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Operating Instructions

SR4D3B01S
Safety Relay Basic Module

EN

Subject to change without notice
Available as PDF file only
Version 2.0
www.wenglor.com

Table of Contents

1 Operating Instructions

1.1 Function

- These operating instructions provide the necessary information for installation, initial startup, safe operation and disassembly of the safety relay module.
- The operating instructions must always be kept in legible condition and made accessible.

1.2 Target Group

- All work described in these operating instructions may only be carried out by trained specialist personnel authorized by the plant operator.
- Only install and commission the device if you have read and understood the operating instructions and are familiar with applicable regulations on work safety and accident prevention.
- The selection and installation of the devices, as well as the integration of their controls, require the machine manufacturer to have qualified knowledge of relevant laws and normative requirements.

2 Use for Intended Purpose

Safety Relay Basic Module

The safety relay modules for use in safety circuits are intended for installation in control cabinets. They are used for the safe evaluation of signals from positively driven position switches for safety functions or magnetic safety sensors on side-sliding, rotating and removable protective devices as well as emergency stop command devices and AOPDs (light barriers).

3 Safety precautions

3.1 Safety Precautions

- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- Read the operating instructions carefully before using the product.
- Installation, initial start-up and maintenance of the product may only be carried out by qualified personnel.
- Tampering with or modifying the product is impermissible.
- Protect the product from contamination during initial start-up.
- The safety instructions given in the operating instructions must be followed, as must the country-specific installation requirements and regulations on safety and accident prevention.
- **The overall concept for the controller into which the safety component is incorporated must be validated in accordance with DIN EN ISO 13849-2.**

3.2 Warning Regarding Incorrect Use

- **If used improperly or for purposes other than those intended, or in the case of manipulation, use of the safety relay module may result in hazards to people and damage to the machine or system components.**
- **Please also note the information on this in standards ISO 14119 and EN ISO 13850.**

3.3 Exclusion of Liability

- No liability is assumed for damage and malfunction resulting from installation errors or non-observance of these operating instructions.
- The manufacturer assumes no further liability for damage resulting from the use of spare parts or accessories not approved by the manufacturer.
- No unauthorized repairs, modifications and alterations are permitted for reasons of safety. If carried out, the manufacturer assumes no liability for any resulting damage.
- The module is only to be operated in the closed housing, i.e., with the front cover mounted.

3.4 General Information on the Product

- The safety function is defined as the opening of releases 13-14 and 23-24 and the time-delayed opening of releases 37-38 when inputs S11-S12 and/or S21-S22 are opened.
- The safety-relevant current paths with output contacts 13-14 and 23-24 meet the following requirements, taking the PFH value into account:
  - Category 4 – PL in accordance with DIN EN ISO 13849-1
  - Complies with SIL 3 in accordance with DIN EN 61508-2
  - Complies with SILCL 3 in accordance with DIN EN 62061
- The safety-relevant current path with output contact 37-38 meets the following requirements, taking the PFH value into account:
  - Category 3 – PL d in accordance with DIN EN ISO 13849-1
  - Complies with SIL 2 in accordance with DIN EN 61508-2
  - Complies with SILCL 2 in accordance with DIN EN 62061
- All relevant components must be considered in order to achieve the performance level (PL) from DIN EN ISO 13849-1 for the overall safety function (e.g., sensor, logic, actuator).
- **The safety function, and thus conformity with the Machinery Directive, can only be maintained if the conversions described in these operating instructions are carried out correctly.**

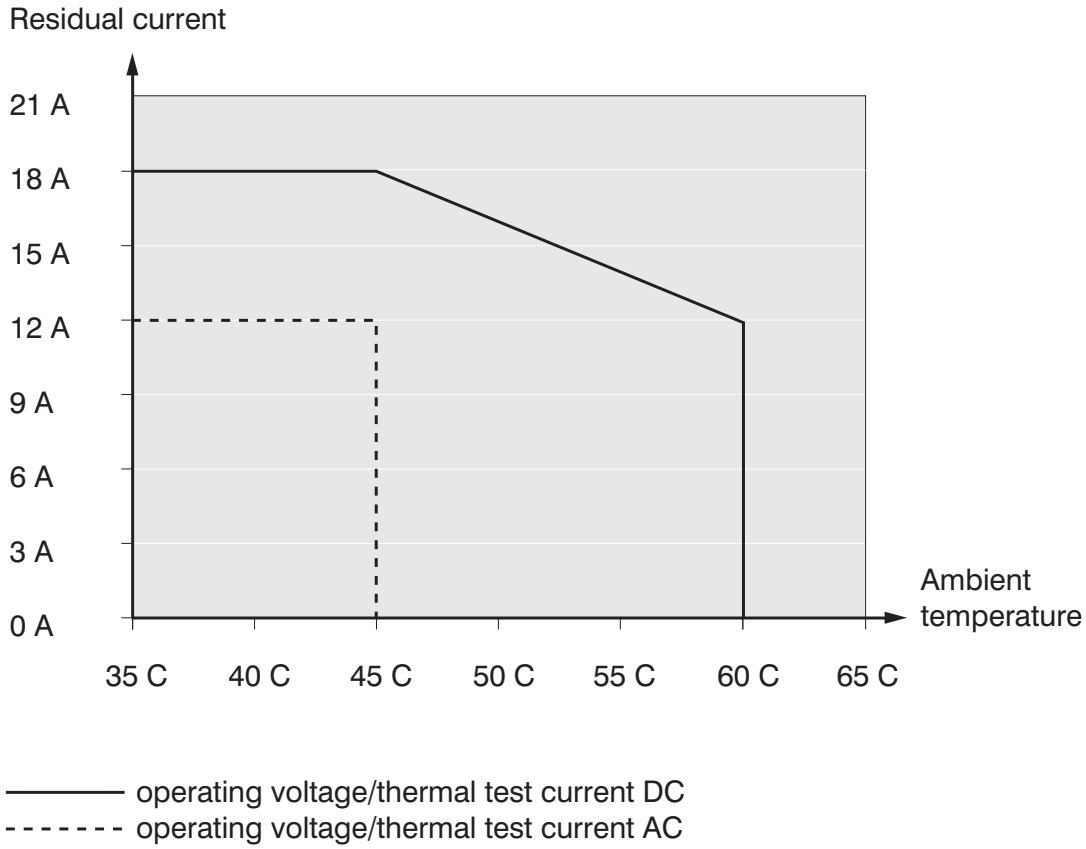
4 Technical Data

4.1 General Data

Technical Data	
Electrical Data	
Temperature range	-25...60 °C
Storage temperature	-40...85 °C
Supply voltage	20.4...28.8 V DC 20.4...26.4 V AC
Input wiring	1-, 2-channel
Response time (automatic start)	Typ. 120 ms
Response time (monitored start)	≤ 25 ms
Fall time (emergency stop) (Stop 0)	Typ. 15 ms, max. 20 ms
Fall time (emergency stop) (Stop 1)	0.1...30 s
Fall time (power failure)	≤ 55 ms
Power consumption	2.4 W / 5.9 VA plus signal output
Frequency range	50 Hz/60 Hz
Operating voltage fuse protection	Internal electronic fuse, Trip current F1: > 750 mA Trip current F2: > 75 mA Reset after interruption of supply voltage Trip current F3: > 140 mA
Current and voltage at S11, S12, S21, S22	24 V DC, 10 mA
Current and voltage at X1, X2	24 V DC, start pulse 25 mA / 25 ms
Current and voltage at X1, X3	24 V DC, start pulse 950 mA / 10 ms
Utilization category (EN 60947-5-1)	Stop 0: AC-15: 230 V AC / 6 A DC-13: 24 V DC / 5 A Stop 1: AC-15: 230 V AC / 3 A DC-13: 24 V DC / 2 A
Contact resistance (new condition)	Max. 100 mΩ
Safety Output	
Safety output	NO
Number of safety outputs, Stop 0	2
Number of safety outputs, Stop 1	1
Safety output switching current, Stop 0 (250 V)	8 A ohmic (inductive with suitable protective circuit), min. 5 V / 5 mA Note derating curve
Safety output switching current, Stop 1 (250 V)	6 A ohmic (inductive with suitable protective circuit), min. 10 V / 10 mA Note derating curve
Safety output fuse, Stop 0	External (I_k = 1000 A) according to EN 60947-5-1 Fuse: 10 A fast, 8 A slow
Safety output fuse, Stop 1	External (I_k = 1000 A) according to EN 60947-5-1 Fuse: 8 A fast, 6.3 A slow
Signal Output	
Signal output	Semiconductors

Technical Data	
Number of signal outputs	1
Signal output switching current (24 V DC)	100 mA
Signal output fuse	100 mA (internal electronic fuse F4)
Mechanical Data	
Material	Plastic, glass-fiber reinforced
Contact material	AgSnO, AgNi, self-cleaning, positively driven
Mounting	Quick mount for standard rail DIN EN 60715
Degree of protection	IP20 (terminals), IP40 (housing), IP54 (mounting space)
Weight	230 g
Connection type	Pluggable screw terminal
Terminal tightening torque	0.6 Nm
Service life	10 million switching cycles
Clampable wire cross-section	0.25...2.5 mm²
Connection line	Rigid or flexible
Vibration resistance	10...55 Hz, amplitude: 0.35 mm
Shock resistance	10 g / 11 ms
Clearances and creepage distances (IEC 60664-1)	4 kV (basic insulation)
Pollution degree	2
Technical Safety Data	
Safety category (EN ISO 13849-1), Stop 0	Up to 4
Safety category (EN ISO 13849-1), Stop 1	Up to 3
Performance level (EN ISO 13849-1), Stop 0	To PL e
Performance level (EN ISO 13849-1), Stop 1	To PL d
Safety integrity level (EN 61508), Stop 0	Up to SIL 3
Safety integrity level (EN 61508), Stop 1	Up to SIL 2
Mission TM (EN ISO 13849-1)	20 a
Stop category (EN 60204-1)	STOP 0, STOP 1
Diagnostic coverage (DC)	99% (Stop 0) 60% (Stop 1)
Common cause failure (CCF)	> 65 points
B10d switching cycles, mechanical (20% load)	20,000,000
B10d switching cycles (40% load)	7,500,000
B10d switching cycles (60% load)	2,500,000
B10d switching cycles (80% load)	1,000,000
B10d switching cycles (100% load)	400,000
Function	
Cross-circuit detection	Optional
Wire break detection	Yes
Ground fault detection	Yes
Start, monitored	Yes
Start, automatic	Yes
Contactor monitoring	Yes
NC input signal	Yes
OSSD input signal	Yes

4.2 Derating Curve



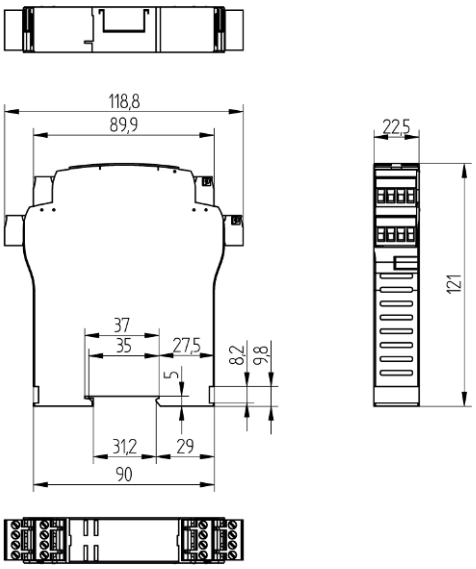
- Installation distance to other modules with a total current > 6 A: min. 10 mm
- Derating curve depending on supply voltage

4.3 Sensor Connection

20

PIN	Function	In/ Out
A1	24 V DC	
A2	0 V DC	
S11-S12	Input Channel 1 (+)	In
S21-S22	Input Channel 2 (+)	In
S21-S22	Input Channel 2 (–) with Wire Beakage Detection	In
13-14	Safety Enabling Circuit 1 (Stop 0)	Out
23-24	Safety Enabling Circuit 2 (Stop 0)	Out
37-38	Safety Enabling Circuit 3 (Stop 1)	Out
X1-X2	Feedback Cicuit/Reset	
X1-X3	Feedback Cicuit/Autostart	
Y1	Auxiliary Contact	Out

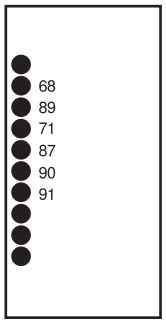
4.4 Housing Dimensions



Dimensions specified in mm (1 mm = 0.03937 Inch)

4.5 Control Panel

SR2



68 = supply voltage (LED illuminates when operating voltage is applied to terminals A1-A2)
89 = internal operating voltage (LED illuminates when operating voltage is applied to terminals A1-A2 and the fuse has not tripped.)
71 = channel 1
87 = channel 2
90 = time-delayed enable channel 3
91 = time delayed enable channel 4

4.6 Complementary Products

wenglor offers you the right connection and mounting technology as well as other accessories for your product. You can find this at www.wenglor.com on the product details page at the bottom.

5 Installation and Electrical Connection

5.1 Installation

- The quick mount is used for mounting standard rails in accordance with EN 60715.
- Hook the bottom of the housing into the DIN rail – tilted slightly forward – and press it upward until it engages.

5.2 Electrical Connection

Electrical connection is only permissible in a de-energized state and must be carried out by authorized, trained personnel.

With regard to electrical safety, the contact protection for connected and electrically interconnected equipment, as well as the insulation for supply lines, must be designed for the highest voltage occurring on the device.

To avoid EMC disturbances, the physical environment and operating conditions at the product's installation location must comply with the electromagnetic compatibility (EMC) section of DIN EN 60204-1.

5.3 Connection Example

Two-channel control, shown on example protective door monitoring system; with two contacts A and B, of which at least one contact is positively driven; with external reset button R

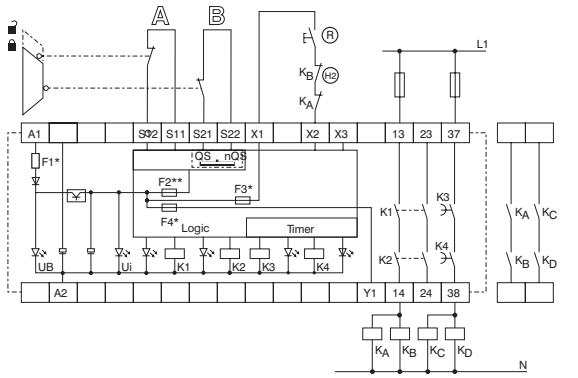
- Power level: Two-channel control, suitable for contact reinforcement or contact multiplication by means of contactors or relays with positively driven contacts.
- The controller detects wire breaks, ground faults and cross-circuits in the monitoring circuit.

Ⓡ Reset button

Ⓗ2 Feedback loop

* = Electronic fuse

** = Hybrid fuse

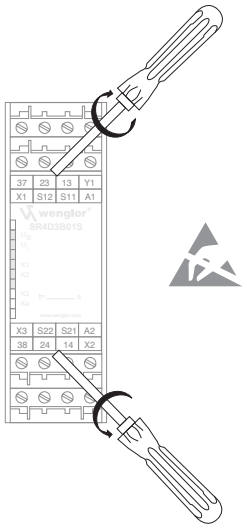


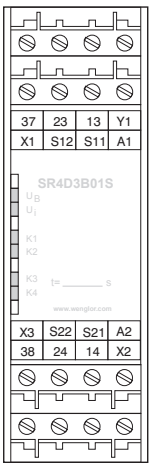
6 Initial Start-Up

6.1 Settings

6.1.1 Opening the Front Cover

- The front cover is opened by inserting a slotted screwdriver into the upper and lower cover recess and lifting slightly.
- The ESD requirements must be met when the front cover is open.
- Once the adjustment has been made, the front cover must be reinstalled.
- The off-delay set must be recorded on the front cover.
- **Only touch components after they have been discharged!**





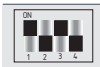
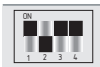
6.1.2 Time Adjustment

- The off-delay for safety release 37-38 can be adjusted by the DIP switches in the range 0...30 sec.
- Safety release 37-38 corresponds to STOP Category 1 from EN 60204-1.
- The off-delay for the STOP 1 safety release can be shortened in the event of a fault.
- Safety releases 13-14 and 23-24 correspond to STOP Category 0 from EN 60204-1.

Adjustments are made using the DIP switch:

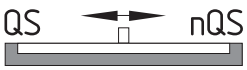
- The DIP switches are located under the front cover of the module.
- Both DIP switch SW1 (Channel 1) and SW2 (Channel 2) must be set equally.
- The DIP switches can be adjusted with the operating voltage switched on, but adjustments are only handled by the SR4D3B01S following a voltage interruption of approx. 3 seconds.
- The off-delay set must be checked and recorded on the front cover and in the adjustment log.
- The effectiveness of the adjustment must be checked.

Setting DIP switch	Off-delay	Setting DIP switch	Off-delay
	< 0.1 s		5.0 s

Setting DIP switch	Off-delay	Setting DIP switch	Off-delay
	0.5 s		8.5 s
	1.0 s		10.0 s
	1.5 s		12.0 s
	2.0 s		15.0 s
	2.5 s		20.0 s
	3.0 s		25.0 s
	4.0 s		30.0 s

6.1.3 Cross-Circuit Monitoring

- The cross-circuit monitoring function (as-delivered condition) is programmed using switch S1 under the front cover of the module.
- The switch may only be operated when it is de-energized using a finger or a blunt, insulated tool.



S1

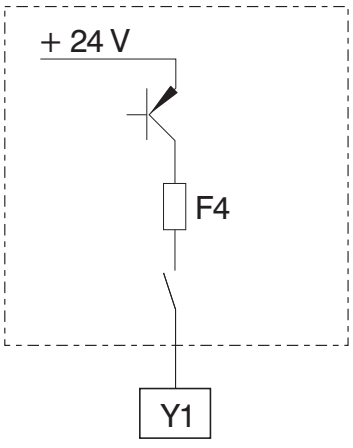
6.1.4 Resetting the Hybrid Fuse

The hybrid fuse on the module can be reset by switching the operating voltage off and back on.

6.1.5 Signal Output

Safety relays K1, K2 are signaled via signal output Y1.

K1	K2	Y1
On	On	Low (0 V)
On	Off	Low (0 V)
Off	On	Low (0 V)
Off	Off	High (+ 24 V)

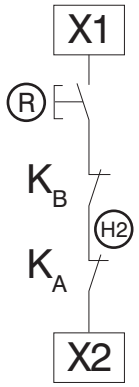


6.2 Configuration

6.2.1 Start Configuration

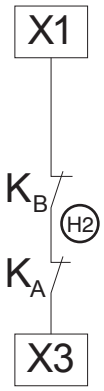
External reset button (with edge detection)

- The external reset button is integrated as shown.
- The module is activated by resetting (after releasing) the reset button (= detection of falling edge).
- Error in reset button, e.g., welded contact or manipulations that could lead to unintentional restart have been detected in this circuit, resulting in operational interruption.



Automatic start

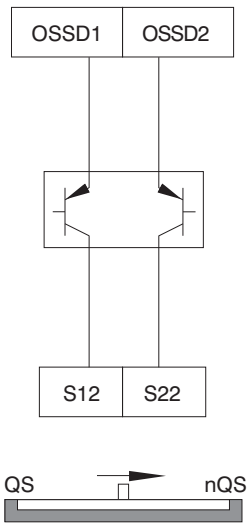
- Automatic start is achieved – as shown – by integrating the feedback loop. If the feedback loop is not required, replace it with a bridge.
- **ATTENTION: Not permissible without additional measures if there is a risk people will step behind!**
- **ATTENTION: In accordance with EN 60204-1, Section 9.2.5.4.2, the "automatic start" operating mode is only permitted to a limited extent. In particular, unintentional restart must be prevented by other suitable measures.**



6.2.2 Sensor Configuration

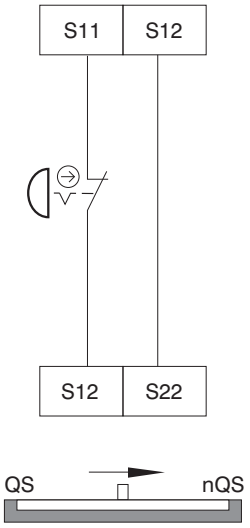
Two-channel control for safety-related electronic (microprocessor-based) protection device with P-switching semiconductor outputs (e.g., AOPDs) in accordance with EN 61496

- This controller detects a wire break and ground fault in the control circuits.
- Cross-circuits between the control circuits are usually detected by the protective devices. The module therefore does not have cross-circuit detection here.
- If cross-circuits are detected in the control circuits by the protective device: Cat. 4 – PL e from DIN EN ISO 13849-1 can be achieved.



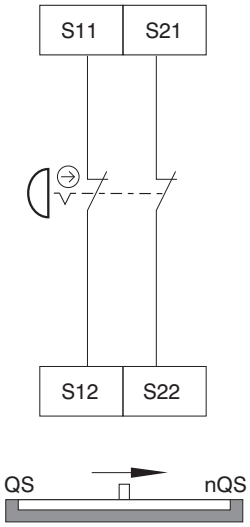
Single-channel emergency stop circuit with command devices in accordance with DIN EN ISO 13850 (EN 418) and EN 60947-5-5

- This controller detects a wire break and ground fault in the control circuit.
- The function without cross-circuit monitoring is programmed using the switch (switch position = nQS) under the front cover.
- Cat. 1 PL c from EN ISO 13849-1 can be achieved when tested according to EN ISO 13849-1, Section 6.5.2.



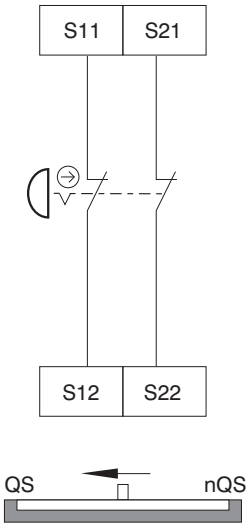
Two-channel EMERGENCY STOP circuit with command devices in accordance with DIN EN ISO 13850 (EN 418) and EN 60947-5-5

- This controller detects a wire break and ground fault in the control circuits.
- Cross-circuits between the control circuits are not detected.
- The function without cross-circuit monitoring is programmed using the switch (switch position = nQS) under the front cover.
- Cat. 4 PL e from EN ISO 13849-1 can be achieved (with protected cable routing).



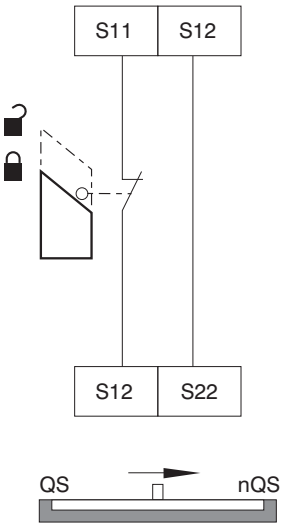
Two-channel EMERGENCY STOP circuit with command devices in accordance with DIN EN ISO 13850 (EN 418) and EN 60947-5-5

- This controller detects a wire break and ground fault in the control circuits.
- Cross-circuits between the control circuits are detected.
- The cross-circuit monitoring function is programmed using the switch (switch position = QS) under the front cover.
- Cat. 4 PL e from EN ISO 13849-1 can be achieved.



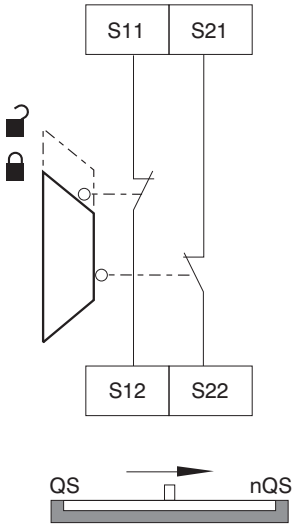
Single-channel protective door monitoring circuit with interlocking devices in accordance with ISO 14119

- At least one positively driven contact required.
- This controller detects a wire break and ground fault in the control circuit.
- The function without cross-circuit monitoring is programmed using the switch (switch position = nQS) under the front cover.
- Cat. 1 PL c from EN ISO 13849-1 can be achieved when tested according to EN ISO 13849-1, Section 6.5.2.



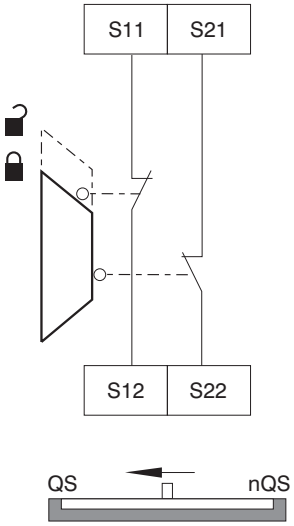
Two-channel protective door monitoring circuit with interlocking device in accordance with ISO 14119

- With at least one positively driven position switch.
- This controller detects a wire break and ground fault in the control circuits.
- Cross-circuits between the control circuits are not detected.
- The function without cross-circuit monitoring is programmed using the switch (switch position = nQS) under the front cover.
- Cat. 4 PL e from EN ISO 13849-1 can be achieved (with protected cable routing).



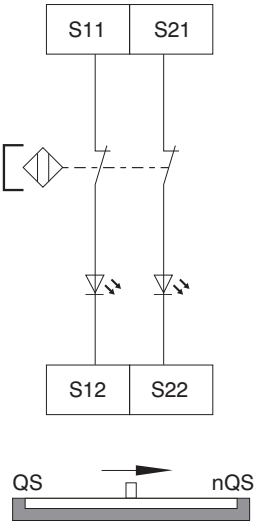
Two-channel protective door monitoring circuit with interlocking device in accordance with ISO 14119

- With at least one positively driven position switch.
- This controller detects a wire break and ground fault in the control circuits.
- Cross-circuits between the control circuits are detected.
- The cross-circuit monitoring function is programmed using the switch (switch position = QS) under the front cover.
- Cat. 4 PL e from EN ISO 13849-1 can be achieved.



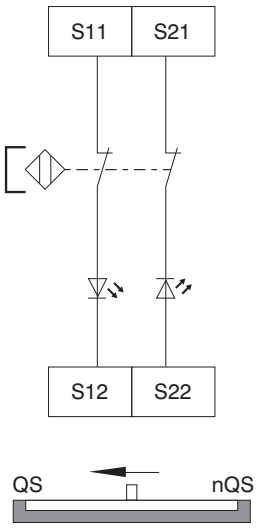
Two-channel control for safety solenoid switches in accordance with EN 60947-5-3

- This controller detects a wire break and ground fault in the control circuits.
- Cross-circuits between the monitoring circuits are not detected.
- The function without cross-circuit monitoring is programmed using the switch (switch position = nQS) under the front cover.
- Cat. 3 PL e from EN ISO 13849-1 can be achieved.



Two-channel control for safety solenoid switches in accordance with EN 60947-5-3

- This controller detects a wire break and ground fault in the control circuits.
- Cross-circuits between the monitoring circuits are detected.
- The cross-circuit monitoring function is programmed using the switch (switch position = QS) under the front cover.
- Cat. 4 PL e from EN ISO 13849-1 can be achieved.



It is only permitted to connect safety solenoid switches to safety relay SR4D3B01S if the requirements of standard EN 60947-5-3 have been met.

The following minimum requirements regarding the technical data must be met:

- **Switching capacity: min. 240 mW**
- **Switching voltage: min. 24 V DC**
- **Switching current: min. 10 mA**

When connecting sensors with LEDs in the control circuit (protective circuit), make sure that the following rated operating voltage is maintained:

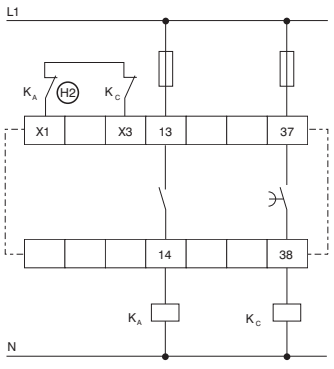
- 24 V DC with max. tolerance of -5%/+20%
- 24 V AC with max. tolerance of -5%/+10%

Availability problems may otherwise occur, especially when sensors are connected in series and there is a voltage drop in the control circuit, e.g., caused by LEDs.

6.2.3 Actuator Configuration

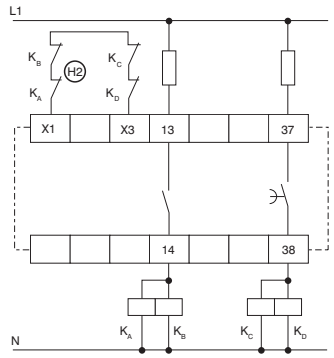
Single-channel control with feedback loop

- Suitable for contact reinforcement or contact multiplication by means of contactors or relays with positively driven contacts.
- (H2) = Feedback loop: If the feedback loop is not required, replace it with a bridge



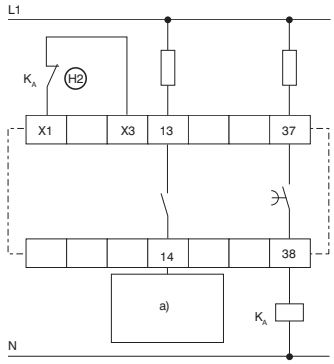
Two-channel control with feedback loop

- Suitable for contact reinforcement or contact multiplication by means of contactors or relays with positively driven contacts.
- (H2) = Feedback loop: If the feedback loop is not required, replace it with a bridge



Diverse control with feedback loop

- Suitable for contact reinforcement or contact multiplication by means of contactors or relays with positively driven contacts.
- (H2) = Feedback loop: If the feedback loop is not required, replace it with a bridge



a) Controller release

6.3 SR4D3B01S Adjustment Log

This product adjustment log must be completed by the customer and enclosed with the machine's technical manual.

The adjustment log must be available for safety inspections.

Company:		
The module is used in the following machine:		
Machine no.	Machine type	Module no.
Configured off-delay:		
Configured on:	Signature of person responsible	

6.4 Function Test

The safety function of the safety relay must be tested. The following must be ensured in advance:

- Tight fit
- Cables must be correctly routed and connected
- Check safety relay module housing for damage
- Check electrical function of connected sensors and their effect on safety relay module and downstream actuators

7 Maintenance Instructions

We recommend performing a visual inspection and a function test at regular intervals including the following steps:

- Check safety relay for secure fit
- Check supply line for damage
- Check electrical connection
- Check off-delay time

The device must be included in the regular inspections in accordance with the Industrial Safety Regulation (BetrSichV), however, at least 1× annually.

Damaged or defective devices must be replaced.

8 Removal

The safety relay module may only be removed in a de-energized state.

Press the bottom of the housing upward and unhook it by tilting slightly forward.

9 Proper Disposal

wenglor sensoric GmbH does not accept the return of unusable or irreparable products. Respectively valid national waste disposal regulations apply to product disposal.

10 Declarations of Conformity

Declarations of conformity can be found on our website at www.wenglor.com in the product's separate download area.

EU Konformitätserklärung
EU Declaration of Conformity (DoC)

wenglor
the innovative family

Name und Anschrift des Herstellers / Name and address of manufacturer:

wenglor sensoric GmbH
wenglor Straße 3
88069 Tettnang / GERMANY

Diese Erklärung gilt für die folgenden Produkte: This declaration applies to the following products:

SR4D3B01S

Wir bestätigen die Übereinstimmung mit den grundlegenden Anforderungen der Europäischen Richtlinien

We confirm compliance with the essential requirements of the European Directives

Richtlinie / Directive		Fundstelle / Reference	
Maschinen / MD	2006/42/EG	Amtsblatt / Official Journal	L157 09.06.2006
EMV / EMC	2014/30/EU	Amtsblatt / Official Journal	L96 29.03.2014
RoHS	2011/65/EU	Amtsblatt / Official Journal	L174 01.07.2011

Folgende Normen wurden angewandt:

DIN EN 60947-5-1:2010-04

The following standards have been used:

DIN EN ISO 13849-2:2013-02

Produkt-Beschreibung

Sicherheitsrelais für Not-Halt-Schaltungen, Schutztürüberwachungen, Sicherheitsmagnet-schalter und AOPDs
Sicherheits-Bauteil nach 2006/42/EG Anhang IV
Seriennummer: Lt. Typenschild

Product description

Safety-monitoring module for emergency stop circuits, guard door monitoring, magnetic safety switches and AOPDs
Safety component per 2006/42/EC annex IV
Serial Number: See rating plate

Benannte Stelle / Zertifikat Nr.
DGUV Test
Prüf- und Zertifizierungsstelle Elektrotechnik
Fachbereich Energie Textil Elektro Medienerzeugnisse
Gustav-Heinemann-Ufer 130
50968 Köln

Notified Body / Certificate Nr.
NB Nr. 0340
ET 19054

Dr. Alexander Ohl, wenglor Straße 3,
88069 Tettnang / Deutschland
ist bevollmächtigt, die technischen Unterlagen zusammenzustellen.

Dr. Alexander Ohl, wenglor Straße 3
88069 Tettnang / Germany
is authorized to compile the technical documentation.

Diese Erklärung stellvertretend für den Hersteller wird abgegeben durch:

On account of the manufacturer, this declaration is given by:

Dr. Alexander Ohl
Leiter Forschung & Entwicklung / Head of Research & Development

Tettnang, 18.11.2019
Ort / Place Datum / Date

i.V.
Unterschrift / Signature

wenglor sensoric elektronische Geräte GmbH · wenglor Straße 3 · 88069 Tettnang · GERMANY · www.wenglor.com

CE

UL-Ratings:
c UL US LISTED 382E
IND.CONT.EQ.
Use Copper Conductors Only, Use 60°C / 75°C Conductors
Use No. 28-12 AWG Wire Size Only, Tightening Torque 5 lb in.

Main-Output
230VAC / 8A
24VDC / 8A
B300, R300