



EN Operating instructions..... pages 1 to 6
Translation of the original operating instructions

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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-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

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 proper functionality of the entire machinery 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 Elan catalogues or in the online catalogue on the Internet: www.schmersal.net.

The information contained in this operating instructions manual is provided without liability. 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 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 1088 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.

2 Product description

2.1 Ordering code

This operating instructions manual applies to the following types:

SRB 301HC/R-①

No.	Option	Description
①	24 V	24 VAC/DC
	230 V	48 ... 240 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 Destination and use

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 on sliding, hinged and removable safety guards as well as emergency stop control devices, safety mats (SMS from Schmersal) and two-hand controls to EN 574, III/C type.

The safety function is defined as the opening of enabling contacts 13-14, 23-24 and 33-34 when the inputs S13-S14 and/or S23-S24 are opened. The safety-relevant current paths with the output contacts 13-14, 23-24 and 33-34 meet the following requirements under observation of a B_{10d} value assessment (also refer to "Requirements to DIN EN ISO 13849-1"):

- control category 4 – PL e to DIN EN ISO 13849-1
- corresponds to SIL 3 to DIN EN 61508-2
- corresponds to SILCL 3 to DIN EN 62061
(corresponds to control category 4 to DIN EN 954-1)

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

2.4 Technical data

General data

Standards:	IEC/EN 60204-1, EN 60947-5-1; EN ISO 13849-1, IEC/EN 61508
Climate resistance:	EN 60068-2-78
Fixing:	Snap onto standard DIN rails to DIN EN 60715
Terminal designations:	EN 60947-1
Material of the enclosure:	glass-fibre reinforced thermoplastic, ventilated
Material of the contacts:	AgSnO, self-cleaning, positive drive
Weight:	24 V version: 320 g 230 V version: 340 g
Start conditions	Start button
Feedback circuit (Y/N):	Yes
Pull-in delay with start button:	typ. 50 ms
Drop-out delay in case of emergency stop:	typ. 20 ms
Drop-out delay on "supply failure":	typ. 100 ms
Bridging in case of voltage drops:	typ. 90 ms

Mechanical data

Connection type:	Screw terminals
Cable section:	min. 2 mm ² , max. 2 mm ²
Connecting cable:	rigid or flexible
Tightening torque for the terminals:	0.6 Nm
With removable terminals (Y/N):	Yes
Mechanical life:	10 million operations
Electrical life:	Derating curve available on request
Resistance to shock:	10 g / 11 ms
Resistance to vibrations to EN 60068-2-6:	10 ... 55 Hz, amplitude 0.35 mm

Ambient conditions

Ambient temperature:	–25°C ... +60°C
Storage and transport temperature:	–40°C ... +85°C
Protection class:	Enclosure: IP 40, Terminals: IP 20, Wiring compartment: IP 54
Air clearances and creepage distances to IEC/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 version: max. 1.4 W / 3.3 VA 230 V version: max. 1.6 W / 4.2 VA
Rated operating voltage U _e :	24 V-Version: – 24 VDC –15% / +20%, residual ripple max. 10% – 24 VAC –15% / +10% 230 V version: 48 ... 240 VAC
Frequency range:	50 Hz / 60 Hz
Max. fuse rating of the operating voltage:	24 V version: F1: internal electronic fuse, tripping current > 500 mA; secondary side: internal electronic fuse, tripping current > 0.12 A 230 V version: primary side: fuse, tripping current T 1 A

Monitored inputs

Cross-wire detection (Y/N):	Yes
Wire breakage detection (Y/N):	Yes
Earth leakage detection (Y/N):	Yes
Number of NO contacts:	0
Number of NC contacts:	2
Cable lengths:	1,500 m with 1.5 mm ² 2,500 m with 2.5 mm ²
Conduction resistance:	max. 40 Ω

Outputs

Number of safety contacts:	3
Number of auxiliary contacts:	1
Number of signalling outputs:	0
Switching capacity of the safety contacts:	13-14; 23-24; 33-34: max. 250 V, 8 A ohmic (inductive in case of appropriate protective wiring); min. 10 V / 10 mA
Switching capacity of the auxiliary contacts:	41-42: 24 VDC / 2 A
Fuse rating of the safety contacts:	8 A slow blow
Recommended fuse for the auxiliary contacts:	2 A slow blow
Utilisation category to EN 60947-5-1:	AC-15 / DC-13: EN 60947-5-1:2007
Dimensions (H/W/D):	100 mm x 45 mm x 121 mm
The data specified in this manual are applicable when the component is operated with rated operating voltage $U_e \pm 0\%$.	

2.5 Safety classification

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	Stop 0: up to e
Control category:	Stop 0: up to 4
DC:	Stop 0: 99% (high)
CCF:	> 65 points
SIL:	Stop 0: up to 3
Service life:	20 years
B _{10d} value (for one channel):	Low voltages range 20%: 20,000,000 40%: 7,500,000 60%: 2,500,000 80%: 1,000,000 Maximum load 100%: 400,000

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

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)

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

3 Mounting

3.1 General mounting instructions

Mounting: snaps onto standard DIN rails to EN 60715.

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

3.2 Dimensions

All measurements in mm.

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

Wiring examples: see appendix

5 Operating principle and settings

5.1 LED functions

- ON: ON: supply voltage is on. /
OFF: supply voltage missing, short-circuit between inputs S13-S14, S23-S24, internal power supply error
- IN A: ON: input S13-S14 closed /
OFF: input S13-S14 open or wire breakage
- IN B: ON: input S23-S24 closed /
OFF: input S23-S24 open or wire breakage
- OUT: ON: both internal relays are interconnected, when S13-S14 and S23-S24 are closed and the feedback circuit is closed /
OFF: when the inputs S13-S14 or S23-S24 or the feedback circuit are/is not closed

5.2 Description of the terminals

Voltages:	A1	+24 VDC / 24 VAC / 48 ... 230 VAC
	A2	0 VDC / 24 VAC
Inputs:	S13-S14	Input channel 1 (+)
	S23-S24	Input channel 2 (-)
Outputs:	13-14	First safety enabling circuit (stop 0)
	23-24	Second safety enabling circuit (stop 0)
	33-34	Third safety enabling circuit (stop 0)
Feedback circuit:	S23-X3	
Start:	S13-X2	Manual start (reset-button)
Signalling output:	41-42	Auxiliary contact

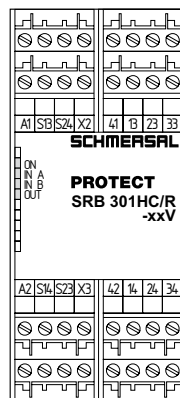


Fig. 1

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

Damaged or defective components must be replaced.

7 Disassembly and disposal

7.1 Disassembly

The safety control 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

Dual-channel control, shown for a guard door monitor; with two contacts A and B, where at least one is a positive break contact; with external reset button J (see Fig. 3)

- 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 and earth faults in the monitoring circuit.
- Cross-wire shorts between the monitoring circuits are detected.

⊕ = Feedback circuit

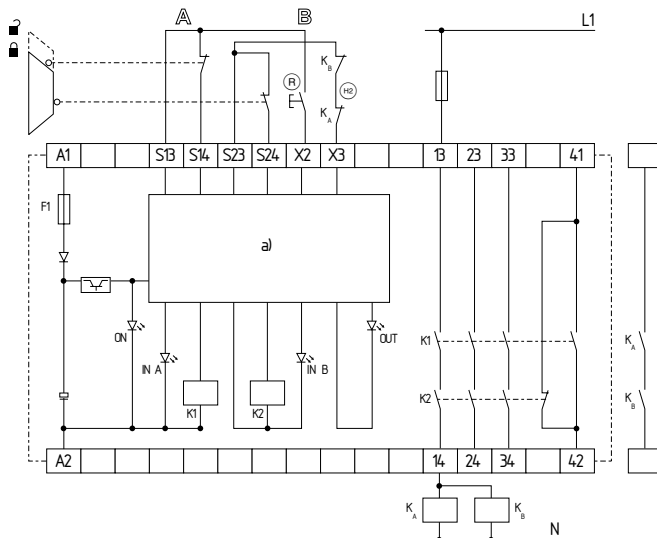


Fig. 2
a) Logic

8.2 Start configuration

External reset button (with edge detection) (see Fig. 3)

- The external reset button is integrated as shown.
- The safety-monitoring module is activated by the reset (after release) of the reset button (= detection of the falling 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.

External reset button (with edge detection) (see Fig. 4)

- When replacing the SRB 301HC/R, the reset button and the feedback circuit can be integrated as shown.
- The safety-monitoring module is activated by the reset (after release) of the reset button (= detection of the falling 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.

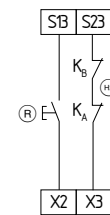


Fig. 3

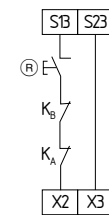


Fig. 4

8.3 Sensor configuration

Two-hand control to DIN EN 574 and EN 60204-1 (see Fig. 5)

- The SRB 301HC/R is designed for connecting two actuating elements, which are each antivalently equipped with an NC and an NO contact. Both actuating elements must be actuated simultaneously within a specific time of ≤ 0.5 s according to the type III/C requirements of EN 574. If this time is exceeded, both actuating elements must be released, before the restart can be initiated.
- Malfunction of every contact as well as earth leakages (not in the 230 V variant) and cross-wire shorts are detected.
- Feedback circuit ⊕: the safety-technical function of external positive-guided contactors is monitored by a series-wiring of the NC contacts as shown. In idle state, this circuit must be closed.
- Safety category III/C to DIN EN 574
- Control category 4 – PL e to DIN EN ISO 13849-1 possible

Dual-channel emergency stop circuit with command devices to DIN EN ISO 13850 (EN 418) and EN 60947-5-5 (Fig. 6)

- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are detected.
- Control category 4 – PL e to DIN EN ISO 13849-1 possible

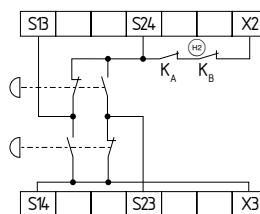


Fig. 5

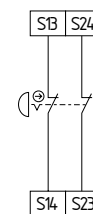


Fig. 6

Dual-channel guard door monitoring circuit with interlocking device to EN 1088 (Fig. 7)

- With at least one positive-break position switch
- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are detected.
- Control category 4 – PL e to DIN EN ISO 13849-1 possible

Safety mat to DIN EN 1760-1 (see Fig. 8)

- In combination with SMS safety mat (from Schmersal)
- With reset function
- The connection of the inputs is realised through the safety mat here.
- When the safety mat is actuated, the potentials of both inputs are connected, so that a cross-wire short is created and the device is safely shut down.
- Control category: 3 to EN 954-1
- Category 3 – PL "e" to DIN EN ISO 13849-1 possible

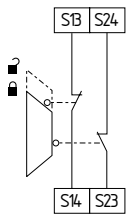


Fig. 7

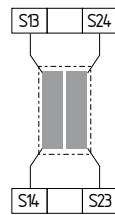


Fig. 8

8.4 Actuator configuration

Single-channel control with feedback circuit (Fig. 9)

- Suitable for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- S = feedback circuit:
If the feedback circuit is not required, establish a bridge.

Dual-channel control with feedback circuit (Fig. 10)

Suitable for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.

- \oplus = feedback circuit:
If the feedback circuit is not required, establish a bridge.

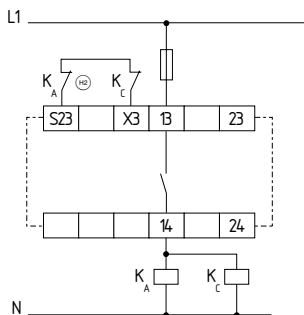


Fig. 9

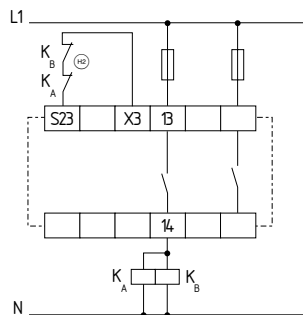


Fig. 10

Differentiated control with feedback circuit (Fig. 11)

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

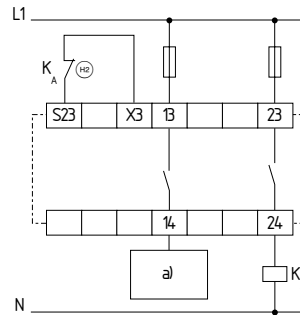

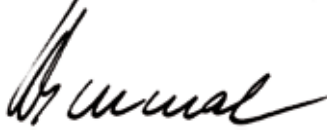


Fig. 11

a) Enabling signal controller

8.5 EC Declaration of conformity

	
EC Declaration of conformity	
Translation of the original declaration of conformity valid as of December 29, 2009	Elan Schaltelemente GmbH & Co. KG Im Ostpark 2 · 35435 Wettenberg Germany Internet: www.elan.de
We hereby certify that the hereafter described safety components both in its basic design and construction conforms to the applicable European Directives.	
Name of the safety component:	SRB 301HC/R-24V / -230V
Description of the safety component:	Safety-monitoring module for emergency stop circuits, guard door monitoring, safety mats and type III/C two-hand controls to EN 574
Harmonised EC-Directives:	2006/42/EC EC-Machinery Directive 2004/108/EC EMC-Directive
Person authorized for the compilation of the technical documentation:	Ulrich Loss Möddinghofe 30 42279 Wuppertal
Notified body, which approved the full quality assurance system, referred to in Appendix X, 2006/42/EC:	TÜV Rheinland Industrie Service GmbH Alboinstraße 56 12103 Berlin ID n°: 0035
Place and date of issue:	Wuppertal, October 6, 2009
SRB301HC-R-B-EN	
	Authorised signature
	Heinz Schmersal Managing Director



Note

The currently valid declaration of conformity can be downloaded from the internet at www.schmersal.net.



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