SCHMERSAL
Elan

EN Operating instructions..... pages 1 to 8
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 und 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.

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.

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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.

2 Product description

2.1 Ordering code

This operating instructions manual applies to the following types:

SRB 202①		
No.	**Option**	**Description**
①	CS	Reset **not monitored**, optionally automatic reset*
	CS/T	Reset **monitored***
	CA	Reset **not monitored**, optionally automatic reset*, switch-off level 2 with antivalent inputs
	CA/T	Reset **monitored***, switch-off level 2 with antivalent inputs, cross-wire short detection*
	CA/Q	Reset **not monitored**, optionally automatic reset*, switch-off level 2 with antivalent inputs
	CA/QT	Reset **monitored***, switch-off level 2 with antivalent inputs, cross-wire short detection*

* with reference to switch-off level 1

⚠ 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 enabling circuits 13-24 when the inputs S31-S32 and/or S41-S42 (S43-S44) are opened and as the opening of enabling circuits 13-14 and 13-24 when the inputs S12 and/or S22 are opened.The safety-relevant current paths with the output contacts 13-14 and 13-24 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:	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, AgNi, self-cleaning, positive drive
Weight:	235 g
Start conditions	Automatic or start button (Refer to 2.1 Ordering code)
Feedback circuit (Y/N):	Yes
Pull-in delay with reset button:	Switch-off level 1: typ. 40 ms Switch-off level 2: typ. 0.5 sec.
Drop-out delay in case of emergency stop:	typ. 50 ms
Mechanical data	
Connection type:	Screw connection
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):	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 … +45°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. 4.4 W
Rated operating voltage U_e:	24 VDC –15%/+20%, residual ripple max. 10%
Max. fuse rating of the operating voltage:	electronic fuse, tripping current > 1 A; reset after approx. 1 sec.
Monitored inputs	
Cross-wire detection (Y/N):	Refer to 2.1 Ordering code
Wire breakage detection (Y/N):	Yes
Earth leakage detection (Y/N):	Yes
Number of NO contacts:	CS, CS/T: 0 pc. CA, CA/T, CA/Q, CA/QT: 1 pc.
Number of NC contacts:	CS, CS/T: 4 pc CA, CA/T, CA/Q, CA/QT: 3 pc
Current and voltage limitation of the control contacts:	**S31-S32, S43-S44:** 26 VDC / 100 mA26 VDC / 100 mA
Cable lengths:	1-channel without cross-wire short detection: – 1,500 m = 1.5 mm² – 2,500 m = 2.5 mm² 2-channel with or without cross-wire short detection
Conduction resistance:	max. 40 Ω

Outputs	
Number of safety contacts:	2
Number of auxiliary contacts:	2
Switching capacity of the safety contacts:	**13-14; 13-24:** max. 250 V, 6 A ohmic (inductive in case of appropriate protective wiring) max. residual current 6 A
Switching capacity of the auxiliary contacts:	**31-32, 31-42:** 24 VDC / 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: EN 60947-5-1:2007
Dimensions (H/W/D):	100 mm x 22.5 mm x 121 mm

The data specified in this manual is 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
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

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

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)

(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 22.5 x 121 mm
with plugged-in terminals: 120 × 22.5 × 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 channel A
- K2: Status channel B
- K3: Status channel C
- K4: Status channel D
- 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 VDC
	A2	0 VDC
Inputs:	S12	Switch-off level 1, input channel 1
	S22	Switch-off level 2, input channel 2
	S31-S32	Switch-off level 2, input channel 1
	S41-S42	Switch-off level 2, input channel 2 (SRB 202CS, 202CS/T)
	S43-S44	Switch-off level 2, input channel 2 (SRB 202CA, SRB 202CA/T, SRB 202CA/Q, SRB 202CA/QT)
Outputs:	13-14	First safety enabling circuit (stop 0), switch-off level 1
	13-24	Second safety enabling circuit (stop 0), switch-off level 2
	31-32	Auxiliary NC contact, switch-off level 1 (must not be used in safety circuits)
	31-42	Auxiliary NC contact, switch-off level 2 (must not be used in safety circuits)
Start:	X1	Feedback circuit, manual start (reset button), automatic start, switch-off level 1
	X2	Feedback circuit, manual start (reset button), automatic start, switch-off level 2

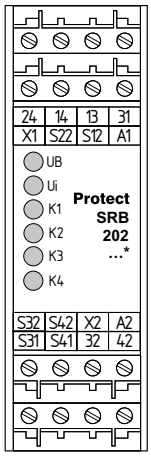

Fig. 1

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

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 a emergency stop circuit; with two contacts A and B and a guard door monitor with two contacts C and D, where at least one is a positive break contact; with external reset button Ⓡ (related on the switch-off level 1) (see Fig. 2)

- 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.
- Ⓜ = Feedback circuit

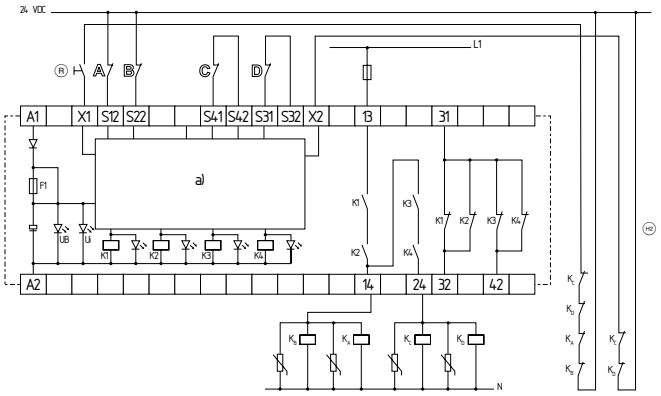

Fig. 2: SRB 202CS, 202CS/T
a) Logic

Dual-channel control, shown for a emergency stop circuit; with two contacts A and B and a guard door monitor with two contacts C and D, where at least one is a positive break contact; with external reset button Ⓡ (related on the switch-off level 1) (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 of the emergency stop circuit detects wire breakage and earth faults (cross-wire shorts in the SRB 202CA/QT and SRB 202CA/Q versions). The control system of the door monitoring circuits detects wire breakage, earth faults and cross-wire shorts.
- Ⓜ = Feedback circuit

Channel B of SRB 202CA/Q and SRB 202CA/QT: 0 V – S22 (see Fig. 4)

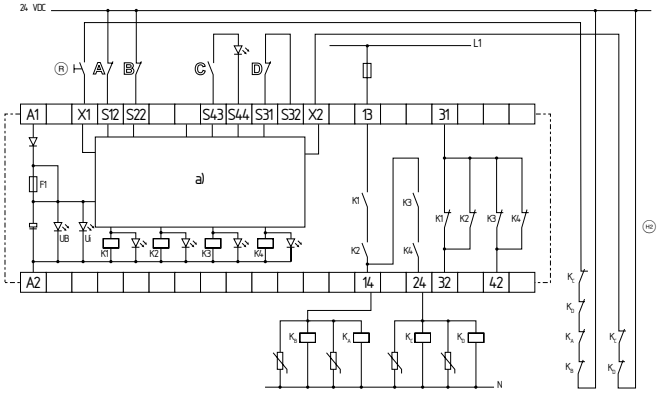

Fig. 3: SRB 202CA, 202CA/T, SRB 202CA/Q, SRB 202CA/QT
a) Logic

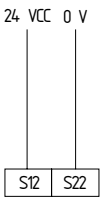

Fig. 4

8.2 Start configuration

External reset button (Fig. 5)
- The external reset button is wired to the terminals X1 (without edge detection for switch-off level 1) and X2 (without edge detection for switch-off level 2).
- The external reset button is integrated in the feedback circuit in series.

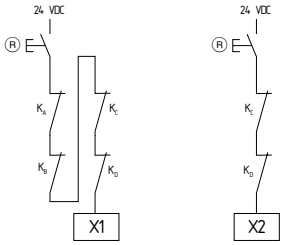

Fig. 5
left = switch-off level 1
right = switch-off level 2 (SRB 202CA, SRB 202CS and SRB 202CA/Q)

External reset button (Fig. 6)
- The external reset button is wired to the terminals X1 (with edge detection for switch-off level 1) and X2 (without edge detection for switch-off level 2).
- The external reset button is integrated in the feedback circuit in series.

* Automatic start at switch-off level 2: the reset button Ⓡ must be replaced with a bridge.

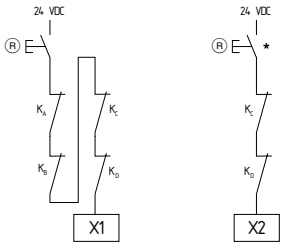

Fig. 6
left = switch-off level 1
right = switch-off level 2 (SRB 202CA/T, SRB 202CS/T and SRB 202CA/QT)

Automatic start (see Fig. 7)
- The automatic start is programmed by connecting the feedback circuit to the terminals X1 (referring to the switch-off level 1) and X2 (referring to the switch-off level 2). Feedback circuits are not required to be replaced by a bridge.
- When the 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 and 10.8.3.

* An external reset button for a manual start can be installed in switch-off level 2.

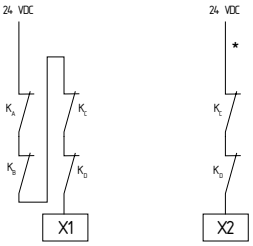

Fig. 7
left = switch-off level 1
right = switch-off level 2 (SRB 202CA, SRB 202CS and SRB 202CA/Q)

8.3 Sensor configuration

8.3.1 Sensor configuration superordinated switch-off level 1

Single-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.

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 not detected.**

Dual-channel emergency stop circuit with command devices to DIN EN ISO 13850 (EN 418) and EN 60947-5-5 (Fig. 10)
- Wire breakage and earth leakage in the control circuits are detected.
- Cross-wire shorts between the control circuits are detected.

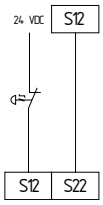

Fig. 8
SRB 202CA,
SRB 202CS,
SRB 202CA/T,
SRB 202CS/T

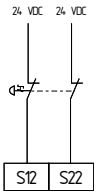

Fig. 9
SRB 202CA,
SRB 202CS,
SRB 202CA/T,
SRB 202CS/T

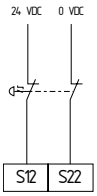

Fig. 10
SRB 202CA/Q,
SRB202CA/QT

8.3.2 Sensor configuration, partially functioning switch-off level 2

Single-channel guard door monitoring circuit with interlocking devices to EN 1088 (Fig. 11)
- With one positive-break position switch.
- Wire breakage and earth leakage in the control circuits are detected.

Dual-channel guard door monitoring circuit with interlocking device to EN 1088 (Fig. 12)
- With at least one positive-break position switch
- The control system recognises wire-breakage and earth faults in the control circuit.
- Cross-wire shorts between the control circuits **are not detected.**

Dual-channel guard door monitoring circuit with interlocking device to EN 1088 (Fig. 13)
- With at least one positive-break position switch
- The control system recognises wire-breakage and earth faults in the control circuit.
- Cross-wire shorts between the control circuits are detected.

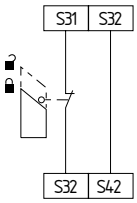

Fig. 11
SRB 202CS,
SRB 202CS/T

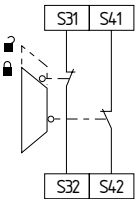

Fig. 12
SRB 202CS,
SRB 202CS/T

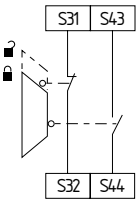

Fig. 13
SRB 202CA,
SRB 202CA/T,
SRB 202CA/Q,
SRB 202CA/QT

8.3.3 Sensor configuration

Dual-channel control of magnetic safety switches to EN 60947-5-3 (see Fig. 14)

- The control system recognises wire-breakage, earth faults and cross-wire shorts in the control circuits.

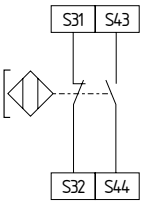

Fig. 14
SRB 202CA, SRB 202CA/T, SRB 202CA/Q, SRB 202CA/QT

The connection of magnetic safety switches to the SRB 202C.. safety-monitoring modules is only admitted when the requirements of the standard EN 60947-5-3 are observed.

As the technical data are regarded, at least the following requirements must be met:

- Switching capacity: min. 3 W
- Switching voltage: min. 30 VDC
- Switching current: min. 10 mA

For example, the following safety sensors from Schmersal meet the requirements:

- BNS 33-11z, BNS 33-12z-2063, BNS 33-11z-2063
- BNS 250-11z
- BNS 120-11z
- BNS 180-11z
- BNS 303-11z

Caution! 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.

8.4 Actuator configuration

Single-channel control (see Fig. 15)

- 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.
- A = switch-off level 1, B = switch-off level 2

* Disabling of the enabling circuits 13-14, 13-24 when switch-off level 1 is triggered, disabling of the enabling circuit 13-24 when switch-off level 2 is triggered

Dual-channel control (Fig. 16)

- 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.
- A = switch-off level 1, B = switch-off level 2

* Disabling of the enabling circuits 13-14, 13-24 when switch-off level 1 is triggered, disabling of the enabling circuit 13-24 when switch-off level 2 is triggered

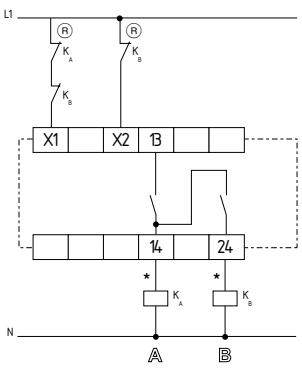

Fig. 15

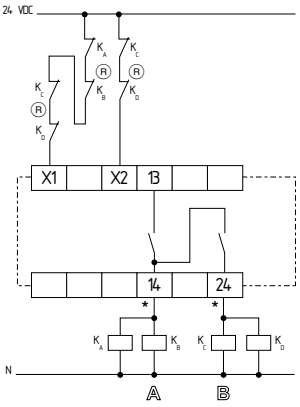

Fig. 16

8.5 Flowcharts

SRB 202CA, SRB 202CS, SRB 202CA/Q
see Fig. 17

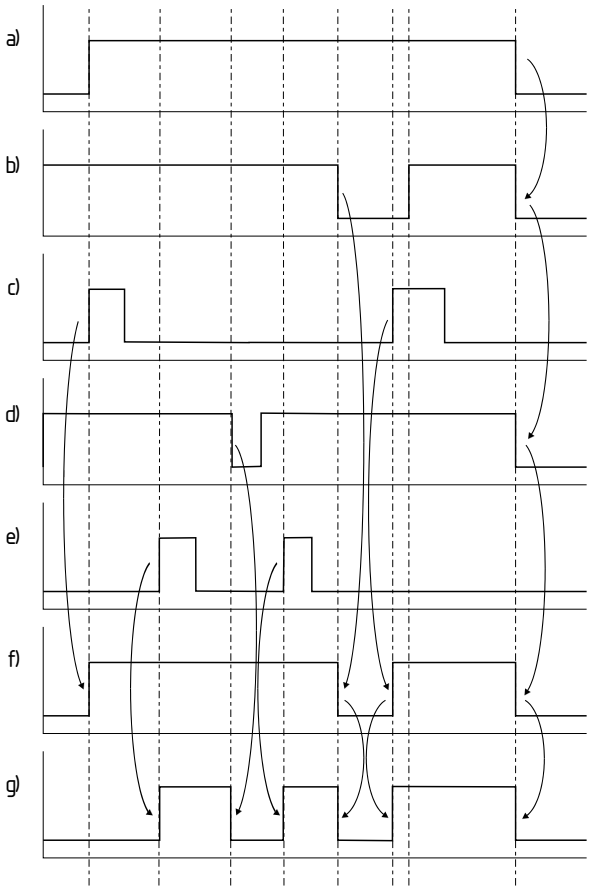

Fig. 17
a) U_B;
b) Sensor level 1;
c) Reset switch-off level 1;
d) Sensor level 2;
e) Reset switch-off level 2;
f) Authorized operation 13-14 switch-off level 1;
f) Authorized operation 13-24 switch-off level 2;

SRB 202CA/T, SRB 202CS/T, SRB 202CA/QT
see Fig. 18

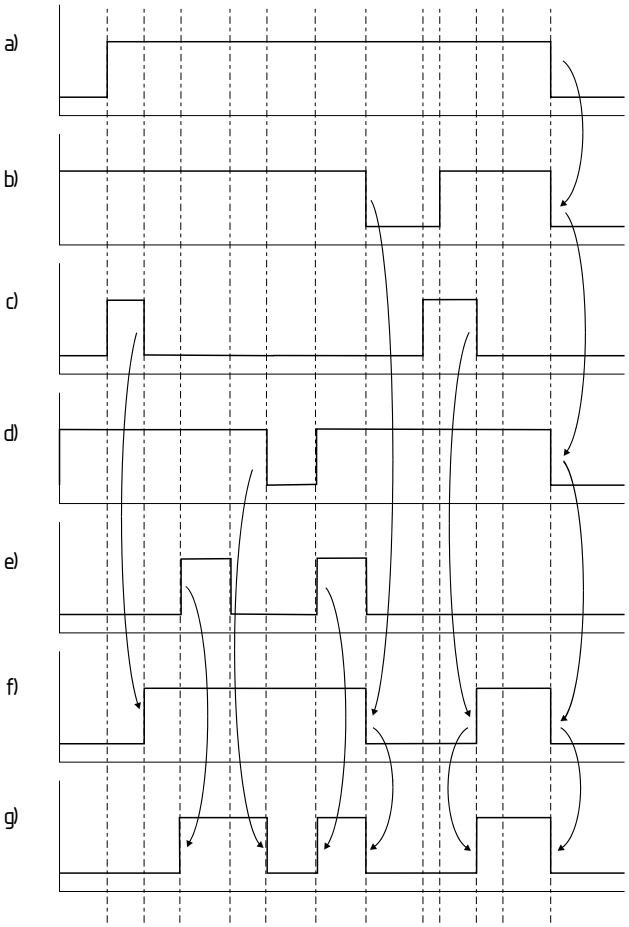

Fig. 18
a) U_B;
b) Sensor level 1;
c) Reset switch-off level 1;
d) Sensor level 2;
e) Reset switch-off level 2;
f) Authorized operation 13-14 switch-off level 1;
f) Authorized operation 13-24 switch-off level 2;

8.6 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 202CS / SRB 202CS/T / SRB 202CA/T / SRB 202CA/QT / SRB 202CA / SRB 202CA/Q
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

SRB202C...-B-EN

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

CE

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