



**EN** Operating instructions. . . . . pages 1 to 12  
Original

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**1. About this document**

**1.1 Function**

These operating instructions provide all the information required for mounting, commissioning, safe operation and also disassembly of the safety fieldbox. The operating instructions must be available in a legible condition and a complete version in the vicinity of the device.

**1.2 Further applicable documents**

Enter search term "SFB-PN" in the Schmersal Online Catalogue at: [products.schmersal.com](https://products.schmersal.com).

- Manual: Safety Field Box SFB-PN-V2
- Operating instructions: Safety Field Box SFB-PN-V2
- GSDML File
- Manual: SFB Configuration Tool

**1.3 Target group: authorised qualified personnel**

All operations described in this operating instructions and in the manual must be carried out by trained specialist personnel, authorised by the plant operator only.

Please make sure that you have read and understood these operating instructions and the manual and that you know all applicable legislations regarding occupational safety and accident prevention prior to installation and putting the component into operation.

The machine builder must carefully select the harmonised standards to be complied with as well as other technical specifications for the selection, mounting and integration of the components.

**1.4 Explanation of the symbols used**



**Information, hint, note:**

This symbol is used for identifying useful additional information.



**Caution:** Failure to comply with this warning notice could lead to failures or malfunctions.

**Warning:** Failure to comply with this warning notice could lead to physical injury and/or damage to the machine.

**1.5 Appropriate use**

Products in Schmersal's range are not intended to be used by private end consumers.

The products described in these operating instructions are developed to execute safety-related functions as part of an entire plant or machine. It is the responsibility of the manufacturer of a machine or plant to ensure the correct functionality of the entire machine or plant.

The safety fieldbox must only be used according to the following versions or for applications that are approved by the manufacturer. Detailed information regarding the range of applications can be found in the chapter "Product description".

### 1.6 General safety instructions

The user must observe the safety instructions in this operating instructions manual, the country specific installation standards as well as all prevailing safety regulations and accident prevention rules.

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications. There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

### 1.7 Warning about misuse



In the event of improper or unintended use or tampering, use of the safety fieldbox could expose persons to danger or cause damage to the machine or system components.

### 1.8 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting or failure to comply with this operating instructions manual. The manufacturer shall accept no liability for damages resulting from the use of unauthorised spare parts or accessories.

For safety reasons, invasive work on the device as well as arbitrary repairs, conversions and modifications to the device are strictly forbidden; the manufacturer shall accept no liability for damages resulting from such invasive work, arbitrary repairs, conversions and/or modifications to the device.

## 2. Product description

### 2.1 Ordering code

This operating instructions manual applies to the following types:

#### SFB-PN-IRT-8M12-IOP-V2

| Option | Description                              |
|--------|------------------------------------------|
| SFB    | Safety fieldbox                          |
| PN     | PROFINET                                 |
| IRT    | Switch IRT-capable                       |
| 8M12   | 8 device ports for M12 connector, 8-pole |
| IOP    | Device connection: IO parallel           |
| V2     | Version 2                                |

### 2.2 Purpose

The SFB-PN-IRT-8M12-IOP-V2 safety fieldbox is designed for connection of up to 8 safety switchgear units with parallel IO signals to a PROFINET/PROFIsafe network.

A maximum of 4 BDF200-FB control panels can be connected.



Only safety switchgears are allowed to be connected for which the feedback of an external voltage can be safely excluded.

The safety signals from the connected safety switchgear are forwarded to a safety controller via the safety field bus for evaluation.

For larger safety applications, multiple fieldboxes can be connected to the power supply and field bus in series.



The user must evaluate and design the safety chain in accordance with the relevant standards and the required safety level.

The non-safe IO signals of the connected devices are connected to the control system via the field bus.

Safety switchgear with parallel IO signals can be connected to device ports X0 - X7.

**BDF200-FB control panels can only be connected to device ports X4 - X7.**



#### Manual: Safety fieldbox SFB-PN-V2

Further information on the commissioning of the safety SFB-PN-V2 fieldbox can be found in the manual.



#### GSDML file for safety fieldbox SFB-PN-V2

The dual-language GSDML file for the SFB-PN-V2 can be found on the internet at [products.schmersal.com](http://products.schmersal.com) after searching 'SFB-PN'.

A GSDML file is also saved in the device. The file can be downloaded via the integrated web server (see 'Info' page).

### 2.3 Technical data

Standards: EN 61131-1, EN 61131-2, EN 60947-5-3  
EN ISO 13849-1, IEC 61508

|                                                     |         |
|-----------------------------------------------------|---------|
| Time to readiness:                                  | ≤ 8 s   |
| Worst Case Delay Time Input acc. DIN EN 61784-3-3:  | ≤ 20 ms |
| Worst Case Delay Time Output acc. DIN EN 61784-3-3: | ≤ 50 ms |
| Device Watchdog Time acc. DIN EN 61784-3-3:         | 10 ms   |
| Device Acknowledgement Time acc. DIN EN 61784-3-3:  | ≤ 25 ms |

#### Materials:

|                     |                      |
|---------------------|----------------------|
| - Enclosure:        | polyamide / PA 6 GF  |
| - Viewing window:   | polyamide / PACM 12  |
| - Encapsulation:    | polyurethane / 2K PU |
| - Labelling plates: | polyamide / PA       |

#### Mechanical data

|                                     |                             |
|-------------------------------------|-----------------------------|
| Electrical connection version:      | Built-in socket / connector |
| - Device ports X0 - X7:             | M12/8-pole, A-coded         |
| - Power I/O:                        | M12-POWER/4-pole, T-coded   |
| - PROFINET P1/P2:                   | M12/4-pole, D-coded         |
| M12 connector tightening torque:    | min. 0.8 Nm / max. 1.5 Nm   |
| - Recommended for Schmersal cables: | 1.0 Nm                      |
| Fixing screws:                      | 2 x M6                      |
| - Tightening torque:                | max. 3.0 Nm                 |
| Viewing window screws:              | 2 x Torx 10                 |
| - Tightening torque:                | 0.5 ... 0.6 Nm              |

#### Ambient conditions

|                                    |                                                                          |
|------------------------------------|--------------------------------------------------------------------------|
| Ambient temperature:               | -25 °C ... +55 °C                                                        |
| Storage and transport temperature: | -25 °C ... +70 °C                                                        |
| Relative humidity:                 | 10 % ... 95 %, non condensing                                            |
| Resistance to shock:               | 30 g / 11 ms                                                             |
| Resistance to vibration:           | 5 ... 10 Hz, amplitude 3.5 mm;<br>10 ... 150 Hz, amplitude 0.35 mm / 5 g |

|                                        |                         |
|----------------------------------------|-------------------------|
| Degree of protection:                  | IP66/IP67 acc. EN 60529 |
| Installation altitude above sea level: | max. 2,000 m            |
| Protection class:                      | III                     |

#### Insulation values to EN 60664-1:

|                                               |        |
|-----------------------------------------------|--------|
| - Rated insulation voltage $U_i$ :            | 32 VDC |
| - Rated impulse withstand voltage $U_{imp}$ : | 0.8 kV |
| - Over-voltage category:                      | III    |
| - Degree of pollution:                        | 3      |

#### Electrical data – Power I/O

|                        |                                                    |
|------------------------|----------------------------------------------------|
| Supply voltage $U_B$ : | 24 VDC -15% / +10%<br>(stabilised PELV mains unit) |
|------------------------|----------------------------------------------------|

|                                 |        |
|---------------------------------|--------|
| Current consumption SFB:        | 200 mA |
| Rated operating voltage $U_e$ : | 24 VDC |
| Rated operating current $I_e$ : | 10 A   |

(external fuse protection required)

|                     |                                        |
|---------------------|----------------------------------------|
| Device fuse rating: | ≤ 10 A slow blow when used to UL 61010 |
|---------------------|----------------------------------------|



Adapters providing field wiring means are available from the manufacturer. Refer to manufacturer's information. Use power cables with minimum AWG14, 80°C, 24Vdc rating. UL 248 fuse (slow blow) or UL 489 Circuit breaker, rated max. 10 A or equivalent.

### Electrical data – Device ports X0 - X7:

|                                               |                                            |                |    |       |
|-----------------------------------------------|--------------------------------------------|----------------|----|-------|
| Maximum cable length:                         | 30 m                                       |                |    |       |
| <b>Safety inputs:</b>                         | <b>X1 and X2</b>                           |                |    |       |
| Switching thresholds (acc. EN 61131, type 1): | -3 V ... 5 V (Low)<br>13 V ... 30 V (High) |                |    |       |
| Current consumption per input:                | < 6 mA / 24 V                              |                |    |       |
| Permissible residual drive current:           | < 1.0 mA                                   |                |    |       |
| Accepted test pulse duration on input signal: | 0.01 ms ... 1.0 ms                         |                |    |       |
| - With test pulse interval of:                | 20 ms ... 120 s                            |                |    |       |
| Classification:                               | ZVEI CB24I                                 |                |    |       |
| <b>Sink:</b>                                  | C1                                         | <b>Source:</b> | C1 | C2 C3 |

### Test pulse outputs: Y1 and Y2

|                                 |                                             |              |    |  |
|---------------------------------|---------------------------------------------|--------------|----|--|
| Switching elements:             | p-type, short-circuit proof                 |              |    |  |
| Rated operating voltage $U_g$ : | 24 VDC                                      |              |    |  |
| Rated operating current $I_g$ : | Y1: 15 mA<br>Y2: 10 mA at 24 V/30 mA at GND |              |    |  |
| Leakage current $I_r$ :         | $\leq 0.5$ mA                               |              |    |  |
| Voltage drop $U_d$ :            | $\leq 1$ V                                  |              |    |  |
| Test pulse duration:            | $\leq 1$ ms                                 |              |    |  |
| Test pulse interval:            | 500 ms                                      |              |    |  |
| Classification:                 | ZVEI CB24I                                  |              |    |  |
| <b>Source:</b>                  | C1                                          | <b>Sink:</b> | C1 |  |

### Digital output: DO

|                                 |                               |              |    |  |
|---------------------------------|-------------------------------|--------------|----|--|
| Switching elements:             | 2 p-type, short-circuit proof |              |    |  |
| Utilisation category:           | DC-12 / DC-13                 |              |    |  |
| Rated operating voltage $U_g$ : | 24 VDC                        |              |    |  |
| Rated operating current $I_g$ : | 0.8 A                         |              |    |  |
| Leakage current $I_r$ :         | $\leq 0.5$ mA                 |              |    |  |
| Voltage drop $U_d$ :            | $\leq 2$ V                    |              |    |  |
| Inductive load:                 | $\leq 400$ mH                 |              |    |  |
| Switching frequency output:     | $\leq 1$ Hz                   |              |    |  |
| Test pulse duration:            | $\leq 1$ ms                   |              |    |  |
| Test pulse interval:            | 15 ... 500 ms                 |              |    |  |
| Classification:                 | ZVEI CB24I                    |              |    |  |
| <b>Source:</b>                  | C1                            | <b>Sink:</b> | C1 |  |

### Diagnostics input/FB interface: DI

|                                        |                                                 |  |  |  |
|----------------------------------------|-------------------------------------------------|--|--|--|
| Switching thresholds:                  | -3 V ... 5 V (Low)<br>13 V ... 30 V (High)      |  |  |  |
| Current consumption per input:         | < 12 mA / 24 V                                  |  |  |  |
| Permissible residual drive current:    | < 1.0 mA                                        |  |  |  |
| Input debounce filter:                 | 10 ms                                           |  |  |  |
| FB interface data transmission rate:   | 19.2 kBaud                                      |  |  |  |
| <b>Power supply devices: A1 and A2</b> |                                                 |  |  |  |
| Rated operating voltage $U_g$ :        | 24 VDC                                          |  |  |  |
| Rated operating current $I_g$ :        | 0.8 A                                           |  |  |  |
| Device port line fuse:                 | 1.5 A<br>(integrated automatic resettable fuse) |  |  |  |

### Electrical data – PROFINET P1/P2

|                               |                                    |  |  |  |
|-------------------------------|------------------------------------|--|--|--|
| Field bus protocol:           | PROFINET / PROFIsafe               |  |  |  |
| Specification:                | V2.3, Conformance class C          |  |  |  |
| - PROFINET:                   | V2.3, Conformance class C          |  |  |  |
| - Supported options:          | MRP, fast start-up                 |  |  |  |
| - PROFIsafe                   | V2.4                               |  |  |  |
| Network load class, PROFINET: | 3                                  |  |  |  |
| Transmission rate:            | 100 Mbit/s Full Duplex             |  |  |  |
| PROFINET addressing:          | via DCP                            |  |  |  |
| Integrated switch:            | Dual port, 100 Mbit/s, IRT-capable |  |  |  |
| Supported PROFINET services:  | I&M0 to I&M3, SNMP, LLDP           |  |  |  |
| Service interface:            | Web interface HTTP                 |  |  |  |

### LED indications

|                          |                             |
|--------------------------|-----------------------------|
| 8 x LED green/red 'E':   | Error LED, device port      |
| 8 x LED yellow 'I':      | Input LED, device port      |
| 2 x LED green 'L':       | Link LED, Ethernet port     |
| 2 x LED green 'A':       | Activity LED, Ethernet port |
| 1 x LED green/red 'SF':  | System fault LED            |
| 1 x LED red 'BF':        | Bus fault LED               |
| 1 x LED green/red 'Err': | Error LED, fieldbox         |
| 1 x LED green 'Pwr':     | Power LED, fieldbox         |



All fieldboxes have a good resistance against chemicals and oil. When used in aggressive media (e.g. chemicals, oils, lubricants and coolants in high concentrations) the material resistance must in each case be checked in advance for the specific application.



The sum of the total current of the individual device ports X0 – X7 for outputs A1 (power supply to devices) and DO (digital output) should not exceed 850 mA.



Protection class IP67 is only reached if all M12 connectors and blanking plugs, as well as the viewing window are properly fastening with screws.

### 2.4 Safety classification

#### - Safety inputs, 2-channel:

|                                                 |                                     |
|-------------------------------------------------|-------------------------------------|
| Standards:                                      | EN ISO 13849-1, IEC 61508, EN 62061 |
| PL:                                             | e                                   |
| Control Category:                               | 4                                   |
| DC:                                             | 99 %                                |
| PFH:                                            | $1.1 \times 10^{-9}$ /h             |
| PFD <sub>avg</sub> :                            | $9.6 \times 10^{-5}$                |
| SIL:                                            | suitable for SIL 3 applications     |
| Mission time:                                   | 20 years                            |
| Response time of local safety input > PROFINET: | 20 ms                               |

The SFB fulfills the requirements as PDB according to EN 60947-5-3 in combination with magnetic sensors (2 NC contacts) up to PL e / SIL 3.

#### - Safety inputs, 1-channel:

|                                                 |                                     |
|-------------------------------------------------|-------------------------------------|
| Standards:                                      | EN ISO 13849-1, IEC 61508, EN 62061 |
| PL:                                             | d                                   |
| Control Category:                               | 2                                   |
| DC:                                             | 90 %                                |
| PFH:                                            | $2.3 \times 10^{-7}$ /h             |
| PFD <sub>avg</sub> :                            | $2.0 \times 10^{-2}$                |
| SIL:                                            | suitable for SIL 1 applications     |
| Mission time:                                   | 20 years                            |
| Response time of local safety input > PROFINET: | 20 ms                               |
| Test interval for error detection:              | 10 s                                |

#### - Safety outputs, 1 wire (PL d):

|                                               |                                     |
|-----------------------------------------------|-------------------------------------|
| Standards:                                    | EN ISO 13849-1, IEC 61508, EN 62061 |
| PL:                                           | d                                   |
| Control Category:                             | 3                                   |
| DC:                                           | 90 %                                |
| PFH:                                          | $1.0 \times 10^{-7}$ /h             |
| PFD <sub>avg</sub> :                          | $8.8 \times 10^{-3}$                |
| SIL:                                          | suitable for SIL 2 applications     |
| Mission time:                                 | 20 years                            |
| PROFINET reaction time > local safety output: | 50 ms                               |

#### - Safety outputs, 2 wires (PL e):

|                                               |                                     |
|-----------------------------------------------|-------------------------------------|
| Standards:                                    | EN ISO 13849-1, IEC 61508, EN 62061 |
| PL:                                           | e                                   |
| Control Category:                             | 4                                   |
| DC:                                           | 99 %                                |
| PFH:                                          | $1.2 \times 10^{-9}$ /h             |
| PFD <sub>avg</sub> :                          | $1.1 \times 10^{-4}$                |
| SIL:                                          | suitable for SIL 3 applications     |
| Mission time:                                 | 20 years                            |
| PROFINET reaction time > local safety output: | 50 ms                               |



This product must only be replaced in the application by an identical product of type SFB-PN-IRT-8M12-IOP-V2 with part no. 103040357. The older product version has a lower safety level.

### Safety response times, SFB-PN-V2

The overall response time of a safety function is made up of the following:

- Response time of the connected safety switchgear
- Delay time safety fieldbox SFB-PN-V2 (WCDT\_Input ≤ 20 ms)
- PROFINET/PROFIsafe transmission time
- Cycle time F runtime group F-PLC
- Response time of safety shut-off element (actuator)



In addition to the maximum response time of the SFB-PN-V2, the response times of the connected safety switchgear, the transmission time from PROFINET and the response times of additional PROFIsafe components (if applicable) must be taken into consideration.



The maximum acceptable response times of the safety functions are defined in the risk analysis of the machine.

### 3. Mounting



The field box must be installed in a way that only authorised specialist personnel can access it.

#### 3.1 General mounting instructions

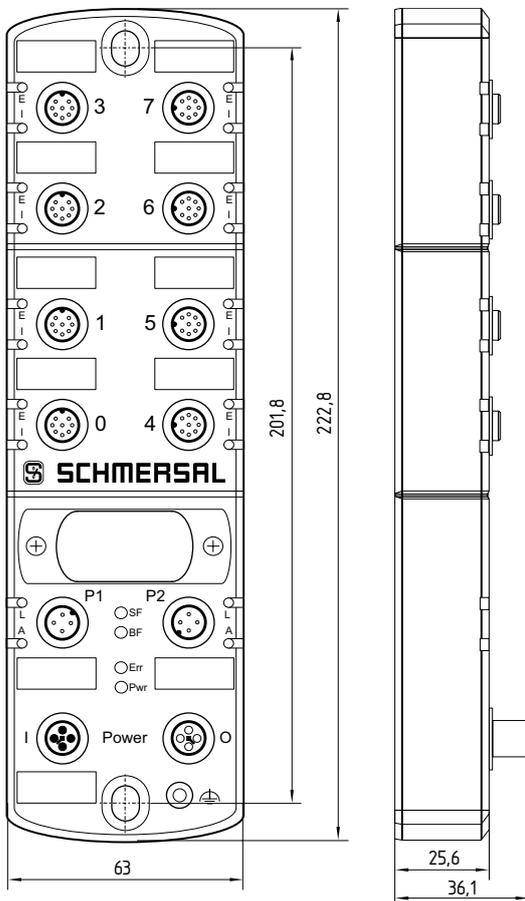
Fasten fieldbox with two M6-screws on a flat mounting surface, for mechanically strain-free installation. The maximum tightening torque is 3.0 Nm. Any mounting position.



Do not install fieldbox outside closed rooms.

#### 3.2 Dimensions

All measurements in mm.



### 3.3 Accessories

Further accessories can be found under the search term "SFB-PN" in the Schmersal Online Catalogue at [products.schmersal.com](http://products.schmersal.com).

#### 3.3.1 Pre-wired and connecting cables

| Device connection – Cable M12, 8 poles, straight, A-coded |                                            |           |
|-----------------------------------------------------------|--------------------------------------------|-----------|
| 0.5 m                                                     | Connecting cable, male / female connectors | 101217786 |
| 1.0 m                                                     | Connecting cable, male / female connectors | 101217787 |
| 1.5 m                                                     | Connecting cable, male / female connectors | 101217788 |
| 2.5 m                                                     | Connecting cable, male / female connectors | 101217789 |
| 3.5 m                                                     | Connecting cable, male / female connectors | 103013428 |
| 5.0 m                                                     | Connecting cable, male / female connectors | 101217790 |
| 7.5 m                                                     | Connecting cable, male / female connectors | 103013429 |
| 10.0 m                                                    | Connecting cable, male / female connectors | 103013125 |
| 15.0 m                                                    | Connecting cable, male / female connectors | 103038984 |
| 20.0 m                                                    | Connecting cable, male / female connectors | 103038566 |
| 30.0 m                                                    | Connecting cable, male / female connectors | 103038567 |

| Power – Cable M12, 4 poles, straight, T-coded |                                            |           |
|-----------------------------------------------|--------------------------------------------|-----------|
| 5.0 m                                         | Pre-wired cable, female connector          | 103013430 |
| 10.0 m                                        | Pre-wired cable, female connector          | 103013431 |
| 20.0 m                                        | Pre-wired cable, female connector          | 103038975 |
| 30.0 m                                        | Pre-wired cable, female connector          | 103038976 |
| 1.5 m                                         | Connecting cable, male / female connectors | 103025136 |
| 3.0 m                                         | Connecting cable, male / female connectors | 103013432 |
| 5.0 m                                         | Connecting cable, male / female connectors | 103013433 |
| 7.5 m                                         | Connecting cable, male / female connectors | 103013434 |
| 10.0 m                                        | Connecting cable, male / female connectors | 103038978 |

| Ethernet – Cable M12, 4 poles, straight, D-coded, shielded |                                          |           |
|------------------------------------------------------------|------------------------------------------|-----------|
| 5.0 m                                                      | Connecting cable, RJ45 to connector M12  | 103013435 |
| 7.5 m                                                      | Connecting cable, RJ45 to connector M12  | 103013436 |
| 10.0 m                                                     | Connecting cable, RJ45 to connector M12  | 103013437 |
| 20.0 m                                                     | Connecting cable, RJ45 to connector M12  | 103038980 |
| 1.5 m                                                      | Connecting cable, male / male connectors | 103038982 |
| 3.0 m                                                      | Connecting cable, male / male connectors | 103013438 |
| 5.0 m                                                      | Connecting cable, male / male connectors | 103013439 |
| 7.5 m                                                      | Connecting cable, male / male connectors | 103013440 |
| 10.0 m                                                     | Connecting cable, male / male connectors | 103038983 |

#### 3.3.2 Adapter cables

| M12-Adapter cables, 8 poles to 4 poles |                                     |           |
|----------------------------------------|-------------------------------------|-----------|
| 2.5 m                                  | VFB-SK8P/4P-M12-S-G-2.5M-BK-2-X-A-4 | 103032864 |
| 5.0 m                                  | VFB-SK8P/4P-M12-S-G-5M-BK-2-X-A-4   | 103032865 |

| Y-Adapter cables for Schmersal AOPD |                                     |           |
|-------------------------------------|-------------------------------------|-----------|
| 1.0 m                               | SFB-Y-SLCG-COM-8P-S-G-1M-BK-2-X-A-4 | 103032866 |
| 1.0 m                               | SFB-Y-SLCG-8P-S-G-1M-BK-2-X-A-4     | 103032867 |

#### 3.3.3 Further accessories

|                                               |           |
|-----------------------------------------------|-----------|
| Sealing stickers for inspection window, 4 pcs | 103013919 |
| Protective caps for M12 sockets, 10 pcs       | 103013920 |
| Labels, frame 4 x 5 pcs                       | 103035090 |

### 4. Electrical connection

#### 4.1 General information for electrical connection



The electrical connection may only be carried out by authorised personnel in a de-energised condition.

To supply the safety fieldbox, M12 power connectors, cables with a cross-section of max. 1.5 mm<sup>2</sup> can be connected to the fieldbox.



In case of a fault, a voltage of up to 60 V can be applied to the device ports.

#### 4.2 Notes for replacing the device

To replace a defective SFB, follow the steps below:

- Bring the machine and the SFB into a de-energised state
- Check replacement device for correct version



This product must only be replaced in the application by an identical product of type SFB-PN-IRT-8M12-IOP-V2 with part no. 103040357. The older product version has a lower safety level.



The replacement of the older SFB-PN-IRT-8M12-IOP with the newer SFB-PN-IRT-8M12-IOP-V2 is possible.

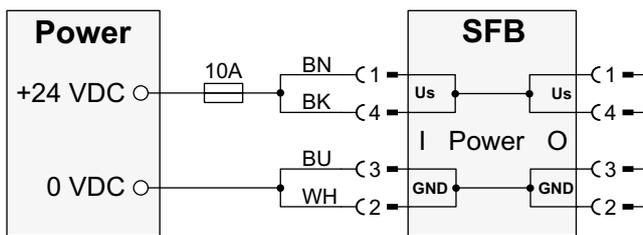
- The replacement device must be in the delivery state. If necessary, carry out a "factory reset" (see 4.10).
- Set or transfer the safety address to the new device (see 4.10).
- Mount and install the unit
- Put the system and SFB back into operation
- Check all safety functions



The simple device change is only possible if the "Support device replacement without exchangeable medium" has been activated in the F-CPU for the PROFINET interface under "General / Advanced options / Interface options".

#### 4.3 Power supply and fuse protection

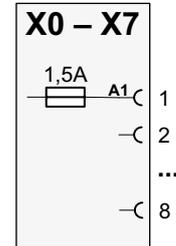
The supply voltage of the safety fieldbox is to be protected with a fuse of 10 A. In order to increase the cable cross section for the supply voltage of the fieldbox, both connections from Us and GND must be connected in parallel. Pins 1 + 4 and 2 + 3 in the fieldbox are bridged.



#### 4.4 Internal fuse elements device ports

The device ports X0 - X7 are designed for 0.8 A continuous current and equipped in each case with an auto-resettable fuse of 1.5 A for line protection. If the fuse element is triggered, the red LED on the device port flashes with 4 pulses.

After eliminating the overload at one of the device ports, the fuse resets itself after a short cool-down phase.



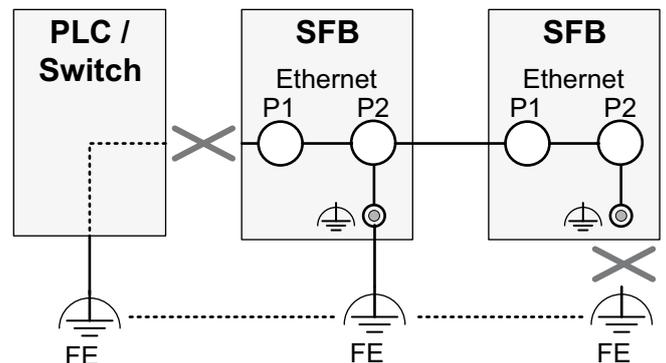
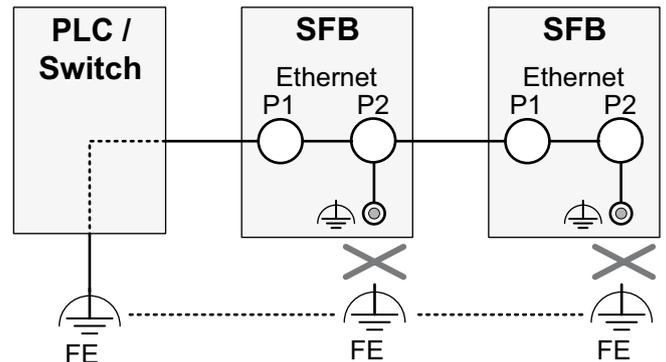
#### 4.5 Earth concept and shielding

A functional earth is connected for fault-free operation of the safety fieldbox. Earth loops must be avoided when connecting the functional earth.

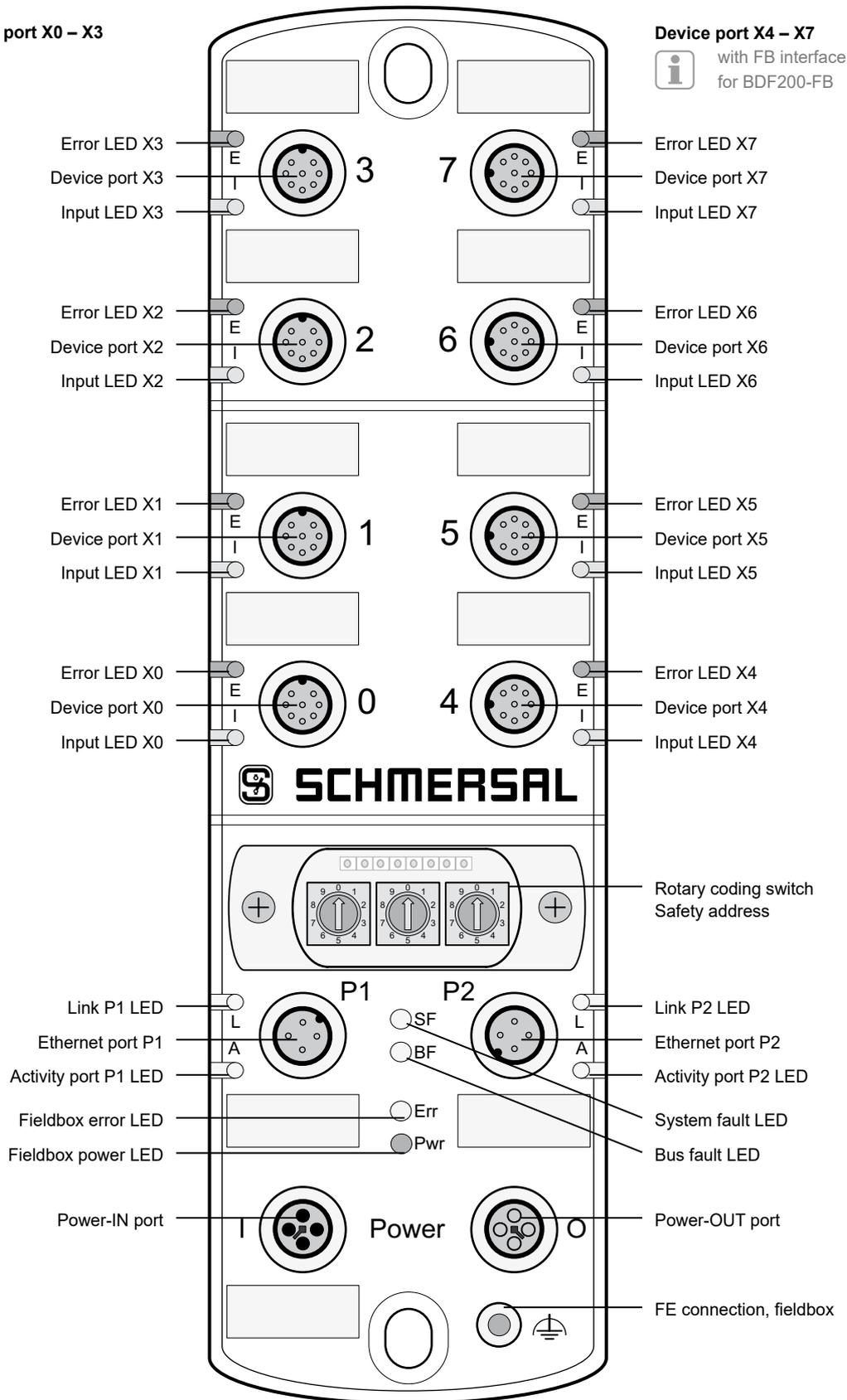
The FE functional earth is normally connected via the switch. In the event of EMC problems, the fieldbox can be earthed via the separate FE connection.

An earth strap is available as an accessory.

#### Wiring examples for avoidance of earth loops:



4.6 Overview of connections and LED indicators



**4.7 Connector configuration of device ports X0 – X7**

Version: M12 socket, 8-pin, A-coded

| PIN | Colour* | Signal | Description of fieldbox signals                 |
|-----|---------|--------|-------------------------------------------------|
| 1   | WH      | A1     | + 24 VDC device supply                          |
| 2   | BN      | Y1     | Test pulse output 1,<br>safety channel 1 supply |
| 3   | GN      | A2     | 0 VDC device supply                             |
| 4   | YE      | X1     | Safety input 1                                  |
| 5   | GY      | DI     | Diagnostic-input / FB-Interface                 |
| 6   | PK      | Y2     | Test pulse output 2,<br>safety channel 2 supply |
| 7   | BU      | X2     | Safety input 2                                  |
| 8   | RD      | DO     | Safe output                                     |

X4 – X7 additional with FB interface for BDF200-FB



The default setting is used for safety switchgear with electronic OSSDs. If safety switchgear with dry contacts are used, cross fault monitoring must be activated. For safety switchgear with electronic OSSDs, cross fault detection of the device connection cable must be carried out by the safety switchgear.

**4.8 Connector configuration POWER I/O**

Version: M12 power connector/socket, 4-pin, T-coded

| PIN | Colour* | Signal | Description of fieldbox signals |
|-----|---------|--------|---------------------------------|
| 1   | BN      | Us     | + 24 VDC SFB supply (= PIN 4)   |
| 2   | WH      | GND    | 0 VDC SFB supply (= PIN 3)      |
| 3   | BU      | GND    | 0 VDC SFB supply (= PIN 2)      |
| 4   | BK      | Us     | + 24 VDC SFB supply (= PIN 1)   |

**4.9 Connector configuration PROFINET P1/P2**

Version: M12 socket, 4-pin, D-coded

| PIN    | Colour* | Signal | Description of fieldbox signals |
|--------|---------|--------|---------------------------------|
| 1      | YE      | TD+    | Transmit-Data +                 |
| 2      | WH      | RD+    | Receive-Data +                  |
| 3      | OG      | TD-    | Transmit-Data -                 |
| 4      | BU      | RD-    | Receive-Data -                  |
| Flange |         | FE     | Ethernet shielding              |

\* Colour code of SCHMERSAL M12 cables

**4.10 Setting the F-address and factory reset**

Carefully remove the viewing window. (Screws Torx 10)



**The screws of the viewing window are not secured.**  
Keep the screws safe so that they do not get lost.

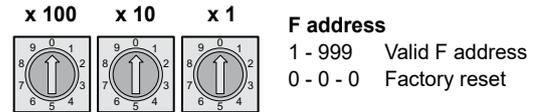


**Caution!**  
Electrostatically sensitive components.  
Do not touch the printed circuit board directly.



When you open the inspection window, ensure that no moisture or excessive humidity penetrates into the fieldbox.

The 3 rotary coding switches behind the viewing window can be used to set the safety address and to carry out a factory reset of the SFB.



**Setting of the F address**

- Remove power from the SFB
- Set the desired F address in the range 1 - 999
- Resupply power to the SFB

**Carrying out an SFB factory reset:**

- Remove power from the SFB
  - Setting of F address 0 – 0 – 0
  - Resupply power to the SFB
  - After 15 seconds, switch off the power of the SFB-PN again
- The IP address and the PROFINET name are deleted during a factory reset.

**5. Diagnostic functions**

**5.1 LED indicators, device ports X0 - X7**

There are 2 LED indicators on each device port. A green/red error LED and a yellow input LED to display the switching condition at the safety inputs.

**Error LED (E)**

The error LED may exhibit the following display and flashing pattern:

| LED display    | Description                                |
|----------------|--------------------------------------------|
| GREEN ON       | No fault at device port                    |
| GREEN Flashes  | Device port fault can be acknowledged      |
| RED 1 impulse  | Safety input cross-fault                   |
| RED 2 impulses | Safety input fault                         |
| RED 3 impulses | Test pulse output fault                    |
| RED 4 impulses | Device supply overload                     |
| RED 5 impulses | Digital output overload                    |
| RED 6 impulses | Digital output fault                       |
| RED 7 impulses | FB interface fault (only device ports 4-7) |

**Input LED (I)**

The input LED may exhibit the following display and flashing pattern:

| LED display    | Description                                                  |
|----------------|--------------------------------------------------------------|
| YELLOW OFF     | Both safety inputs LOW                                       |
| YELLOW ON      | Both safety inputs HIGH                                      |
| YELLOW Flashes | Only one safety input HIGH, or discrepancy/stable time fault |

**5.2 LED indicators, PROFINET ports P1/P2**

There are 2 LED indicators at the Ethernet ports.  
A green link LED and yellow activity LED.

**LED link (L)**

The link LED may exhibit the following display and flashing pattern:

| LED display | Description                   |
|-------------|-------------------------------|
| GREEN   ON  | Connection to Ethernet active |

**LED Activity (A)**

The activity LED may exhibit the following display and flashing pattern:

| LED display      | Description                       |
|------------------|-----------------------------------|
| YELLOW   Flashes | Ethernet data transmission active |

**5.3 Central LED indicators, SFB-PN**

There are 4 LEDs for central diagnostics of the fieldbox. A green/red LED indicator for a system fault, a red LED for bus fault, a green/red error LED and a green power LED.

**System fault LED (SF)**

The system fault LED may exhibit the following display and flashing pattern:

| LED display     | Description                               |
|-----------------|-------------------------------------------|
| RED   ON        | Module error or device port error         |
| GREEN   Flashes | FLASH signal for identifying the fieldbox |

**Bus fault LED (BF)**

The bus fault LED may exhibit the following display and flashing pattern:

| LED display   | Description                         |
|---------------|-------------------------------------|
| RED   ON      | No or slow connection               |
| RED   Flashes | Connection but no data transmission |

**Fieldbox error LED (Err)**

The error LED may exhibit the following display and flashing pattern:

| LED display      | Description                      |
|------------------|----------------------------------|
| GREEN   ON       | Field box in RUN                 |
| GREEN   Flashes  | Module fault can be acknowledged |
| RED   ON         | Internal field box fault         |
| RED   3 Hz       | F_WD_Time SFB-PN exceeded        |
| RED   1 impulse  | Internal over temperature fault  |
| RED   2 impulses | Invalid F address fault          |
| RED   3 impulses | Invalid F_iPar_CRC fault         |
| RED   4 impulses | Acknowledge impulse length fault |
| RED   5 impulses | Test pulse output overload fault |
| RED   6 impulses | Overvoltage fieldbox U > 29 V    |

**Fieldbox power LED (Pwr)**

The power LED may exhibit the following display and flashing pattern:

| LED display  | Description                     |
|--------------|---------------------------------|
| GREEN   ON   | Supply voltage of fieldbox OKAY |
| GREEN   1 Hz | Low voltage warning U < 20 V    |
| GREEN   3 Hz | Low voltage fault U < 17 V      |
| GREEN   OFF  | Fieldbox switched off U < 12 V  |

**6. Set-up and maintenance**

**6.1 Functional testing**

A check must be carried out to ensure that the projected safety function is effective.



The safety functions, configuration of the safety fieldbox and correct installation must be checked by a responsible safety specialist/safety representative.

**6.2 Maintenance**

The safety fieldbox operates error-free if installed and used properly.

**7. Disassembly and disposal**

**7.1 Disassembly**

Only disassemble the safety fieldbox if it is in de-energized state.

**7.2 Disposal**

Dispose of the safety fieldbox properly in accordance with national regulations and laws.

8. Annex system configuration

8.1 Configuration examples of the power supply

If the power supply of each fieldbox is separated and in a star configuration, the maximum cable length of a fieldbox series is limited only by the maximum permissible cable length of the field bus used.

**If the power supply from fieldbox to fieldbox is looped through, the following maximum configurations apply.**

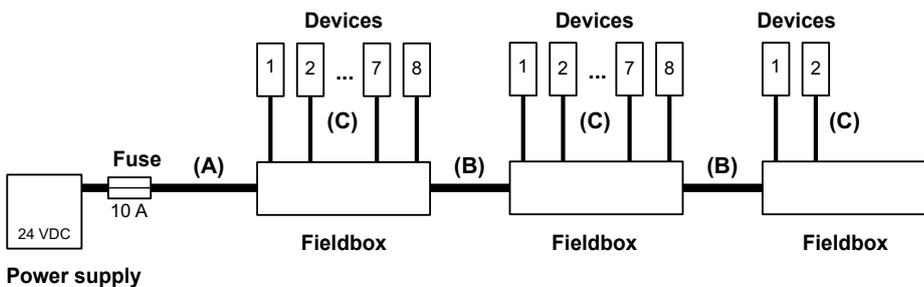
3 different configurations are shown respectively for the different SCHMERSAL safety switchgear. One configuration with long cable lengths (maximum), one configuration with medium cable lengths (medium) and one configuration with shorter cable lengths (small).

The following assumptions are made for the configuration examples listed in the table:

- The examples represent maximum configurations. If individual cable lengths are shortened, larger systems are possible.
- 2 x 1.5 mm<sup>2</sup> power supply wiring and 10 A fuse protection.
- Use of SCHMERSAL cables.
- The cable lengths listed in the table between the power supply and the first fieldbox as well as the individual fieldboxes are the maximum lengths. Reducing the individual cable lengths is not critical.
- For interlocks, these designs are based on simultaneous activation of all lock and unlock functions. In the event of delayed activation of the lock and unlock function, larger systems are possible.

| Device / configuration version | Max. number of devices | Equals number of fieldboxes | Length of the cable (A) up to the first fieldbox | Length of the cables (B) between the fieldboxes | Length of stub cables (C) for device connection |
|--------------------------------|------------------------|-----------------------------|--------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| AZM 201 / Maximum              | 16                     | 2                           | 10.0 m                                           | 10.0 m                                          | 7.5 m                                           |
| AZM 201 / Medium               | 20                     | 2.5                         | 7.5 m                                            | 7.5 m                                           | 5.0 m                                           |
| AZM 201 / Small                | 24                     | 3                           | 7.5 m                                            | 5 m                                             | 3.5 m                                           |
| MZM 100 / Maximum              | 20                     | 2.5                         | 10.0 m                                           | 10.0 m                                          | 7.5 m                                           |
| MZM 100 / Medium               | 24                     | 3                           | 7.5 m                                            | 7.5 m                                           | 5.0 m                                           |
| MZM 100 / Small                | 28                     | 3.5                         | 7.5 m                                            | 5 m                                             | 3.5 m                                           |
| AZM 300 / Maximum              | 28                     | 3.5                         | 10.0 m                                           | 10.0 m                                          | 7.5 m                                           |
| AZM 300 / Medium               | 32                     | 4                           | 7.5 m                                            | 7.5 m                                           | 5.0 m                                           |
| AZM 300 / Small                | 40                     | 5                           | 7.5 m                                            | 5 m                                             | 3.5 m                                           |
| AZM 400 / Maximum              | 16                     | 2                           | 10.0 m                                           | 10.0 m                                          | 7.5 m                                           |
| AZM 400 / Medium               | 16                     | 2                           | 7.5 m                                            | 7.5 m                                           | 5.0 m                                           |
| AZM 400 / Small                | 16                     | 2                           | 7.5 m                                            | 5 m                                             | 3.5 m                                           |
| AZM 1xx / Maximum              | 20                     | 2.5                         | 10.0 m                                           | 10.0 m                                          | 7.5 m                                           |
| AZM 1xx / Medium               | 24                     | 3                           | 7.5 m                                            | 7.5 m                                           | 5.0 m                                           |
| AZM 1xx / Small                | 28                     | 3.5                         | 7.5 m                                            | 5 m                                             | 3.5 m                                           |
| RSS & CSS / Maximum            | 48                     | 6                           | 10.0 m                                           | 10.0 m                                          | 7.5 m                                           |
| RSS & CSS / Medium             | 56                     | 7                           | 7.5 m                                            | 7.5 m                                           | 5.0 m                                           |
| RSS & CSS / Small              | 64                     | 8                           | 7.5 m                                            | 5 m                                             | 3.5 m                                           |
| Mixed / Maximum                | 24                     | 3                           | 10.0 m                                           | 10.0 m                                          | 7.5 m                                           |
| Mixed / Medium                 | 28                     | 3.5                         | 7.5 m                                            | 7.5 m                                           | 5.0 m                                           |
| Mixed / Small                  | 32                     | 4                           | 7.5 m                                            | 5 m                                             | 3.5 m                                           |

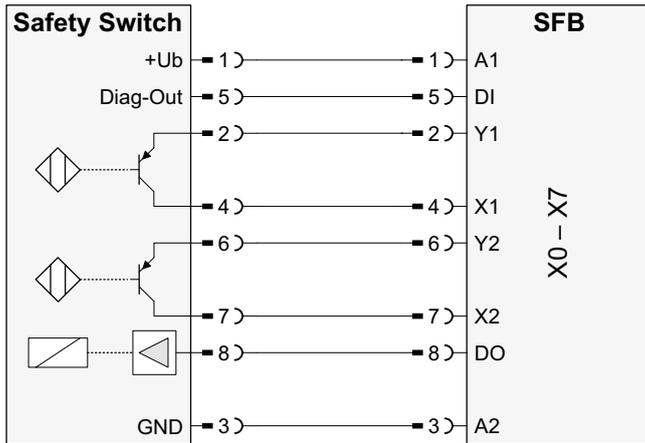
Mixed fitting of fieldbox: 2 x AZM 201, 2 x MZM 100, 2 x AZM 300 and 2 x RSS / CSS



 A useful design tool for calculating the real voltage drops is available on the Internet at [www.system-engineering-tool.com](http://www.system-engineering-tool.com)

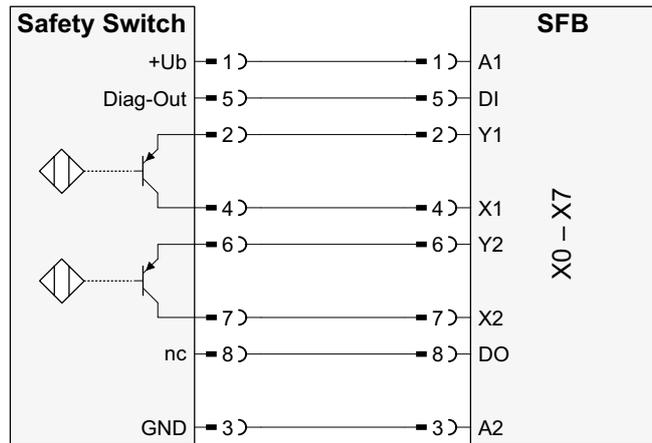
8.2 Wiring example of the safety switches

Electronic interlock, unlocking function via 1 wire



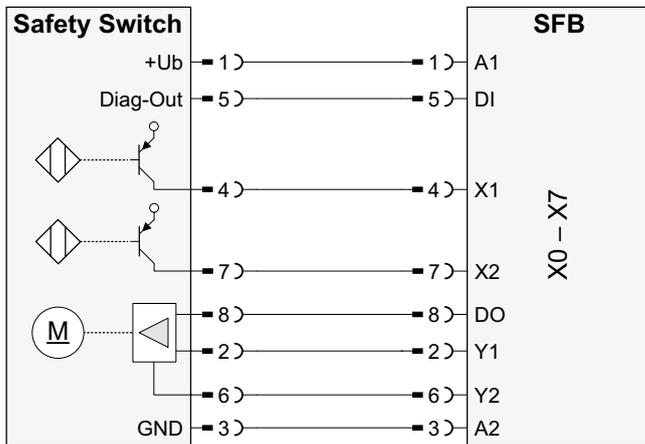
SCHMERSAL devices: MZM100, AZM201, AZM300, AZM40, ...

Electronic sensor, 8-pin



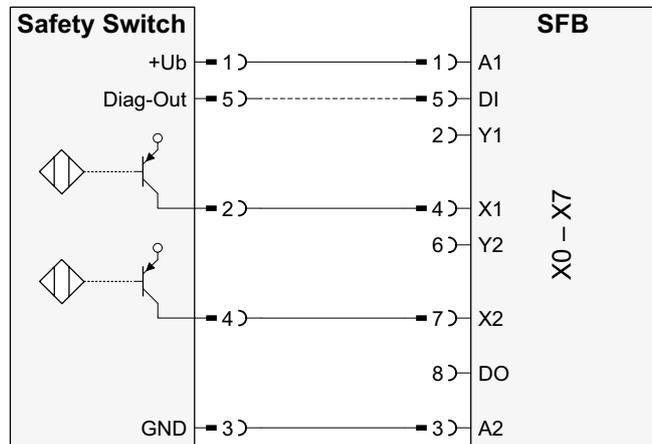
SCHMERSAL devices: CSS series, RSS series, ...

Electronic interlock, unlocking function via 2 wires



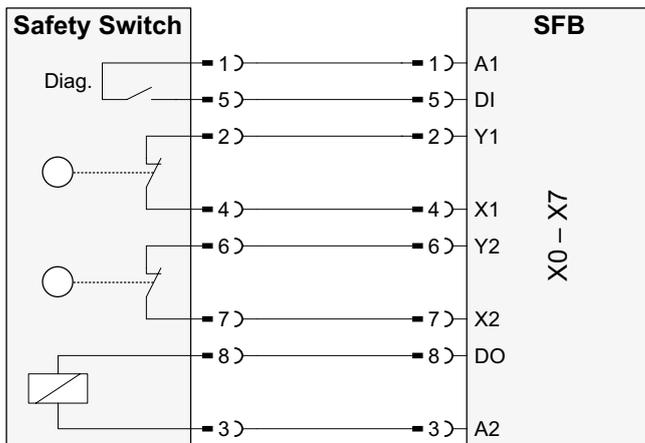
SCHMERSAL devices: AZM400, ...

Electronic sensor, 4/5-pin



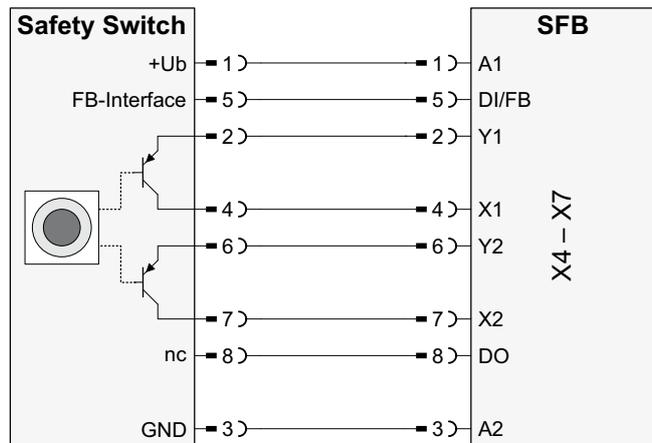
Different safety switchgear

Electromechanical interlock, unlocking function via 1 wire



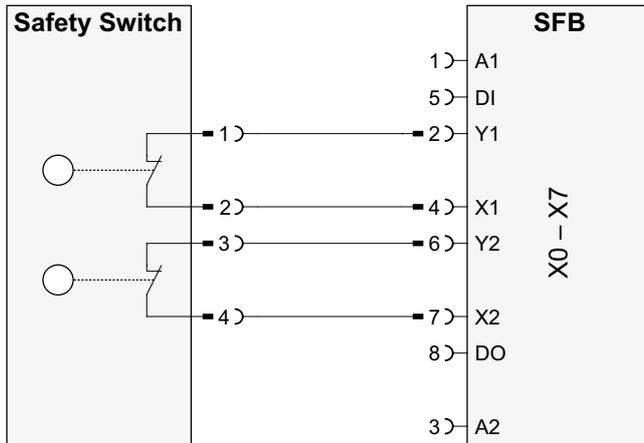
SCHMERSAL devices: AZM 161-FB, AZM 170-FB, AZM150-ST, ...

Electronic E-STOP, BDF 200 FB, FB interface



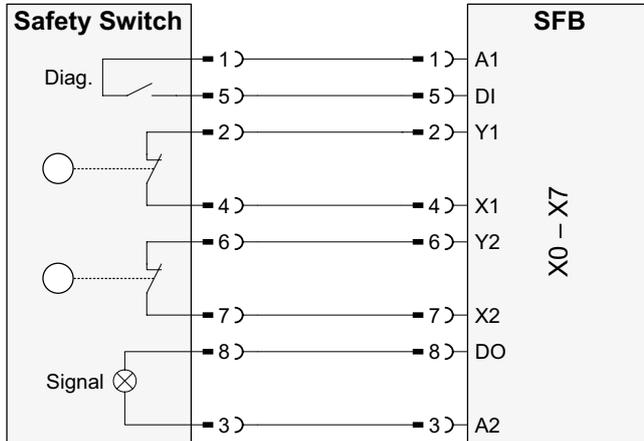
SCHMERSAL devices: BDF 200-FB, ...

Electromechanical switches/sensors, 2-channel, 4-pin



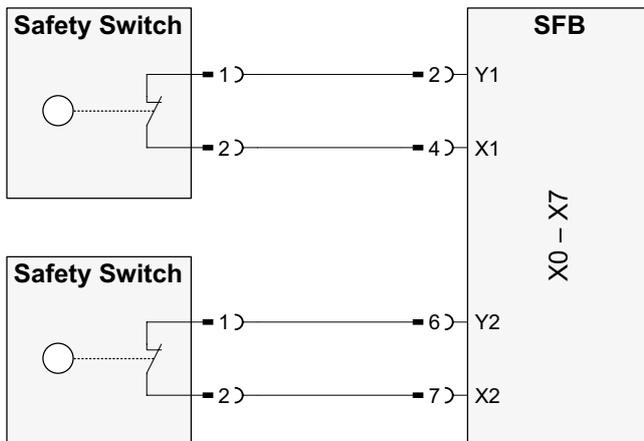
SCHMERSAL devices: BNS series, TESK, ...

Electromechanical switches, 2-channel, 8-pin



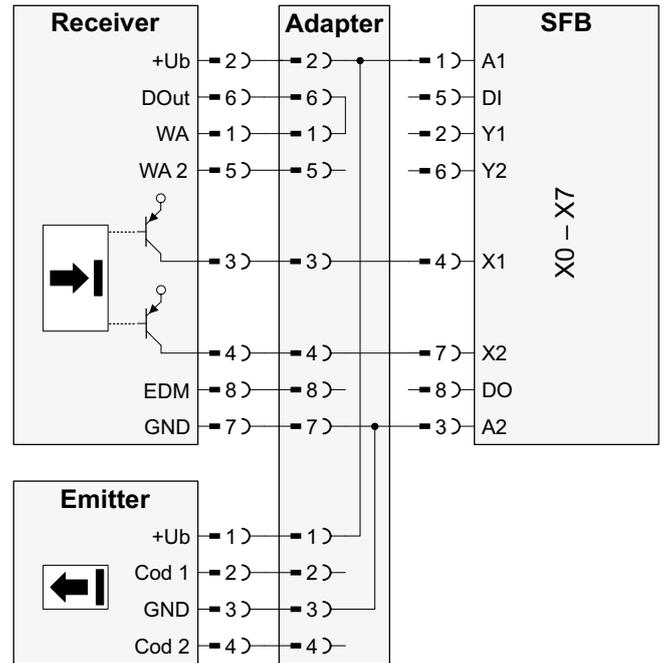
SCHMERSAL devices: BDF100-NH(K), AZ series, PS series, ZQ series, ...

2 electromechanical switches, 1-channel, forcibly interrupted



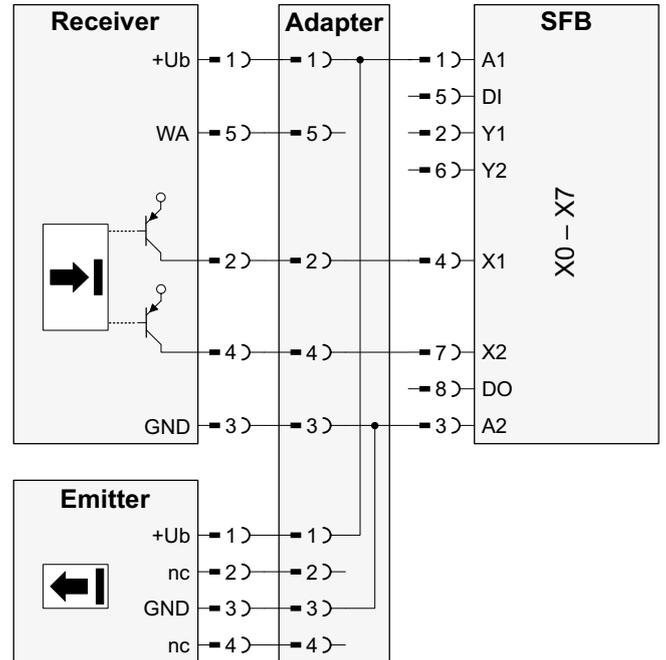
Different safety switchgear

Optoelectronic AOPD, 8-pin



SCHMERSAL devices: SLC 440, SLG 440, ...

Optoelectronic AOPD, 5-pin

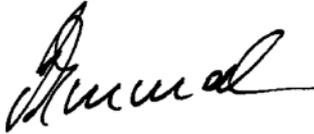


SCHMERSAL devices: SLC 440 COM, SLG 440 COM, SLB 440, ...



Other wiring examples can be found in the 'Safety SFB-PN fieldbox manual' on the internet at [products.schmersal.com](http://products.schmersal.com).

9. EU Declaration of conformity

|                                                                                                                                                      |                                                                                                             |                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>EU Declaration of conformity</b>                                                                                                                  |                                                                                                             |  |
| Original                                                                                                                                             | K.A. Schmersal GmbH & Co. KG<br>Möddinghofe 30<br>42279 Wuppertal<br>Germany<br>Internet: www.schmersal.com |                                                                                    |
| We hereby certify that the hereafter described components both in their basic design and construction conform to the applicable European Directives. |                                                                                                             |                                                                                    |
| <b>Name of the component:</b>                                                                                                                        | SFB                                                                                                         |                                                                                    |
| <b>Type:</b>                                                                                                                                         | See ordering code                                                                                           |                                                                                    |
| <b>Description of the component:</b>                                                                                                                 | Safety fieldbox (IO module with fieldbox interface)                                                         |                                                                                    |
| <b>Relevant Directives:</b>                                                                                                                          | 2006/42/EC    Machinery Directive<br>2014/30/EU    EMC-Directive<br>2011/65/EU    RoHS-Directive            |                                                                                    |
| <b>Applied standards:</b>                                                                                                                            | EN 61131-2:2007<br>EN 60947-5-3:2013<br>EN ISO 13849-1:2015<br>IEC 61508 Teile 1-7:2010                     |                                                                                    |
| <b>Notified body for the prototype test:</b>                                                                                                         | TÜV Rheinland Industrie Service GmbH<br>Am Grauen Stein, 51105 Köln<br>ID n°: 0035                          |                                                                                    |
| <b>EC-prototype test certificate:</b>                                                                                                                | 01/205/5878.00/22                                                                                           |                                                                                    |
| <b>Person authorised for the compilation of the technical documentation:</b>                                                                         | Oliver Wacker<br>Möddinghofe 30<br>42279 Wuppertal                                                          |                                                                                    |
| <b>Place and date of issue:</b>                                                                                                                      | Wuppertal, January 5, 2022                                                                                  |                                                                                    |
| SFB-PN-IOP-V2-A-EN                                                                                                                                   |                         |                                                                                    |
|                                                                                                                                                      | Authorised signature<br><b>Philip Schmersal</b><br>Managing Director                                        |                                                                                    |



The currently valid declaration of conformity can be downloaded from the internet at [products.schmersal.com](http://products.schmersal.com).

