

**PROTECT SRB's –  
Safety relay modules  
with intrinsically safe monitoring circuits Exi**  
⊕-protection for ATEX zones 1, 2, 21 and 22

**News 08**



# PROTECT SRB's

## Safety relay modules with intrinsically safe monitoring circuits Exi

### PROTECT SRB's

- ATEX certified
- For emergency stop and guard monitoring

The new generation of safety relay modules SRB EXi combines the approved safety technique with the demands of the explosion protection.

The SRB EXi modules are developed on the basics of the ATEX directive 94/9/EG and the European standards EN 60079 et seq. The intrinsically safe monitoring guards Exi are designed for equipment of the category 2GD. Therewith emergency stop devices and safety door monitorings may be used in gas- and dust-explosive atmosphere.

### Explosion protection – ATEX

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

### Safety-related function

#### SRB 101EXi-1R

- 1 safety enabling output Stop 0
- 1 auxiliary contact
- cross-short detection (optional)
- monitored reset function

#### SRB 101EXi-1A

- 1 safety enabling output Stop 0
- 1 auxiliary contact
- cross-short detection (optional)
- automatic and manual reset function

#### SRB 200 EXi-1R

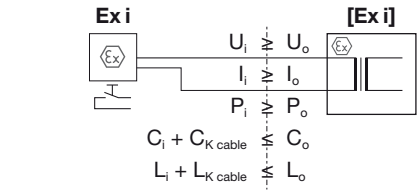
- 2 safety enabling output Stop 0
- cross-short detection (optional)
- monitored reset function

#### SRB 200 EXi-1A

- 2 safety enabling output Stop 0
- cross-short detection (optional)
- automatic and manual reset function



### Dimension of intrinsic safety circuits



|                  |                      |           |
|------------------|----------------------|-----------|
| Resistance       | 0.5 mm <sup>2</sup>  | 72 ohm/km |
| (bidirectional)* | 0.75 mm <sup>2</sup> | 48 ohm/km |
|                  | 1.5 mm <sup>2</sup>  | 24 ohm/km |
| Capacity*        | 180–200 nF/km        |           |
| Inductivity*     | 0.8–1 mH/km          |           |

\* Approximate values

| Gas                   |                   |                                      | Dust              |                       |
|-----------------------|-------------------|--------------------------------------|-------------------|-----------------------|
| category <sup>1</sup> | Zone <sup>2</sup> | Definition explosive atmosphere      | Zone <sup>2</sup> | category <sup>1</sup> |
| 1G                    | 0                 | Continuous, long periods, frequent   | 20                | 1D                    |
| 2G                    | 1                 | Occasional                           | 21                | 2D                    |
| 3G                    | 2                 | Normally not, only for short periods | 22                | 3D                    |

1) Manufacturer: 94/9/EG = ATEX directive

2) User: 1999/92/EG = ATEX directive

# PROTECT SRB's

## ATEX – use in hazardous areas

### Ex-relevant technical data

|                                                    |                                                                                                                                                                                                 |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EC type test examination/<br>type examination test | TÜV 08 ATEX 7522 / TÜV 08 ATEX 7557                                                                                                                                                             |
| Group, category, type of protection                | <ul style="list-style-type: none"> <li>Gas: Ⓜ II 3 G Ex nAnC IIC T5 (SRB in zone 2)</li> <li>Gas/dust: Ⓜ II (2) GD [Ex ib] IIC/[Ex ibD]<br/>(electric circuits in zones 1, 21/2, 22)</li> </ul> |
| Safety-related maximum current $U_m$               | 253 VAC (Attention: $U_m$ is'nt rated voltage!)                                                                                                                                                 |
| Inputs (S11-S12, S21-S22, X1-X2/X3)                | [Ex ib] IIC/[Ex ibD]                                                                                                                                                                            |
| Temperature class                                  | T5                                                                                                                                                                                              |
| Max. output voltage $U_o$                          | 33.6 V                                                                                                                                                                                          |
| Current $I_o$                                      | 57.0 mA                                                                                                                                                                                         |
| Max. output power $P_o$                            | 478.8 mW (characteristic curve linear)                                                                                                                                                          |
| Isolation (intrinsically safe/other circuits)      | safe isolation acc. to EN 60079-11:2007, voltage peak value 375 V                                                                                                                               |

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

Reference value of a circuit:  $C = 200$  nF/km,  $L = 1$  mH/km ( $C = 200$  pF/m,  $L = 1$   $\mu$ H/m)

#### Simple apparatus

In connection with the intrinsically safe safety relay modules the following reset buttons, emergency stop control devices, locking devices and safety magnet switches can be used in intrinsically safe electric circuits as simple apparatus (acc. EN 60079-11):

#### Reset buttons

(Elan Schaltelemente GmbH & Co. KG)

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

#### Emergency stop control devices

(Elan Schaltelemente GmbH & Co. KG)

- Ex-RDRZ...

For reset buttons and emergency stop control devices we recommend the use of mounting boxes (Elan Schaltelemente GmbH & Co. KG):

- Ex-EBG 331.0
- Ex-EBG 633.0

#### Locking devices

(K.A. Schmersal GmbH)

- EX-AZ 17-...-3D
- EX-AZ 16-...-3D
- EX-AZ 336-...-3D
- EX-AZ 356-...-3D
- EX-AZ 415-...-3D
- EX-AZ 3350-...-3D
- EX-Z/T 235-...-3D
- EX-Z/T 335-...-3D

#### Safety magnet switches

(K.A. Schmersal GmbH)

- EX-BNS 33-...-3G/D, without LED version
- EX-BNS 120-...-3G/D, without LED version
- EX-BNS 180-...-3G/D
- EX-BNS 303-...-3G/D, without LED version
- EX-BN 20-...-3G/D

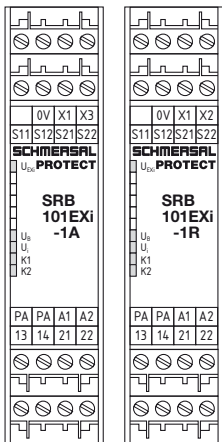


# PROTECT SRB 101EXi-1A, ...-1R

## for emergency stop- and guard monitoring

### SRB 101EXi-1A/-1R

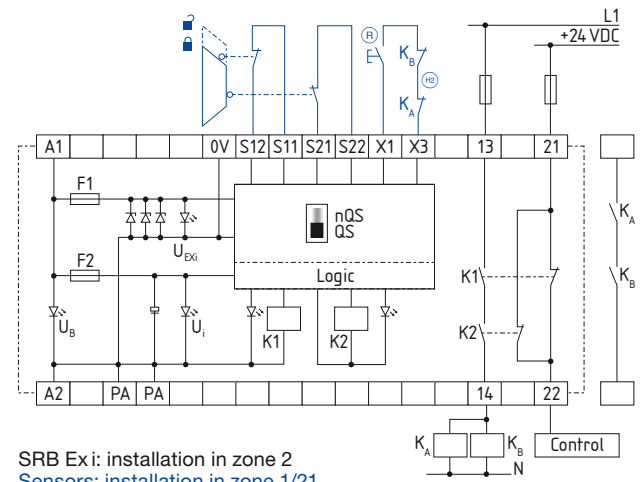
### Switching example



Dimensions (H x W x D):  
100 x 22.5 x 121 mm

#### Features

- 1- or 2-selection control
- 1 safety enabling output
- Capable for signal processing of emergency stop control devices, interlocking devices etc.
- 1 additional auxiliary contact (signalling outputs may not be used in safety circuits)
- Trailing edge (version -1R)
- Automatic reset function (version -1A)
- Optional cross-short monitoring (with a switch)
- Current and voltage restrictions of the input (intrinsically safe)
- Green LED displays for relays K1, K2, U<sub>B</sub>, U<sub>i</sub> and U<sub>EXi</sub>
- Top hat rail mounting DIN EN 60715:2001
- Housing of thermoplastic material acc. UL-94-V-0, graphite-black RAL 9011
- Certified acc. DIN EN ISO 13849-1:2007
- Certified acc. ATEX 94/9/EG



#### Information on the circuit example:

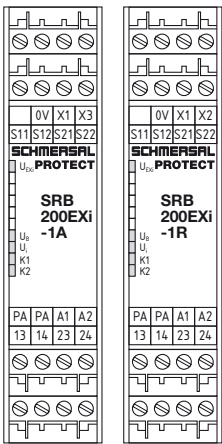
- 2-selection control, shown by way of example of a guard monitoring system with two limit switches, at least one of which is a contact with positive opening; with external reset button (R).
- Power level: 2-channel selection, suitable for contact amplification and contact multiplication through contactors or relays with positively driven contacts.
- (R) = feedback circuit
- Wire breaks and cross-shorts (in switch position "QS") and earth leakages in the monitoring circuits are detected.
- The safety function is defined as follows: the enabling output 13-14 is open, when the input(s) S11-S12 and/or S21-S22 opens.
- The safety-relevant current path with the output contact 13-14 comply, in consideration with a B<sub>10d</sub>-value view, the following requirements (refer also „Information within the meaning of DIN EN ISO 13849-1“):
  - category 4 – PL „e“ acc. DIN EN ISO 13849-1:2007
  - is equivalent to SIL 3 acc. DIN EN 61508-2:2002
  - is equivalent SILCL 3 acc. DIN EN 62061:2005
 (is equivalent control category 4 acc. DIN EN 954-1:1997).
- For designation of the performance level (PL) acc. DIN EN ISO 13849-1:2007 of the whole safety function (e.g. sensor, logic, actor), a view to all relevant components is necessary.

# PROTECT SRB 200EXi-1A, ...-1R

## for emergency stop- and guard monitoring

### SRB 200EXi-1A/-1R

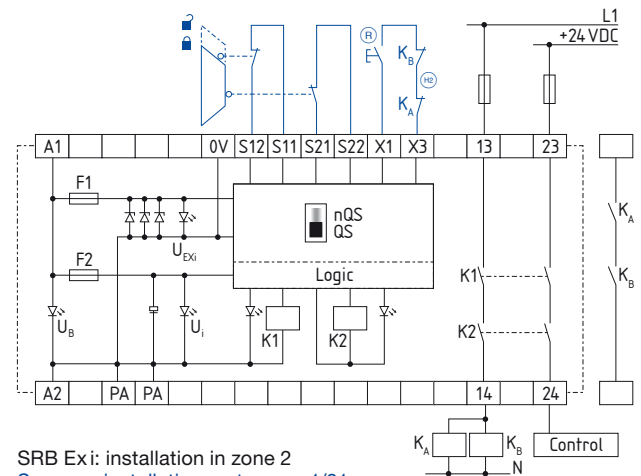
### Switching example



Dimensions (H x W x D):  
100 x 22.5 x 121 mm

#### Features

- 1- or 2-selection control
- 2 safety enabling outputs
- Capable for signal processing of emergency stop control devices, interlocking devices etc.
- Trailing edge (version -1R)
- Automatic reset function (version -1A)
- Optional cross-short monitoring (with a switch)
- Current and voltage restrictions of the input (intrinsically safe)
- Green LED displays for relays K1, K2, U<sub>B</sub>, U<sub>i</sub> and U<sub>Exi</sub>
- Top hat rail mounting DIN EN 60 715:2001
- Housing of thermoplastic material acc. UL-94-V-0, graphite-black RAL 9011
- Certified acc. DIN EN ISO 13849-1:2007
- Certified acc. ATEX 94/9/EG



SRB Exi: installation in zone 2  
Sensors: installation up to zone 1/2/1

#### Information on the circuit example:

- 2-selection control, shown by way of example of a guard monitoring system with two limit switches, at least one of which is a contact with positive opening; with external reset button (R).
- Power level: 2-channel selection, suitable for contact amplification and contact multiplication through contactors or relays with positively driven contacts.
- (R) = feedback circuit
- Wire breaks and cross-shorts (in switch position "QS") and earth leakages in the monitoring circuits are detected.
- The safety function is defined as follows: the enabling outputs 13-14/23-24 are open, when the input(s) S11-S12 and/or S21-S22 opens.
- The safety-relevant current path with the output contacts 13-14/23-24 comply, in consideration with a B<sub>10d</sub>-value view, the following requirements (refer also „Information within the meaning of DIN EN ISO 13849-1“):
  - category 4 – PL „e“ acc. DIN EN ISO 13849-1:2007
  - is equivalent to SIL 3 acc. DIN EN 61 508-2:2002
  - is equivalent SILCL 3 acc. DIN EN 62 061:2005
 (is equivalent control category 4 acc. DIN EN 954-1:1997).
- For designation of the performance level (PL) acc. DIN EN ISO 13849-1:2007 of the whole safety function (e.g. sensor, logic, actor), a view to all relevant components is necessary.

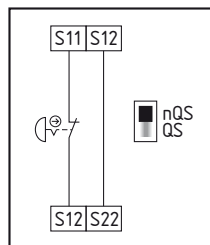
#### Information within the meaning of DIN EN ISO 13849-1:2007

|                                                                                           |                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B <sub>10d</sub> value (for one channel)                                                  | <ul style="list-style-type: none"> <li>• With low load: 20.000.000</li> <li>• With maximum load: 400.000</li> </ul>                                                                                                                                   |
| CCF                                                                                       | > 65 points                                                                                                                                                                                                                                           |
| Conversion in MTTF <sub>d</sub> :<br>refer to DIN EN ISO 13849-1:2007 Annex C<br>Item 4.2 | d <sub>op</sub> = average number of operating days per year<br>h <sub>op</sub> = average number of operating hours per day<br>t <sub>cycle</sub> = average request of the safety function in s<br>(for example 4 x per hour = 1 x per 15 min = 900 s) |
| $MTTF_d = \frac{B_{10d}}{0.1 \times n_{op}}$                                              | $n_{op} = \frac{d_{op} \times h_{op} \times 3,600 \text{ s/h}}{t_{cycle}}$                                                                                                                                                                            |

# PROTECT SRB xxxEXi-1x

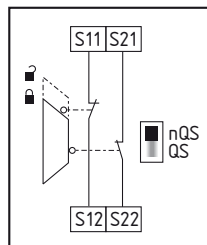
## Technical data

| General technical data                               |                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                      | SRB 101EXi-1A, SRB 101EXi-1R, SRB 200EXi-1A, SRB 200EXi-1R                                                                                                                                                                                                                                                                                                       |
| Operating voltage                                    | 24 VDC –15%/+20%, residual ripple max. 10%                                                                                                                                                                                                                                                                                                                       |
| Fuse of the operating voltage                        | <ul style="list-style-type: none"> <li>internal fuse F1: T 50 mA/250 V</li> <li>internal fuse F2: T 100 mA/250 V</li> </ul>                                                                                                                                                                                                                                      |
| Power consumption                                    | max. 3.0 W                                                                                                                                                                                                                                                                                                                                                       |
| Switching capacity of the enabling contacts          | 230 V; 3 A ohmic (inductive with suitable protective circuit) <ul style="list-style-type: none"> <li>AC-15: 230 VAC/3 A</li> <li>DC-13: 24 VDC/3 A</li> </ul>                                                                                                                                                                                                    |
| Fuse of the enabling contacts                        | 3.15 A slow-blowing                                                                                                                                                                                                                                                                                                                                              |
| Min. switching capacity                              | min. 10 V/10 mA                                                                                                                                                                                                                                                                                                                                                  |
| Contact resistance                                   | max. 100 mΩ in new state                                                                                                                                                                                                                                                                                                                                         |
| Utilisation categories                               | AC-15/DC-13: EN IEC 60947-5-1:2007                                                                                                                                                                                                                                                                                                                               |
| Contact materials/contacts                           | AgSnO, self-cleaning, positively-driven                                                                                                                                                                                                                                                                                                                          |
| Switching capacity of the auxiliary contacts (21-22) | 24 VDC, 2 A                                                                                                                                                                                                                                                                                                                                                      |
| Fuse of the auxiliary contacts                       | 2 A slow-blowing                                                                                                                                                                                                                                                                                                                                                 |
| Current and voltage at S11-S12, S21-S22              | 24 VDC, 5 mA                                                                                                                                                                                                                                                                                                                                                     |
| Current limiting an S11-S12, S21-S22                 | 15 mA                                                                                                                                                                                                                                                                                                                                                            |
| On-delay                                             | <ul style="list-style-type: none"> <li>approx. 300 ms (version -1A)</li> <li>approx. 20 ms (version -1R)</li> </ul>                                                                                                                                                                                                                                              |
| Drop-out delay                                       | <ul style="list-style-type: none"> <li>at emergency stop: approx. 20 ms</li> <li>at power failure: approx. 20 ms</li> </ul>                                                                                                                                                                                                                                      |
| Jumper in the case of voltage drop                   | approx. 15 ms                                                                                                                                                                                                                                                                                                                                                    |
| Air clearance and creepage distance                  | <ul style="list-style-type: none"> <li>EN IEC 60664-1:2003 (DIN VDE 0110-1), 4 kV/2</li> <li>EN 60079-11:2007 (VDE 0170/0171 Part 7)</li> </ul>                                                                                                                                                                                                                  |
| Class of protection                                  | <ul style="list-style-type: none"> <li>housing: IP 40</li> <li>terminals: IP 20</li> <li>installation space: IP 54</li> </ul>                                                                                                                                                                                                                                    |
| Cable connections                                    | <ul style="list-style-type: none"> <li>Single core: rigid or flexible (with and without wire-end ferrule) 0.25 ... 2.5 mm<sup>2</sup></li> <li>Dual wire with same cross section: rigid or flexible (with wire-end ferrule without plastics) 0.25 ... 2.5 mm<sup>2</sup>; flexible (without or with TWIN wire-end ferrule) 0.5 ... 1.5 mm<sup>2</sup></li> </ul> |
| Tightening torque                                    | 0.6 Nm                                                                                                                                                                                                                                                                                                                                                           |
| Max. resistance of entire line                       | 30 Ohm                                                                                                                                                                                                                                                                                                                                                           |
| Cable lengths (at nominal load)                      | <ul style="list-style-type: none"> <li>1-channeled without cross-short recognition:<br/>1.5 mm<sup>2</sup> = 1,500 m; 2.5 mm<sup>2</sup> = 2,500 m</li> <li>2-channeled with/without cross-short recognition:<br/>1.5 mm<sup>2</sup> = 1,500 m; 2.5 mm<sup>2</sup> = 2,500 m</li> </ul>                                                                          |
| Ambient operating temperature                        | –25 °C ... +60 °C                                                                                                                                                                                                                                                                                                                                                |
| Storage temperature                                  | –40 °C ... +85 °C                                                                                                                                                                                                                                                                                                                                                |
| Mechanical life                                      | 10 <sup>7</sup> switching cycles                                                                                                                                                                                                                                                                                                                                 |
| EMC                                                  | EN IEC 61 000-6-2:2005                                                                                                                                                                                                                                                                                                                                           |
| Oscillations                                         | EN IEC 60068-2-6:1996: <ul style="list-style-type: none"> <li>frequency: 10 ... 55 Hz</li> <li>amplitude: 0.35 mm</li> </ul>                                                                                                                                                                                                                                     |
| Climatic demands                                     | EN 60068-2-3:1986                                                                                                                                                                                                                                                                                                                                                |
| CE conformity                                        | acc. directives: <ul style="list-style-type: none"> <li>Machine safety 98/37/EG</li> <li>EMC: 2004/108/EG</li> <li>ATEX: 94/9/EG</li> </ul>                                                                                                                                                                                                                      |
| Ex-relevant technical data                           |                                                                                                                                                                                                                                                                                                                                                                  |
| refer to page 3                                      |                                                                                                                                                                                                                                                                                                                                                                  |



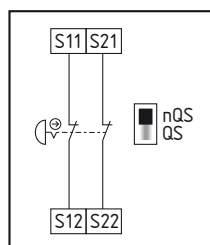
**Single-channel emergency stop circuit with control devices acc. DIN EN ISO 13850:2007 (EN 418) and DIN EN 60947-5-5:2005**

- Detects wire breaks and earth leakage in the control circuits.
- Category 2 – PL d acc. DIN EN ISO 13849-1:2007 reachable.



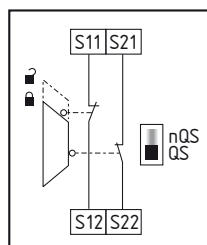
**Dual-channel guard monitoring circuit with interlocking devices acc. EN 1088:2007**

- At least one positively opening contact.
- Detects wire breaks and earth leakage in the control circuits.
- Cross-shorts between the control circuits are not detected.
- Category 4 – PL e acc. DIN EN ISO 13849-1:2007 reachable.



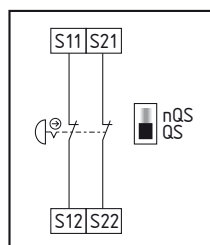
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- Detects wire breaks and earth leakage in the control circuits.
- Cross-shorts between the control circuits are not detected.
- Category 4 – PL e acc. DIN EN ISO 13849-1:2007 reachable (with protected cable laying).



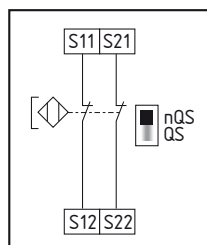
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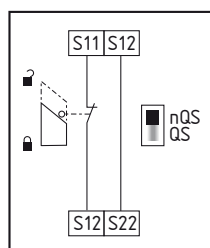
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- Detects wire breaks and earth leakage in the control circuits.
- Cross-shorts between the control circuits are detected.
- Category 4 – PL e acc. DIN EN ISO 13849-1:2007 reachable.



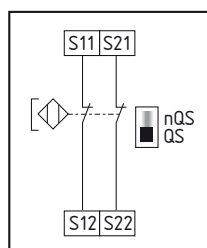
**Dual-channel control with electromagnetic safety switches acc. DIN EN 60947-5-3:2005**

- Detects wire breaks and earth leakage in the control circuits.
- Cross-shorts between the control circuits are not detected.
- Category 3 – PL e acc. DIN EN ISO 13849-1:2007 reachable.



**Single-channel guard monitoring circuit with interlocking devices acc. EN 1088:2007**

- At least one positively opening contact.
- Detects wire breaks and earth leakage in the control circuits.
- Category 2 – PL d acc. DIN EN ISO 13849-1:2007 reachable.



**Dual-channel control with electromagnetic safety switches acc. DIN EN 60947-5-3:2005**

- Detects wire breaks and earth leakage in the control circuits.
- Cross-shorts between the control circuits are detected.
- Category 3 – PL e acc. DIN EN ISO 13849-1:2007 reachable.





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