SCHMERSAL

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 indicates 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 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.

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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 13856-2 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:

SRB303SQP-SS-①②

No.	Option	Description
①		**Plug-in screw clamps:** single wire (rigid) or fine wire (flexible): 0.2 … 2.5 mm²; fine wire with ferrule: 0.25 … 2.5 mm²
	CC	**Plug-in cage clamps:** single wire (rigid) or fine wire (flexible): 0.2 … 1.5 mm²; fine wire with ferrule: 0.25 … 1.5 mm²
	PC	**Screw clamps:** single wire (rigid) or fine wire (flexible): 0.2 … 2.5 mm²; fine wire with ferrule: 0.25 … 2.5 mm²
②	24V	24 VAC/DC
	230V	230 VAC
	115V	115 VAC

Only if the action described in these operating instructions is carried out correctly will the safety function be safeguarded, including compliance with the Machinery Directive.

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 safety edges of the series STW-SL. The operating instructions of the STW-SL must be observed.

The safety function is defined as deactivating outputs 13-14, 23-24 and 33-34 after actuation of the safety edge. The safety-relevant current paths with the outputs contacts 13-14, 23-24 and 33-34 meet the following requirements under observation of a PFH value assessment (also refer to chapter 2.5 "Safety classification"):
– Control category 3 - PL e to EN ISO 13849-1
– SIL 3 to IEC 61508
– SIL CL 3 to EN 62061

To determine the Performance Level (PL) to EN ISO 13849-1 of the entire safety function (e.g. sensor, logic, actuator), an assessment 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, EN 62061, IEC 61508
EMC rating:	to EMC Directive
Air clearances and creepage distances:	to EN 60664-1
Mounting:	standard rail to EN 60715
Terminal designations:	EN 60947-1
Electrical characteristics:	
Rated operating voltage U_e:	24 VDC – 15% / +20%, Residual ripple max. 10%, 24 VAC –15% / +10%, 115VAC / 230VAC –15% / +6%
Frequency range:	50 Hz/60 Hz
Power consumption:	24V version: max. 3.0 W / 7.5 VA, 115V version: max. 6.5 VA, 230V version: max. 6.0 VA
Fuse rating for the operating voltage:	Internal electronic trip, tripping current > 500 mA, Reset after disconnection of supply voltage
Insulation values in accordance with EN 60664-1:	
Rated insulation voltage U_i:	
- Safety contacts:	250 V
Rated impulse withstand voltage U_{imp}:	
- Safety contacts 13-14, 23-24, 33-34:	4 kV
Overvoltage category:	III
Degree of pollution:	2
Pull-in delay for automatic start:	typ. 80 ms
Pull-in delay with reset button:	typ. 15 ms
Drop-out delay:	typ. 20 ms
Drop-out delay on "supply failure":	typ. 50 ms
Bridging in case of voltage drops:	typ. 40 ms
Control current circuits/inputs:	
- Inputs 5, 6:	24 VDC / 5 mA
- Input X3:	24 VDC, start impulse 20 mA / 20 ms
- Input X4:	24 VDC / 25 mA
- Input S2 (with reset button):	24 VDC, start impulse 20 mA / 20 ms
- Input S2 (auto start):	24 VDC / 25 mA
Safety edge STW-SL:	
Cable lengths:	0.2 m up to 24 m
Conduction resistance:	5 kΩ / m
Relay outputs:	
Switching capacity of the safety contacts:	13-14; 23-24; 33-34: max. 250 V, 6 A ohmic (inductive in case of appropriate protective wiring); min. 10 V / 10 mA
Fuse rating of the safety contacts:	external (I_k = 1000 A) to EN 60947-5-1 Safety fuse 8 A quick blow, 6.3 A slow blow
Utilisation category to EN 60947-5-1:	AC-15: 230 VAC / 6 A DC-13: 24 VDC / 6 A
Switching capacity of the auxiliary contacts:	41-42: 24 VDC / 2 A 51-52, 51-54: 24 VDC / 1 A
Fuse rating for the auxiliary contact:	external (I_k = 1000 A) to EN 60947-5-1 41-42: Safety fuse 2.5 A quick blow, 2 A slow blow 51-52, 51-54: Safety fuse 1.25 A quick blow, 1 A slow blow
Electrical life:	Derating curve available on request
Mechanical life:	10 million operations
Safety contact values:	resistance max. 100 mΩ, AgSnO, self-cleaning, positive action

Mechanical data:

Connection type:	refer to 2.1 Ordering code
Cable section:	refer to 2.1 Ordering code
Connecting cable:	rigid or flexible
Tightening torque for the terminals:	0.5 Nm
Material of enclosure:	glass-fibre reinforced thermoplastic, ventilated
Weight:	24V-version: 320 g 115 / 230V-version: 470 g

Ambient conditions:

Ambient temperature:	–25°C … +60°C (non condensing)
Storage and transport temperature:	–40°C … +85°C (non condensing)
Degree of protection:	Enclosure: IP40 Terminals: IP20 Clearance: IP54
Resistance to shock:	10 g / 11 ms
Resistance to vibration in accordance with EN 60068-2-6:	10 ... 55 Hz, amplitude 0.35 mm
Altitude:	max. 2,000 m

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, EN 62061
PL:	up to e
Control category:	up to 3
DC:	high
CCF:	> 65 points
PFH_D:	≤ 2.0 x 10^{-8} / h
PFD_{avg}:	1.8 x 10^{-4}
SIL:	up to 3
Mission time:	20 years

The PFH value of 2.0 × 10^{-8}/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles ($n_{op/y}$) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t_{cycle}) for the relay contacts.
Diverging applications upon request.

Contact load	$n_{op/y}$	t_{cycle}
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

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 standard rail and push up until it latches in position.

3.2 Dimensions

All measurements in mm.

Device dimensions (H/W/D):

SRB303SQP-SS/PC: 100 x 45 x 121 mm
SRB303SQP-SS: 120 x 45 x 121 mm
SRB303SQP-SS/CC: 130 x 45 x 121 mm

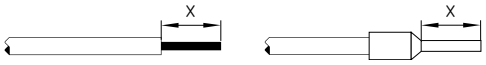
4. Electrical connection

4.1 General information for electrical connection

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

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.

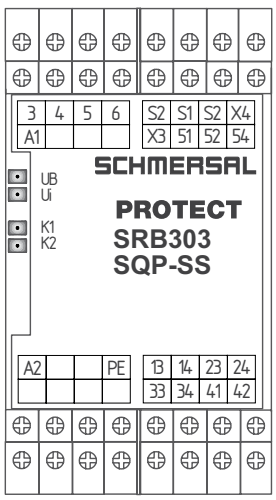
Settle length x of the conductor: 7 mm



5. Operating principle and settings

5.1 Description of the terminals and LED indications

Clip	Function	LED	Function
A1	Operating voltage +24 VDC / 24 VAC / 115VAC / 230VAC	**U_B** **U_i**	Operating voltage OK Internal fuse OK
A2	Operating voltage 0 VDC / 24 VAC / 115VAC / 230VAC		
S1	Output feedback circuit		
S2	Input feedback circuit / Output start circuit		
X3	Input external reset		
X4	Input automatic start		
3	Output safety edge channel 1		
5	Input safety edge channel 1	**K1**	Status K1
4	Output safety edge channel 2		
6	Input safety edge channel 2	**K2**	Status K2
41 / 42	Signalling contact (NC)		
51 / 52	Signalling contact (NC)		
51 / 54	Signalling contact (NO)		
13 / 14 **23 / 24** **33 / 34**	Safety releases		



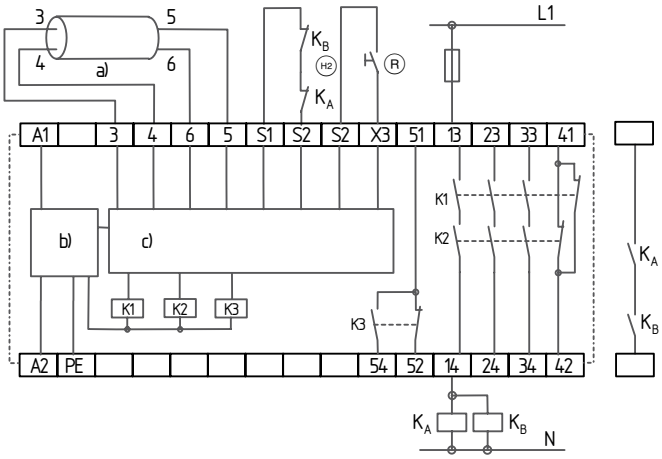
6. Wiring examples

6.1 Wiring example: Function SQP (External reset button)

Dual-channel control, shown for a safety edge and an external master reset button Ⓡ.

- The safety-monitoring module is activated by the reset (after release) of the reset button (= detection of the trailing edge). Faults in the reset button, e.g. welded contacts or manipulations which could lead to an inadvertent restart, are detected in this configuration and will result in an inhibition of the operation.
- Relay outputs: Suitable for 2-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, earth faults and cross-wire shorts in the monitoring circuit.
- Ⓗ2 = Feedback circuit

Signalling outputs must not be used in safety circuits.



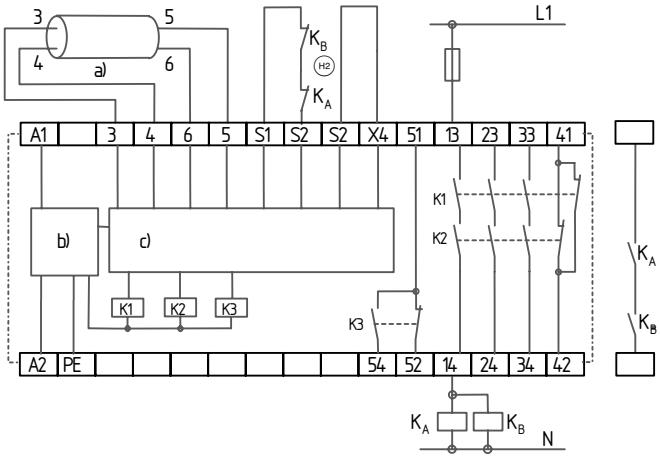
Key
a) Safety inputs
b) Power
c) Processing

6.2 Wiring example: Function SS (Automatic start)

Dual-channel control, shown for a safety edge

- The safety relay module is activated automatically when the feedback circuit is closed.
- Relay outputs: Suitable for 2-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, earth faults and cross-wire shorts in the monitoring circuit.
- Ⓗ2 = Feedback circuit

Signalling outputs must not be used in safety circuits.

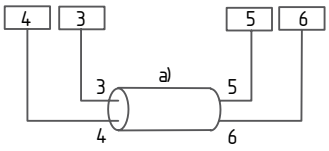


Key
a) Safety inputs
b) Power
c) Processing

6.3 Sensor configuration

Connection of a safety edge

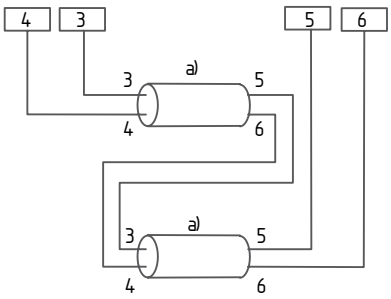
- This control detects wire breakage, earth leakage and cross faults in the drive circuits.
- Category 3 – PL e to EN ISO 13849-1 possible.



Key
a) Safety edge

Connection of multiple safety edges

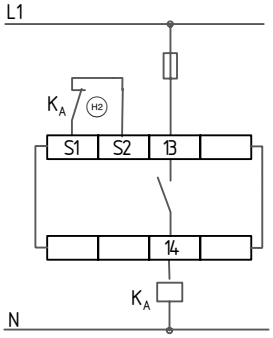
- This control detects wire breakage, earth leakage and cross faults in the drive circuits.
- Category 3 – PL e to EN ISO 13849-1 possible.



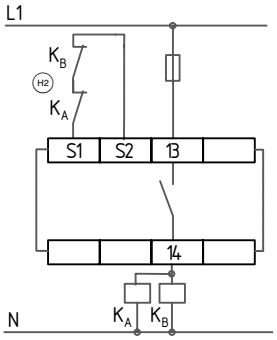
Key
a) Safety edge

6.4 Actuator configuration

Single-channel control with feedback circuit
- Suitable for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- If the feedback circuit is not required, establish a bridge.
- Ⓗ2 = Feedback circuit



Dual-channel control with feedback circuit
- Suitable for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- If the feedback circuit is not required, establish a bridge.
- Ⓗ2 = Feedback circuit



7. Set-up and maintenance

7.1 Commissioning
The safety relay module features degree of protection IP54 for installation in a switch cabinet.

7.2 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

7.3 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 13849-1) or SIL 2 with HFT (hardware fault tolerance) = 1 (according to EN 62061).

Damaged or defective components must be replaced.

8. Disassembly and disposal

8.1 Disassembly
The safety-monitoring module must be disassembled in a de-energised condition only.
Push up the bottom of the enclosure and hang out slightly tilted forwards.

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

9. EU Declaration of conformity

EU Declaration of conformity

SCHMERSAL

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:	SRB303SQP-SS
Type:	See ordering code
Description of the component:	Safety-monitoring module for the signal evaluation of safety edges
Relevant Directives:	Machinery Directive 2006/42/EC EMC-Directive 2014/30/EU RoHS-Directive 2011/65/EU
Applied standards:	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, 10. February, 2021

Authorised signature
Philip Schmersal
Managing Director

SRB303SQP-SS-B-DE

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

K.A. Schmersal GmbH & Co. KG
Möddinghofe 30, 42279 Wuppertal
Germany
Phone: +49 202 6474-0
Telefax: +49 202 6474-100
E-Mail: info@schmersal.com
Internet: www.schmersal.com