



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. For additional information please refer to the manual "Safety Field Box SFB-EC".

1.2 Further applicable documents

Enter search term "SFB-EC" in the Schmersal Online Catalogue at: products.schmersal.com.

- Manual: Safety Field Box SFB-EC
- Operating instructions: Safety Field Box SFB-EC
- ESI File

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.



The SFB-EC is only for use in LAN, not for connection to telecommunication circuits.

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-EC-8M12-IOP

Option	Description
SFB	Safety fieldbox
EC	EtherCAT®
8M12	8 device ports for M12 connector, 8-pole
IOP	Device connection: IO parallel

2.2 Purpose

The SFB-EC-8M12-IOP safety fieldbox is designed for connection of up to 8 safety switchgear units with parallel IO signals to a EtherCAT® / FSoE 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-EC

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



ESI file for safety fieldbox SFB-EC

The ESI file for the SFB-EC can be found on the internet at **products.schmersal.com** after searching 'SFB-EC'. An ESI 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:	≤ 12 s
Reaction Time Safety Input SFB:	≤ 30 ms
Reaction Time Safety Output SFB:	≤ 50 ms
Device Watchdog Time SFB:	12 ms
Device Acknowledgement Time SFB:	≤ 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
- EtherCAT IN/OUT:	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; 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% (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			
Safety inputs:	X1 and X2			
Switching thresholds (acc. EN 61131, type 1):	-3 V ... 5 V (Low) 13 V ... 30 V (High)			
Current consumption per input:	< 10 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			
Sink:	C1	Source:	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 Y2: 10 mA at 24 V/30 mA at GND			
Leakage current I_r :	≤ 0.5 mA			
Voltage drop U_d :	≤ 1 V			
Test pulse duration:	≤ 1 ms			
Test pulse interval:	500 ms			
Classification:	ZVEI CB24I			
Source:	C1	Sink:	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 :	≤ 0.5 mA			
Voltage drop U_d :	≤ 2 V			
Inductive load:	≤ 400 mH			
Switching frequency output:	≤ 1 Hz			
Test pulse duration:	≤ 1 ms			
Test pulse interval:	15 ... 500 ms			
Classification:	ZVEI CB24I			
Source:	C1	Sink:	C1	

Diagnostics input/FB interface:

	DI			
Switching thresholds:	-3 V ... 5 V (Low) 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			
Power supply devices:	A1 and A2			
Rated operating voltage U_g :	24 VDC			
Rated operating current I_g :	0.8 A			
Device port line fuse:	1.5 A (integrated automatic resettable fuse)			

Electrical data – EtherCAT IN/OUT:

Field bus protocol:	EtherCAT® / FSoE		
Specification:			
- EtherCAT®:	V1.0.10		
- CIP Safety	V1.2.0		
Transmission rate:	100 Mbit/s Full Duplex		
Addressing:	Topology dependent		
Integrated switch:	Dual port, 100 Mbit/s		
Communication Watchdog-Time, minimum:	25 ms		
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/A':	Link/Activity LED, Ethernet port
1 x LED green 'RUN':	EtherCAT RUN LED
1 x LED red 'ERR':	EtherCAT ERROR LED
1 x LED green/red 'Diag':	Diagnosis 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:	1.1×10^{-9} /h
PFD _{avg} :	9.6×10^{-5}
SIL:	suitable for SIL 3 applications
Mission time:	20 years
Response time of local safety input > EtherCAT:	30 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:	2.3×10^{-7} /h
PFD _{avg} :	2.0×10^{-2}
SIL:	suitable for SIL 1 applications
Mission time:	20 years
Response time of local safety input > EtherCAT:	30 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:	1.0×10^{-7} /h
PFD _{avg} :	8.8×10^{-3}
SIL:	suitable for SIL 2 applications
Mission time:	20 years
EtherCAT 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:	1.2×10^{-9} /h
PFD _{avg} :	1.1×10^{-4}
SIL:	suitable for SIL 3 applications
Mission time:	20 years
EtherCAT reaction time > local safety output:	50 ms

EtherCAT® and Safety over EtherCAT®

"EtherCAT®" and "Safety over EtherCAT®" are registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Safety response times, SFB-EC

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

- Reaction time of the connected safety switchgear
- Reaction time safety fieldbox SFB-EC
- Reaction time Safety Controller, incl. transmission time field bus
- Reaction time of Output
- Reaction time of safety shut-off element (actuator)



In addition to the maximum reaction times of the SFB-EIP, the response times of the connected safety switchgear, the configured watchdog time of the communication, the reaction time of the safety logic, the reaction time of output and the reaction times of other components, as for example actuators, must be taken into calculation.



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

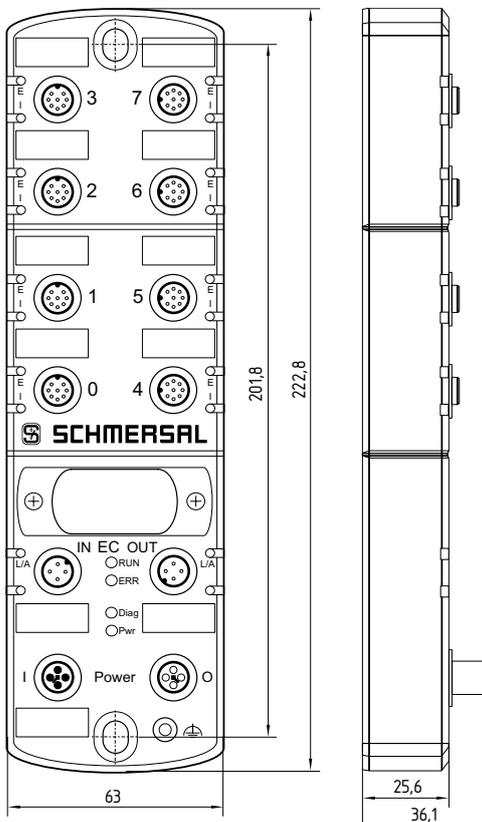
Fasten fieldbox with two M6-screws on a flat mounting surface, for mechanically strain-free installation. The maximum tightening torque is 3.0 Nm. Any mounting position.



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-EC" in the Schmersal Online Catalogue at 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 mm² 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



The replacement device must be in the factory settings!
If necessary, perform a "factory reset" without the memory stick inserted (s. a. Manual SFB-EIP).

To replace a defective SFB-EC, follow the steps below:

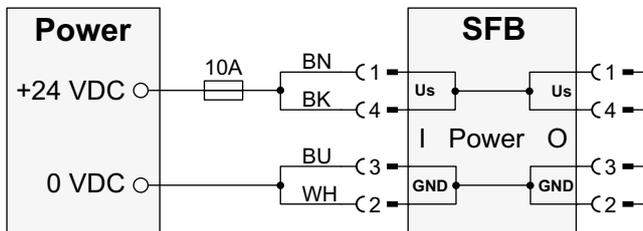
- Bring the machine and the SFB into a de-energised state.
- Disconnect all cables and dismount the old device.
- Set the rotary coding switch on the replacement device to the selected TwinSAFE address.
- Close the viewing window, mount the device and install all cables.
- Put the system and SFB back into operation.



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

4.3 Power supply and fuse protection

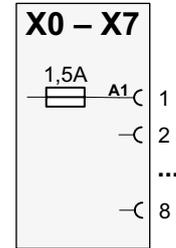
The supply voltage of the safety fieldbox is to be protected with a fuse of 10 A. In order to increase the cable cross section for the supply voltage of the fieldbox, both connections from Us and GND must be connected in parallel. Pins 1 + 4 and 2 + 3 in the fieldbox are bridged.



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.



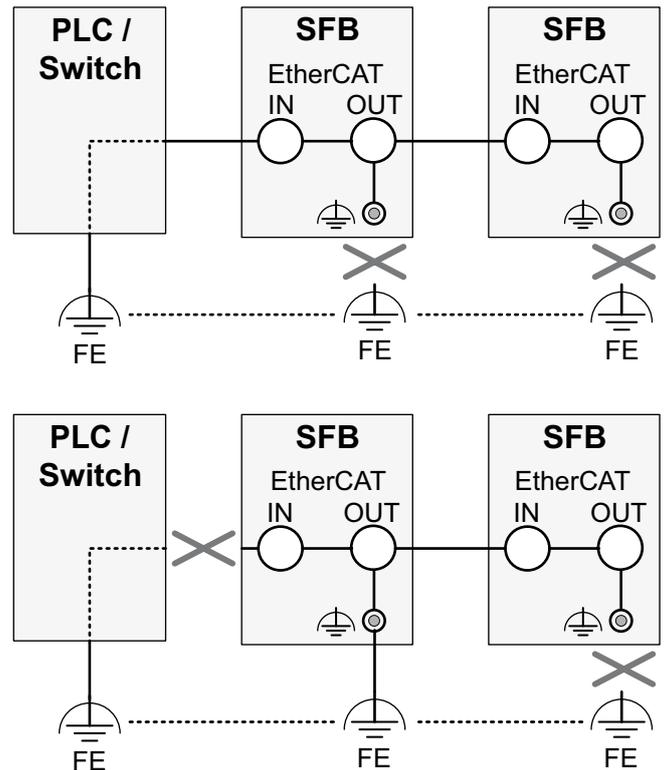
4.5 Earth concept and shielding

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:

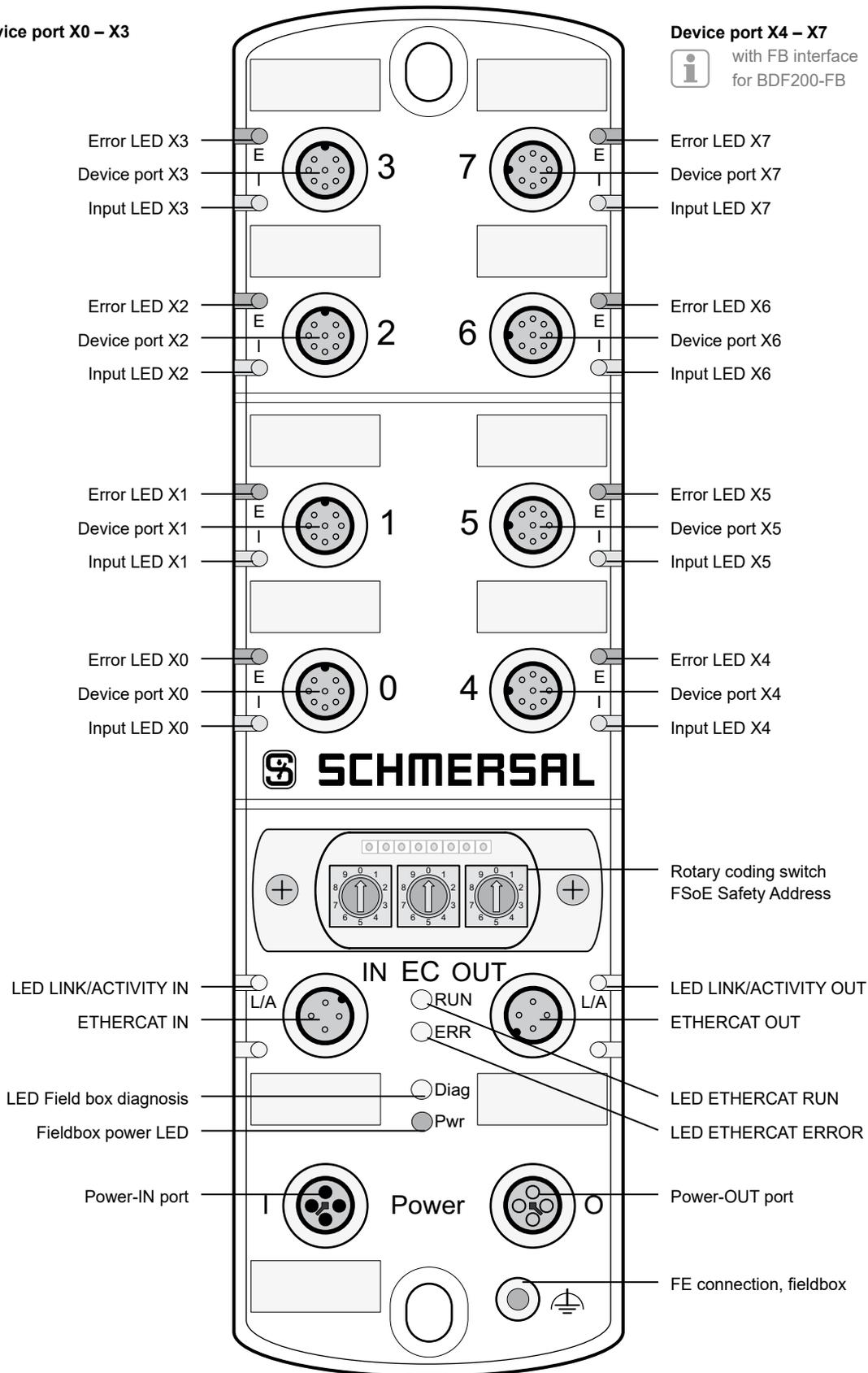


4.6 Overview of connections and LED indicators

Device port X0 – X3

Device port X4 – X7

 with FB interface
for BDF200-FB



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, 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, 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 EtherCAT IN/OUT

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 TwinSAFE address

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.

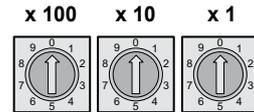


Caution!
Electrostatically sensitive components.
Do not touch the printed circuit board directly.



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 TwinSAFE address of the SFB.



TwinSAFE address	Description
0 0 0	Invalid TwinSAFE address, Reset Station-Alias is executed (delivery state, SFB carries out LED test)
0 0 1 ... 9 9 9	Valid TwinSAFE address range

Select TwinSAFE address:

- Remove power from the SFB
- Select TwinSAFE address
- Close the viewing window again
- Resupply power to the SFB



Make sure that the correct TwinSAFE address is set for the module. Double addressing must be avoided.



More information about the issue:

- Setting the TwinSAFE address can be found in the SFB-EC manual.

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	Parameter fault / 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, EtherCAT ports IN/OUT

There is one green Link/Activity LED indicator at the Ethernet ports.

Link/Activity LED (L/A)

The Link/Activity LED may exhibit the following display and flashing pattern:

LED display		Description
GREEN	OFF	No Link active
GREEN	10 Hz	Link and data exchange active
GREEN	ON	Link active, but no data exchange
GREEN	n flashes	PHY Auto Negotiation Error

5.3 Central LED indicators, SFB-EC

There are 4 LEDs for central diagnostics of the fieldbox. A green LED for EtherCAT RUN status, a red LED for the EtherCAT Error status, a green/red SFB diagnosis LED and a green power LED.

EtherCAT RUN status LED (RUN)

The RUN status LED may exhibit the following display and flashing pattern:

LED display		Description
GREEN	OFF	INITIALISATION
GREEN	Flashes	PRE-OPERATIONAL
GREEN	Single flash	SAFE-OPERATIONAL
GREEN	ON	OPERATIONAL
GREEN	10 Hz	INITIALISATION or BOOTSTRAP

EtherCAT ERROR status LED (ERR)

The ERROR status LED may exhibit the following display and flashing pattern:

LED display		Description
RED	OFF	No Error
RED	Flashes	Invalid Configuration
RED	Single flash	Local Error
RED	Double flash	Watchdog Timeout
RED	10 Hz	Booting Error
RED	ON	Application Controller Failure

Fieldbox diagnosis LED (Diag)

The diagnosis 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	1 impulse	Internal over temperature fault
RED	2 impulses	Invalid FSoE Slave address
RED	3 impulses	Invalid FSoE CRC
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 or U > 34 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.

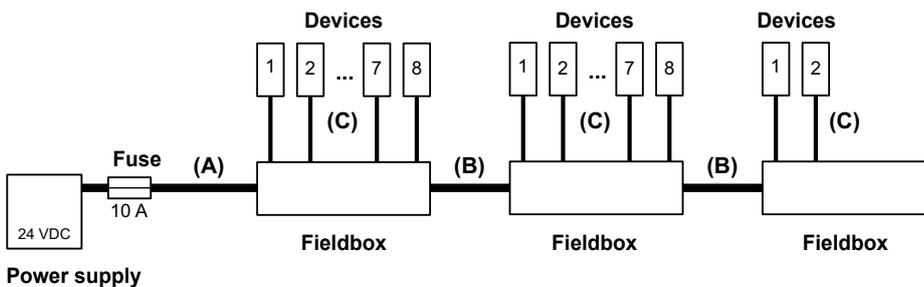
3 different configurations are shown respectively for the different SCHMERSAL safety switchgear. One configuration with long cable lengths (maximum), one configuration with medium cable lengths (medium) and one configuration with shorter cable lengths (small).

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 mm² 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

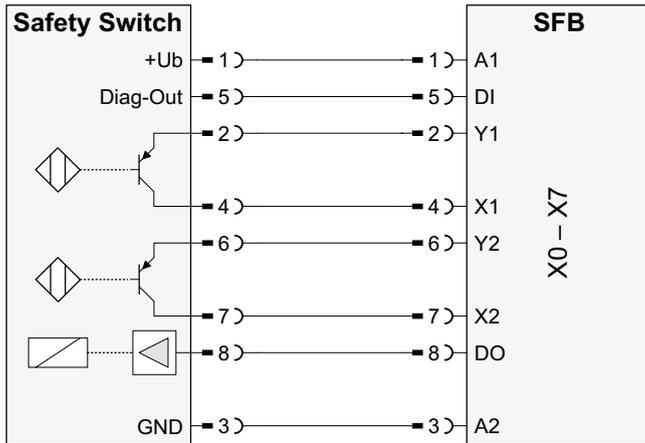
Mixed fitting of fieldbox: 2 x AZM 201, 2 x MZM 100, 2 x AZM 300 and 2 x RSS / CSS



A useful design tool for calculating the real voltage drops is available on the Internet at www.system-engineering-tool.com

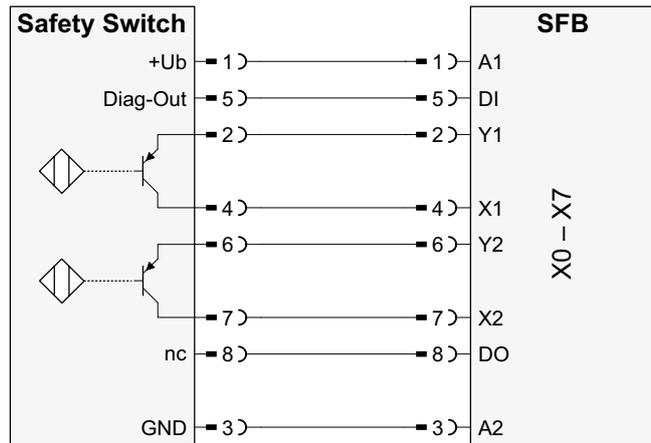
8.2 Wiring example of the safety switches

Electronic interlock, unlocking function via 1 wire



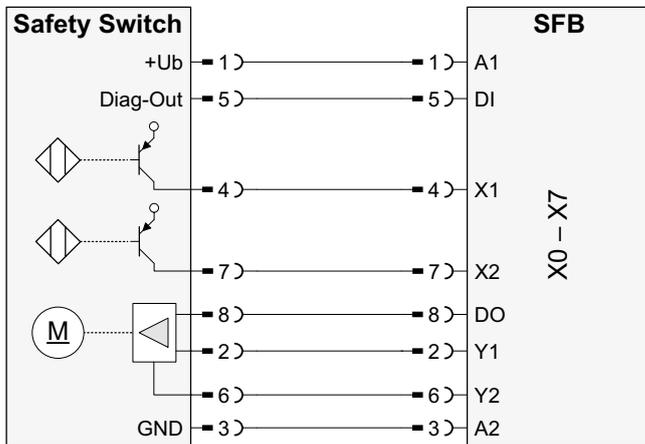
SCHMERSAL devices: MZM100, AZM201, AZM300, AZM40, ...

Electronic sensor, 8-pin



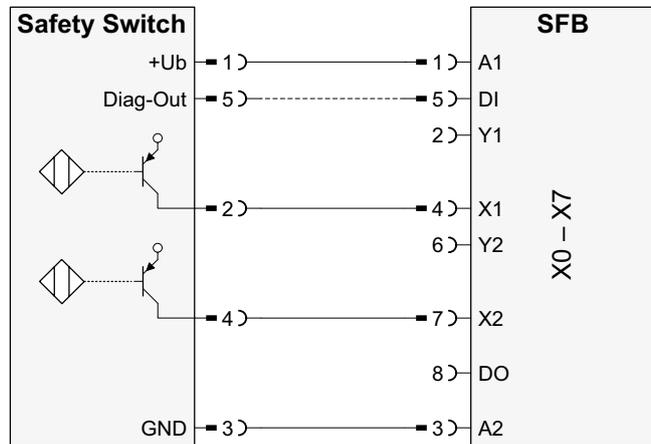
SCHMERSAL devices: CSS series, RSS series, ...

Electronic interlock, unlocking function via 2 wires



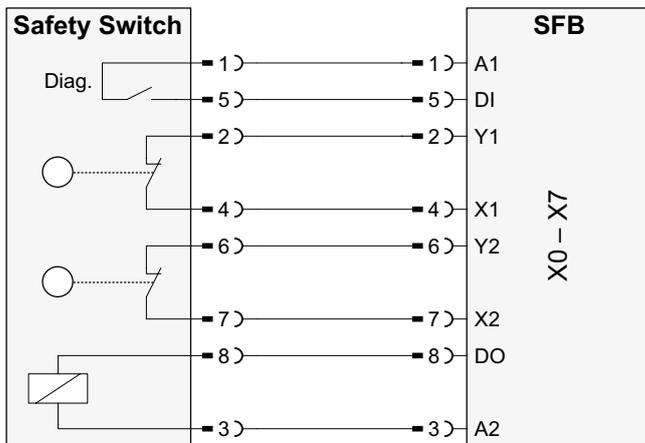
SCHMERSAL devices: AZM400, ...

Electronic sensor, 4/5-pin



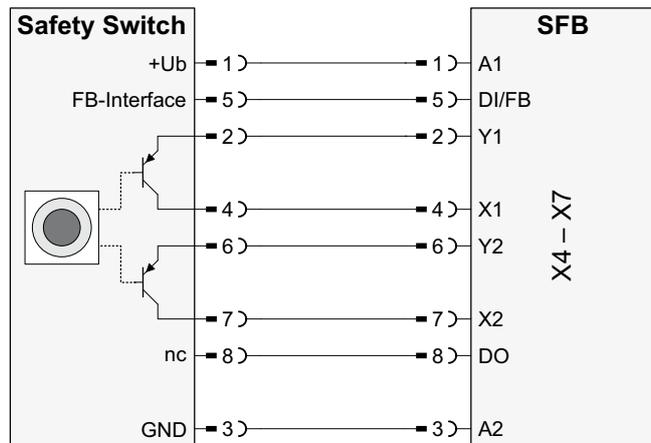
Different safety switchgear

Electromechanical interlock, unlocking function via 1 wire



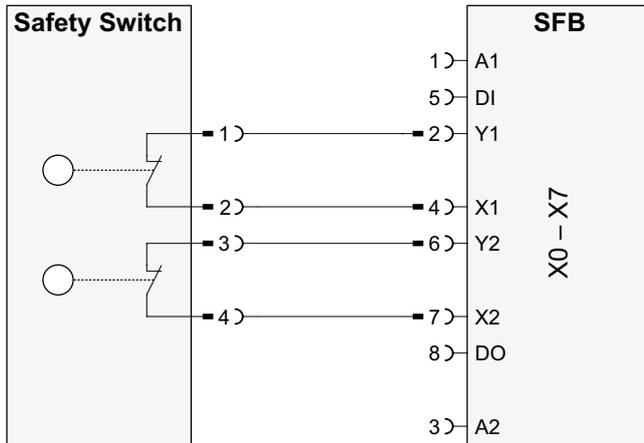
SCHMERSAL devices: AZM 161-FB, AZM 170-FB, AZM150-ST, ...

Electronic E-STOP, BDF 200 FB, FB interface



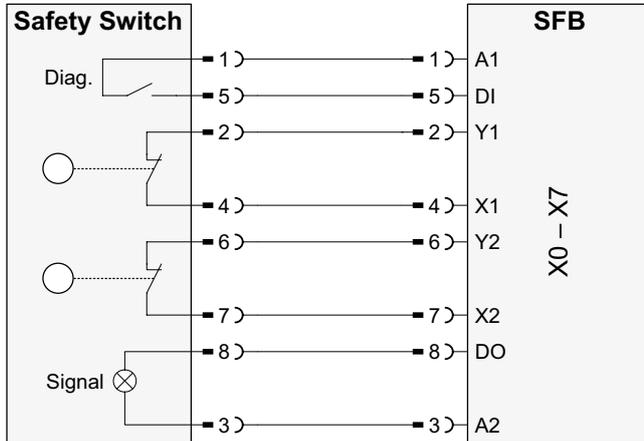
SCHMERSAL devices: BDF 200-FB, ...

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



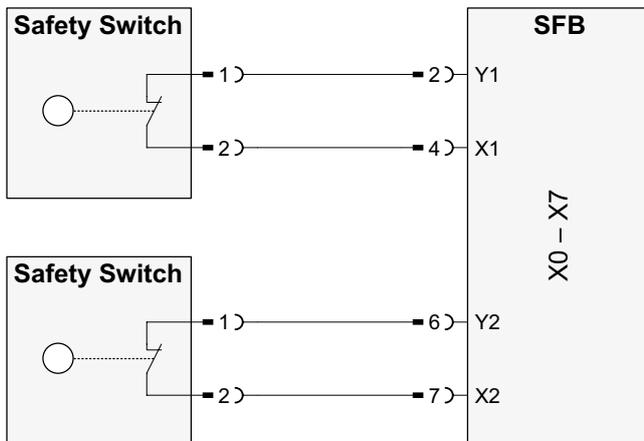
SCHMERSAL devices: BNS series, TESK, ...

Electromechanical switches, 2-channel, 8-pin



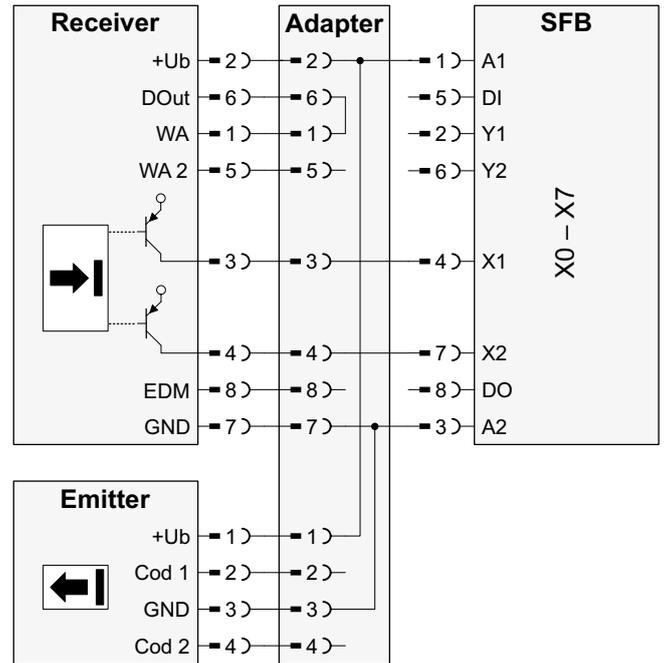
SCHMERSAL devices: BDF100-NH(K), AZ series, PS series, ZQ series, ...

2 electromechanical switches, 1-channel, forcibly interrupted



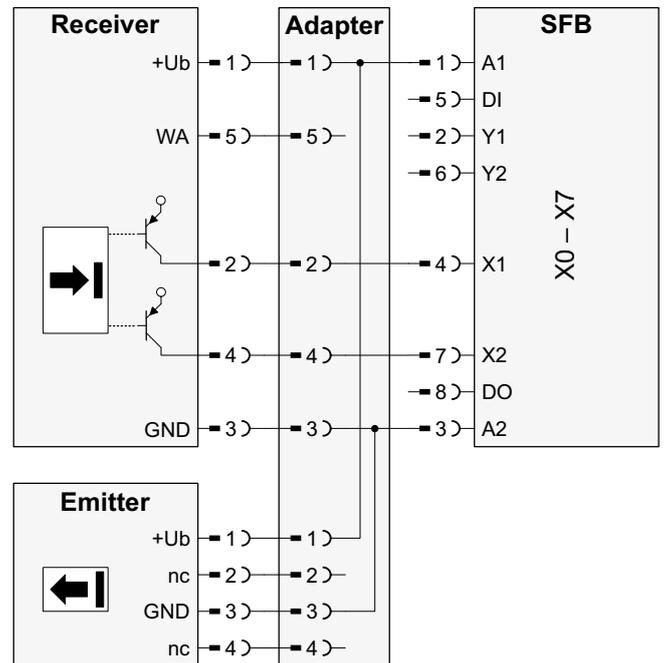
Different safety switchgear

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 'Manual: Safety Field Box SFB-EIP' on the internet at products.schmersal.com.

9. EU Declaration of conformity

EU Declaration of conformity		
Original	K.A. Schmersal GmbH & Co. KG Möddinghofe 30 42279 Wuppertal Germany 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.		
Name of the component:	SFB-EC	
Type:	See ordering code	
Description of the component:	Safety fieldbox (IO module with fieldbox interface)	
Relevant Directives:	2006/42/EC Machinery Directive 2014/30/EU EMC-Directive 2011/65/EU RoHS-Directive	
Applied standards:	EN 61131-2:2007 EN 60947-5-3:2013 EN ISO 13849-1:2015 IEC 61508 parts 1-7:2010	
Notified body for the prototype test:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln ID n°: 0035	
EC-prototype test certificate:	01/205/5878.02/23	
Person authorised for the compilation of the technical documentation:	Oliver Wacker Möddinghofe 30 42279 Wuppertal	
Place and date of issue:	Wuppertal, September 25, 2023	
		
	Authorised signature Philip Schmersal Managing Director	

SFB-EC-A-EN



The currently valid declaration of conformity can be downloaded from the internet at products.schmersal.com.

