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1. About this document

1.1 Function

This operating instructions manual provides all the information you need for the mounting, set-up and commissioning to ensure the safe operation and disassembly of the safety switchgear. The operating instructions must be available in a legible condition and a complete version in the vicinity of the device.

1.2 Target group: authorised qualified personnel

All operations described in this operating instructions 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 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.

1.3 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.

1.4 Appropriate use

The Schmersal range of products is not intended for private 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 switchgear must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of applications can be found in the chapter "Product description".

1.5 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.



Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: products.schmersal.com.

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.

1.6 Warning about misuse



In case of improper use or manipulation of the safety switchgear, personal hazards or damages to machinery or plant components cannot be excluded when safety switchgear is used.

1.7 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:

BNS 40S-12Z-①-②-③-④

No.	Option	Description
①	T	High temperature version (up to 100 °C) without LED
②	G	with LED
③	C	Through-holes Rear-side threaded hole
④	LST	Cable, 1 m Cable with connector M12, 0.3 m

Actuator

BPS 40S-1, BPS 40S-1-C	Actuator installation position, horizontally on one level with the sensor
BPS 40S-2, BPS 40S-2-C	Actuator installation position vertically 90° offset to sensor

2.2 Special versions

For special versions, which are not listed in the order code below 2.1, these specifications apply accordingly, provided that they correspond to the standard version.

2.3 Destination and use

The safety sensor is designed for application in safety circuits and is used for monitoring the position of movable safety guards to EN ISO 14119 and EN 60947-5-3. The safety switches are used for applications, in which the hazardous situation is terminated without delay when the safety guard is opened. To actuate the safety sensors, only the above-mentioned actuators can be used, conventional magnets are not suitable.

Only the entire system consisting of the safety sensor the actuator and the safety-monitoring module meets the requirements of the standard EN 60947-5-3.



The safety switchgears are classified according to EN ISO 14119 as type 4 interlocking devices.

The safety sensor is especially suitable for food-processing machinery and plants. Due to the stainless steel enclosure, the safety sensor is resistant to corrosion and cleaning agents. The safety sensor is suitable for concealed mounting behind non-ferromagnetic covers.



Information for the selection of suitable safety-monitoring modules can be found in the Schmersal catalogues or in the online catalogue on the Internet: products.schmersal.com.



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



The entire concept of the control system, in which the safety component is integrated, must be validated to the relevant standards.

2.4 Technical data

Standards:	EN 60947-5-3
Design:	rectangular
Enclosure:	stainless steel V4A (material designation according to DIN 1.3960)
Degree of protection:	IP65 / IP67 / IP69
Connection type:	
- Cable:	LIYY, 1 m, (food safe)
- Cable with connector:	LIYY, 0.3 m, (food safe), Connector with VA-thread M12, 8-pin
Cable section:	6 × 0.25 mm ²
Operating principle:	magnetic
Actuating magnet:	BPS 40S-1, BPS 40S-2, BPS 40S-1-C, BPS 40S-2-C, coded
assured switching distance s_{so} :	8 mm
assured switch-off distance s_{gr} :	18 mm
Coding level according to EN ISO 14119:	low
Switching condition indication:	LED only with ordering suffix G
Switching voltage:	
- without LED:	max. 100 VAC/DC
- with LED:	max. 24 VDC
- Version LST:	max. 30 VAC/DC
Switching current:	
- without LED:	max. 250 mA
- with LED:	max. 10 mA
Switching capacity:	
- without LED:	max. 3 W
- with LED:	max. 240 mW
Required short-circuit current:	100 A
Ambient temperature:	-25 °C ... +80 °C
- ordering suffix -T:	-25 °C ... +100 °C
Storage and transport temperature:	-25 °C ... +80 °C
- ordering suffix -T:	-25 °C ... +100 °C
Switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55 Hz, amplitude 1 mm

2.5 Safety classification

Standards:	EN ISO 13849-1
Safety contact:	
- NC / NC combination:	S21-S22 and S31-S32
- NC / NO combination:	S21-S22 and S13-S14
Intended structure:	
- 2-channel usage	useable to cat. 4 / PL e with suitable logic unit
B_{10D} NC contacts at 20 % contact load:	25.000.000
B_{10D} NO contacts at 20 % contact load:	25.000.000
Mission time:	20 years

$$MTTF_D = \frac{B_{10D}}{0,1 \times n_{op}} \quad n_{op} = \frac{d_{op} \times h_{op} \times 3600 \text{ s/h}}{t_{cycle}}$$

(Determined values can vary depending on the application-specific parameters h_{op} , d_{op} and t_{cycle} as well as the load.)

If multiple safety components are wired in series, the Performance Level to EN ISO 13849-1 will be reduced due to the restricted error detection under certain circumstances.

3. Mounting

3.1 General mounting instructions

- Fitting is only authorised in a de-energised condition.
- Do not use the sensor and the actuator as a mechanical backstop.
- Any mounting position, provided that the active surfaces are opposite.
- Inseparably fix the sensor and the actuator to the safety guard.
- Do not install the safety sensor and the actuator in strong magnetic fields.
- If possible, do not mount the sensor and the actuator on ferromagnetic material. When the sensor and the actuator are installed on ferromagnetic material, variations can be expected in the limit distances. The use of a non-magnetic spacer of at least 5 mm thick must be used. The use of non-magnetic fixing screws is recommended also.
- Do not subject the safety sensor and actuator to extreme vibrations and shocks.
- Keep away from metal chips.
- The mounting distance between two sensors should always be at least 50 mm.

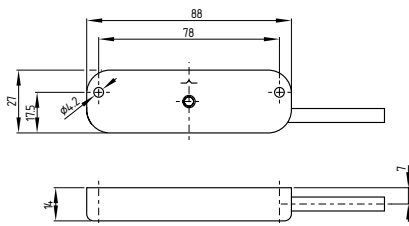


Also suitable for concealed mounting behind non-ferromagnetic covers.

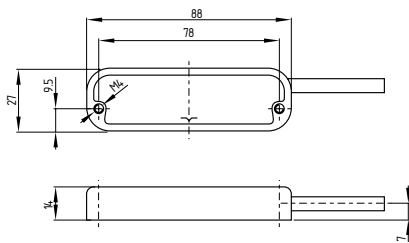
3.2 Dimensions

All measurements in mm.

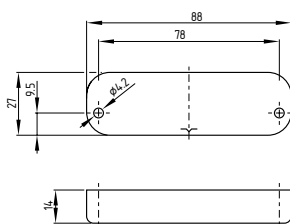
BNS 40 AS safety sensor



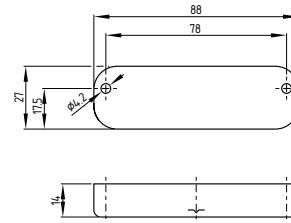
BNS 40S-...-C safety sensor



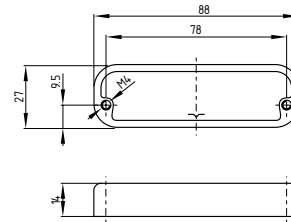
BPS 40S- Actuator



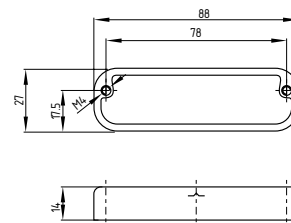
BPS 40S-2 Actuator



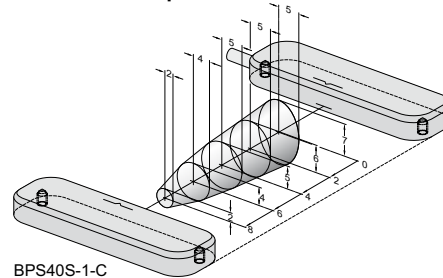
BPS 40S-1-C Actuator



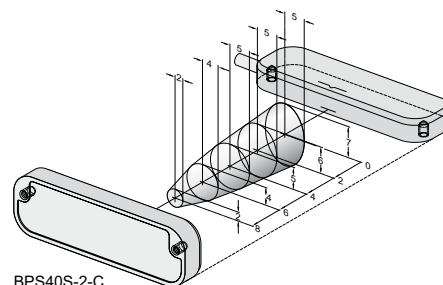
BPS 40S-2-C Actuator



3.3 Installation position and switch distance



BPS40S-1-C



BPS40S-2-C

3.4 Adjustment

Align the central markings of the safety sensor and the actuator with each other. The LED can only be used as rough setting tool. The correct functionality of both safety channels must be checked by means of the connected safety-monitoring module.



Recommended Adjustment

Align the safety sensor and actuator at a distance of $0.5 \times s_{80}$.

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.

The safety sensors must be wired in accordance with the specified wire colours.

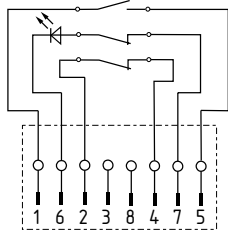
4.2 Contact variants

The contact position shows the actuated sensor function when the safety guard is closed. For safety sensors with LED, the LED is illuminated when the safety guard is closed. The contact configurations of the versions with or without LED are identical.

BNS 40S--12Z(G)

GY S13
GN S21
WH S31

BNS 40S--12Z(G)-LST



4.3 Connection

The safety sensor is suitable for use in conjunction with safety-monitoring modules, which are controlled through NO/NC safety inputs or NC/NC safety inputs.

In these versions, the optional LED is integrated in the S21-S22 circuit.

Connection to safety-monitoring modules with NO/NC inputs:

NO contact: S13 - S14 at the NO input of the safety-monitoring module

NC contact: S21 - S22 at the NC input of the safety-monitoring module

NC contact: S31 - S32 can be used as signalling contact

Connection to safety-monitoring modules with NC/NC inputs:

NC contact: S21 - S22 at the 1st NC input of the safety-monitoring module

NC contact: S31 - S32 at the 2nd NC input of the safety-monitoring module

NO contact: S13 - S14 can be used as signalling contact

Technically, multiple safety sensors can be wired to one SRB safety-monitoring module. To connect multiple safety sensors (check if authorised!), their NO contacts are wired in parallel and their NC contacts in series. The Protect-IE-11 or -02 or PROTECT-PE-11 (-AN) or -02 input expander module can be used to connect up to 4 safety sensors with NC/NC or NC/NO contacts.

Safety sensors equipped with LEDs shall not be wired in series, except for the Protect-IE input expander module. As a result of this, the luminosity of the LEDs would considerably decrease and the voltage could drop below the minimum input voltage of the downstream safety-monitoring module. Please observe that the diagnostic coverage could reduce if multiple safety sensors are connected to one safety-monitoring module.

5. Set-up and maintenance

5.1 Functional testing

The safety function of the safety components must be tested. The following conditions must be previously checked and met:

1. Fitting of the sensor and the actuator.
2. Fitting and integrity of the power cable.
3. The system is free of dirt and soiling (in particular metal chips).

5.2 Maintenance

In the case of correct installation and adequate use, the safety sensor features maintenance-free functionality.

A regular visual inspection and functional test, including the following steps, is recommended:

- Check the fitting of the sensor and the actuator.
- Remove possible metal chips.
- Check the cable for damage.



Adequate measures must be taken to ensure protection against tampering either to prevent tampering of the safety guard, for instance by means of replacement actuators.

Damaged or defective components must be replaced.

6. Disassembly and disposal

6.1 Disassembly

The safety switchgear must be disassembled in a de-energised condition only.

6.2 Disposal



The safety switchgear must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.

7. Declaration of conformity

We hereby certify that the hereafter described components both in their basic design and construction conform to the applicable European Directives.

Relevant Directives: Machinery Directive 2006/42/EC
RoHS-Directive 2011/65/EU



Applied standards: EN 60947-5-3:2013
EN ISO 14119:2013



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

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