SCHMERSAL

EN Operating instructions. . . . . .pages 1 to 6
Original

Content

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-monitoring module. 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

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-monitoring module 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.

x.000 / 12.2021 / v.A. - 101184956-EN / D / 2021-11-16 / AE-Nr. 14349

1.6 Warning about misuse

In case of inadequate or improper use or manipulations of the safety-monitoring module, personal hazards or damage to machinery or plant components cannot be excluded. The relevant requirements of the standard EN ISO 14119 must be observed.

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.

The safety-monitoring module must only be used when the enclosure is closed, i.e. with the front cover fitted.

2. Product description

2.1 Ordering code

This operating instructions manual applies to the following types:

SRB400NE-①
SRB402NE-①

No.	Option	Description
①	24V	24 VAC / VDC
	230V	230 VAC

Only if the information described in this operating instructions manual are realised correctly, the safety function and therefore the compliance with the Machinery Directive is maintained.

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 Purpose

The safety-monitoring modules for integration in safety circuits are designed for fitting in control cabinets. They are used for the safe evaluation of the signals of positive break position switches for safety functions or BN20-2RZ type magnetic safety sensors from Schmersal.

The safety function is defined as the opening of release 13-14 / 23-24 or 33-34 / 43-44 when the inputs S11-S12 and/or S21-S22 or S31-S32 and/or S41-S42 are opened. The safety-relevant current path with the output contacts 13-14, 23-24, 33-34 and 43-44 meet the following requirements under observation of a B_{10D} value assessment (also refer to "Requirements to EN ISO 13849-1"):
– control category 4 – PL e to EN ISO 13849-1
– corresponds to SIL 3 to IEC 61508
– corresponds to SIL CL 3 to EN 62061

To determine the Performance Level (PL) of the entire safety function (e.g. sensor, logic, actuator) to EN ISO 13849-1, an analysis of all relevant components is required.

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

General data:	
Standards:	EN 60204-1, EN 60947-5-1, EN ISO 13849-1, IEC 61508
Climate resistance:	EN 60068-2-78
Mounting:	Snaps onto standard rail to EN 60715
Terminal designations:	EN 60947-1
Material of the housings:	Plastic, glass-fibre reinforced thermoplastic, ventilated
Material of the contacts:	AgNi, self-cleaning, positive drive
Weight:	24 V: 370 g, 230 V: 550 g
Start conditions:	Automatic
Feedback circuit available:	yes
Pull-in delay:	typ. 0.5 s
Drop-out delay in case of emergency stop:	typ. 50 ms
Pull-in delay auxiliary contacts:	57-58, 67-68 (only SRB402NE): adjustable 0 … 5 s (factory setting 5 s)
Mechanical data:	
Connection type:	Screw connection
Cable section:	min. 0,25 mm² / max. 2,5 mm²
Connecting cable:	rigid or flexible
Tightening torque for the terminals:	0.6 Nm
With removable terminals:	yes
Mechanical life:	10 million operations
Resistance to shock:	10 g / 11 ms
Resistance to vibrations to EN 60068-2-6:	10 … 55 Hz, amplitude 0.35 mm
Ambient temperature:	–25 °C … +45 °C
Storage and transport temperature:	–40 °C … +85 °C
Degree of protection:	Enclosure: IP40 Terminals: IP20 Clearance: IP54
Air clearances and creepage distances to EN 60664-1:	4 kV/2 (basic insulation)
EMC rating:	to EMC Directive
Electrical data:	
Contact resistance in new state:	max. 100 mΩ
Power consumption:	24 V: max. 6 W / 6 VA 230 V: max. 6 W / 7.8 VA
Rated operating voltage U_e:	24 VDC: –15% / +20%, residual ripple max. 10%, 24 VAC, 230 VAC: –15% / +10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	internal F1: T 1 A
Monitored inputs:	
Cross-wire detection:	yes
Wire breakage detection:	yes
Earth connection detection:	yes
Number of NO contacts:	0
Number of NC contacts:	4
Outputs:	
Number of safety contacts:	4
Number of auxiliary contacts:	SRB402NE: 2
Switching capacity of the safety contacts:	230 VAC: 6 A ohmic (inductive in case of appropriate protective wiring) 13-14 or 23-24 max. 6 A; 33-34 or 43-44 max. 6 A; 13-14 and 23-24 max. 4.2 A each; 33-34 and 43-44 max. 4.2 A each
Switching capacity of the auxiliary contacts:	230 VAC: 2 A ohmic; AC-15: 250 V / 2 A; DC-13: 24 V / 2 A
Fuse rating of the safety contacts:	6.3 A slow blow
Recommended fuse for the auxiliary contacts:	2 A slow blow
Utilisation category to EN 60947-5-1:	AC-15, DC-13

The data specified in this manual are applicable when the component is operated with rated operating voltage U_e ±0%.

2.5 Safety classification

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to e
Control category:	up to 4
DC:	99% (high)
CCF:	> 65 points
SIL:	up to 3
Service life:	20 years
B_{10D} value (for one channel of the relay output):	20%: 20,000,000 40%: 7,500,000 60%: 2,500,000 80%: 1,000,000 100%: 400,000

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

For an average annual demand rate of n_{op} = 126,720 cycles per year, Performance Level PL e can be obtained at maximum load.

n_{op} = average number of activations per year
d_{op} = average number of operating days per year
h_{op} = average number of operating hours per day
t_{cycle} = average demand rate of the safety function in s (e.g. 4 × per hour = 1 × per 15 min. = 900 s)

3. Mounting

3.1 General mounting instructions

Mounting: snaps onto standard rails to EN 60715.

Snap the bottom of the enclosure slightly tilted forwards in the rail and push up until it latches in position.

To avoid EMC disturbances, the physical ambient and operational conditions at the place where the product is installed, must meet the provisions laid down in the paragraph "Electromagnetic Compatibility (EMC)" of EN 60204-1.

3.2 Dimensions

All measurements in mm.

Device dimensions (H/W/D): 100 x 45 x 121 mm
with plugged-in terminals: 120 × 45 × 121 mm

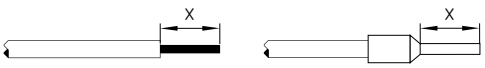
4. Electrical connection

4.1 General information for electrical connection

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

As far as the electrical safety is concerned, the protection against unintentional contact of the connected and therefore electrically interconnected apparatus and the insulation of the feed cables must be designed for the highest voltage, which can occur in the device.

Settle length x of the conductor: 7 mm



Wiring examples: see appendix

5. Operating principle and settings

5.1 LED functions

- K1: status channel 1, limit switch LHS
- K2: status channel 2, limit switch LHS
- K3: status channel 1, limit switch RHS
- K4: status channel 1, limit switch RHS
- K5: time-delayed channel
- U_B: Status operating voltage (LED is on, when the operating voltage on the terminals A1-A2 is ON)
- U_i: Status internal operating voltage (LED is on, when the operating voltage on the terminals A1-A2 is ON and the fuse has not been triggered)

5.2 Description of the terminals

Voltages:	A1	+24 VAC / VAC or 230 VAC
	A2	0 VAC / VDC
Inputs:	S11-S12	Input channel 1 right
	S11-S22	Input channel 2 right
	S31-S32	Input channel 1 left
	S41-S42	Input channel 2 left
Outputs:	13-14	First safety enabling circuit right
	23-24	Second safety enabling circuit right
	33-34	First safety enabling circuit left
	43-44	Second safety enabling circuit left
		Only SRB402NE:
	57-58	Time-delayed auxiliary contact
	67-68	Time-delayed auxiliary contact

Opening the front cover (see Fig. 2)

- To open the front cover, insert a slot screwdriver in the top and bottom cover notch and gently lift it (only required for SRB402NE).
- When the front cover is open, the electrostatic discharge requirements must be respected and observed.

Only touch the components after electrical discharge!

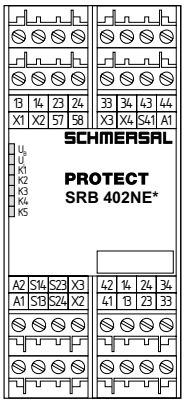


Fig. 1
The SRB400NE does not have the auxiliary contacts 57-58 and 67-68

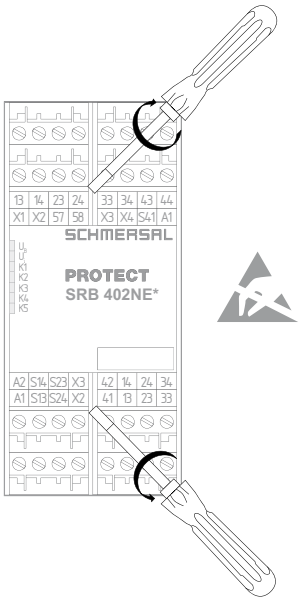


Fig. 2

Setting the pull-in delay (only SRB402NE) (see Fig. 3)

- The pull-in delay (0...5 s) is set by means of a potentiometer located at the front of the enclosure (behind the front cover).
- The pull-in delay of the safety-monitoring module is set to 5 s in factory. Upon the customer's request, the safety-monitoring module can be supplied with a different setting.
- A clockwise rotation of the potentiometer causes the pull-in delay to be decreased.

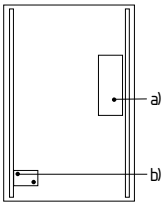


Fig. 3
a) Fuse;
b) Potentiometer

5.3 Circuitry notes

Auxiliary contacts must not be used in safety circuits.

Due to the operating principle of the electronic fuse, the customer must check that no hazard is caused by an unexpected restart in circuits without reset button (automatic reset).

6. Set-up and maintenance

6.1 Functional testing

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

1. Correct fixing
2. Check the integrity of the cable entry and connections
3. Check the safety-monitoring module's enclosure for damage
4. Check the electrical function of the connected sensors and their influence on the safety-monitoring module and the downstream actuators

6.2 Maintenance

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

1. Check the correct fixing of the safety-monitoring module
2. Check the cable for damages
3. Check electrical function

If a manual functional check is necessary to detect a possible accumulation of faults, then this must take place during the intervals noted as follows:

- at least every month for PL e with category 3 or category 4 (according to EN ISO 13849-1) or SIL 3 with HFT (hardware fault tolerance) = 1 (according to EN 62061);
- at least every 12 months for PL d with category 3 (according to EN ISO 13489-1) or SIL 2 with HFT (hardware fault tolerance) = 1 (according to EN 62061).

Damaged or defective components must be replaced.

7. Disassembly and disposal

7.1 Disassembly

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

7.2 Disposal

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

8. Appendix

8.1 Wiring examples

The example represent a dual-channel control of a circuit with limit switches (see Fig. 4).

- Relay outputs: Suitable for 1 channel control, for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- The control system recognises wire-breakage and earth faults in the monitoring circuit.

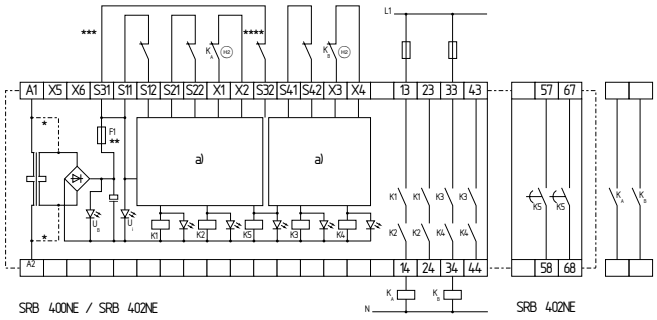


Fig. 4
a) Channel control
* Fuse 1 A T
** To be bridge for the 24V version
*** Limit switch RHS
**** Limit switch LHS
H2 Feedback circuit

8.2 Sensor configuration

The connection of magnetic safety switches to the safety-monitoring modules is only admitted when the requirements of the standard EN 60 947-5-3 are observed.

The following safety sensors from Schmersal meet the requirements:
BN 20-2RZ

When sensors with LED are wired in the control circuit (protective circuit), the following rated operating voltage must be observed and respected:
– 24 VDC with a max. tolerance of –5 %/+ 20 %

Otherwise availability problems could occur, especially in series-wired sensors, where a voltage drop in the control circuit is triggered by LED's for instance.

SRB400NE/SRB402NE, switch-off in end position:
Dual-channel control of magnetic safety switches to EN 60947-5-3

- The control system recognises wire-breakage, earth faults and cross-wire shorts in the control circuits.
- Fig. 5: limit switch LHS, partially acting on switch-off level 1 (safety enabling circuits 13-14, 23-24)
- Fig. 6: limit switch RHS, partially acting on switch-off level 2 (safety enabling circuits 33-34, 43-44)

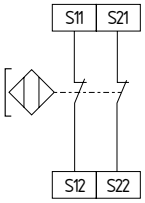


Fig. 5

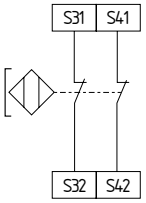


Fig. 6

SRB402NE, preliminary switch-off and switch-off in end position:
Dual-channel control of magnetic safety switches to EN 60947-5-3 (see Fig. 7 and 8)

- The enabling circuits 13-14 and 23-24 are closed again by the bridge X5-X6 after the release of the limit switch.

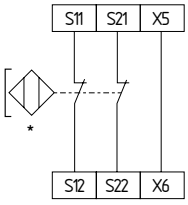


Fig. 7
* = limit switch

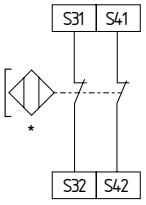


Fig. 8
* = preliminary limit switch

SRB402NE (see Fig. 9)

- The time-delayed auxiliary contacts 57-58 and 67-68 can be set with a pull-in delay from 0 to 5 s.
- When the control contacts are opened, the auxiliary contacts will close after the set pull-in delay.
- Function 5 ("brake activation circuit"): when the limit switch is actuated, the drives are switched off. By means of the K5 outputs with pull-in delay, the drives can be enabled with reduced speed.

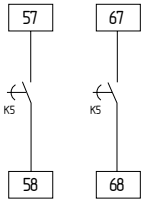


Fig. 9

8.3 Actuator configuration

Single-channel control with feedback circuit (see Fig. 10)
- Suitable for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- (H2) = feedback circuit: If the feedback circuit is not required, establish a bridge.

Dual-channel control with feedback circuit (see Fig. 11)
- Suitable for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- (H2) = feedback circuit: If the feedback circuit is not required, establish a bridge.

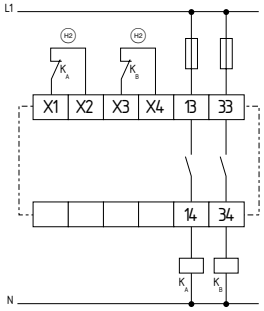


Fig. 10

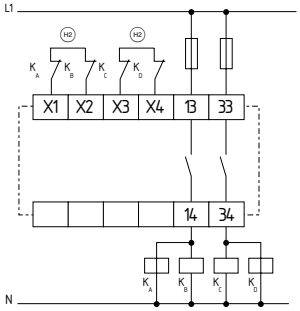


Fig. 11

8.4 Flowcharts

Flowchart SRB400NE / SRB402NE (see Fig. 12)

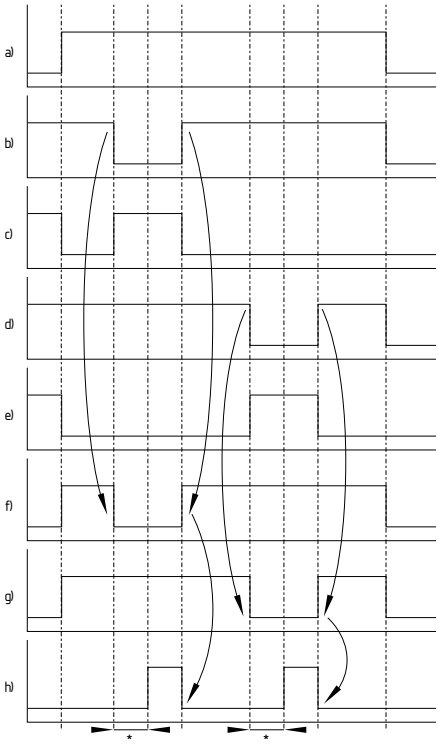


Fig. 12
a) Operating voltage U_B
b) Limit switch RHS (S12-S22)
c) Feedback circuit X1-X2
d) Limit switch LHS (S32-S42)
e) Feedback circuit X3-X4
f) Enabling circuit 13-14 / 23-24
g) Enabling circuit 33-34 / 43-44
h) Auxiliary contact 57-58 / 67-68
* = pull-in delay

Flowchart SRB402NE, preliminary limit switch and limit switch (see Fig. 13)

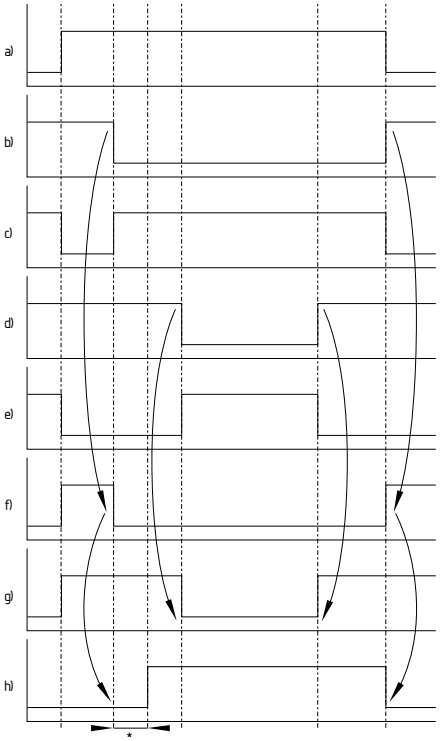


Fig. 13
a) Operating voltage U_B
b) Preliminary limit switch S32-S42
c) Feedback circuit X3-X4
d) Limit switch S12-S22
e) Feedback circuit X1-X2
f) Enabling circuit 33-34 / 43-44
g) Enabling circuit 13-14 / 23-24
h) Auxiliary contact 57-58 / 67-68
* = pull-in delay

9. EU Declaration of conformity

EU Declaration of conformity

SCHMERSAL

Original

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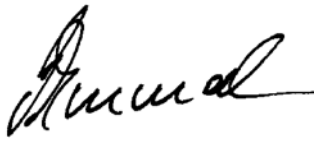
We hereby certify that the hereafter described components both in their basic design and construction conform to the applicable European Directives.

Name of the component:	SRB400NE / SRB402NE
Description of the component:	Safety-monitoring module for guard door monitoring and BNS20-2rz type magnetic safety switches from Schmersal
Relevant Directives:	Machinery Directive 2006/42/EC EMC-Directive 2014/30/EU RoHS-Directive 2011/65/EU
Applied standards:	EN 60947-5-1:2004 + AC:2005 + A1:2009 EN 60947-5-1:2017 EN ISO 13849-1:2015 EN ISO 13849-2:2012
Notified body, which approved the full quality assurance system, referred to in Appendix X, 2006/42/EC:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln ID n°: 0035
Person authorised for the compilation of the technical documentation:	Oliver Wacker Möddinghofe 30 42279 Wuppertal
Place and date of issue:	Wuppertal, November 22, 2021



Authorised signature
Philip Schmersal
Managing Director

SRB400NE-D-EN

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

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