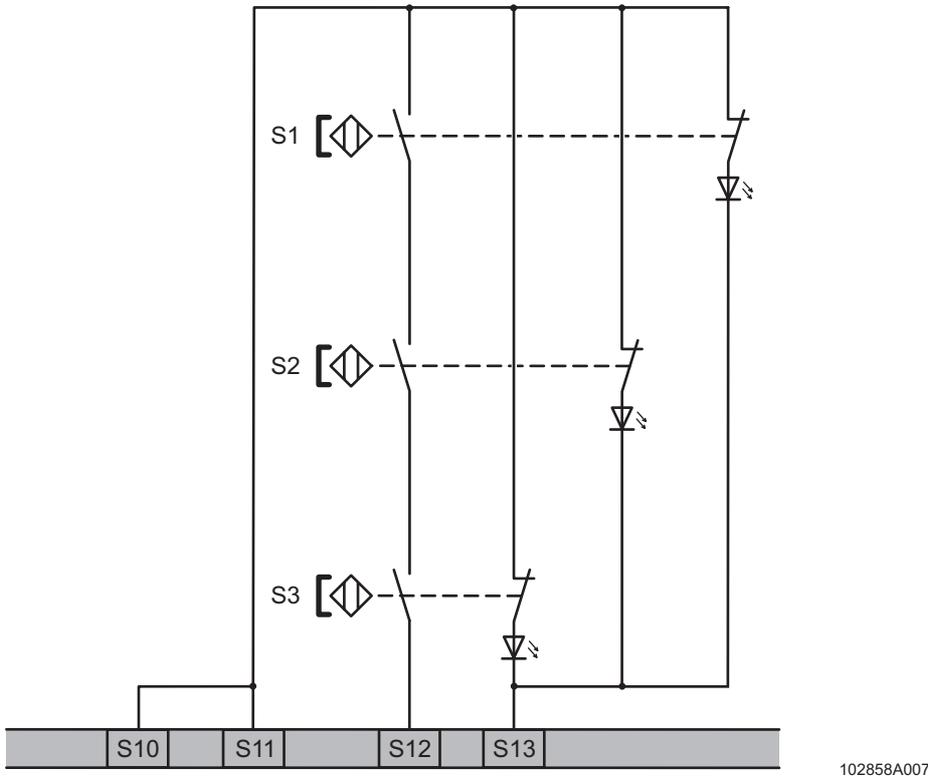


Figure 10 Connection for safety category 3 according to EN 954-1: Example with three magnetic switches with 2-pos. control switch (N/C contact and N/O contact), with open safety door

Comparison of Safety Categories According to EN 954-1 and Product Standard EN 60947-5-3

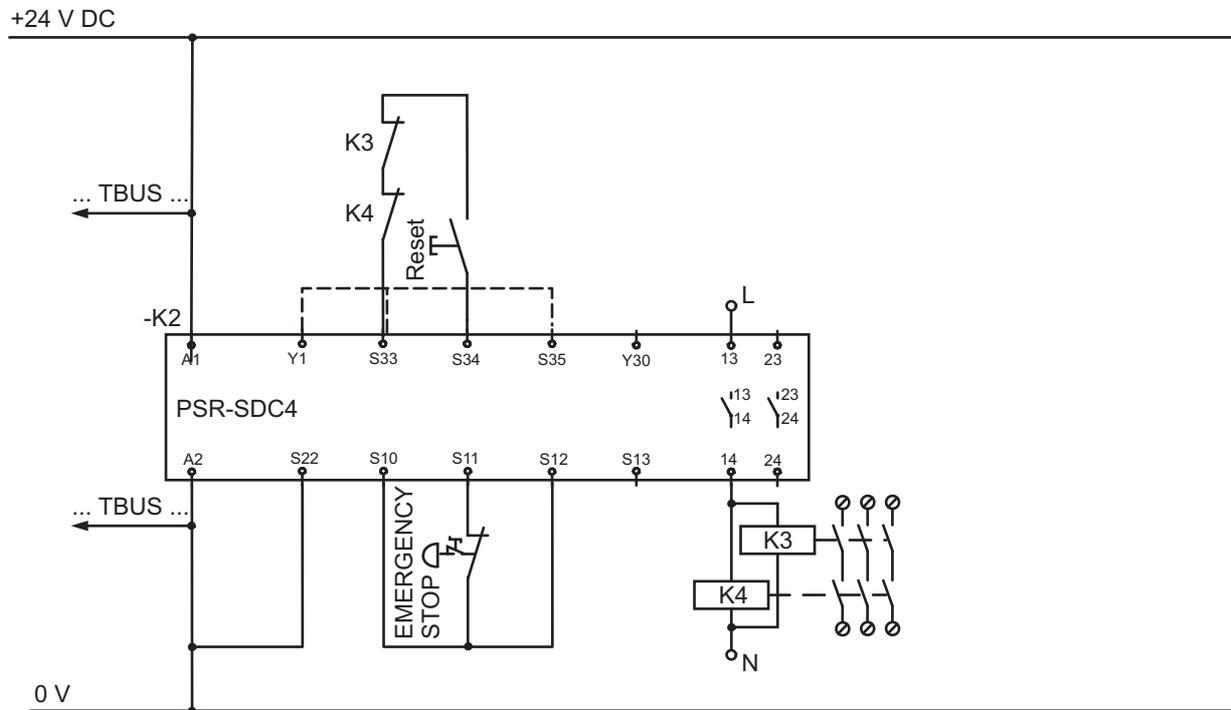
The machine manufacturer must carry out a risk analysis according to the Machinery Directive.

The assignment of safety categories according to EN 954-1 for proximity switches is somewhat difficult because it is not fully congruent with product standard EN 60947-5-3.

The proximity switches (magnetic switches) are classified as PDFs (Proximity Devices with Defined Behavior under Fault Conditions):

Class	Description
PDF-D	Reliability due to special design
PDF-T	Test capability
PDF-S	Single-fault tolerance
PDF-M	Self monitoring

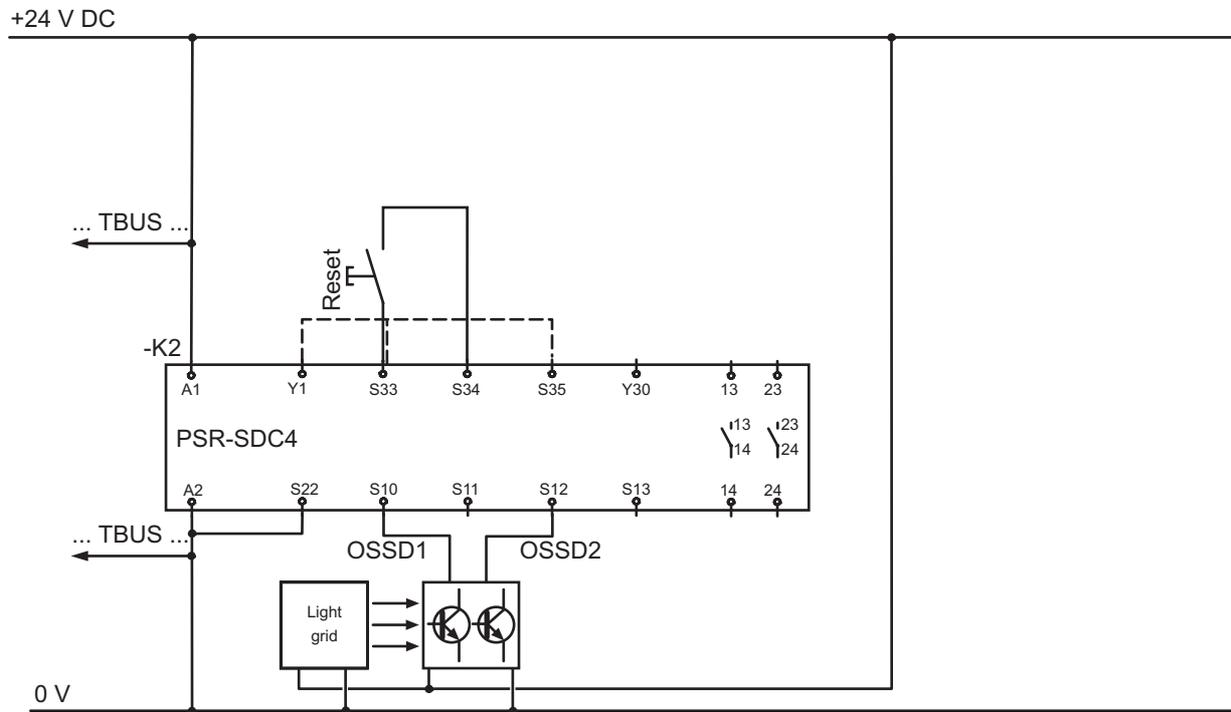
Categories acc. to EN 954-1	PDF classes acc. to EN 60947-5-3
B	D
1	T
2	S
3	M
4	



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Figure 11 Single-channel emergency stop circuit with monitored contact extension

- Manual activation (monitored reset button at S33-S34)
- Automatic activation (jumper at Y1-S33-S35)
- Suitable up to safety category 2



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Figure 12 Two-channel light grid monitoring with cross-circuit detection

- Manual activation (monitored reset button at S33-S35)
- Automatic activation (jumper at Y1-S33-S35)
- Suitable up to safety category 4

Start and Feedback Circuits

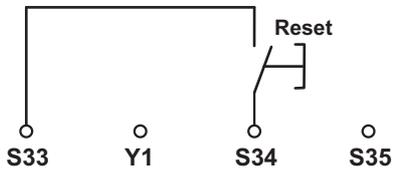


Figure 13 Monitored reset

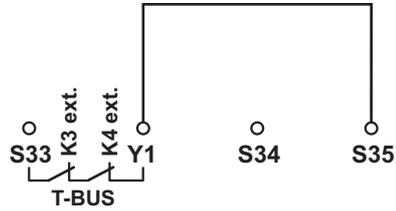


Figure 14 Automatic activation with monitored contact extension (K3 ext., K4 ext.) via T-BUS DIN rail connector

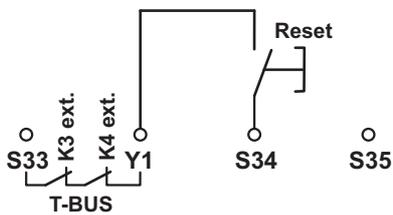


Figure 15 Monitored reset with monitored contact extension (K3 ext., K4 ext.) via T-BUS DIN rail connector

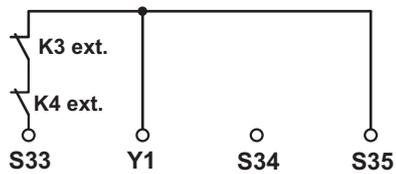


Figure 16 Automatic activation with monitored contact extension (K3 ext., K4 ext.)

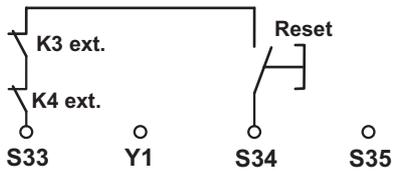


Figure 17 Monitored reset with monitored contact extension (K3 ext., K4 ext.)



Figure 18 Automatic activation with restart inhibit in the event of mains failure (E-S1, E-S2)
Not fault-proof

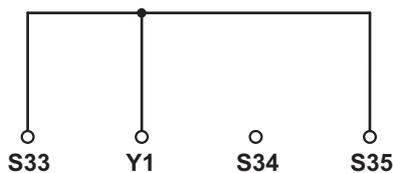


Figure 19 Automatic activation

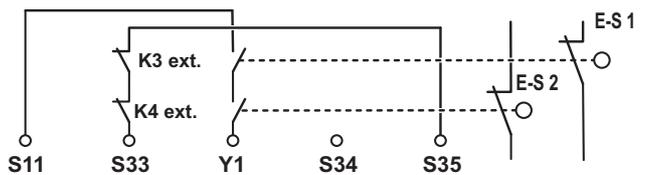


Figure 20 Automatic activation with restart inhibit in the event of mains failure (E-S1, E-S2) with monitored contact extension (K3 ext., K4 ext.)
Not fault-proof

Emergency Stop Circuits

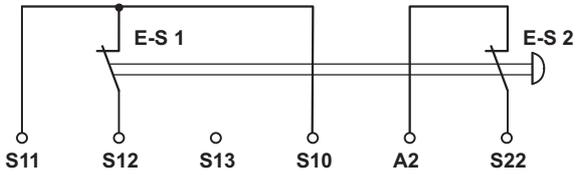


Figure 21 Two-channel with cross-circuit detection, two N/C contacts

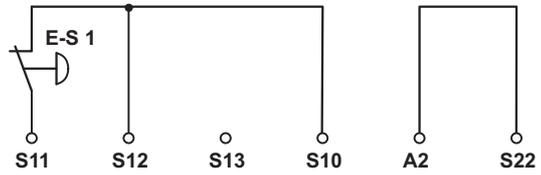


Figure 22 Single-channel

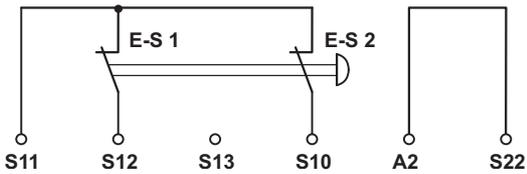


Figure 23 Two-channel without cross-circuit detection, two N/C contacts

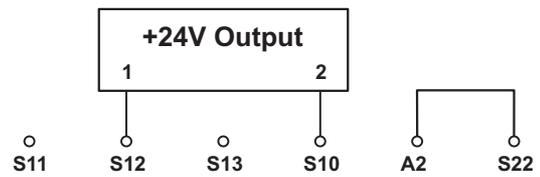


Figure 24 Semiconductor outputs

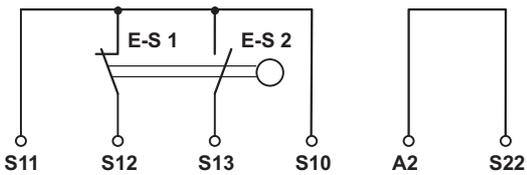


Figure 25 Two-channel without cross-circuit detection, one N/C contact and one N/O contact

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