

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

Safety relay for emergency stop and safety door monitoring.



Data sheet
102858_en_04

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1 Description

Safety relay PSR-...-24DC/SDC4/2x1/B can be used in safety circuits according to EN 60204-1/VDE 0113-1.

With this switching device, circuits are interrupted in a safety-oriented manner.

Control takes place either via:

- Switch with N/C // N/O contacts
- Switch with N/C // N/C contacts

The switching device has an interface for the T-BUS DIN rail connector. This interface can be used for single-channel control and monitoring of extension modules. A T-BUS with switching contacts is needed for this function.

Depending on the external wiring, up to category 4, PL e according to EN ISO 13849-1 or SIL 3 according to IEC 61508 (EN 62061) can be achieved.

The safety relay is equipped with two enabling current paths that drop out without delay corresponding to stop category 0.

Features

- Contact extension
- suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (IEC 61508)
- Single-channel or two-channel wiring
- 2 enabling current paths without delay
- 1 signaling current path
- Optional plug-in screw or spring-cage terminal blocks



WARNING: Risk of electric shock

Observe the safety instructions in the corresponding section.



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



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

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3 Ordering data

Description	Type	Order No.	Pcs. / Pkt.
Safety relay for emergency stop, safety door, and magnetic switches, as well as light grid, up to SIL 3 or Cat. 4, PL e according to EN ISO 13849, 2 N/O contacts, TBUS interface, automatic or manual activation, plug-in screw connection terminal blocks	PSR-SCP- 24DC/SDC4/2X1/B	2981486	1
Safety relay for emergency stop, safety door, and magnetic switches, as well as light grid, up to SIL 3 or Cat. 4, PL e according to EN ISO 13849, 2 N/O contacts, TBUS interface, automatic or manual activation, plug-in spring-cage connection terminal blocks	PSR-SPP- 24DC/SDC4/2X1/B	2981499	1
Documentation	Type	Order No.	Pcs. / Pkt.
User manual, English, for applications for PSR safety relay	UM EN SAFETY RELAY APPLICATION	2888712	1
Accessories	Type	Order No.	Pcs. / Pkt.
PSR-TBUS DIN rail connector, for supplying/controlling/monitoring (depending on the module)	PSR-TBUS	2890425	50
PSR-TBUS-TP dummy plug	PSR-TBUS-TP	2981716	50

4 Technical data

Input data	
Nominal input voltage U_N	24 V DC
Input voltage range (factor)	0.85 ... 1.1
Typical input current	70 mA
Voltage at input/start and feedback circuit	approx. 24 V DC
Max. permissible overall conductor resistance (Input and reset circuit at U_N)	50 Ω (Input and start circuits at U_N)
Typical response time	20 ms (manual start) 150 ms (automatic start)
Typical release time	10 ms
Recovery time	1 s
Output data	
Contact type	2 enabling current paths 1 semiconductor signaling output
Contact material	AgSnO ₂
Minimum switching voltage	15 V AC/DC
Maximum switching voltage	250 V AC/DC
Limiting continuous current	6 A (N/O contact)
Maximum inrush current	6 A
Inrush current, minimum	25 mA
Interrupting rating (ohmic load) max.	144 W (24 V DC, $\tau = 0$ ms) 288 W (48 V DC, $\tau = 0$ ms) 77 W (110 V DC, $\tau = 0$ ms) 88 W (220 V DC, $\tau = 0$ ms) 1500 VA (250 V AC, $\tau = 0$ ms)
Maximum interrupting rating (inductive load)	48 W (24 V DC, $\tau = 40$ ms) 40 W (48 V DC, $\tau = 40$ ms) 35 W (110 V DC, $\tau = 40$ ms) 33 W (220 V DC, $\tau = 40$ ms)
Switching capacity min.	0.4 W
Mechanical service life	Approx. 10^7 cycles

Output data	
Switching capacity (360/h cycles)	6 A (24 V DC) 5 A (230 V (AC15))
Switching capacity (3600/h cycles)	3 A (24 V (DC13)) 3 A (230 V (AC15))
Output fuse	10 A gL/gG NEOZED (N/O contact) (Miniature circuit breaker C6 (24 V / 20 A power supply unit))

General data	
Relay type	Electromechanically forcibly guided, dust-proof relay.
Nominal operating mode	100% operating factor
Degree of protection	IP20
Min. degree of protection of inst. location	IP54
Mounting position	Any
Air and creepage distances between the power circuits	DIN EN 50178/VDE 0160
Rated surge voltage / insulation	4 kV / Basic isolation, (safe isolation, reinforced insulation and 6 kV between input circuit and enabling current paths.)

Dimensions	Screw connection	Spring-cage conn.
W x H x D	22.5 x 99 x 114.5 mm	22.5 x 112 x 114.5 mm

Connection data	Screw connection	Spring-cage conn.
Conductor cross section, solid	0.2 mm ² ... 2.5 mm ²	0.2 mm ² ... 1.5 mm ²
Conductor cross section, stranded	0.2 mm ² ... 2.5 mm ²	0.2 mm ² ... 1.5 mm ²
Conductor cross section AWG/kcmil	24 ... 12	24 ... 16
Stripping length	7 mm	8 mm

Ambient conditions	
Ambient temperature (operation)	-20 °C ... 55 °C
Ambient temperature (storage/transport)	-40 °C ... 70 °C
Max. permissible relative humidity (operation)	75 %
Max. permissible humidity (storage/transport)	75 %

Certification / Approvals	
Approvals	

Safety data	
Stop category according to IEC 60204	0

Safety parameters for IEC 61508 - High demand	
SIL	3
PFH _d	2.53 x 10 ⁻¹⁰
Diagnostic coverage (DC)	99 %
MTTF _d	450586 Years
Proof test interval	< 12 Months
Duration of use	240 Months

Safety parameters for IEC 61508 - Low demand	
SIL	3
Diagnostic coverage (DC)	0 %
MTTF _d	11319 Years

Safety parameters for IEC 61508 - Low demand

PFD _{avg}	1,43 x 10 ⁻⁴
Proof test interval	40 Months
Duration of use	240 Months

Safety characteristic data according to EN ISO 13849

Category	4 (Undelayed contacts)
Performance level	e
DC _{avg}	99 %
MTTF _d	244 Years (high)
CCF	Passed
Duration of use	240 Months

5 Basic circuit diagram

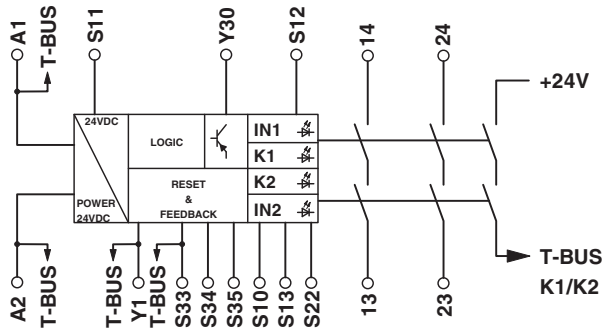


Figure 1 Block diagram

Key:

Designation	Explanation
A1/A2	Supply voltage
Y30	Alarm output (24 V)
Y1	Activating circuit
13/14	Enabling current paths
23/24	
S33/S34	Manual start circuit
S33/S35	Automatic start circuit
S10	Input circuits
S11	
S12	
S13	

6 Derating

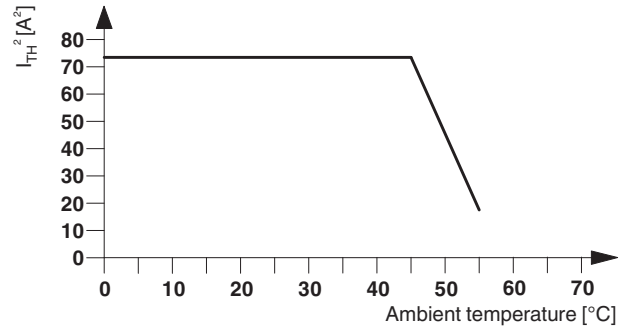


Figure 2 Derating curve

7 Safety notes



WARNING: Risk of electric shock

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

Before working on the switching 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, mounting, modifications, and upgrades should only be carried out by a skilled electrical engineer!



WARNING: Risk of automatic machine restart!

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.



WARNING: Danger due to faulty devices!

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

In the event of an error, replace the device immediately.

Repairs to the device, especially if the housing must be opened, may only be carried out by the manufacturer or authorized persons. Otherwise the warranty is invalidated.



NOTE: Risk of damage to equipment due to incorrect installation

For reliable operation, the safety relay must be installed in housing protected from dust and humidity (IP54).

Carry out wiring according to the application. Use the Application Examples section for this purpose.



NOTE: Risk of damage to equipment due to noise emissions

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.

8 Operating and indication elements

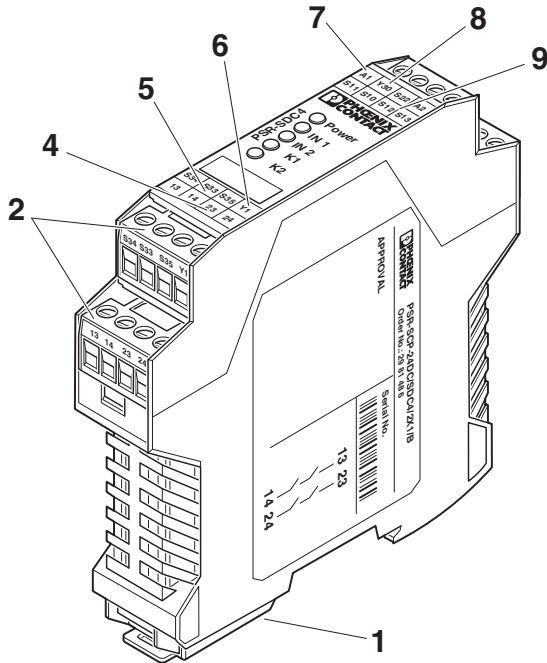


Figure 3 PSR-SCP-24DC/SDC4/2X1/B

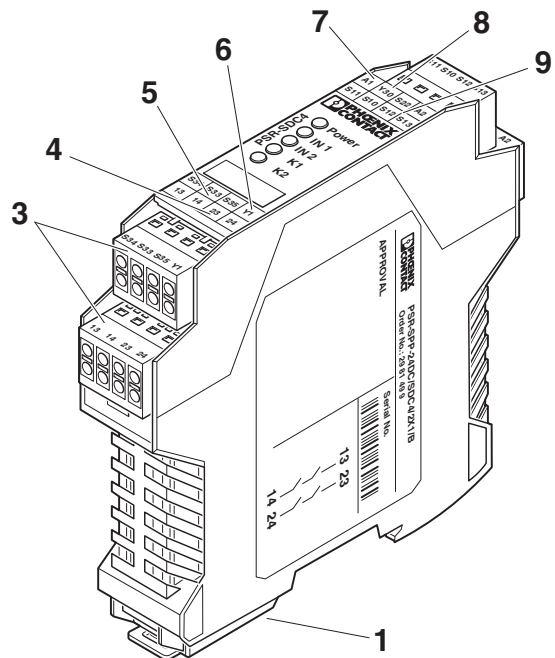


Figure 4 PSR-SPP-24DC/SDC4/2X1/B

Key:

Designation	Explanation
1	Metal lock for mounting on the DIN rail
2	COMBICON plug-in screw terminal blocks
3	COMBICON plug-in spring-cage terminal blocks
4	13/14, 23/24 - undelayed enabling 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

9 Diagnostics

For a detailed diagnostic description, please refer to Section 7 of the user manual for PSR safety relays.

10 Application examples

10.1 Two-channel emergency stop circuit with cross-circuit detection and monitored reset button

- monitored reset button at S33-S34 (manual activation)
- automatic activation (bridge at Y1-S33-S35)
- suitable up to category 3, PL d (EN ISO 13849-1), SIL2 (IEC 61508) in the case of error prevention for the mechanical switch.

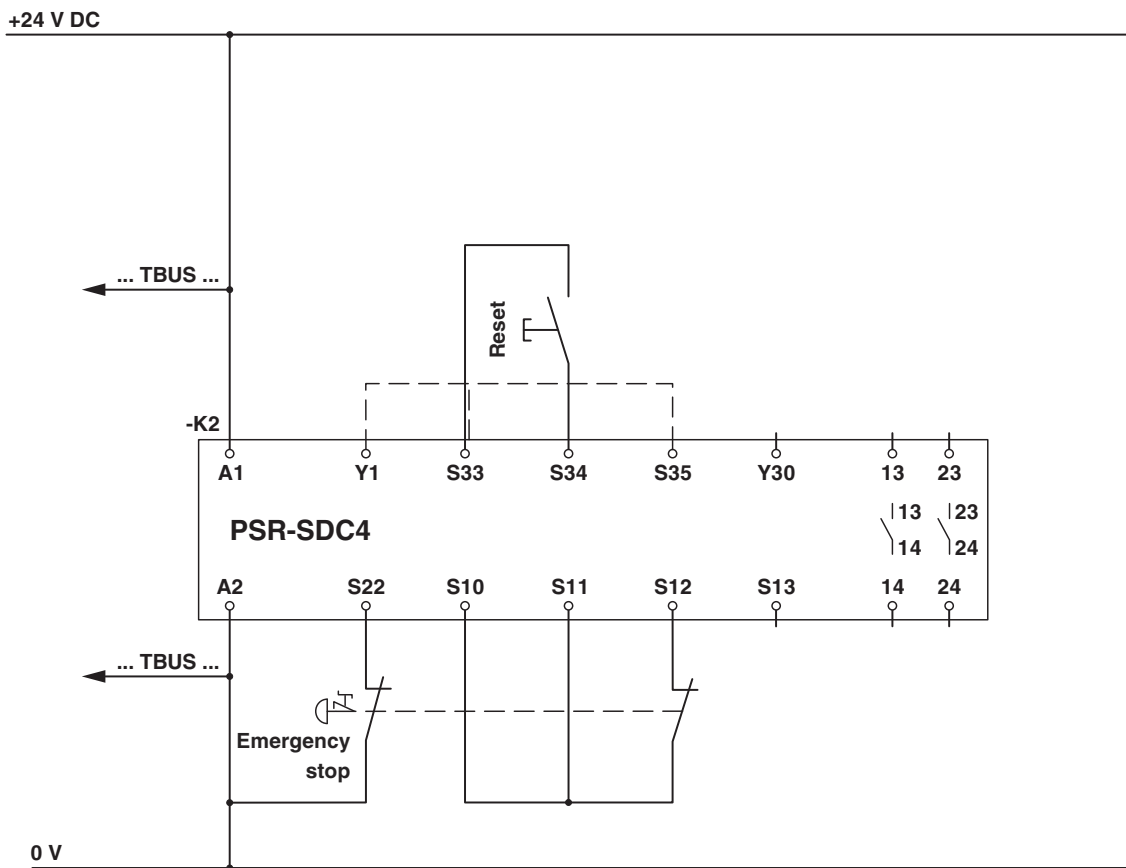


Figure 5 Two-channel emergency stop circuit with cross-circuit detection

10.2 Two-channel emergency stop circuit with monitored reset button without cross-circuit detection

- monitored reset button at S33-S34 (manual activation)
- automatic activation (bridge at Y1-S33-S35)
- suitable up to category 3, PL d (EN ISO 13849-1), SIL2 (IEC 61508)

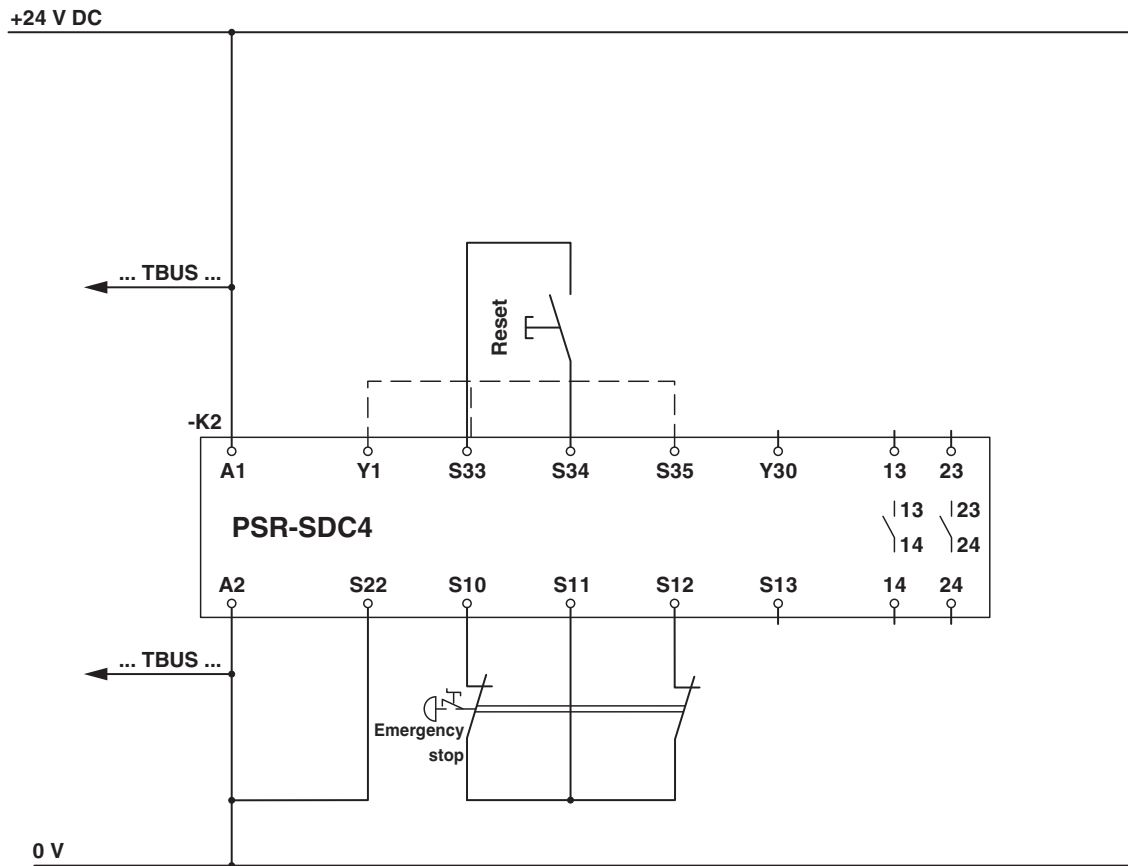


Figure 6 Two-channel emergency stop circuit without cross-circuit detection

10.3 Safety door monitoring without cross-circuit detection

- monitored reset button at S33-S34 (manual activation)
- automatic activation (bridge at Y1-S33-S35)
- suitable up to PL c (EN ISO 13849-1), SIL 2 (IEC 61508)

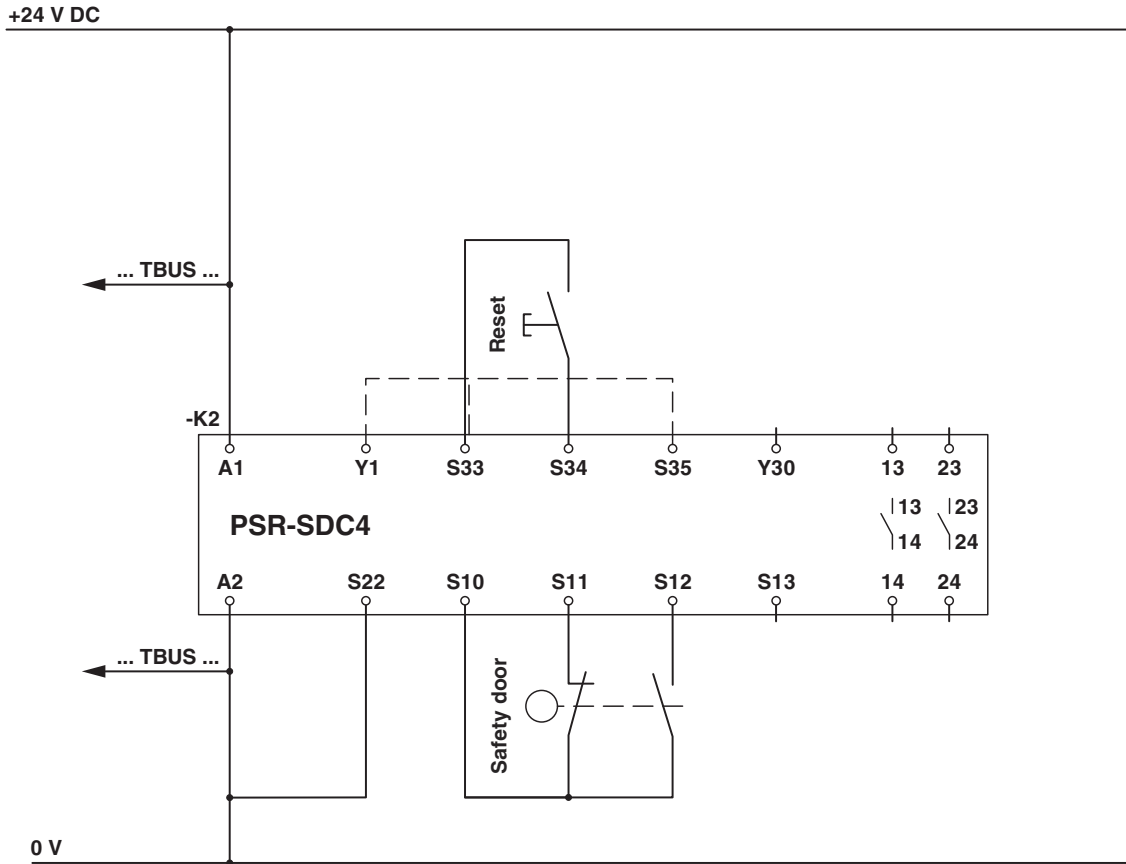


Figure 7 Safety door monitoring without cross-circuit detection

10.4 Monitoring with encoded magnetic switch without cross-circuit detection

- monitored reset button at S33-S34 (manual activation)
- automatic activation (bridge at Y1-S33-S35)
- suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (IEC 61508)

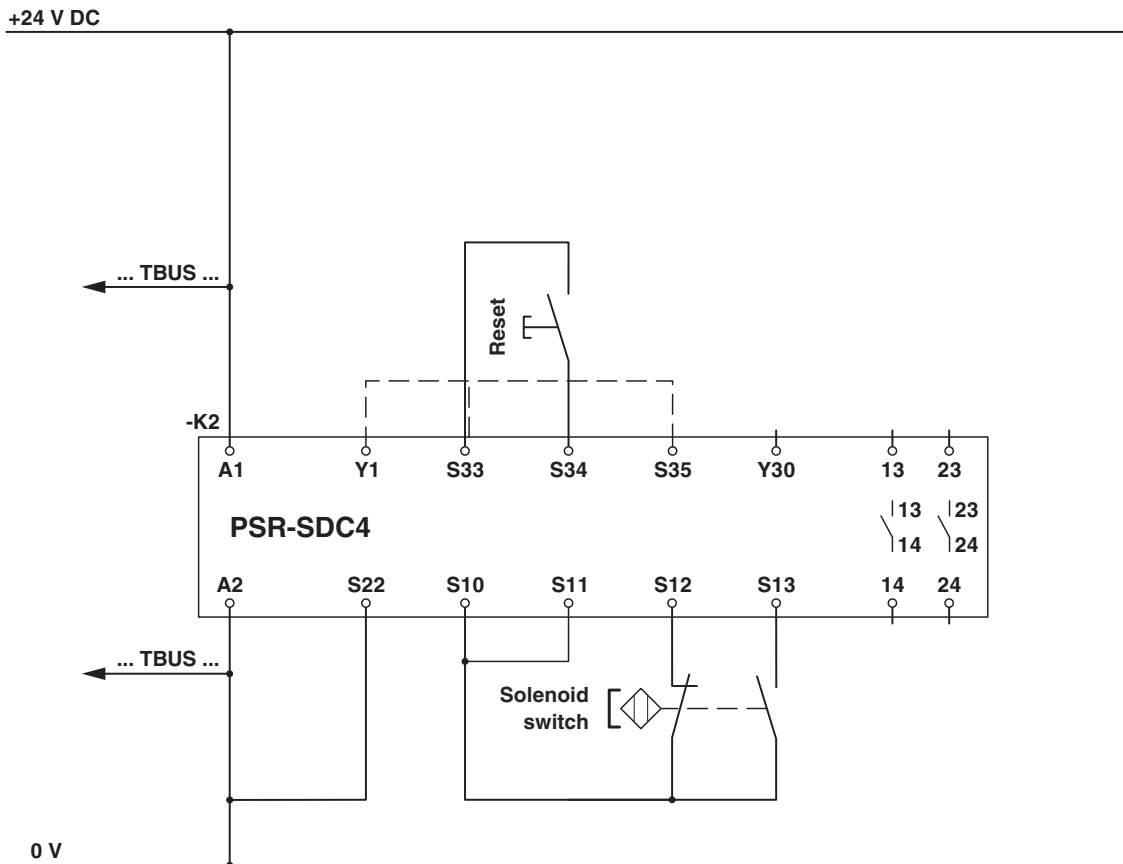


Figure 8 Monitoring with encoded magnetic switch without cross-circuit detection

10.5 Three magnetic switches

- suitable up to category 3, PL d (EN ISO 13849-1), SIL2 (IEC 61508)
- see also ISO 14119

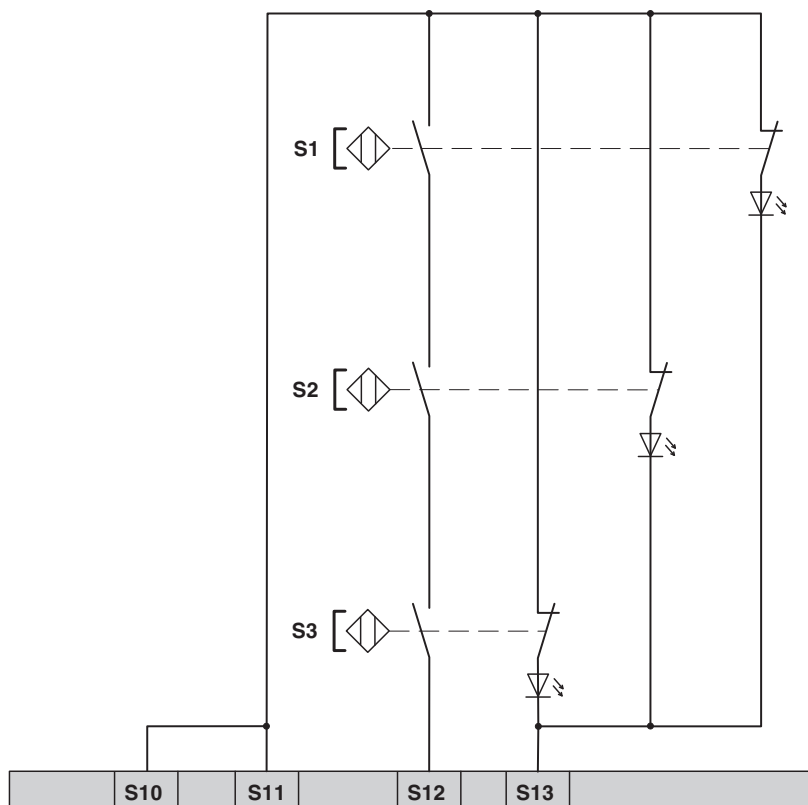


Figure 9 Series connection of three magnetic switches

10.6 Single-channel emergency stop circuit with monitored contact extension

- monitored reset button at S33-S34 (manual activation)
- automatic activation (bridge at Y1-S33-S35)
- suitable up to category 1, PL c (EN ISO 13849-1), SIL 2 (IEC 61508)

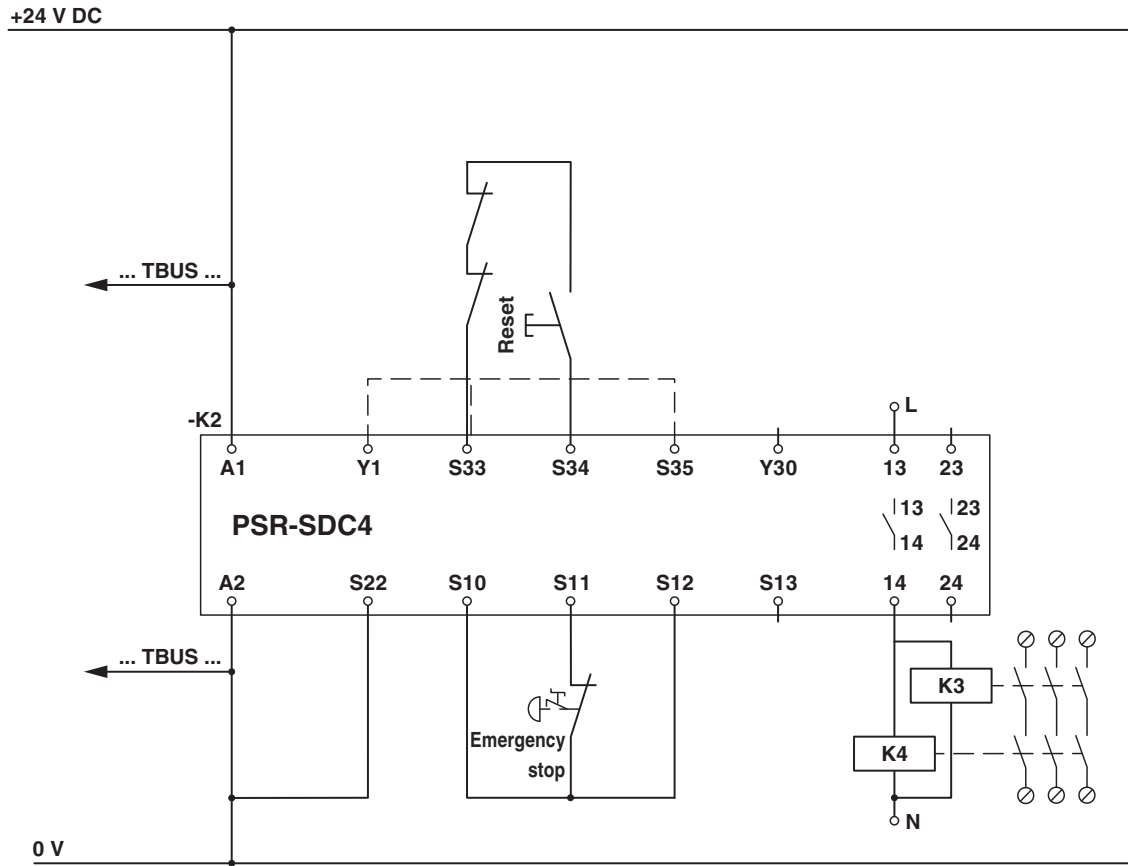


Figure 10 Single-channel emergency stop circuit with monitored contact extension

10.7 Two-channel light grid monitoring (cross-circuit detection via light grid)

- monitored reset button at S33-S34 (manual activation)
- automatic activation (bridge at Y1-S33-S35)
- suitable up to category 4, PL e (EN ISO 13849-1), SIL 3 (IEC 61508)

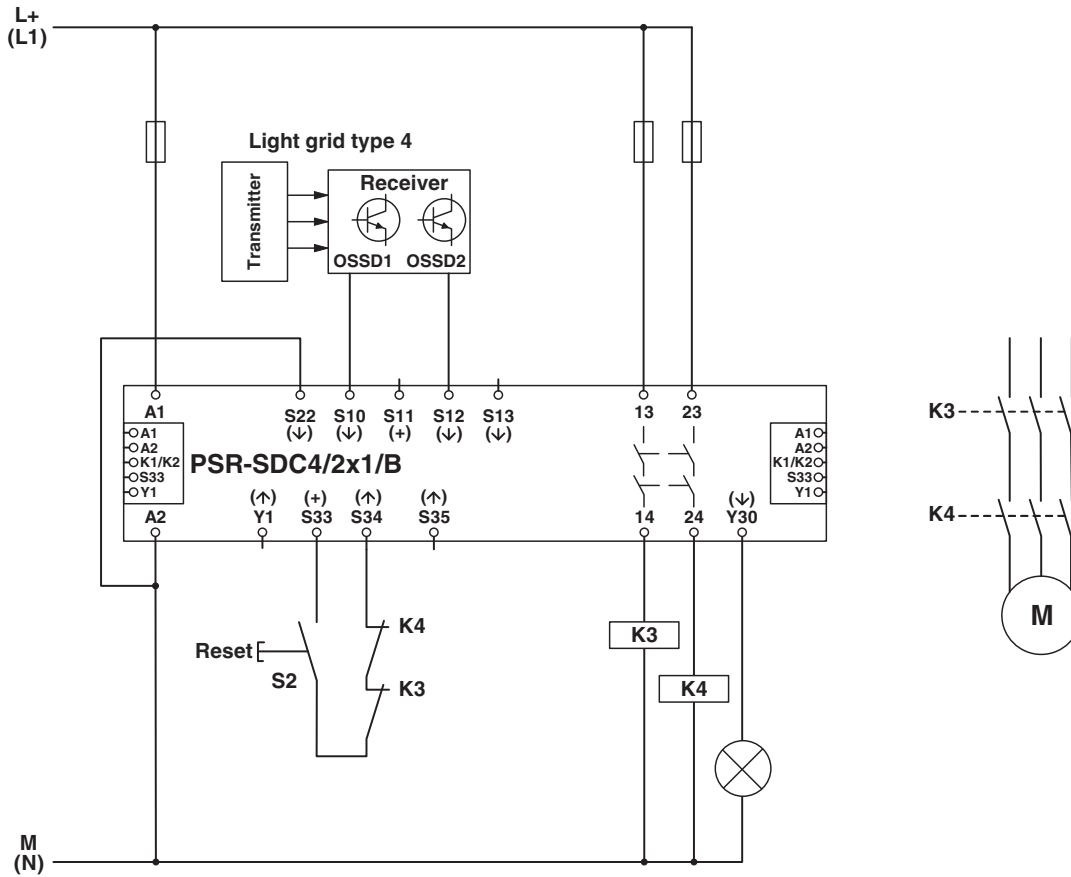


Figure 11 Two-channel light grid monitoring

10.8 Start and Feedback Circuits

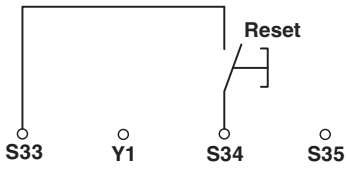


Figure 12 Monitored reset

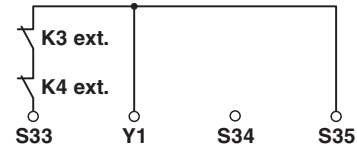


Figure 17 Automatic activation with monitored contact extension

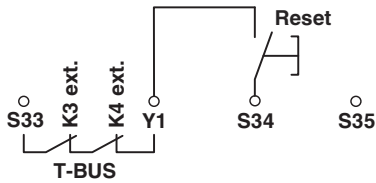


Figure 13 Monitored reset with monitored contact extension via T-BUS

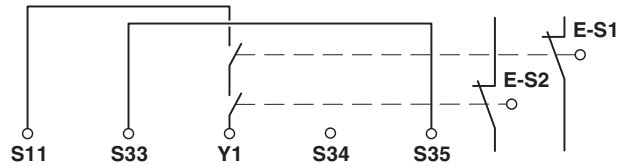


Figure 18 Automatic activation with restart inhibit in the event of a mains failure. Not fault-proof.

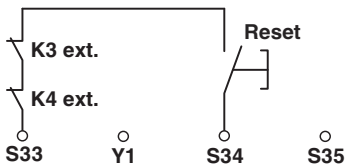


Figure 14 Monitored reset with monitored contact extension

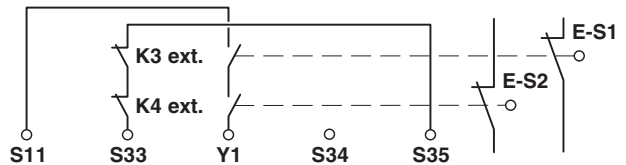


Figure 19 Automatic activation with restart inhibit in the event of a mains failure with monitored contact extension. Not fault-proof.

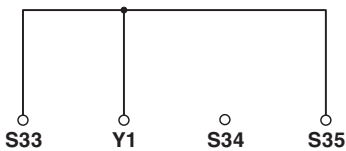


Figure 15 Automatic activation

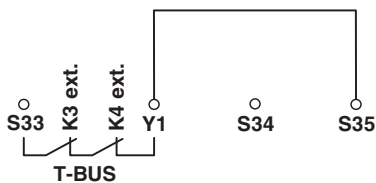


Figure 16 Automatic activation with monitored contact extension via T-BUS

10.9 Emergency stop circuits

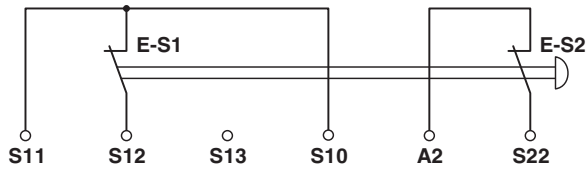


Figure 20 Two-channel with cross-circuit detection

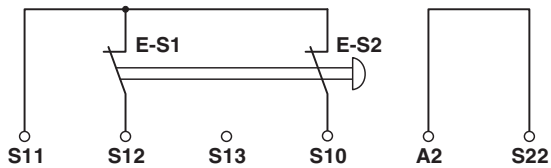


Figure 21 Two-channel without cross-circuit monitoring

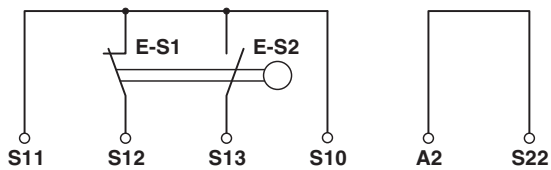


Figure 22 Two-channel without cross-circuit monitoring

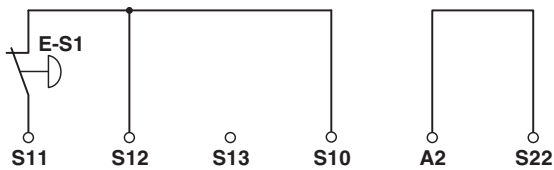


Figure 23 Single-channel

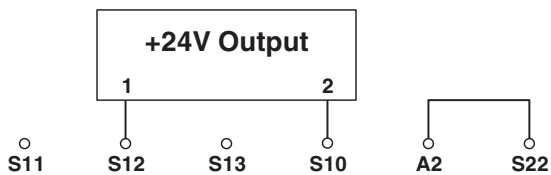


Figure 24 Semiconductor outputs