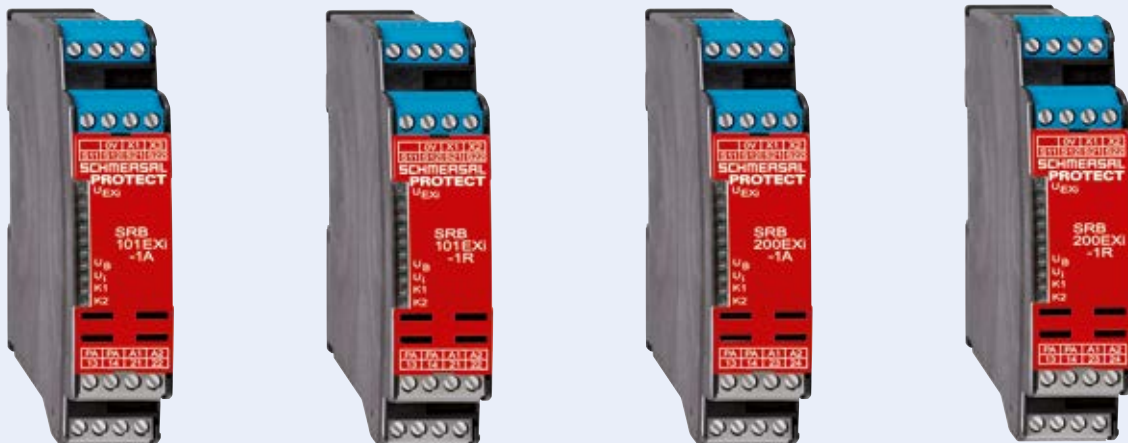


Safety relay modules for areas with risk of explosion

PROTECT SRB...EXi



IECEX
INMETRO
ATEX

IEC 61508
PTC = 100%
SC = 3

PL: e
Cat. 4
SIL: 3



SCHMERSAL
Safe solutions for your industry

ATEX use in areas with risk of explosion

| EX-relevant technical Data | |
|---|---|
| Group, Category, Ignition protection type | <ul style="list-style-type: none"> • Gas: Ⓜ II 3 G Ex nA nC IIC T5 Gc (SRB in zone 2) • Gas: Ⓜ II (2) G [Ex ib Gb] IIC • Dust: Ⓜ II (2) D [Ex ib Db] IIIC (power circuits in zone 1, 21/2, 22) |
| Maximum safety voltage U_m | 253 VAC (caution: U_m is not a rated voltage!) |
| Inputs (S11-S12, S21-S22, X1-X2/X3) | [Ex ib Gb] IIC / [Ex ib Db] IIIC |
| Temperature class | T5 |
| Voltage U_o | 33.6 V |
| Current I_o | 57.0 mA |
| Power P_o | 478.8 mW (linear characteristic) |
| Separation (intrinsically safe/other circuits) | safe separation to EN 60079-11, |

| Group, category | II C | | | | II B | | | | | |
|---|------|-----|-----|-----|------|-----|-----|-----|-----|-----|
| external capacity C_o (nF) | 26 | 36 | 46 | 49 | 160 | 180 | 230 | 280 | 350 | 412 |
| external inductivity L_o (mH) | 4.0 | 2.0 | 1.0 | 0.5 | 38.0 | 5.0 | 2.0 | 1.0 | 0.5 | 0.2 |

Target value for cable: C = 200 nF/km, L = 1 mH/km (C = 200 pF/m, L = 1 μ H/m)

Simple electrical apparatus

In connection with the inherently safe safety relay modules, the reset buttons, emergency stop command devices, locking devices and safety solenoid switches in the inherently safe current circuit can be used as simple electrical operating equipment (in accordance with EN 60079-11):

reset button

- Ex-RDT...
- Ex-RDM...

Emergency stop control devices

- Ex-RDRZ...

For reset buttons and emergency stop command devices, we recommend the use of an assembly housing:

- Ex-EBG 331.0
- Ex-EBG 633.0

Safety sensor

- EX-BNS40S

Safety switch

- EX-AZ 16 ZI

Position switch with safety function

- EX-T 335
- EX- 335

SRB with inherently safe monitoring circuits Ex i

PROTECT SRB's

- ATEX-certified
- For emergency stop and safety guard monitoring

The new generation of safety relay modules of the SRB EXi series combines tried and trusted safety technology with the requirements of explosion protection.

The SRB EXi modules were developed based on ATEX directive 2014/34/EU and European standards EN 60 079 ff. The inherently safe monitoring current circuits Ex-i are configured for devices of category 2GD. In this way, emergency stop command devices and protective safety door/guard monitoring can be used in areas with risk of gas and dust explosion.

Ex protection – ATEX

- ATEX category (2)GD for connection of devices from zone 1 or 21.
- ATEX category 3G permits installation of SRB EXi units in gas zone 2.

Safety-related function

SRB 101EXi-1R

- 1 safety approval, stop 0
- 1 feedback contact
- Optionally with short-circuit recognition
- Monitored reset function

SRB 101EXi-1A

- 1 safety approval, stop 0
- 1 feedback contact
- Optionally with short-circuit recognition
- Automatic and manual reset function

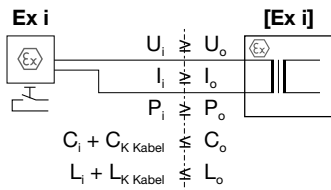
SRB 200 EXi-1R

- 2 safety approvals, stop 0
- Optionally with short-circuit recognition
- Monitored reset function

SRB 200 EXi-1A

- 2 safety approvals, stop 0
- Optionally with short-circuit recognition
- Automatic and manual reset function

Design of intrinsically safe electric circuits



| | | |
|--------------------------------|----------------------|-----------|
| Resistance (back/forth) | 0.5 mm ² | 72 Ohm/km |
| | 0.75 mm ² | 48 Ohm/km |
| | 1.5 mm ² | 24 Ohm/km |
| Capacity* | 180...200 nF/km | |
| Inductivity* | 0.8...1 mH/km | |

* Reference values

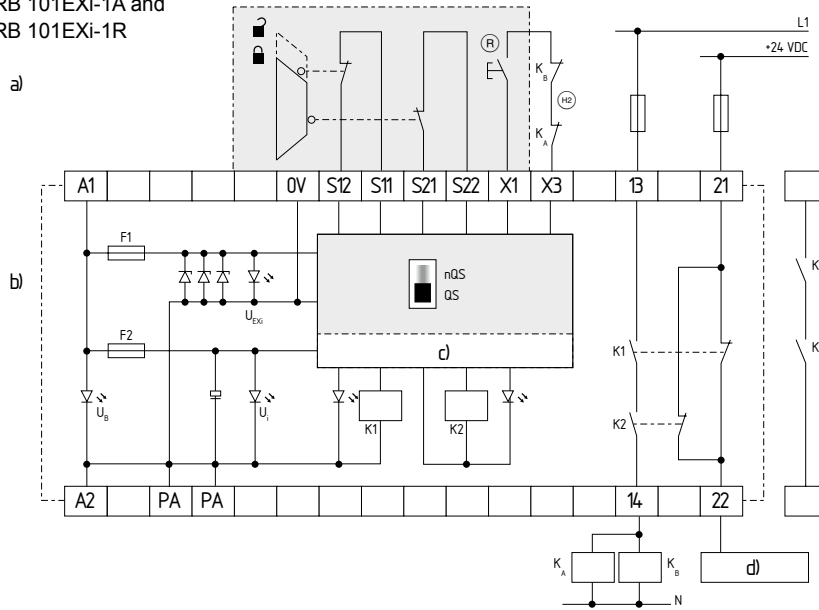
| Definition of explosive atmosphere | Dust | | Gas | |
|------------------------------------|------------------------|--------------------|------------------------|--------------------|
| | category ¹⁾ | Zone ²⁾ | category ¹⁾ | Zone ²⁾ |
| Permanent, long periods, frequent | 1D | 20 | 1G | 0 |
| Occasionally | 2D | 21 | 2G | 1 |
| Not normally, only briefly | 3D | 22 | 3G | 2 |

¹⁾ Manufacturer: 2014/34/EU = ATEX directive

²⁾ Operator: 1999/92/EC = ATEX directive

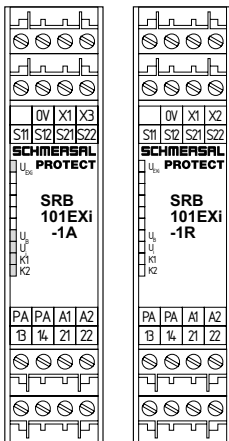
PROTECT SRB...EXi for emergency stop and safety door monitoring

PROTECT SRB 101EXi-1A and
PROTECT SRB 101EXi-1R



Legend for wiring examples
a) Installation in zone 1/21
b) Installation in zone 2
c) Logic
d) Control

PROTECT SRB 101EXi-1A and ...-1R



Features

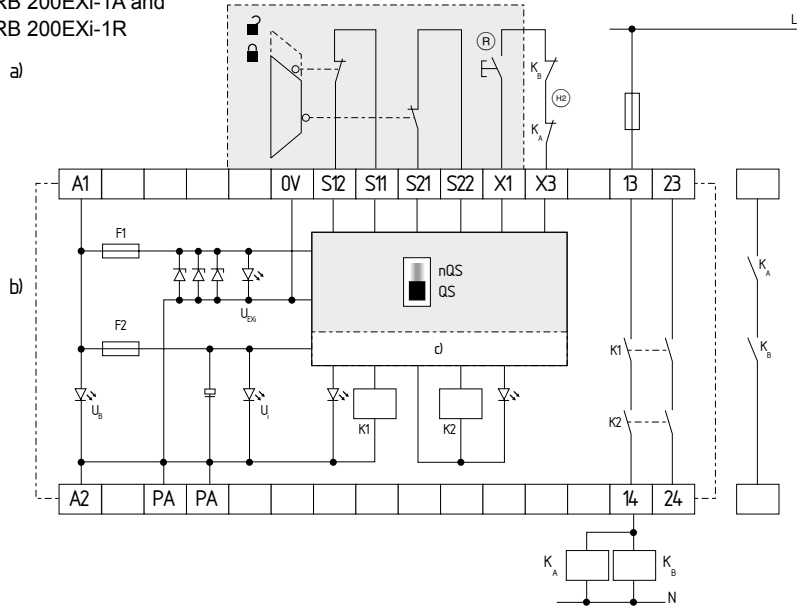
- 1 or 2 channel control
- **1 safety enabling circuit**
- Suitable for signal processing of emergency stop control devices, interlocking equipment, etc.
- **1 additional signalling contact** (auxiliary contacts must not be used in safety circuits)
- Trailing edge (version -1R)
- Automatic reset function (version -1A)
- Optionally with short-circuit recognition (through switch)
- Current and voltage limitation of the input circuits (intrinsically safe)
- Green LED indications for relays K1, K2, UB, Ui and UEXi
- Anchor rail assembly EN 60 715:2001
- Thermoplastic enclosure to UL-94-V0, graphite black RAL 9011
- Dimensions H x W x D: 100 x 22,5 x 121 mm
- Certification in accordance with ISO 13849-1:2007

Notes on the wiring diagram

- Dual-channel control, shown for a guard door monitor with two position switches where one has a positive break contact; with external reset button (R).
- Relay outputs: Suitable for 2 channel control, for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- (H) = Feedback circuit
- The control recognises cable break, cross-wire shorts (switch in position "QS") and earth leakages in the monitoring circuit.
- The safety function is defined as the opening of release 13-14 when the inputs S11-S12 and/or S21-S22 are opened.
- The safety-relevant current path with the **output contact 13-14** fulfils the following requirements in consideration of a B_{10d} value (see also "Details in terms of ISO 13 849-1"):
 - Category 4 – PL e in accordance with ISO 13849-1:2007
 - Complies with SIL 3 in accordance with EN 61508-2:2002
 - Complies with SILCL 3 in accordance with EN 62061:2005 (equates to control category 4 in accordance with EN 954-1:1997).
- To determine the Performance Level (PL) to ISO 13849-1:2007 of the entire safety function (e.g. sensor, logic, actuator), an assessment of all relevant components is required.

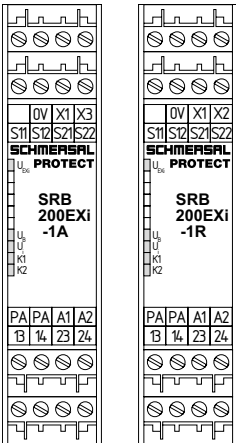
PROTECT SRB...EXi with up to 2 safety approvals, STOP 0

PROTECT SRB 200EXi-1A and
PROTECT SRB 200EXi-1R



Legend for wiring examples
a) Installation in zone 1/21
b) Installation in zone 2
c) Logic
d) Control

PROTECT SRB 200EXi-1A and ...-1R



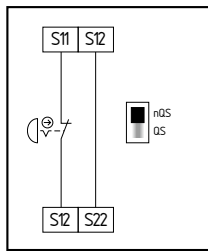
Features

- 1 or 2 channel control
- **2 safety releases**
- Suitable for signal processing of emergency stop control devices, interlocking equipment, etc.
- Trailing edge (version -1R)
- Automatic reset function (version -1A)
- Optionally with short-circuit recognition (through switch)
- Current and voltage limitation of the input circuits (intrinsically safe)
- Green LED indications for relays K1, K2, UB, Ui and UEXi
- Anchor rail assembly EN 60 715:2001
- Thermoplastic enclosure to UL-94-V0, graphite black RAL 9011
- Dimensions H × W × D: 100 × 22.5 × 121 mm
- Certification in accordance with ISO 13849-1:2007

Notes on the wiring diagram

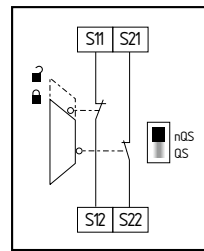
- Dual-channel control, shown for a guard door monitor with two position switches where one has a positive break contact; with external reset button (R).
- Relay outputs: Suitable for 2 channel control, for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- (H2) = Feedback circuit
- The control recognises cable break, cross-wire shorts (switch in position "QS") and earth leakages in the monitoring circuit.
- The safety function is defined as the opening of release 13-14 when the inputs S11-S12 and/or S21-S22 are opened.
- The safety-relevant current paths with the **output contacts 13-14/23-24** fulfil the following requirements in consideration of a B_{10D} value (see also "Details in terms of ISO 13849-1"):
 - Category 4 – PL e in accordance with ISO 13849-1:2007
 - Complies with SIL 3 in accordance with EN 61508-2:2002
 - Complies with SILCL 3 in accordance with EN 62061:2005 (equates to control category 4 in accordance with EN 954-1:1997).
- To determine the Performance Level (PL) to ISO 13849-1:2007 of the entire safety function (e.g. sensor, logic, actuator), an assessment of all relevant components is required.

Wiring examples in accordance with ISO 13849-1:2007



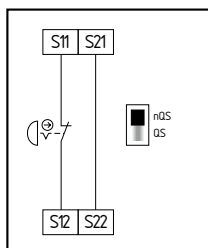
One channel emergency stop as per ISO 13850:2007 and EN 60947-5-5:2005

- Wire breakage and earth leakage in the control circuits are detected.
- Category 2 – PL "d" achievable.



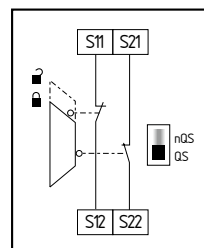
Two channel protective door/guard monitoring circuit in accordance with EN 1088:2007

- At least one contact with positive break required.
- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are not detected.
- Category 4 – PL "e" achievable.



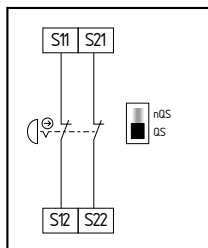
Two channel emergency stop circuit as per ISO 13850:2007 and EN 60947-5-5:2005

- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are not detected.
- Category 4 – PL "e" achievable (with protected cable routing).



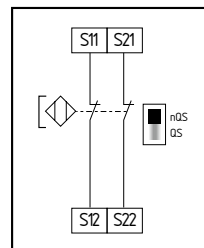
Two channel protective door/guard monitoring circuit in accordance with EN 1088:2007

- At least one contact with positive break required.
- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are detected.
- Category 4 – PL "e" achievable.



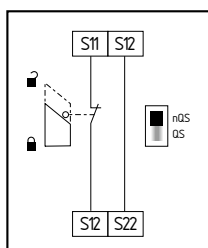
Two channel emergency stop circuit as per ISO 13850:2007 and EN 60947-5-5:2005

- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are detected.
- Category 4 – PL "e" achievable.



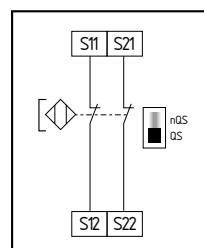
Dual-channel control of magnetic safety switches to EN 60947-5-3:2005

- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are not detected.
- Category 3 – PL "e" achievable.



Single-channel guard door monitoring circuit with interlocking devices to EN 1088:2007

- At least one contact with positive break required.
- Wire breakage and earth leakage in the control circuits are detected.
- Category 2 – PL "d" achievable.



Dual-channel control of magnetic safety switches to EN 60947-5-3:2005

- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are detected.
- Category 3 – PL "e" achievable.

Technical data

| General technical data | |
|--|---|
| Rated operating voltage | 24 VDC –15%/+20%, residual ripple max. 10% |
| Max. fuse rating of the operating voltage | - internal fuse F1: T 50 mA/250 V - internal fuse F2: T 100 mA/250 V |
| Switching capacity of the enabling paths | max. 230 V; 3 A ohmic (inductive in case of appropriate protective wiring) AC-15: 230 VAC/3 A DC-13: 24 VDC/3 A |
| Min. switching capacity | min. 10 V/10 mA |
| Utilisation categories | AC-15/DC-13: EN IEC 60 947-5-1:2007 |
| Current and voltage at S11-S12, S21-S22 | 24 VDC, 5 mA |
| Current limitation at S11-S12, S21-S22 | 15 mA |
| Pull-in delay: | - approx. 300 ms (Version -1A) - approx. 20 ms (Version -1R) |
| Drop-out delay | - in case of emergency stop: approx. 20 ms - in case of voltage drop: approx. 20 ms |
| Bridging in case of voltage drops | approx. 15 ms |
| Air clearances and creepage distances | IEC 60 664-1:2003 (DIN VDE 0110-1), 4 kV/2 EN 60 079-11:2007 (VDE 0170/0171 Part 7) |
| Cable connections | - Single wire: rigid or flexible (with and without ferrule) 0.25 ... 2.5 mm ² - Two wire: with same cross section, rigid or flexible (with ferrule, no plastic) 0.25 ... 2.5 mm ² ; flexible (without or with TWIN ferrule) 0.5 ... 1.5 mm ² |
| Max. total line resistance | 30 Ohm |
| Wire lengths (with rated voltage) | - 1-channel without short circuit detection: 1.5 mm ² = 1500 m; 2.5 mm ² = 2500 m - 2-channel with/without cross circuit detection: 1.5 mm ² = 1500 m; 2.5 mm ² = 2500 m |
| Ambient operating | -25 °C ... +60 °C |
| EMC | IEC 61 000-6-2:2005 |
| Vibrations | IEC 60 068-2-6:1996: Frequency: 10 ... 55 Hz; amplitude: 0.35 mm |

| Details in terms of IEC 61508:2010 | |
|------------------------------------|--------|
| Proof-Test-Coverage (PTC) | = 100% |
| Systematic Capability (SC) | 3 |

| Details in terms of ISO 13849-1:2007 | |
|--|--|
| B_{10D} value (for one channel) | - Low voltages range: 20,000,000 - Maximum load: 400,000 |
| CCF | > 65 points |
| Conversion in MTTF_D: See ISO 13849-1:2007 Annex C number 4.2 | d _{op} = average number of operating days per year h _{op} = average number of operating hours per day t _{cycle} = average demand rate of the safety function in s (e.g. 4 × per hour = 1 × per 15 min. = 900 s) = 900 s) |

$$MTTF_D = \frac{B_{10D}}{0.1 \times n_{op}} \quad n_{op} = \frac{d_{op} \times h_{op} \times 3,600 \text{ s/h}}{t_{cycle}}$$



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In the demanding field of machine safety, the owner-managed Schmersal Group is one of the international market and component leaders. The company, which was founded in 1945, has a workforce of about 2000 people and seven manufacturing sites on three continents along with its own companies and sales partners in more than 60 nations.

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- Safety controllers and safety relay modules, safety bus systems
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Technical amendments and errors possible.

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