SCHMERSAL
Elan

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

FR Vous trouverez la version actuelle du mode d'emploi dans votre langue nationale officielle sur l'Internet, www.schmersal.net.

ES Encontrará el manual de instrucciones actual en su idioma oficial de la UE en nuestra página de Internet www.schmersal.net.

NL U vindt de huidige versie van de gebruikshandleiding in uw officiële landstaal op het Internet, www.schmersal.net.

IT Il manuale d'istruzioni aggiornato nella vostra lingua (lingua ufficiale UE) è scaricabile in Internet all'indirizzo www.schmersal.net.

JP EU公用語で書かれた最新の取扱説明書は、インターネット(www.schmersal.net)からダウンロードできます。

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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.

The entire concept of the control system, in which the safety component is integrated, must be validated to EN ISO 13849-2.

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 standards EN 1088 and EN ISO 13850 must be observed.

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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:

SRB 301MC

⚠ 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 or magnetic safety sensors for safety functions on sliding, hinged and removable safety guards as well as emergency stop control devices and AOPD's.

The safety function is defined as the opening of the enabling circuits 13-14, 23-24 and 33-34 when the inputs S11-S12 and/or S21-S22 are opened.
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 4 - PL e to DIN EN ISO 13849-1
– SIL 3 to DIN EN 61508-2
– SILCL 3 to DIN EN 62061
(meets the requirements of 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 61508
Climate resistance:	EN 60068-2-78
Fixing:	Snaps 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:	230 g
Start conditions	Automatic or start button
Feedback circuit (Y/N):	Yes
Pull-in delay for automatic start:	typ. 100 ms
Pull-in delay with reset button:	typ. 20 ms
Drop-out delay in case of emergency stop:	typ. 20 ms
Drop-out delay on "supply failure":	typ. 80 ms
Bridging in case of voltage drops:	typ. 80 ms
Mechanical data	
Connection type:	Screw terminals
Cable section:	min. 2 mm² / max. 2 mm²
Connecting cable:	rigid or flexible
Tightening torque for the terminals:	0.6 Nm
With removable terminals (Y/N):	No
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:	max. 2.0 W / 4.9 VA
Rated operating voltage U_{e1}:	24 VDC –15%/+20%, residual ripple max. 10% 24 VAC –15% / +10%
Frequency range:	50 Hz / 60 Hz
Max. fuse rating of the operating voltage:	internal electronic fuse, tripping current > 500 mA, reset after approx. 1 sec.
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 mm² 2.500 m with 2,5 mm²
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 suitable protective wiring); min. 10 V / 10 mA, residual current at ambient temperature up to 45°C: 24 A / 55°C: 18 A / 60°C: 12 A
Switching capacity of the auxiliary contacts:	**41-42:** 24 VDC / 2 A
Fuse rating of the safety contacts:	external (I_k = 1000 A) to EN 60947-5-1 Safety fuse 10 A quick blow, 8 A slow blow
Recommended fuse for the auxiliary contacts:	external (I_k = 1000 A) to EN 60947-5-1 Safety fuse 2,5 A quick blow, 2 A slow blow
Utilisation category to EN 60947-5-1:	AC-15 / DC-13: EN 60947-5-1
Dimensions (H/W/D):	100 mm x 22.5 mm x 121 mm

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 60947-5-1, DIN EN 574
PL:	up to e
Control category:	up to 4
PFH-value:	≤ 2,00 x 10^{-8}/h
SIL:	up to 3
Service life:	20 years

The PFH value of 2.00 x 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 (s / min)
20%	525,600	60 s / 1,0 min
40%	210,240	150 s / 2,5 min
60%	75,087	420 s / 7,0 min
80%	30,918	1020 s / 17 min
100%	12,223	2580 s / 43 min

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 22.5 x 121 mm

4 Electrical connection

4.1 General information for electrical connection

⚠ 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.

⚠ 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
- K1: Status channel 1
- K2: Status channel 2
- UB: Status operating voltage (LED is on, when the operating voltage on the terminals A1-A2 is ON)
- Ui: 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 Terminal description (see Fig. 1)

Voltages:	A1	+24 VDC/24 VAC
	A2	0 VDC/24 VAC
Inputs:	S11-S12	Input channel 1 (+)
	S12-S22	Input channel 2 (+)
	S21-S22	Input channel 2 (–) (with cross-wire short detection)
Outputs:	13-14	First safety enabling circuit
	23-24	Second safety enabling circuit
	33-34	Third safety enabling circuit
Start:	X1-X2	Feedback circuit and external reset
	41-42	Auxiliary NC contact

5.3 Notes

⚠ Signalling outputs 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).

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.
- When the front cover is open, the electrostatic discharge requirements must be respected and observed.
- After the setting, the front cover must be fitted back in position.

⚠ Only touch the components after electrical discharge!

Setting the switch (see Fig. 3)
- The cross-wire short monitoring function (factory setting) is programmed by means of the switch underneath the front cover of the safety-monitoring module.
- The switch must only be operated in de-energised condition by means of a finger or an insulated blunt tool.
- Pos. nQS (top), not cross-wire short proof: suitable for 1-channel applications and applications with outputs connected to potential in the control circuits.
- Pos. QS (bottom), cross-wire short proof: suitable for 2-channel applications without outputs connected to potential in the control circuits.

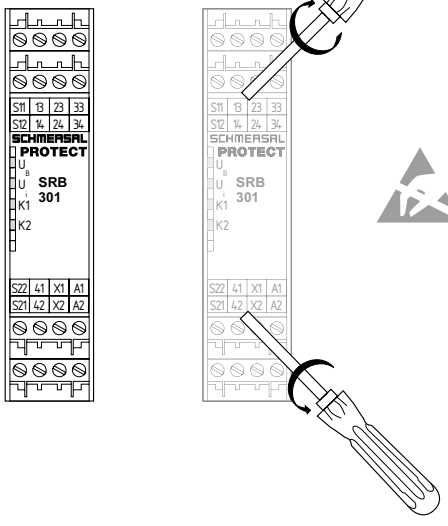

Fig. 1 Fig. 2 Fig. 3

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

The device has to be integrated into the periodic check-ups according to the Ordinance on Industrial Safety and Health, however at least 1x/year.

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.
Push up the bottom of the enclosure and hang out slightly tilted forwards.

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 position switches where one has a positive break contact; with external reset button Ⓡ (Fig. 4)
- 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.
- Ⓗ = Feedback circuit

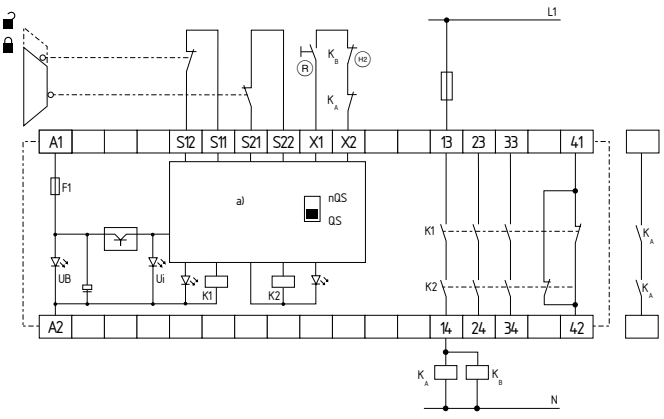

Fig. 4
a) Logic

8.2 Start configuration

External reset button (non-monitored start) (see Fig. 5)
- The external reset button is integrated in the feedback circuit in series.
- The safety-monitoring module is activated upon actuation of the reset button.

Automatic start (see Fig. 6)
- The automatic start is programmed by connecting the feedback circuit to the terminals X1/X2. If the feedback circuit is not required, establish a bridge.
- **Caution: Not admitted without additional measure due to the risk of gaining access by stepping behind!**
- When the SRB 301MC safety-monitoring module is used with the operating mode "Automatic start", an automatic restart after a shutdown in case of emergency must be prevented by the upstream control to EN 60204-1 paragraph 9.2.5.4.2.

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).

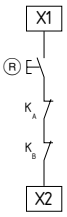

Fig. 5



Fig. 6

8.3 Sensor configuration

Single-channel emergency stop circuit with command devices to DIN EN ISO 13850 (EN 418) and EN 60947-5-5 (Fig. 7)
- Wire breakage and earth leakage in the control circuits are detected.
- Control category 1 – PL c 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. 8)
- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are not detected.
- Control category 4 – PL e to DIN EN 13849-1 possible (with protective wiring).

Dual-channel emergency stop circuit with command devices to DIN EN ISO 13850 (EN 418) and EN 60947-5-5 (Fig. 9)
- 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

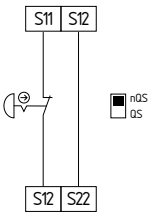

Fig. 7

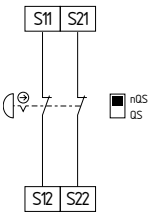

Fig. 8

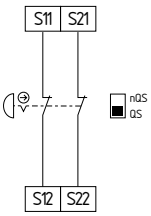

Fig. 9

Single-channel guard door monitoring circuit with interlocking devices to EN 1088 (Fig. 10)
- At least one contact with positive break required
- Wire breakage and earth leakage in the control circuits are detected.
- Control category 1 – PL c to DIN EN ISO 13849-1 possible

Dual-channel guard door monitoring circuit with interlocking device to EN 1088 (Fig. 11)
- At least one contact with positive break required
- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the monitoring circuits are not detected.
- Control category 4 – PL e to DIN EN 13849-1 possible (with protective wiring).

Dual-channel guard door monitoring circuit with interlocking device to EN 1088 (Fig. 12)
- At least one contact with positive break required
- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the monitoring circuits are detected.
- Control category 4 – PL e to DIN EN ISO 13849-1 possible

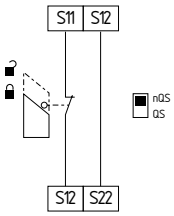

Fig. 10

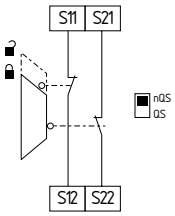

Fig. 11

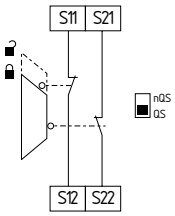

Fig. 12

Dual-channel control of a safety-related electronic (microprocessor-based) safety guard with p-type transistor outputs e.g. AOPD's to EN IEC 61496 (see Fig. 13)
- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are usually detected by the safety guards. The safety-monitoring module therefore is not equipped with a cross-wire short detection here.
- Control category 3 – PL e to DIN EN ISO 13849-1 possible
- If cross-wire shorts in the control circuits are detected by the safety guard: control category 4 – PL e to DIN EN ISO 13849-1 possible.

2-channel control of magnetic safety switches according to EN 60947-5-3 (see Fig. 14)
- The control system recognises wire breakage and earth faults in the control circuit.
- Cross-wire shorts between the control circuits are not detected.
- Control category 3 – PL e to DIN EN ISO 13849-1 possible

2-channel control of magnetic safety switches according to EN 60947-5-3 (see Fig. 15)
- The control system recognises wire breakage and earth faults in the control circuit.
- Cross-wire shorts between the control circuits are detected.
- Control category 4 – PL e to DIN EN ISO 13849-1 possible

The connection of magnetic safety switches to the SRB 301 MC safety-monitoring module is only admitted when the requirements of the standard EN 60947-5-3 are observed.

As the technical data are regarded, the following minimum requirements must be met:
– switching capacity: min. 240 mW
– switching voltage: min. 24 VDC
– switching current: min. 10 mA

For example, the following safety sensors meet the requirements:
– BNS33-02z-2187, BNS33-02zG-2187
– BNS260-02z, BNS260-02zG
– BNS260-02-01z, BNS260-02-01zG

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 %
– 24 VAC with a max. tolerance of –5 %/+10 %

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.

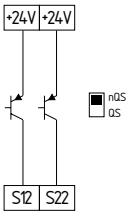

Fig. 13

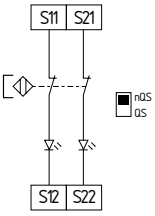

Fig. 14

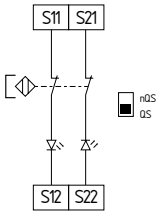

Fig. 15

8.4 Actuator configuration

Single-channel control (see Fig. 16)
- 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.
- H2 = Feedback circuit

Dual-channel control with feedback circuit (Fig. 17)
- 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.
- H2 = Feedback circuit

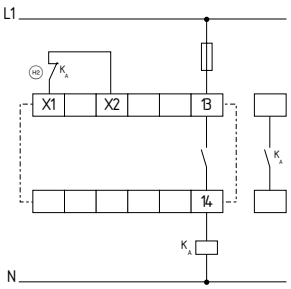

Fig. 16

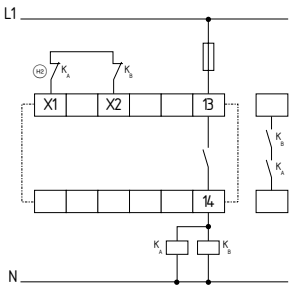

Fig. 17

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 301MC
Description of the safety component:	Safety-monitoring module for emergency stop circuits, guard door monitoring, magnetic safety switches and AOPD's
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

Authorised signature
Heinz Schmersal
Managing Director

SRB301MC-B-EN

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

CE

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