INSTRUÇÕES DE OPERAÇÃO E MONTAGEM

Módulo de segurança multifuncional SRB-E-301MC

Conteúdo

1 About this document

1.1 Function

This document provides all the information you need for the mounting, set-up and commissioning to ensure the safe operation and disassembly of the switchgear. The operating instructions must be available in a legible condition and a complete version in the vicinity of the device.

1.2 Target group of the operating instructions: authorised qualified personnel

All operations described in the 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 Schmersal range of products is not intended for private consumers.

The products described in these operating instructions are developed to execute safety-related functions as part of an entire plant or machine. It is the responsibility of the manufacturer of a machine or plant to ensure the correct functionality of the entire machine or plant.

The safety-monitoring module must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of applications can be found in the chapter "Product description".

1.5 General safety instructions

The user must observe the safety instructions in this operating instructions manual, the country specific installation standards as well as all prevailing safety regulations and accident prevention rules.

Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: products.schmersal.com.

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

There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

1.6 Warning about misuse

In case of inadequate or improper use or manipulations of the component, personal hazards or damage to machinery or plant components cannot be excluded.

1.7 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting or failure to comply with the 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

Product type description: SRB-E-301MC-(1)(2)

	Signalling contact 41/42, NC contacts in parallel
20	Signalling contact 41/42, normally closed contacts in series

(2)	
	Plug-in screw clamps: single wire (rigid) or fine wire (flexible): 0.2 ... 2.5 mm²; fine wire with ferrule: 0.25 ... 2.5 mm²
CC	Plug-in cage clamps: single wire (rigid) or fine wire (flexible): 0.2 ... 1.5 mm²; fine wire with ferrule: 0.25 ... 1.5 mm²

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

2.2 Special versions

For special versions, which are not listed in the ordering code, these specifications apply accordingly, provided that they correspond to the standard version.

2.3 Purpose

The safety relay 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 safety sensors for safety functions on sliding, hinged and removable safety guards as well as emergency stop control devices, safety solenoid switches and AOPDs.

The safety function is defined as deactivating outputs 13/14, 23/24, 33/34 when inputs S12 and/or S22 are opened. Taking account of a PFH value assessment, the safety-relevant current paths meet the following requirements (see also chapter 2.6 “Safety classification”):

- Category 4 / PL e to DIN EN ISO 13849-1
- SIL 3 to IEC 61508 and DIN EN 62061

The safety relay module is to be operated in an area in which access by personnel is restricted.

All applications for 1 or 2 channel fail-safe signal evaluation for the following guard systems:
• Guard door monitoring in accordance with EN ISO 14119
• Positive-break position switches in accordance with EN 60947-5-1
• Safety sensors in accordance with EN 60947-5-3
• Emergency-stop command devices in accordance with EN ISO 13850 and EN 60947-5-5
• Safety magnetic switches in accordance with EN 60947-5-3
• Safety light grids and barriers in accordance with EN 61496

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

The entire concept of the control system, in which the safety component is integrated, must be validated to the relevant standards.

2.4 Technical Data

The data specified in this manual are applicable when the component is operated with rated operating voltage Ue ±0%.

Air clearances and creepage distances of the safety contacts
The safety contacts comply with the requirements for basic insulation.

Note about the safety classification

The PFH value of 6.0×10^{-9}/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles ($n_{op/y}$). At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t_{cycle}) for the relay contacts. Diverging applications upon request.

Contact load	$n_{op/y}$	t_{cycle}
20 %	880,000	0.6 min
40 %	330,000	1.6 min
60 %	110,000	5.0 min
80 %	44,000	12.0 min
100 %	17,600	30.0 min

Propriedades globais

Instruções	EN IEC 62061 EN ISO 13849-1 EN IEC 60947-5-1 EN IEC 60947-5-3 EN IEC 60947-5-5 EN IEC 61508 EN IEC 60204-1 EN IEC 60947-1
Stress climático	EN 60068-2-78
Material do invólucro	Plástico, termoplástico reforçado com fibra de vidro, auto-extinção de fogo
Peso bruto	175 g

Propriedades globais - Características

Fusível eletrónico	Sim
Deteção de quebra do cabo	Sim
Reconhecimento de curto-circuito	Sim
Terminais amovíveis	Sim
Entrada iniciação	Sim
Circuito de retorno	Sim
Função de reinício automático	Sim
Deteção de fuga à terra	Sim
Indicação integrada, estado	Sim
Número de contactos auxiliares	1
Número de LED's	5
Número de normalmente fechados	2
Número de contactos de segurança, STOP 0	3

Classificação

Certificados	EN ISO 13849-1 EN IEC 62061 EN IEC 61508

Categoria Stop	0

Avaliação de segurança - Saídas de relé

Performance Level, até	e
Categoria de controlo	4
Nível de cobertura de diagnóstico (DC)	> 99 %
Valor PFH	6,00 x 10^{-9} /h
Valor PFD	4,00 x 10^{-5}
Safety Integrity Level (SIL), apropriado para aplicações em	3
Vida útil	20 Jahr(e)
Falha de causa comum (CCF), mínimo	65

Dados mecânicos

Resistência mecânica, Mínimo	10 000 000 Schaltspiele
Fixação	Fixação rápida para perfil normalizado segundo IEC 60715

Dados mecânicos - Tecnologia conectiva

Designação dos terminais	IEC 60947-1
Tipo de conexão	rígido ou flexível Conexão por parafuso, conectáveis
Secção dos cabos de conexão, mínimo	0,25 mm²
Secção dos cabos de conexão, máximo	2,5 mm²
Binário de aperto dos terminais	0,5 Nm

Dados mecânicos - dimensões

Largura	22,5 mm
Altura	98 mm
Profundidade	115 mm

Ambiente

Tipo de proteção de invólucro	IP40
Tipo de proteção do espaço de instalação	IP54
Tipo de proteção do bornes ou terminais	IP20
Temperatura ambiente	-25 ... +60 °C
Temperatura para armazenar e transportar	-40 ... +85 °C
Resistência à vibração	10 ... 55 Hz, amplitude 0,35 mm

Resistência a impactos	30 g / 11 ms

Ambiente - Parâmetros de isolamento

Medição da rigidez dielétrica da tensão máxima U_{imp}	4 kV
Categoria de sobre-tensão	III
Grau de contaminação por sujeira	2

Dados elétricos

Faixa de frequência	50 Hz 60 Hz
Tensão de operação	24 VAC -15 % / +10 % 24 VDC -15 % / +20 %
ondulação remanescente	10 %
Medição da tensão de operação	24 VAC
Medição da tensão de operação	24 VDC
Tensão nominal CA mínima para controlos, 50 Hz, mínimo	20,4 VAC
Tensão nominal CA mínima para controlos, 50 Hz, máximo	26,4 VAC
Tensão nominal CA mínima para controlos, 60 Hz, mínimo	20,4 VAC
Tensão nominal CA mínima para controlos, 60 Hz, máximo	26,4 VAC
Medição da tensão de comando DC, mínimo	20,4 VDC
Medição de tensão de comando DC, máximo	28,8 VDC
Potência admissão elétrica	2,9 W
Potência admissão elétrica	5 VA
Resistência de contacto, máximo	0,1 Ω
Orientação (Resistência de contacto)	em perfeitas condições
Desativação retardada em caso de queda de energia da rede, típico	80 ms
Desativação retardada em caso de PARAGEM DE EMERGÊNCIA, típico	20 ms
Ligação atrasada no arranque automático, típico	100 ms
ligação atrasada no RESET, típico	20 ms
Frequência de comutação, máximo	0,3 Hz
Material dos contactos, elétrico	Ag-Ni, auto limpante, contactos com guia positivo

Dados elétricos - Saídas de relé seguras

Voltagem, categoria de aplicação AC-15	230 VAC
Potência, categoria de aplicação AC-15	4 A
Voltagem, categoria de aplicação DC-13	24 VDC
Potência, categoria de aplicação DC-13	4 A

Capacidade de comutação, mínimo	10 VDC
Capacidade de comutação, mínimo	10 mA
Capacidade de comutação, máximo	250 VAC
Capacidade de comutação, máximo	6 A

Dados elétricos - Entradas digitais

Resistência de condução, máximo	40 Ω

Dados elétricos - Saídas de relé (contactos auxiliar)

Capacidade de comutação, máximo	24 VDC
Capacidade de comutação, máximo	1 A

Dados elétricos - Compatibilidade eletromagnética (EMV)

Imunidade a interferência	Diretiva CEM

Indicação de estado

Estados funcionais exibidos	Posição dos relés K2 Posição dos relés K1 Tensão interna de operação U_{i}sub> USB: Tensão de alimentação presente

Dados gerais

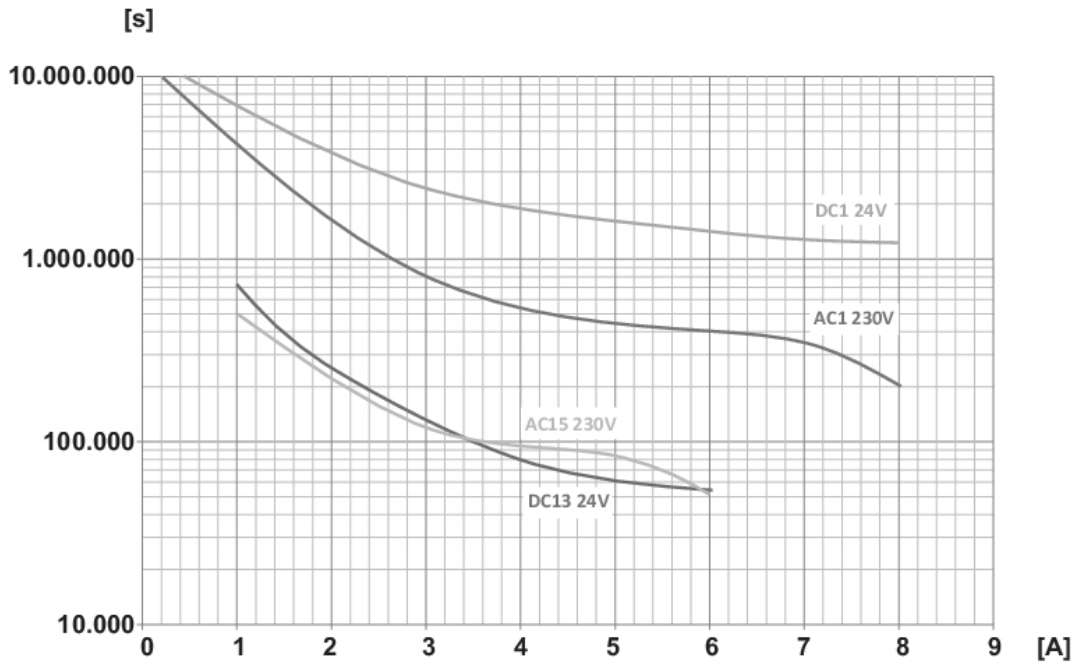
Orientação (Aplicações de aplicação)	Sensor de segurança Dispositivo de segurança Dispositivo de segurança giratório Botão "Paragem de Emergência" Interruptor de emergência - acionamento por cabo Cortina ótica de segurança Barreiras óticas de segurança

2.5 Derating / electrical lifespan of safety contacts

No derating with individual installation of modules.

Derating on request if several modules are installed one after the other without spacing and with maximum output load and ambient temperatures.

Electrical life of the safety contacts



Legend
A Contact load in ampere
s switching cycles

3 Mounting

3.1 General mounting instructions

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

Mounting: snaps onto standard DIN rails to EN 60715.

Hook bottom of enclosure in standard rail and push down until it engages in position.

3.2 Dimensions

Device dimensions (H/W/D): 98 x 22.5 x 115 mm

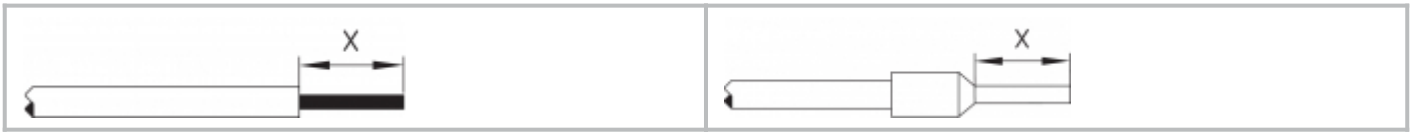
4 Electrical connection

4.1 General information for electrical connection

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

To avoid EMC disturbances, the physical ambient and operational conditions at the place where the product is installed, must meet the provisions laid down in the paragraph "Electromagnetic Compatibility (EMC)" of EN 60204-1.

Settle length x of the conductor: 7 mm



The connection of magnetic safety switches to the SRB-E-... safety relay module is only admitted when the requirements of the standard EN 60947-5-3 are observed.
The following minimum requirements must be met:
• switching capacity: min. 240 mW
• switching voltage: min. 24 VDC
• switching current: min. 10 mA

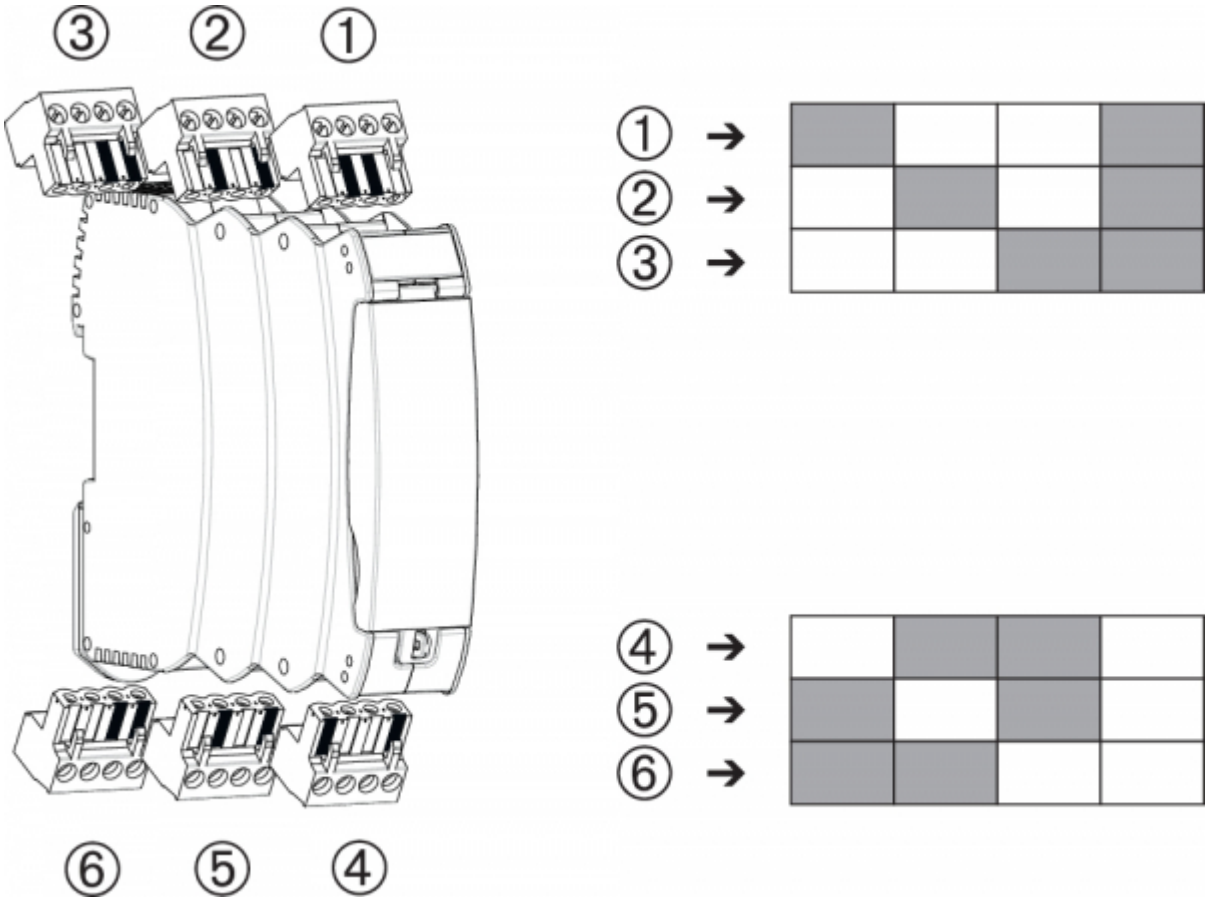
For example, the following safety sensors meet the requirements:
• BNS 36-02Z(G), BNS 36-02/01Z(G)
• BNS 260-02Z(G), BNS 260-02/01Z(G)

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 %

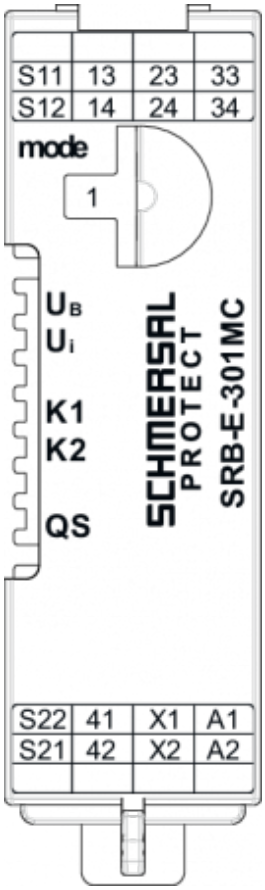
Otherwise availability problems could occur, especially in series-wired sensors, where a voltage drop in the control circuit is triggered by LEDs for instance.

4.2 Coding of connecting terminals

The plug-in terminal blocks must be arranged according to the coding shown,



4.3 Pin configuration and LED displays



Clip	Function	LED	Function
A1	Operating voltage + 24 VDC / 24 VAC	U_B U_i	Operating voltage OK Internal fuse OK
A2	Operating voltage 0 V / 24 VAC		
	GND	QS	Cross-wire monitoring active
X1	Output start circuit / feedback circuit		
X2	Input start circuit / feedback circuit		
S11	Output channel 1		+ 24 VDC
S21	Output channel 2		+ 24 VDC without QS 0V with QS
S12	Input channel 1	K1	Status K1
S22	Input channel 2	K2	Status K2
41/22	Signalling contact (NC)		
13/14, 23/24, 33/34	Safety outputs		

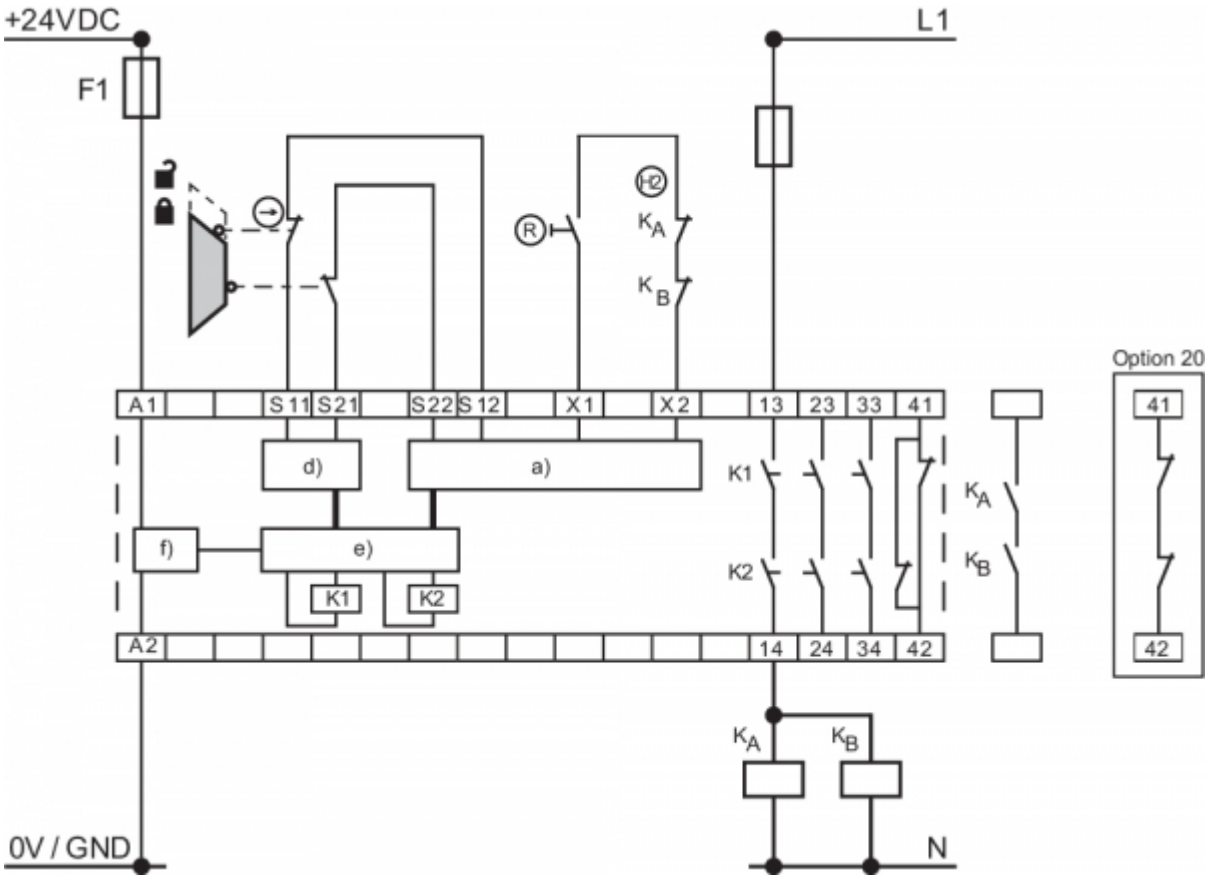
4.4 Wiring examples and configuration

Dual-channel control, shown for a guard door monitor with two position switches where one has a positive break contact; with external reset button (R)

• Performance level: two-channel actuation, suitable for ↲increasing capacity or number of contacts by means of contactor ↲or relay with positive action contacts

• (H2) = feedback circuit

Signalling outputs must not be used in safety circuits.

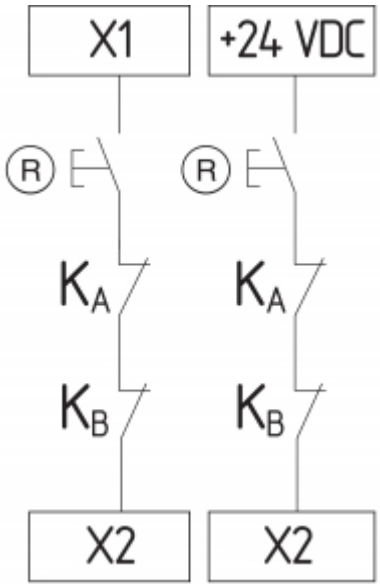


Key	
a)	Safety inputs
d)	Outputs
e)	Logic
f)	Input voltage

4.5 Start configuration

4.5.1 External reset button

• The external reset button is integrated in the feedback circuit in series.
• The manual start or the activation of the module occurs when the button is pressed (not when it is released!).

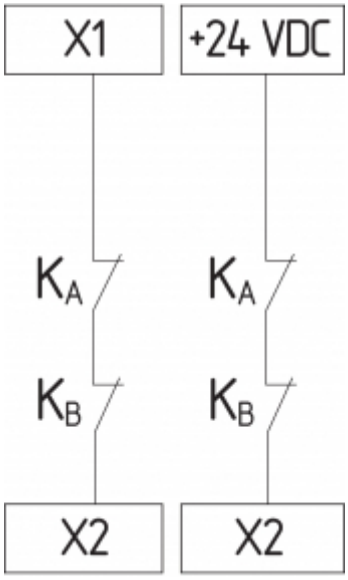


4.5.2 Feedback circuit / Automatic start

• 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.

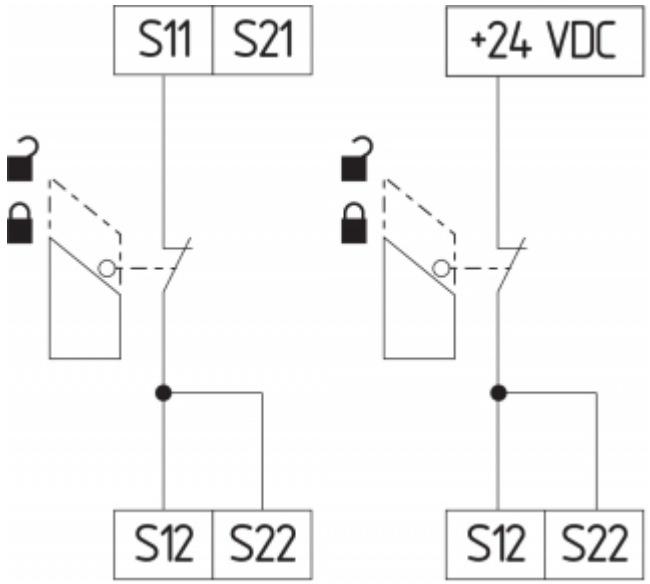
Not admitted without additional measure due to the risk of gaining access by stepping behind.

Within the meaning of EN 60204-1 paragraph 9.2.3.4.2, the operating mode "automatic start" is only restrictedly admissible. In particular, any inadvertent restart of the machine must be prevented by other suitable measures.



4.6 Sensor configuration

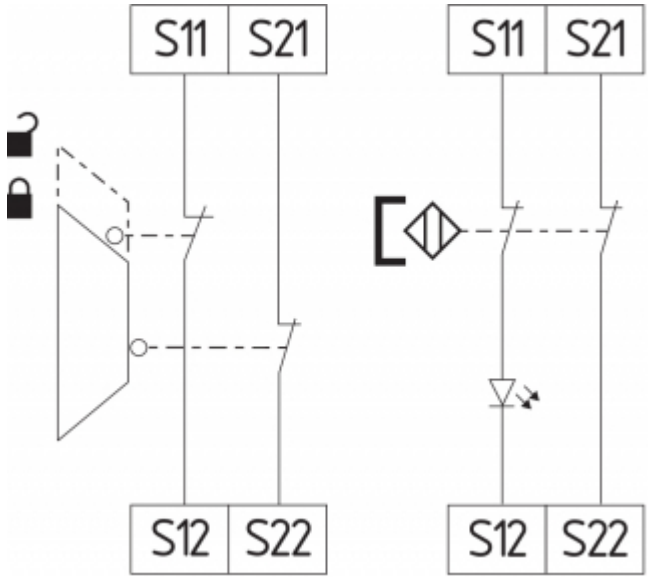
Single channel signal processing



Rotary switch position	Function
2, 6, 10, 14	without cross-wire monitoring

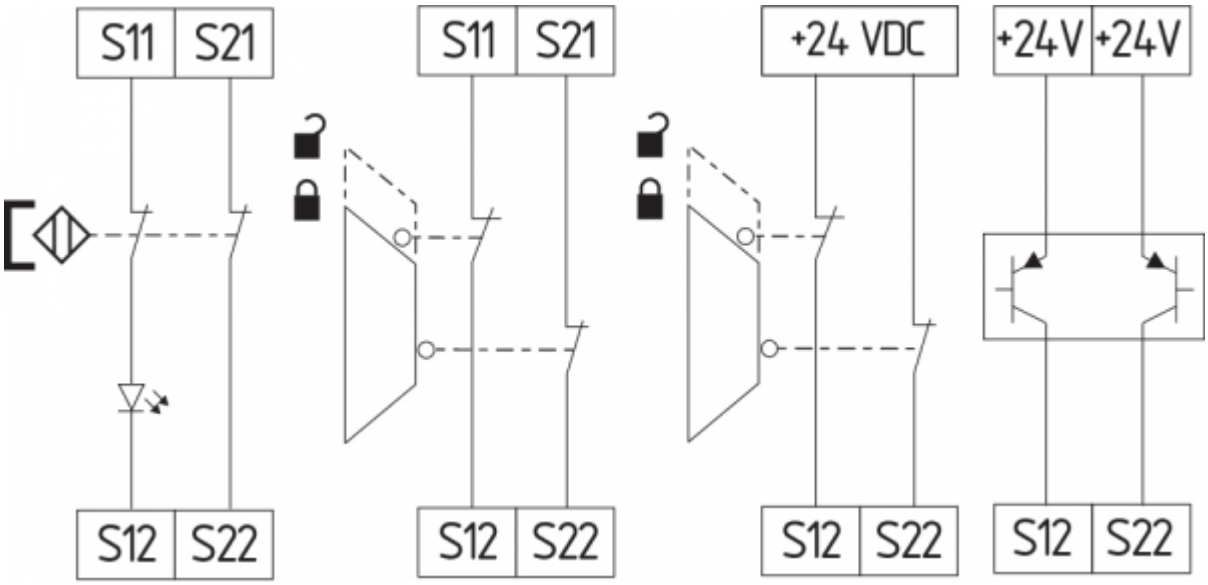
Dual channel signal processing NC / NC

With cross-circuit monitoring
(category 4 – PL e to DIN EN ISO 13849-1 possible)



Rotary switch position	Function
1, 5, 9, 13	with cross-wire monitoring

Without cross-circuit monitoring
(Cat. 4 - PL e to EN ISO 13849-1 only possible with protective wiring)



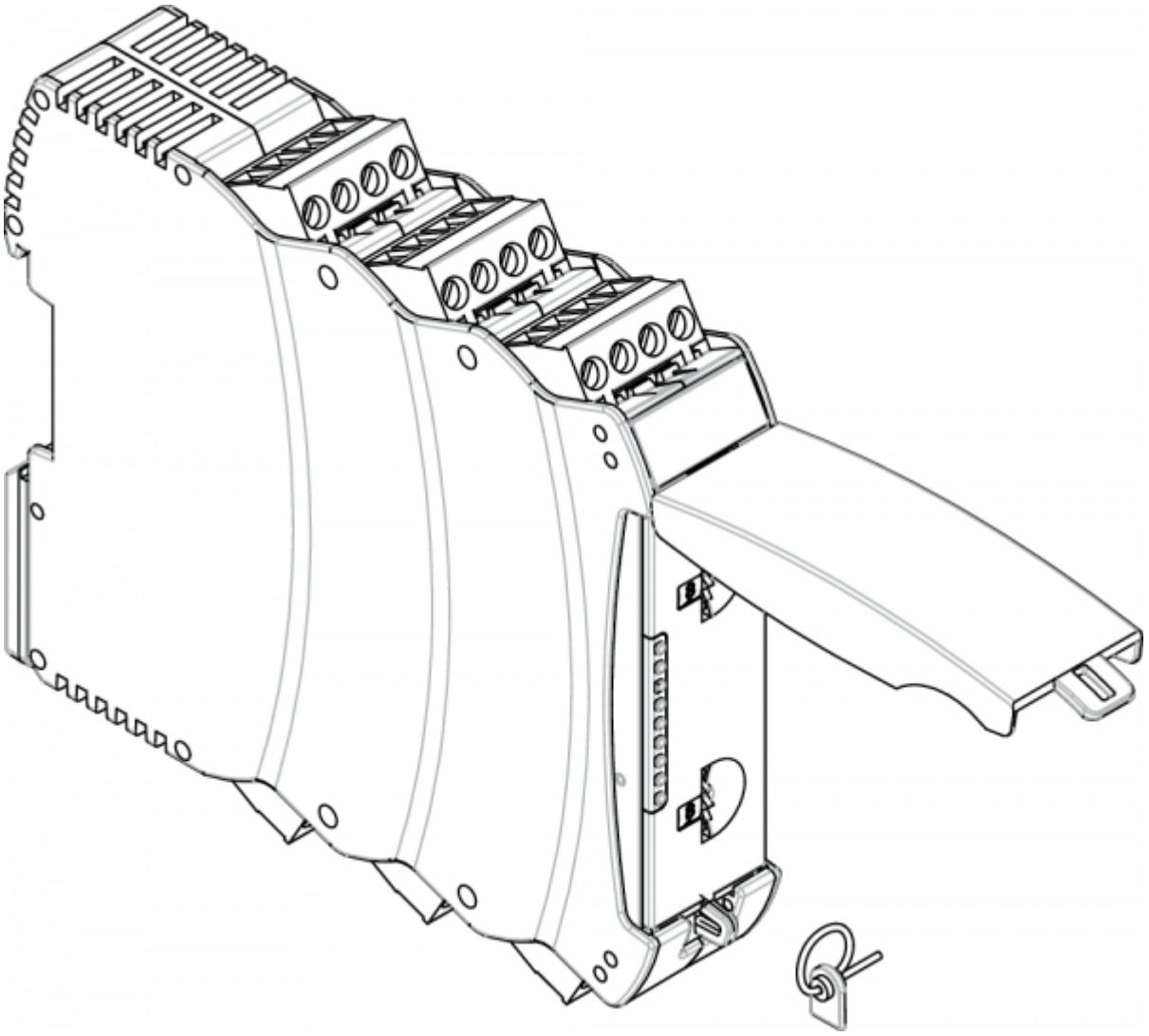
Rotary switch position	Function
2, 6, 10, 14	without cross-wire monitoring

5 Settings

The safety relay module is delivered ready for operation.
Application 1 is preset in the factory.

Only touch the components after electrical discharge.

Adjustment of application using rotary “mode” switch
• Open front transparent cover (see fig.).
• Opening is carried out by lifting side with lock.
• Select desired application using rotary mode switch by turning up or down (see 5.3).
• After performing setting, close front cover again.
• Front cover can be secured with a lead seal to protect it from being opened unintentionally



5.1 Adjustable applications

Rotary switch position	Reset button / feedback circuit	Cross-wire monitoring active	Input- / Sensor configuration
1, 5, 9, 13	Yes	Yes	NC / NC
2, 6, 10, 14	Yes	No	NC / NC

5.2 Changing setting or application

Description / procedure	Rotary (mode) switch	System response	LED indications		
			U_B	U_i	QS
Factory setting	Position 1	Ready for application 1	-	-	-
Switch operating voltage on	Position 1	Ready for application 1	Lights up	Lights up	Lights up
Change SRB-E application					
Switch off operating voltage	Setting application 2		-	-	-
Switch operating voltage on		Ready for application 2	Lights up	Lights up	-

6 Diagnostic

LED	Function	Display type
U_B	Ready for operation	Continuously lit
	No operating voltage at A1 and A2	Not lit
U_i	Operationally ready and internal fuse OK	Continuously lit
	No operating voltage at A1 and A2	Not lit
	Internal fuse triggered	
K1	Relay channel 1 active	Continuously lit
	Input S12 open, relay K1 deactivated	Not lit
	Manual start signal, feedback circuit missing	
	Invalid rotary switch setting	
K2	Relay channel 2 active	Continuously lit
	Input S22 open, relay K2 deactivated	Not lit
	Manual start signal, feedback circuit missing	
	Invalid rotary switch setting	

The safety relay module features self-test functions. If a fault is detected, the system adopts a safe mode and leads, if necessary, to undelayed deactivation of all safety outputs.

7 Set-up and maintenance

7.1 Functional testing

The safety function of the safety relay 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 relay module's enclosure for damage
4. Check the correctness of the set application.
5. Check the electrical function of the connected sensor technology and their influence on the safety relay module and the downstream actuators

7.2 Behaviour in the case of faults

In the event of a fault the following procedure is recommended:
1. identify errors using chapter 6.1.
2. Rectify the fault if it is described in the table.
If fault could not be rectified, please contact the manufacturer.

7.3 Setting report

The form for documenting the selected settings of the device can be found in the online document area of the safety relay module. It must be completed accordingly by the customer and attached to the technical documentation of the machine. The setting report must be available whenever a safety check is performed.

7.4 Maintenance

It must be completed accordingly by the customer and attached to the technical documentation of the machine:
1. Check the correct fixing of the safety relay 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 (in accordance with EN ISO 13849-1) or SIL 3 with HFT (hardware fault tolerance) = 1 (in accordance with EN 62061);
• at least every 12 months for PL d with category 3 (in accordance with EN ISO 13849-1) or SIL 2 with HFT (hardware fault tolerance) = 1 (in accordance with EN 62061).

Damaged or defective components must be replaced.

8 Disassembly and disposal

8.1 Disassembly

The safety relay module must be disassembled in a de-energised condition only.

8.2 Disposal

The safety relay module must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.