



EN Operating instructions.pages 1 to 8
Original

Content

1 About this document

1.1 Function 1

1.2 Target group: authorised qualified personnel. 1

1.3 Explanation of the symbols used 1

1.4 Appropriate use 1

1.5 General safety instructions 1

1.6 Warning about misuse 2

1.7 Exclusion of liability 2

2 Product description

2.1 Ordering code 2

2.2 Special versions. 2

2.3 Purpose 2

2.4 Technical data 2

2.5 Safety classification 3

3 Mounting

3.1 General mounting instructions 3

3.2 Dimensions 3

4 Electrical connection

4.1 General information for electrical connection. 3

5 Operating principle and settings

5.1 LED functions. 3

5.2 Description of the terminals 3

5.3 Set-up instructions 4

6 Set-up and maintenance

6.1 Functional testing. 4

6.2 Maintenance 4

7 Disassembly and disposal

7.1 Disassembly. 4

7.2 Disposal 4

8 Appendix

8.1 Wiring examples 5

8.2 Sensor configuration 6

8.3 Actuator configuration 6

8.4 Flow diagram 6

9 EU Declaration of conformity

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 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: www.schmersal.net.

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications.



The entire concept of the control system, in which the safety component is integrated, must be validated to 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 standard 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:

SRB 202MSL



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 or semi-conductor sensors to initiate a muting function.

The safety function is defined as the opening of enabling circuits 13-14 and 23-24 when the inputs S11-S12 and/or S22-S23 are opened. The safety-relevant current paths with output contacts 13-14 and 23-24 meet the following requirements under observation of a B_{10D} value assessment (also refer to "Requirements of ISO 13849-1"):

- Control category 4 - PL e to ISO 13849-1
- SIL 3 to IEC 61508
- SILCL 3 to IEC 62061

To determine the Performance Level (PL) to 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

Standards:	IEC 60204-1, IEC 60947-5-1, ISO 13849-1, IEC 61508, IEC 61496-1
Climate resistance:	EN 60068-2-78
Mounting:	snaps onto standard DIN rail to EN 60715
Terminal designations:	IEC 60947-1
Material of the housings:	Plastic, glass-fibre reinforced thermoplastic, ventilated
Material of the contacts:	AgSnO, AgNi, self-cleaning, positive drive
Weight:	400 g
Start conditions:	by external muting sensors
Feedback circuit (Y/N):	yes
Pull-in delay:	typ. 200 ms
Drop-out delay in case of emergency stop:	typ. 20 ms
Drop-out delay on "supply failure":	typ. 60 ms
Time difference muting sensors:	typ. 2.5 sec
Mechanical data:	
Connection type:	Screw connection
Cable section:	min. 0,25 mm ² / max. 2,5 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 vibration in accordance with 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
Protection class:	Enclosure: IP40 Terminals: IP20 Clearance: IP54
Air clearances and creepage distances to IEC 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. 5.6 W plus signalling outputs and muting indicators
Rated operating voltage U_e :	24 VDC -15% / +20%, residual ripple max. 10%
Fuse rating for the operating voltage:	F1: Internal electronic trip, tripping current > 1.25 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 length:	1,500 m mit 1.5 mm ² 2,500 m mit 2.5 mm ²
Conduction resistance:	max. 40 Ω
Current and voltage at:	S11-S12: 23 VDC / 60 mA S22-S23: 0 VDC / 60 mA
Outputs:	
Number of safety contacts:	2
Number of auxiliary contacts:	0
Number of signalling outputs:	3
Switching capacity of the safety contacts:	
- 13-14, 23-24:	24 VDC, 4 A ohmic (inductive in case of appropriate protective wiring), DC-13: 24 VDC / 2 A
Fuse rating of the safety contacts:	4 A slow blow
Switching capacity of the signalling outputs:	L54 / L84: max. 50 mA Muting indicators LA1 / LA2: 24 V / max. 0.5 A, min. 150 mA
Fuse rating of the signalling outputs:	LA1 / LA2, F2, F3 = T 0.5 A

Utilisation category to IEC 60947-5-1:	DC-13: IEC 60947-5-1
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 $U_e \pm 0\%$.

-  Use copper conductors only.
- Use 60°C/75°C conductors.
- Use No. 28-12 AWG wire size only.
- Tightening torque: 5 lb in.
- Use 60/75°C wire only.

2.5 Safety classification

Standards:	ISO 13849-1, IEC 61508, IEC 60947-5-1, IEC 61496-1
PL:	up to e
Control category:	up to 4
DC:	Stop 0: 99% (high)
CCF:	> 65 points
SIL:	up to 3
Mission time:	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 standard 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 IEC 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 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.

Wiring examples: see appendix.

5. Operating principle and settings

5.1 LED functions

- K1: Status reset
- K2: Status channel 1
- K3: Status channel 2
- K4: Status monitoring channel 1
- K5: Status monitoring channel 2
- LA: Status LA1-LA2
- UB: 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 VDC
	A2	0 VDC
Inputs:	S11-S12	Input channel S1-S3 (+)
	S12-S13	Input channel S1-S3 (-)
	S21-S22	Input channel S2-S4 (+)
	X1-MR	Master reset
Outputs:	13-14	First safety enabling circuit (STOP 0)
	23-24	Second safety enabling circuit (STOP 0)
	X13-14	Bridging first enabling circuit
	X23-24	Bridging second enabling circuit
	LA1-LA2	Muting lamp
Start:	X1-X2	Feedback circuit
Signalling outputs:	L54	Signalling output
	L84	Signalling output

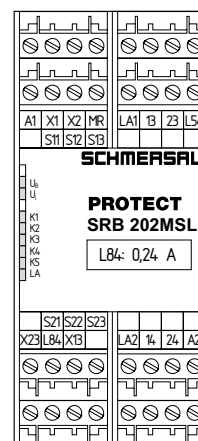


Fig. 1

5.3 Set-up instructions

According to IEC 61496-1 (paragraph A.7.2.2), a failure of the signal light must cause a bridged condition to be avoided. The signalling output L84 is used to avoid that the immediate activation of the emergency stop function of the SRB 202MSL in case of failure of only one of both muting lamps, so that the operator has the opportunity to exchange the defective lamp in due time. This function increases the availability of the system and prevents the shutdown of a relatively expensive plant due to a simple lamp failure. To set this signalling output, the following steps must be executed:

- Prior to switching the supply voltage (24 VDC) on, check the proper connection of the SRB 202MSL and connect a muting lamp to the outputs LA1 and LA2 (min. 150 mA, max. 500 mA).
- The enclosure must be opened to set the signalling output L84. To open the front cover, insert a slotted screwdriver in the top and bottom cover notch and gently lift it (Fig. 2). When the front cover is open, the electrostatic discharge requirements must be respected and observed. After setting, the front cover must be fitted back in position.
- Bring the SRB 202MSL in muting condition (actuate the sensors S1 and S2 within the timeframe).
- Check if the muting lamp is on.
- Connect a voltmeter to output L84 and the 0V potential and turn the lamp trimmer R1 (Fig. 3) until the signal condition of output L84 changes from 24V to 0V.
- Remove the muting lamp at the outputs LA1 and LA2. The signal condition of output L84 changes to 0V. Reconnect the muting lamp.
- The set lamp current must be entered on the front cover.

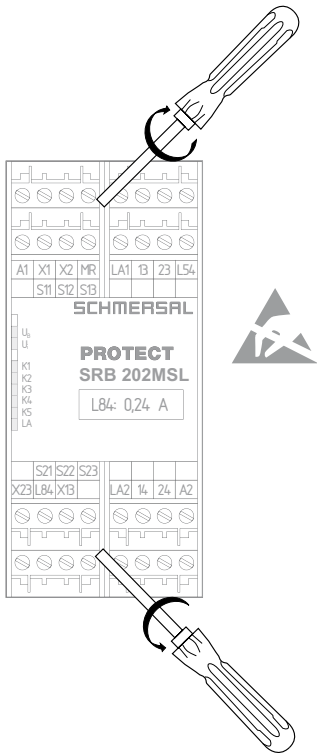


Fig. 2



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



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 ISO 13849-1) or SIL 3 with HFT (hardware fault tolerance) = 1 (according to IEC 62061)
- at least every 12 months for PL d with category 3 (according to ISO 13849-1) or SIL 2 with HFT (hardware fault tolerance) = 1 (according to IEC 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

Dual-channel control, shown for 2 muting sensors and an external master 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 and earth faults in the monitoring circuit.
- Cross-wire shorts between the monitoring circuits are detected.
- Electronic fuse F1: 1.25 A
- (H2) = Feedback circuit

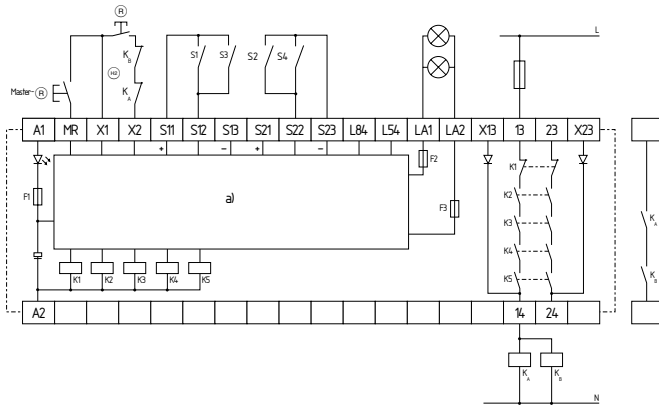


Fig. 4:
b) Logic and lamp monitoring

Wiring examples AOPD* with relay outputs and muting sensors with potential-free contacts

* Active Optoelectronic Protective Device, e.g. safety light grids etc., formerly also known as ESD (= electro-sensitive safety device)

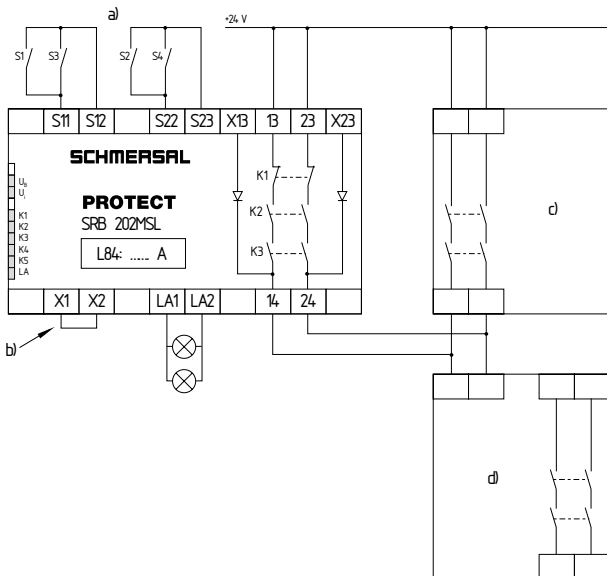


Fig. 5
a) Muting sensors,
b) Bridge,
c) AOPD (relay outputs),
d) Schmersal-SRB

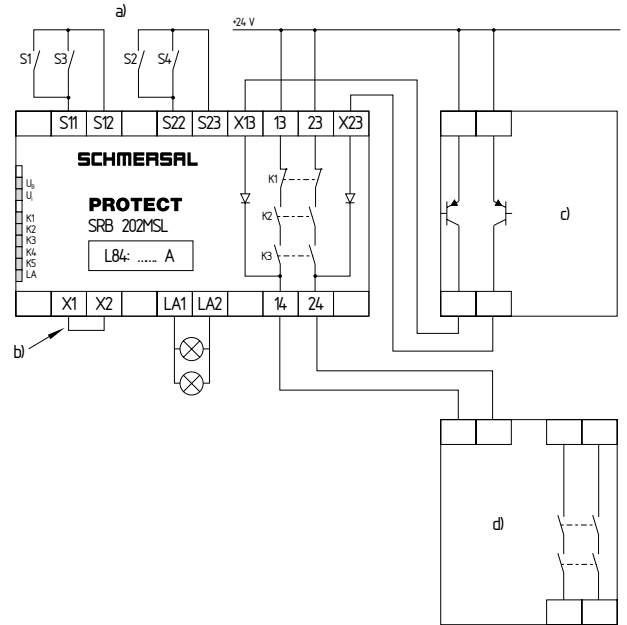


Fig. 6
a) Muting sensors,
b) Bridge,
c) AOPD (semi-conductor outputs),
d) Schmersal-SRB

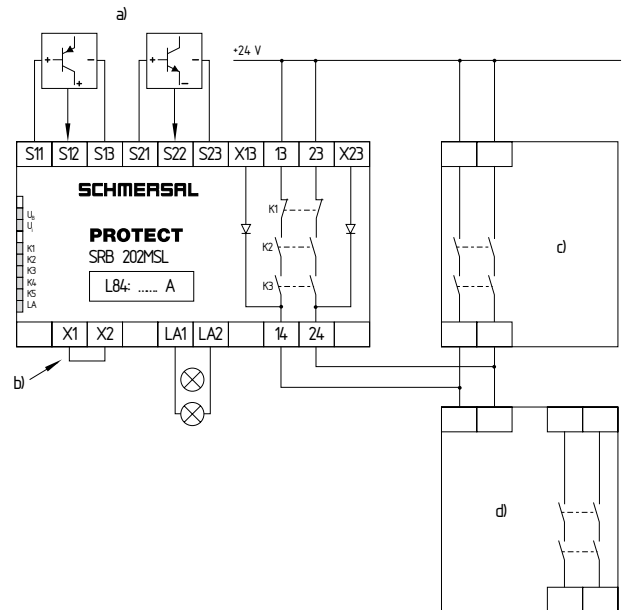


Fig. 7
a) Semi-conductor muting sensors,
b) Bridge,
c) AOPD (relay outputs),
d) Schmersal-SRB

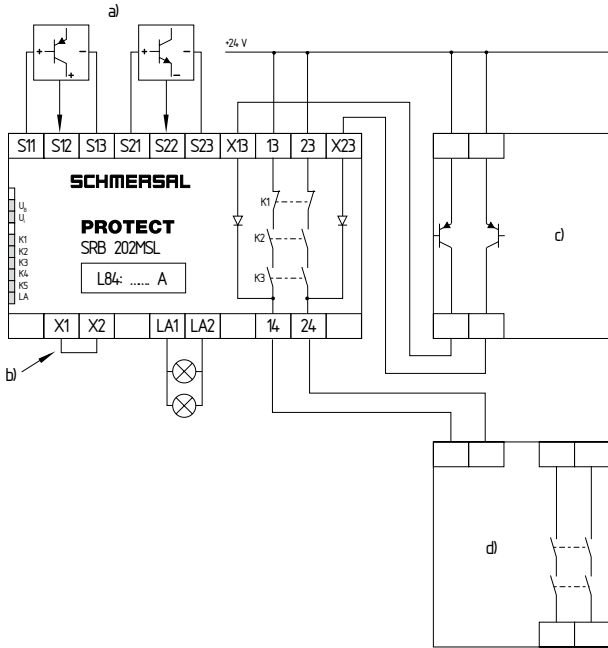


Fig. 8
a) Semi-conductor muting sensors,
b) Bridge,
c) AOPD (semi-conductor outputs),
d) Schmersal-SRB

8.2 Sensor configuration

Dual-channel muting circuit (Fig. 9)

- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the muting sensors are detected.
- With external reset button
- The reset button is integrated in the feedback circuit in series.
- If the reset button is not required, establish a bridge.
- Category 4 – PL e to ISO 13849-1 possible.

Master reset (Fig. 10)

- The master reset pushbutton must be connected to terminal X1-MR.
- The master reset enables resetting a locked safety-monitoring module. The input MR reacts on a rising edge.

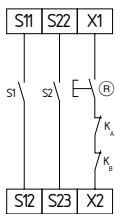


Fig. 9

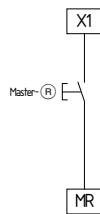


Fig. 10

8.3 Actuator configuration

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

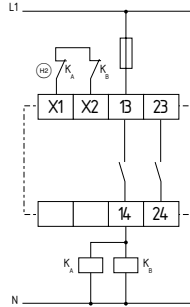


Fig. 11

8.4 Flow diagram

see Fig. 12

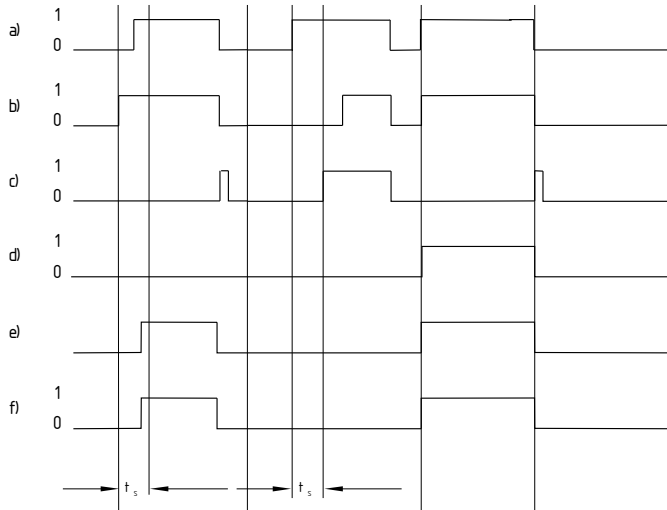


Fig. 12

- a) Bypass switch S1,
- b) Bypass switch S2,
- c) Simultaneity indication L54,
- d) Signalling output L84 (lamp current),
- e) Lamp current LA1-LA2,
- f) Output contacts 13-14 / 23-24 potential-free,
- g) uninterrupted workcycle,
- h) Synchronous actuation fault $t_s > 2.5$ s,
- i) Muting indicator defective

9. EU Declaration of conformity

EU Declaration of conformity



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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: SRB202MSL

Description of the component: Safety-monitoring module for emergency stop circuits and guard door monitoring

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 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
Alboinstr. 56, 12103 Berlin
ID n°: 0035

Person authorised for the compilation of the technical documentation:
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Place and date of issue: Wuppertal, 22. November 2017

Authorised signature
Philip Schmersal
Managing Director

SRB202MSL-C-EN



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



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