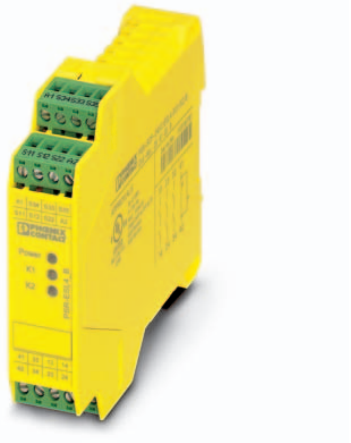
PSR-...-24UC/ESL4/3X1/1X2/B

Safety relay as contact extension for emergency stop relays, safety door switches, and light grids



Data sheet
100515_en_04

1 Description

The safety relay can be used to monitor electrosensitive protective equipment with monitored active switching output (OSSD) in accordance with EN 61496 as well as emergency stop and safety door locking mechanisms.

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

The safety relay is equipped with three enabling current paths that drop out without delay corresponding to stop category 0 according to EN 60204-1.

Features

- Emergency stop and safety door monitoring
- Light grid monitoring
- Suitable up to category 4, PL e (EN ISO 13849-1), SILCL 3 (EN 62061)
- Optional plug-in screw or spring-cage terminal blocks
- Single or two channel operation
- 3 undelayed enabling current paths
- 1 undelayed signaling current path

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 pages.

2 Table of contents

3 Ordering data

Description	Type	Order No.	Pcs. / Pkt.
Safety relay for emergency stop and safety door and light grid monitoring up to SIL 3 or Cat. 4, PL e according to EN ISO 13849, single or two-channel operation, 3 enabling current paths, nominal input voltage of 24 V AC/DC, plug-in screw terminal blocks	PSR-SCP- 24UC/ESL4/3X1/1X2/B	2981059	1
Safety relay for emergency stop and safety door and light grid monitoring up to SIL 3 or Cat. 4, PL e according to EN ISO 13849, single or two-channel operation, 3 enabling current paths, nominal input voltage of 24 V AC/DC, plug-in spring-cage terminal blocks	PSR-SPP- 24UC/ESL4/3X1/1X2/B	2981062	1

Documentation	Type	Order No.	Pcs. / Pkt.
User manual, English, for applications for PSR safety relay	UM EN SAFETY RELAY APPLICATION	2888712	1

4 Technical data

Input data	
Nominal input voltage U_N	24 V AC/DC
Input voltage range (factor)	0.85 ... 1.1
Typical input current	150 mA AC 70 mA DC
Voltage at input/start and feedback circuit	approx. 24 V DC
Typical response time	25 ms (manual start) 100 ms (automatic start)
Typical release time	10 ms
Recovery time	1 s
Operating voltage display	Green LED
Status display	Green LED
Protective circuit	Fuse PTC resistor

Output data	
Contact type	3 enabling current paths 1 signaling current path
Contact material	$AgSnO_2$, + 0.2 µm Au
Minimum switching voltage	15 V AC/DC
Maximum switching voltage	250 V AC/DC
Limiting continuous current	6 A
Maximum inrush current	6 A
Inrush current, minimum	25 mA
Sq. Total current	72 A^2 ($I_{TH}^2 = I_1^2 + I_2^2 + I_3^2$) (see derating curve)
Interrupting rating (ohmic load) max.	144 W (24 V DC, τ = 0 ms) 288 W (48 V DC, τ = 0 ms) 77 W (110 V DC, τ = 0 ms) 88 W (220 V DC, τ = 0 ms) 1500 VA (250 V AC, τ = 0 ms)
Maximum interrupting rating (inductive load)	48 W (24 V DC, τ = 40 ms) 40 W (48 V DC, τ = 40 ms) 35 W (110 V DC, τ = 40 ms) 33 W (220 V DC, τ = 40 ms)
Switching capacity min.	0.4 W
Mechanical service life	Approx. 10^7 cycles
Switching capacity (360/h cycles)	6 A (24 V DC) 5 A (230 V AC)
Switching capacity (3600/h cycles)	3 A (24 V (DC13)) 3 A (230 V (AC 15))
Output fuse	10 A gL/gG NEOZED (N/O contact)

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
Mounting type	DIN rail mounting
Air and creepage distances between the power circuits	DIN EN 50178/VDE 0160
Rated insulation voltage	250 V

General data	
Rated surge voltage / insulation	4 kV / basic insulation (safe isolation, reinforced insulation, and 6 kV between A1-A2/logic/enabling and signaling current paths)
Pollution degree	2
Surge voltage category	III

Dimensions	Screw connection	Spring-cage connection
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 connection
Conductor cross section, solid	0.2 mm² ... 2.5 mm²	0.2 mm² ... 1.5 mm²
Conductor cross section, stranded	0.2 mm² ... 2.5 mm²	0.2 mm² ... 1.5 mm²
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	5.56×10^{-10}
Demand rate	12 Months
Proof test interval	240 Months

Safety parameters for IEC 61508 - Low demand	
SIL	3
$MTTF_d$	17913 Years
PFD_{avg}	$1{,}50 \times 10^{-4}$
Proof test interval	75 Months

Safety characteristic data according to EN ISO 13849	
Category	4
Performance level	e
CCF	Passed

5 Basic circuit diagram

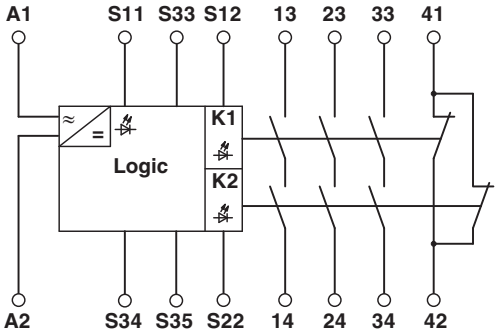


Figure 1 Block diagram

6 Derating

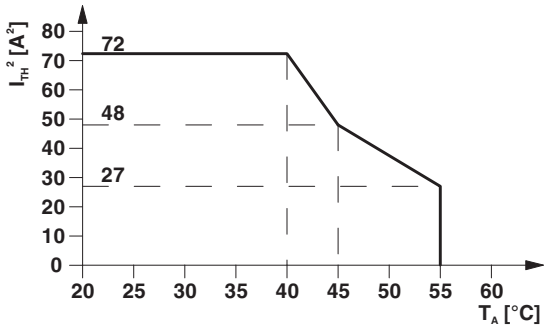


Figure 2 Derating curve

Key:

Designation	Explanation
A1, A2	Supply voltage connection (+24 V DC, GND)
S11, S12, S22	Input circuit
S33, S34, S35	Start circuit
13/14	Undelayed enabling current path 1
23/24	Undelayed enabling current path 2
33/34	Undelayed enabling current path 3
41/42	Signaling current path

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. Refer to the “Application examples” section for this.

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

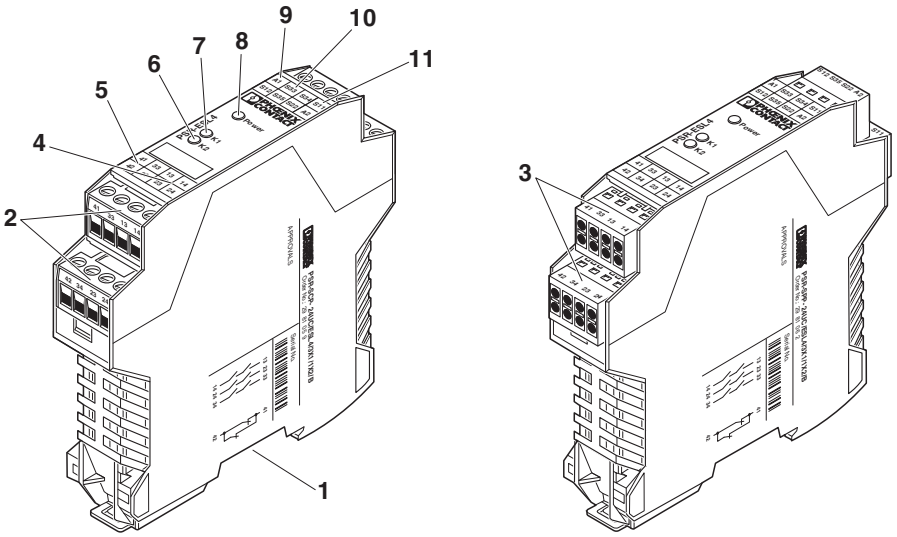


Figure 3 PSR-SCP-24UC/ESL4/3X1/1X2/B and PSR-SPP-24UC/ESL4/3X1/1X2/B

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, 33/34 enabling current paths
5	41/42 signaling current path
6	LED status indicator, green - K2
7	LED status indicator, green - K1
8	LED status indicator, green - Power
9	A1, A2 - supply voltage connection
10	S33, S34, S35 - start circuit (activating circuit)
11	S11, S12, S22 input circuit

9 Diagnostics

For the diagnostic description, please refer to the application manual for PSR safety relays.

10 Application example

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

- Manual activation
- Automatic activation with jumper at S33-S35
- Suitable up to category 4, PL e (EN ISO 13849-1), SILCL 3 (EN 62061)

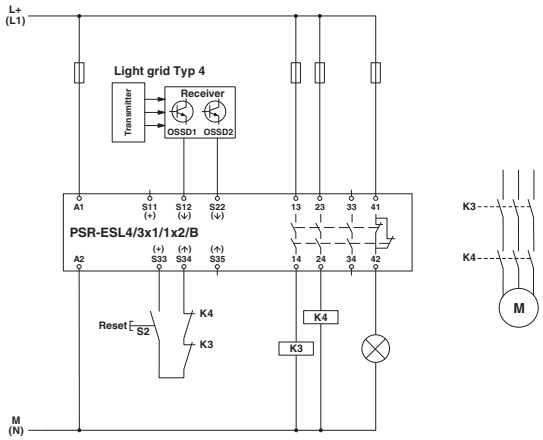


Figure 4 Two-channel light grid monitoring

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

- Manual activation
- Automatic activation with jumper at S33-S35
- Suitable up to category 3, PL d (EN ISO 13849-1), SILCL 2 (EN 62061)

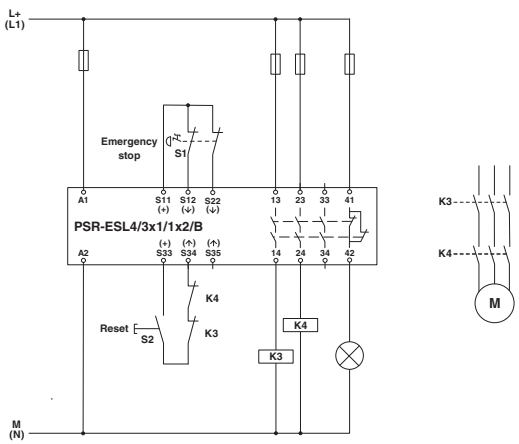


Figure 5 Two-channel emergency stop circuit without cross-circuit detection

10.3 Single-channel emergency stop monitoring

- Manual activation
- Automatic activation with jumper at S33-S35
- Suitable up to category 1, PL c (EN ISO 13849-1), SILCL 1 (EN 62061)

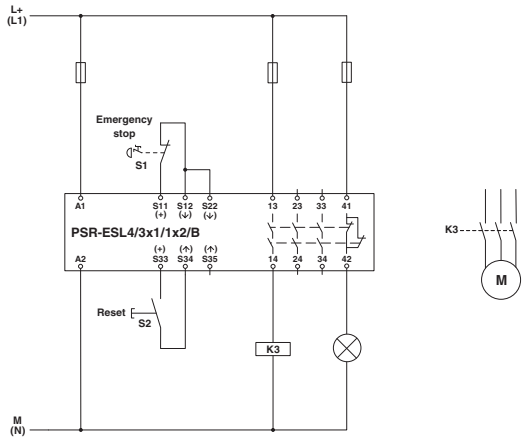


Figure 6 Single-channel emergency stop circuit with monitored reset button

10.4 Two-channel safety door monitoring without cross-circuit detection, with monitored reset button

- Manual activation
- Automatic activation with jumper at S33-S35
- Suitable up to category 3, PL d (EN ISO 13849-1), SILCL 2 (EN 62061)

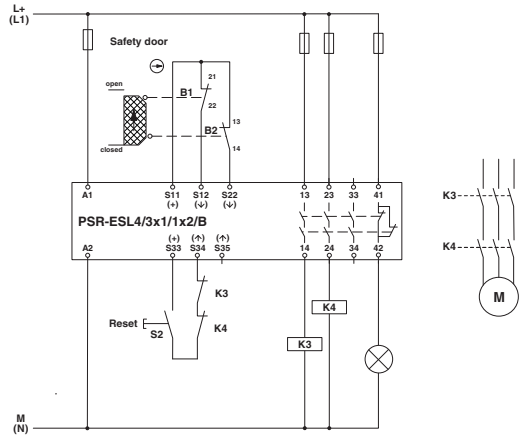


Figure 7 Two-channel safety door monitoring without cross-circuit detection