

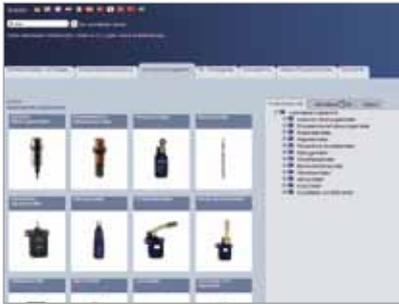
Safety controlling systems

PROTECT series / Version 02



You will also find detailed information regarding our product variety on our website:

www.schmersal.net



Online documentation in 13 languages

The online catalogue for our customers is permanently updated. The Main catalogue can be consulted on the Internet in as much as 13 languages.

The technical data of our entire product range are always up-to-date. The declarations of conformity, the test certificates and the mounting instructions can be consulted or even downloaded as well.

Service for designers

The online catalogue also includes the technical drawings of our products – a special service to designers. In this way, they can be downloaded and directly fed in CAD-systems.

The Schmersal homepage furthermore contains up-to-date information on general subjects, technical articles on machine safety as well as news regarding events and trainings. To be bookmarked!

The direct way

If you need further information or you want personal advice, you can call us as well:
Tel. +49-(0) 2 02-64 74-0.

We are at your disposal –
anyplace, anywhere, anytime!



Important note!

The devices of our product range are not specified for private and users, i.e. they are no consumer goods in terms of the European Directive (in Germany, in the sense of ProdSG) or other national legal provisions.

Only competent and qualified persons with an appropriate electrical and technical training may carry out the mounting and commissioning of the devices.

Descriptions of technical correlations, details on external control units, installation and operating information or similar have been provided to the best of our knowledge. However, this does not mean that the warranted characteristics or other properties under liability law may be assumed which extend beyond the "General Terms of Delivery of Products and Services of the Electrical Industry".

The data and values in this catalogue have been checked thoroughly.
Technical modifications and errors excepted.

Contents

General information

- Quick selection guide for safety control modules _____ Page 4
- PROTECT SRBs _____ Page 6
- Summary of EN ISO 13849-1 _____ Page 8

PROTECT series safety controlling systems

- Standard applications STOP 0 _____ Page 11
- Standard applications STOP 0 / STOP 1 _____ Page 19
- Input and output expanders _____ Page 25
- Two-hand applications _____ Page 33
- Muting applications _____ Page 39
- Safety mat applications _____ Page 43
- Double reset _____ Page 47
- Antivalent input circuit _____ Page 51
- Standstill monitoring _____ Page 57
- Differential switch-off behaviour _____ Page 63
- Potentially explosive atmospheres _____ Page 69
- Compact safety controller _____ Page 75
- Multifunctional applications _____ Page 79

Quick selection guide for safety control modules

Guide to module selection

1. Select application
2. Select required features
3. Page number for module

Chapter	Standard Applications STOP 0					Standard Applications STOP 0 / STOP 1					Input and output expanders			Two-hand Applications		Muting Applications
	SRB 301MA	SRB 301MC	SRB 301ST V.2	SRB 211ST V.2	SRB 324ST V.3	PROTECT IE	SRB 402EM	SRB 401EM	SRB 201ZH	SRB 301HC/R	SRB 202MSL					
Type designation																
Application	EMERGENCY STOP/guard-door monitor	■	■	■	■	■				■						
	BNS compatible	■	■	■	■	■										
	Optoelectronics/CSS/AZM compatible	■	■	■	■	■										
	Standstill monitoring															
	Two-hand monitoring								■	■						
	Muting monitoring											■				
	Safety mat monitoring									■						
	Input expansion						■									
	Output expansion							■	■							
	Double reset															
Module-specific features	Supply voltage 24 VDC	■	■	■	■	■	■		■	■					■	
	Supply voltage 24 VAC	■	■	■	■	■	■	■		■						
	Supply voltage 230 VAC								■	■						
	Number of safety devices	1	1	1	1	1	4			1	1					
	Number of safe stop-0 outputs	3	3	3	2	3	2	4	4		3				2	
	Number of safe stop-1 outputs				1	2										
	Number of floating signal outputs	1	1	1		1	2	2	1		1					
	Number of semiconductor signal outputs				1	3	5									
	Automatic start		■	■	■	■	■								■	
	Reset without edge detection	■		■	■	■				■					■	
	Reset with edge detection		■	■	■	■									■	
	Electronic fuse	■	■	■	■	■	■	■		■					■	
	Performance level to EN 13849-1	PL e	PL e	PL e	PL e	PL e	PL d	–	–	PL e	PL e				PL e	
	Cross circuit detection, optional	■	■	■	■	■										
	Cross-circuit detection fixed						a)			■	■				■	
Plug-in terminals			■	■	■		■	■	■	■				■		
Housing width in mm	22,5	22,5	22,5	22,5	45	65,5	22,5	22,5	22,5	45				45		
see Page	12	14	16	20	22	26	28	30	34	36	40					

See our online catalogue www.schmersal.net for more MRL-compliant modules which supplement the product range.

PROTECT IE	SRB 211LT	SRB 301X4
SRB 031MC	SRB 219IT	SRB 302X3
SRB 200X2	SRB 301LC	SRB 308IT
SRB 201ZHx3	SRB 301LC/B	SRB 401EM-230V
SRB 206ST/SQ	SRB 301ST/SQ-230V	SRB 504ST
SRB 207AN	SRB 301X1	

Safety mat Applications		Double reset	Antivalent input circuit		Standstill monitoring		Differential switch-off behaviour		Potentially explosive atmospheres		Multifunctional Applications	
SRB 301HC/T	SRB 301HC/R	SRB 100DR	SRB 301AN	SRB 211AN V.2	AZR 31S1 (sensor/los)	FWS 1206	SRB 202C	SRB 400C	SRB 101Exi	SRB 200Exi	PROTECT SELECT	PROTECT PSC
■	■		■	■			■	■	■	■	■	■
			■	■			■	■	■	■	■	■
											■	■
	■				■	■						
■	■										■	■
		■										■
■	■	■	■	■	■	■	■	■	■	■	■	■
1	1		1	1	1	1	2	2	1	1	up to 6	up to 125
3	3		3	2	3	2	2	4	1	2	up to 6	up to 125
				1							up to 6	up to 125
1	1				1		1		1			
■			1	1							opt. 4	16
	■	■	■	■	■		a)	a)	a)	a)	b)	b)
■			■	■	■							
■	■	■	■	■	■	■	■	■	■	■	■	■
PL e	PL e	-	PL e	PL e	PL e	PL d	PL e	PL e	PL e	PL e	PL e	PL e
							a)	a)	■	■	■	■
■	■	■	■	■	■		■	■			■	■
■	■											
45	45	22,5	22,5	22,5	45	22,5	22,5	22,5	22,5	22,5	52,5	c)
44	36	48	52	54	58	60	64	66	70	72	76	80

Legend

- a) Type-dependent
- b) optional
- c) modular

■ Differences in each chapter have a pale blue background.

PROTECT series safety controlling systems

PROTECT SRBs

Since its introduction, the range of PROTECT series safety control modules (also called "PROTECT SRBs") has become one of the most comprehensive on the market, both in terms of breadth and depth.



The PROTECT product range includes safety control modules, safe compact controllers, a safe modular controller and a safe drive monitor which are intended for typical applications in the safety-related parts of machine controllers, such as the signal processing of EMERGENCY-STOP devices, safety switches with and without interlocking or other safety devices, and for monitoring drive signals coming from PNP proximity switches, encoder or resolver sender units or even coming directly from the motor emf.

EC conformity according to the new MRL

All PROTECT evaluation units listed here comply with the requirements of EC Machinery Directive 2006/42/EC in terms of their design, printing and enclosed instructions. They appear under Appendix IV as logic units for guaranteeing the safety functions, where a special quality assurance system is used during their development and manufacture (= comprehensive quality assurance according to MRL-Appendix X).

Schmersal/Elan has a TÜV Rheinland certified QA system and is entitled to implement the procedure for the conformity assessment of machinery in Appendix X of the Machinery Directive and the components, for guaranteeing the safety function.

Certificates from independent testing institutes

Many of the listed safety control modules are also certificated by independent, so-called, "Notified Bodies" such as the TÜV and BG(IfA). The devices are also cULus certificated for the North American market. These are combined UL and CSA certifications which are issued by the Underwriters Laboratories' testing organisation in relation to the product and reviewed at regular intervals. Not only is the final product examined but also its manufacture.

Safety appraisal

All safety control modules in this list have been subjected to a safety appraisal according to EN ISO 13849-1, or EN IEC 62061. The user can learn to print out the safety characteristics for all units in the form of "performance levels" (PL) and/or in the form of a PFHd value or SIL value.

For safety control modules, with their purely electromechanical release contacts, the safety appraisal must included the contact load and the number of switching cycles. Here, the user is given a table to help in the initial classification. The specified PFH value can therefore only be achieved under a "worst case" appraisal (24 operation over 365 days) with the contact load listed when the specified number of switching cycles per year (n-op/y) and the switch-cycle time (t-cycle) in the application concerned have not been exceeded.

The "Sistema" software developed by the Institute of Occupational Safety of the German statutory accident insurance organisation (IFA) can be used to determine the exact values. For the Schmersal component library required for this, go to www.schmersal.net.



Safety switches

Solenoid interlocks

Non-contact interlocks

Position switches with safety function

Pull-wire emergency-stop switches

Safety switches for hinged safety devices

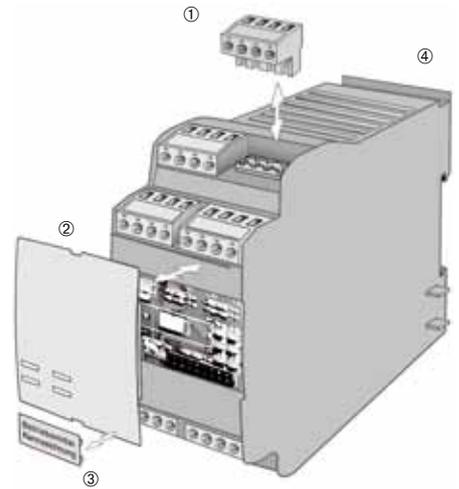
Structural design

Structurally, all PROTECT SRBs have a unique shaped housing, 22.5 mm and 45 mm wide offering the following particular functional advantages:

- ① Plug-in and optional codable screw terminals (0.25 mm² to 2.5 mm²), so that it is possible to work with prefabricated cable harnesses and servicing can be carried out more quickly;
- ② EN ISO 12100-2 compliant settings which are accessible from the front and protected by a cover from tampering by unauthorized third parties;
- ③ Snap-on equipment identification;
- ④ Applications at higher ambient temperatures are also possible due to ventilation slots in the housings.

The housing design also caters for the following alternative connection methods (on request):

- Connectors with spring-loaded terminals or screw terminals for wire cross-sectional areas 0.25 mm² to 2.5 mm²
- The so-called TWIN-core sleeves even make it possible to clamp two (flexible) wires with CSAs 0.5 mm² to 1.0 mm² regardless of the connection technology.



Two-hand control panels



Safety sensors



Safety sensors (Magnetic switch)



Safety light barrier



Tactile safety devices



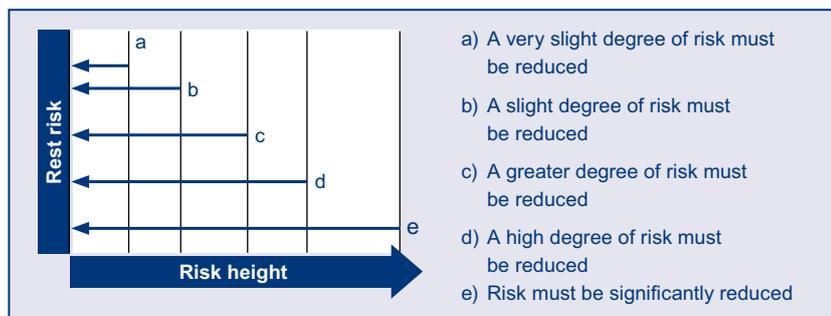
Enable switches



Emergency-stop push button

Summary of the standard

EN ISO 13849-1:2008 (2006)



Roughly summarised, a performance level, as required by the standard EN ISO 13849-1 for the design of an SRP/CS, represents an appraisal of several factors which are now recognised worldwide in order to measure the safety and reliability of systems so as to determine controls and rules, i.e. factors which make up the security integrity of a system. In contrast to what is now common practice in engineering, a performance level is equivalent to a multi-dimensional appraisal. Instead of complex models, however, EN ISO 13849-1 uses a simplified approach which considers four auxiliary variables.

Note, however, that a performance level (regardless of its height) is subject to additional basic requirements, i.e. measures for avoiding and controlling systematic failures and faults, whereas a PL-classification (PL "a" - "e") essentially relates to preventing and controlling random failures and faults (see also Glossary section, "failures").

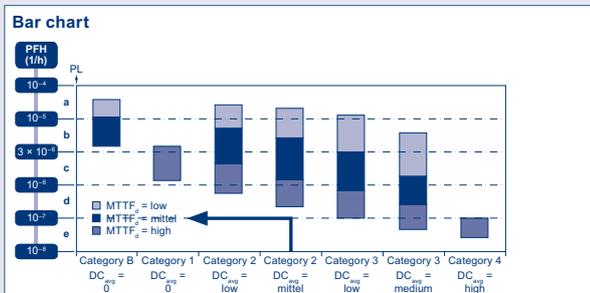
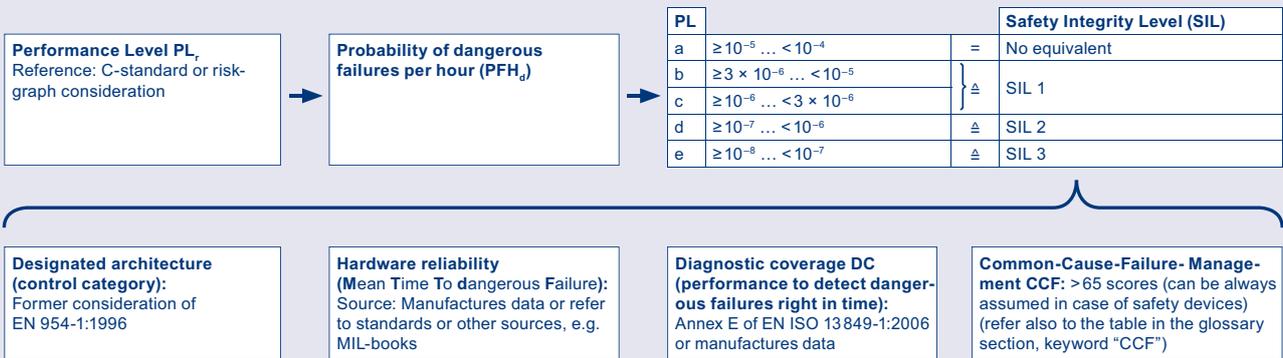
- A PL appraisal starts by determining the various safety functions of a machine or a machine controller.
- Determination of the required performance levels PLr for the safety functions concerned follows. Which of the five performance levels ("a" - "e") is selected is found from the C (product standard) concerned or by risk appraisal.
- Here, the performance level reflects the degree of measures necessary to reduce risks. A PL always relates to the overall safety function, i.e. the chain [I] inputs + [L] signal processing/logic and [O] outputs. Safety control modules generally depict the [L] level and are used for fault diagnosis, when simple safety switching devices on the [I] level and feedback signals on the [O] level are connected to the feedback loop. The diagnostic coverage is between 60% (for simple 2-channel series circuits on the [I] level) to 99% (with 2-channel single wiring/parallel wiring on the [I] level or with feedback signals from positive-guided power contactors on the [O] level). If in doubt about the diagnostic coverage, refer to Appendix E of EN ISO 13849-1:2008 (2006).

- The effectiveness of the (necessary) measures is expressed in the form of a PFHd value (a value of the remaining maximum tolerated average probability of a dangerous failure per hour = Average Probability). Here, the PFHd value is also the parentheses for the International Safety Integrity Levels (SILs), as they recognise EN IEC 61508:2000 or EN IEC 62061:2005.
- Schmersal specifies a pre-calculated PFHd value for certain conditions, so it is not necessary to carry out calculations for individual SRB devices.
- The assessment (calculation) of a Performance level is now carried out according to EN ISO 13849-1 based on the appraisal of 4 individual parameters (auxiliary variables):



1. The architecture, essentially identical to the appraisal of controller categories as they are known from the application of EN 954-1:1996, which has been incorporated in EN ISO 13849-1;
 2. From the appraisal of the hardware reliability, expressed as Mean Time to dangerous Failure MTTFd in years (a statistically based assumption over the time during which the hardware will operate without random safety failures);
 3. The assessment (of the probability) of the effectiveness of the diagnostic measures in the SRP/CS or relevant SRP/CS-section, expressed in % as a diagnostic coverage DC;
 4. The assessment of measures against so-called common-cause or common-mode failures (CCF) = which could destroy the safety benefit of a multi-channel system).
- Using a graphic - a bar chart - or from Appendix K of EN ISO 13849-1 it is possible to determine the performance level PL and compare and validate it with the PLr required for the particular safety function.

Schematic conclusion



Numerical description acc. EN ISO 13849-1:2006 Annex K

Table K.1 – Numerical description of Fig. 5 (of EN ISO 13849-1:2006 [D] – Annex K (informative))

MTTF _d for each channel	Average probability of a dangerous failure per hour (1/h) and corresponding performance level (PL)													
	Cat. B	PL	Cat. 1	PL	Cat. 2	PL	Cat. 2	PL	Cat. 3	PL	Cat. 3	PL	Cat. 4	PL
years	DC _{avg} = none		DC _{avg} = none		DC _{avg} = low		DC _{avg} = medium		DC _{avg} = low		DC _{avg} = medium		DC _{avg} = high	
3	3.80 × 10 ⁻⁵ a				2.58 × 10 ⁻⁵ a	1.99 × 10 ⁻⁵ a	1.25 × 10 ⁻⁵ a	6.09 × 10 ⁻⁶ b						
3.3	3.46 × 10 ⁻⁵ a				2.33 × 10 ⁻⁵ a	1.79 × 10 ⁻⁵ a	1.13 × 10 ⁻⁵ a	5.41 × 10 ⁻⁶ b						
3.6	3.17 × 10 ⁻⁵ a				2.13 × 10 ⁻⁵ a	1.62 × 10 ⁻⁵ a	1.03 × 10 ⁻⁵ a	4.86 × 10 ⁻⁶ b						
3.9	2.93 × 10 ⁻⁵ a				1.95 × 10 ⁻⁵ a	1.48 × 10 ⁻⁵ a	9.37 × 10 ⁻⁶ b	4.40 × 10 ⁻⁶ b						
4.3	2.65 × 10 ⁻⁵ a				1.76 × 10 ⁻⁵ a	1.33 × 10 ⁻⁵ a	8.39 × 10 ⁻⁶ b	3.89 × 10 ⁻⁶ b						
4.7	2.43 × 10 ⁻⁵ a				1.60 × 10 ⁻⁵ a	1.20 × 10 ⁻⁵ a	7.58 × 10 ⁻⁶ b	3.48 × 10 ⁻⁶ b						
5.1	2.24 × 10 ⁻⁵ a				1.47 × 10 ⁻⁵ a	1.10 × 10 ⁻⁵ a	6.91 × 10 ⁻⁶ b	3.15 × 10 ⁻⁶ b						
5.6	2.04 × 10 ⁻⁵ a				1.33 × 10 ⁻⁵ a	9.87 × 10 ⁻⁶ b	6.21 × 10 ⁻⁶ b	2.80 × 10 ⁻⁶ c						
6.2	1.84 × 10 ⁻⁵ a				1.19 × 10 ⁻⁵ a	8.80 × 10 ⁻⁶ b	5.53 × 10 ⁻⁶ b	2.47 × 10 ⁻⁶ c						
6.8	1.68 × 10 ⁻⁵ a				1.08 × 10 ⁻⁵ a	7.93 × 10 ⁻⁶ b	4.98 × 10 ⁻⁶ b	2.20 × 10 ⁻⁶ c						
7.5	1.52 × 10 ⁻⁵ a				9.75 × 10 ⁻⁶ b	7.10 × 10 ⁻⁶ b	4.43 × 10 ⁻⁶ b	1.95 × 10 ⁻⁶ c						
8.2	1.39 × 10 ⁻⁵ a				8.87 × 10 ⁻⁶ b	6.43 × 10 ⁻⁶ b	4.02 × 10 ⁻⁶ b	1.74 × 10 ⁻⁶ c						
9.1	1.25 × 10 ⁻⁵ a				8.04 × 10 ⁻⁶ b	5.71 × 10 ⁻⁶ b	3.57 × 10 ⁻⁶ b	1.53 × 10 ⁻⁶ c						

Up-to-date without fail.
Online on the worldwide web



For detailed information, check out
www.schmersal.com

PROTECT SRBs

Standard applications STOP 0



- SRB 301MA _____ Page 12
- SRB 301MC _____ Page 14
- SRB 301ST V.2 _____ Page 16

The most common application of safety control modules is to disconnect the power from the actuators after the request of a safety sensor system (EMERGENCY STOP or guard-door monitor) instantaneously (STOP Category 0 according to EN 60204-1).

Here, Schmersal offers 3 modules which mainly differ in respect of their reset or start-up function. While SRB 301ST V.2 is suitable both for applications where Reset with monitoring on falling edge or an automatic start is required, SRB 301MA (reset only monitoring the falling edge) and SRB 301MC (automatic start only or reset without monitoring the falling edge) can only satisfy one of these criteria. Furthermore, the SRB 301ST V.2 has plug-in terminals which allows pre-wiring or facilitates changing the module.

Standard applications STOP 0

SRB 301MA

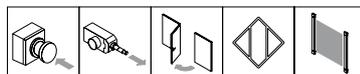


- Suitable for the signal treatment of potential-free contacts, e.g. emergency stop command devices, position switches, interlocking devices with and without interlocking function and magnetic safety switches
- Suitable for the signal treatment of potential-loaded outputs, e.g. electronic safety sensors with p-type semi-conductor outputs as well as safety light grids and light curtains
- 1 or 2 channel control
- 3 safety contacts, STOP 0
- 1 additional acknowledgement output
- Reset function with trailing edge
- Optionally with short-circuit recognition (through switch)
- 4 LEDs to show operating conditions

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Start button (monitored)
Feedback circuit (Y/N):	yes
ON delay with reset button:	typ. 15 ms
Drop-out delay in case of emergency stop:	≤ 15 ms
Drop-out delay on „supply failure“:	typ. 80 ms
Rated operating voltage U_e :	24 VDC -15%/+20%, residual ripple max. 10%; 24 VAC -15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current > 500 mA, reset after approx. 1 sec
Internal electronic protection (Y/N):	yes
Power consumption:	1.8 W; 4.4 VA
Monitored inputs:	
- Short-circuit recognition:	optional
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	3 (13-14; 23-24; 33-34)
Number of auxiliary contacts:	1 (41-42)
Max. switching capacity of the safety contacts:	230 VAC, 8 A ohmic (inductive in case of appropriate protective wiring); min. 10 V, 10 mA
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15: 230 V / 6 A DC-13: 24 V / 6 A
Fuse rating of the safety contacts:	8 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +60 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	250 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 301MA

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

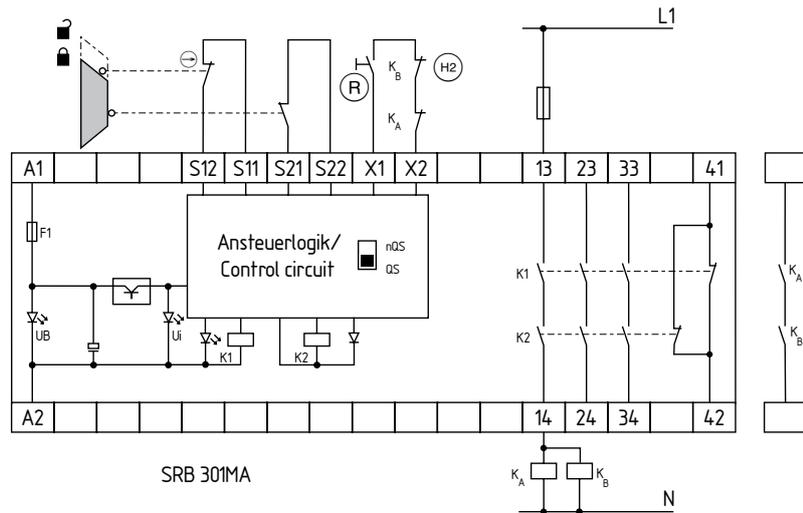
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Standard applications STOP 0

Note

- Monitors a guard door to PL e and category 4.
- Input level: The example shows a 2-channel control of a guard door monitoring with two position switches, whereof one with positive break, external reset button (R) and feedback circuit (H2).
- The feedback circuit monitors the position of the contactors Ka and Kb.
- Switch setting:
The cross-wire short detection function (factory default) is programmed by means of the switch located underneath the front cover of the module:
Position nQS (top):
no cross-wire short protection, suitable for 1-channel applications and applications with outputs with potential in the control circuits.
Position QS (bottom):
cross-wire short protection, suitable for 2-channel applications without outputs with potential in the control circuits.
- For 1-channel control, connect NC contact to S11/S12 and bridge S12/S22 (QS-switch = nQS)
- Connect potential p-type outputs of safety light grids/curtains to S12/S22. The devices must have the same reference potential. (QS-switch = nQS)
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Supply voltage U_B
- Internal operating voltage U_i

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

Standard applications STOP 0

SRB 301MC

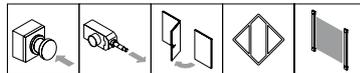


- Suitable for the signal treatment of potential-free contacts, e.g. emergency stop command devices, position switches, interlocking devices with and without interlocking function and magnetic safety switches
- Suitable for the signal treatment of potential-loaded outputs, e.g. electronic safety sensors with p-type semi-conductor outputs as well as safety light grids and light curtains
- 1 or 2 channel control
- 3 safety contacts, STOP 0
- 1 additional acknowledgement output
- Automatic reset function
- Optionally with short-circuit recognition (through switch)
- 4 LEDs to show operating conditions

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic or start button
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 100 ms
ON delay with reset button:	typ. 20 ms
Drop-out delay in case of emergency stop:	≤ 20 ms
Drop-out delay on „supply failure“:	typ. 80 ms
Rated operating voltage U _e :	24 VDC –15%/+20%, residual ripple max. 10%; 24 VAC –15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current > 500 mA, reset after approx. 1 sec
Internal electronic protection (Y/N):	yes
Power consumption:	2.0 W; 4.9 VA
Monitored inputs:	
- Short-circuit recognition:	optional
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	3 (13-14; 23-24; 33-34)
Number of auxiliary contacts:	1 (41-42)
Max. switching capacity of the safety contacts:	230 VAC, 8 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15: 230 V / 6 A DC-13: 24 V / 6 A
Fuse rating of the safety contacts:	8 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	–25 °C ... +60 °C
Storage and transport temperature:	–40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	250 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 301MC-24V

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

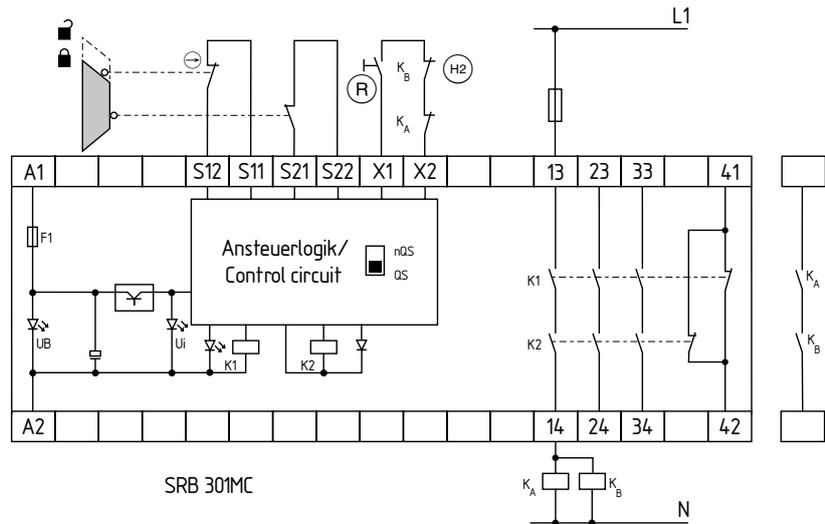
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Standard applications STOP 0

Note

- Monitors a guard door to PL e and category 4.
- Input level: The example shows a 2-channel control of a guard door monitoring with two position switches, whereof one with positive break, external reset button (R) and feedback circuit (H2).
- The feedback circuit monitors the position of the contactors Ka and Kb.
- Switch setting:
The cross-wire short detection function (factory default) is programmed by means of the switch located underneath the front cover of the module:
Position nQS (top):
no cross-wire short protection, suitable for 1-channel applications and applications with outputs with potential in the control circuits.
Position QS (bottom):
cross-wire short protection, suitable for 2-channel applications without outputs with potential in the control circuits.
- For 1-channel control, connect NC contact to S11/S12 and bridge S12/S22 (QS-switch = nQS)
- Connect potential p-type outputs of safety light grids/curtains to S12/S22. The devices must have the same reference potential. (QS-switch = nQS)
- 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.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Supply voltage U_b
- Internal operating voltage U_i

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

Standard applications STOP 0

SRB 301ST V.2

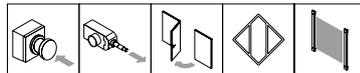


- Suitable for the signal treatment of potential-free contacts, e.g. emergency stop command devices, position switches, interlocking devices with and without interlocking function and magnetic safety switches
- Suitable for the signal treatment of potential-loaded outputs, e.g. electronic safety sensors with p-type semi-conductor outputs as well as safety light grids and light curtains
- 1 or 2 channel control
- 3 safety contacts, STOP 0
- 1 signalling output (NC contact)
- Optionally with short-circuit recognition (through switch)
- With hybrid fuse
- Reset with edge detection or automatic start
- 4 LEDs to show operating conditions
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic or start button (monitored)
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 100 ms
ON delay with reset button:	typ. 25 ms
Drop-out delay in case of emergency stop:	≤ 25 ms
Drop-out delay on „supply failure“:	typ. 100 ms
Rated operating voltage U _e :	24 VDC –15%/+20%, residual ripple max. 10%; 24 VAC –15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current F1 > 500 mA; tripping current (S11, S21) > 50 mA; reset after disconnection of supply voltage
Internal electronic protection (Y/N):	yes
Power consumption:	2.0 W; 4.9 VA
Monitored inputs:	
- Short-circuit recognition:	optional
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	3 (13-14; 23-24; 33-34)
Number of auxiliary contacts:	1 (41-42)
Max. switching capacity of the safety contacts:	250 VAC, 8 A ohmic (inductive in case of appropriate protective wiring); min. 10 V, 10 mA
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15; DC-13
Fuse rating of the safety contacts:	8 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +60 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	240 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 301ST V.2

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

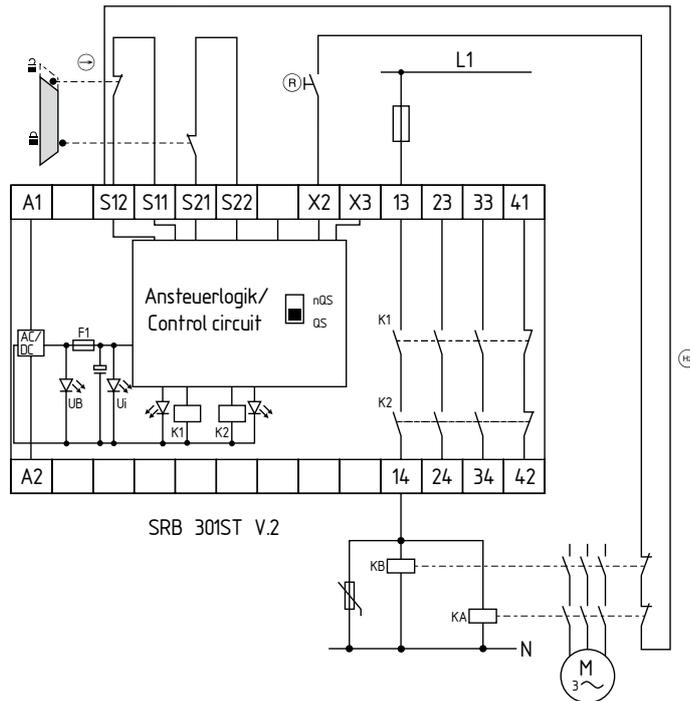
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Standard applications STOP 0

Note

- Input level: The example shows a 2-channel control of a guard door monitoring with two position switches, whereof one with positive break, external reset button (R) and feedback circuit (H2).
- The control recognises cross-short, cable break and earth leakages in the monitoring circuit.
- F1 = hybrid fuse
- 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.
- Switch setting:
The cross-wire short detection function (factory default) is programmed by means of the switch located underneath the front cover of the module:
Position nQS (top):
no cross-wire short protection, suitable for 1-channel applications and applications with outputs with potential in the control circuits.
Position QS (bottom):
cross-wire short protection, suitable for 2-channel applications without outputs with potential in the control circuits.
- For 1-channel control, connect NC contact to S11/S12 and bridge S12/S22 (QS-switch = nQS)
- Connect potential p-type outputs of safety light grids/curtains to S12/S22. The devices must have the same reference potential. (QS-switch = nQS)
- Automatic start:
The automatic start is programmed by connecting the feedback circuit to the terminals S12/X3. If the feedback circuit is not required, establish a bridge.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Supply voltage U_b
- Internal operating voltage U_i

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

Humanity first and foremost.
Safety Consulting



For detailed information, check out
www.schmersal.com

PROTECT SRBs

Standard applications STOP 0 / STOP 1



- SRB 211ST V.2 _____ Page 20
- SRB 324ST V.3 _____ Page 22

With safety control modules, in addition to instantaneous trip (STOP category 0 according to EN 60204-1) a drop-out delay (STOP category 1 according to EN 60204-1) is required - especially when using frequency converters. With the instantaneous shutdown at the safety input of the frequency converter, the build-up of a rotating field is reliably prevented and the motor running down can quickly feed its energy back into the mains until it has come to a halt. The output with the drop-out delay then safely disconnects the motor from the mains after a well-defined time.

Here, Schmersal offers of 2 modules, which mainly differ in the number of enabling paths, adjustable drop-out delay time and width.

Standard applications STOP 0 / STOP 1

SRB 211ST V.2

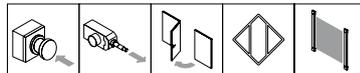


- Suitable for signal processing of potential-free outputs, e.g. emergency stop command devices, position switches, solenoid interlocks and magnetic safety switches
- Suitable for signal processing of outputs connected to potentials (AOPDs), e.g. safety light grids/curtains
- 1 or 2 channel control
- 2 safety contacts, STOP 0
1 safety contact, STOP 1
- 1 signalling output (transistor output)
- Optionally with short-circuit recognition, reset with edge detection or automatic start
- 6 LEDs to show operating conditions
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic or start button (monitored)
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 120 ms
ON delay with reset button:	typ. 25 ms
Drop-out delay in case of emergency stop:	(STOP 0: 13-14; 23-24) ≤ 20 ms
Drop-out delay on „supply failure“:	typ. 55 ms
Rated operating voltage U_e :	24 VDC –15%/+20%, residual ripple max. 10%; 24 VAC –15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current F1: > 750 mA; F2: > 75 mA; reset after disconnection of supply voltage; tripping current F3: > 140 mA
Internal electronic protection (Y/N):	yes
Power consumption:	2.4 W; 5.9 VA plus signalling output
Monitored inputs:	
- Short-circuit recognition:	optional
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0/1
Number of safety contacts:	3 (STOP 0: 13-14; 23-24) (STOP 1: 37-38)
Number of signalling outputs:	1 (Y1)
Max. switching capacity of the safety contacts:	(STOP 0: 13-14; 23-24) 250 VAC, 8 A ohmic; min. 5 V, 5 mA (STOP 1: 37-38) 250 VAC, 6 A ohmic ; min. 10 V, 10 mA (inductive in case of appropriate protective wiring)
Max. switching capacity of the signalling outputs:	24 VDC, 100 mA
Utilisation category to EN 60947-5-1:	AC-15; DC-13
Fuse rating of the safety contacts:	(STOP 0: 13-14; 23-24) 8 A slow blow (STOP 1: 37-38) 6.3 A slow blow
Fuse rating of the signalling outputs:	Internal electronic protection, tripping current F4: 100 mA
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	–25 °C ... +60 °C
Storage and transport temperature:	–40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 211ST V.2

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e; STOP 1: up to d
Category:	STOP 0: up to 4; STOP 1: up to 3
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h; STOP 1: ≤ 2.00 x 10 ⁻⁷ /h
SIL:	STOP 0: up to 3; STOP 1: up to 2
Mission time:	20 years

The PFH values of 2.00 x 10⁻⁸/h and 2.00 x 10⁻⁷/h apply to the combinations of contact load

(current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below.

At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts.

Diverging applications upon request.

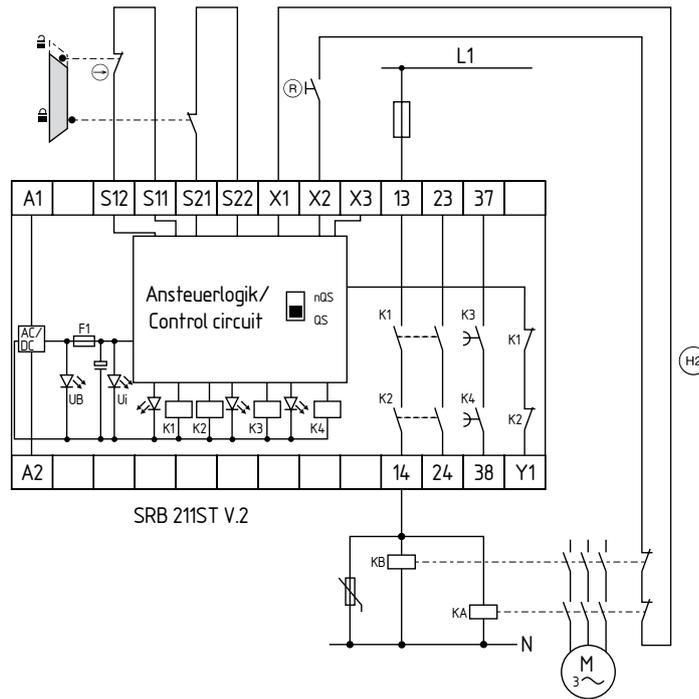
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Standard applications STOP 0 / STOP 1

Note

- Input level: The example shows a 2-channel control of a guard door monitoring with two position switches, whereof one with positive break, external reset button (R) and feedback circuit (H2).
- The control recognises cross-short, cable break and earth leakages in the monitoring circuit.
- F1 = hybrid fuse
- 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.
- Switch setting:
The cross-wire short detection function (factory default) is programmed by means of the switch located underneath the front cover of the module:
Position nQS (top):
no cross-wire short protection, suitable for 1-channel applications and applications with outputs with potential in the control circuits.
Position QS (bottom):
cross-wire short protection, suitable for 2-channel applications without outputs with potential in the control circuits.
- For 1-channel control, connect NC contact to S11/S12 and bridge S12/S22
- Connect potential p-type outputs of safety light grids/curtains to S12/S22. The devices must have the same reference potential.
- Automatic start:
The automatic start is programmed by connecting the feedback circuit to the terminals X1/X3. If the feedback circuit is not required, establish a bridge.
- Time delay:
The time-delayed safety enable 37/38 is adjustable for 1 to 30 seconds drop-out delay (see setting instructions).
- The safety enabling circuit 37/38 conforms to EN 60204-1 for STOP Category 1. The safety enabling circuits 13/14 and 23/24 conform to EN 60204-1 for STOP Category 0.
- Setting of the drop-out delay time is carried out by means of a potentiometer from the front of the enclosure.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Position relay K3
- Position relay K4
- Supply voltage U_B
- Internal operating voltage U_i

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Standard applications STOP 0 / STOP 1

SRB 324ST V.3

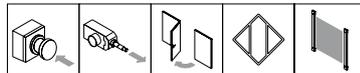


- Suitable for the signal treatment of potential-free contacts, e.g. emergency stop command devices, position switches, interlocking devices with and without interlocking function and magnetic safety switches
- Suitable for the signal treatment of potential-loaded outputs, e.g. electronic safety sensors with p-type semi-conductor outputs as well as safety light grids and light curtains
- 1 or 2 channel control
- 3 safety contacts, STOP 0;
2 safety contacts, STOP 1,
adjustable 1 ... 30 s
- 4 signalling outputs
- 6 LEDs to show operating conditions
- With hybrid fuse
- Optional: Short-circuit recognition, manual reset with edge detection in fail-safe circuit, automatic reset function

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic or start button (monitored)
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 400 ms
ON delay with reset button:	typ. 30 ms
Drop-out delay in case of emergency stop:	(13-14; 23-24; 33-34): ≤ 30 ms
Drop-out delay on „supply failure“:	typ. 80 ms
Rated operating voltage U_e :	24 VDC –15%/+20%, residual ripple max. 10%; 24 VAC –15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection; tripping current F1: > 2.5 A, F2: > 50 mA (S11-S31), > 800 mA (X4); reset after disconnection of supply voltage
Internal electronic protection (Y/N):	yes
Power consumption:	3.2 W; 7.1 VA, plus signalling output
Monitored inputs:	
- Short-circuit recognition:	optional
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0/1
Number of safety contacts:	5 (STOP 0: 13-14; 23-24; 33-34) (STOP 1: 47-48; 57-58)
Number of auxiliary contacts:	1 (61-62)
Number of signalling outputs:	3 (Y1-Y3)
Max. switching capacity of the safety contacts:	(STOP 0: 13-14; 23-24; 33-34): 250 VAC, 8 A (STOP 1: 47-48; 57-58): 250 VAC, 6 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Max. switching capacity of the signalling outputs:	24 VDC, 100 mA; residual current: 200 mA
Utilisation category to EN 60947-5-1:	AC-15; DC-13
Fuse rating of the safety contacts:	(STOP 0: 13-14; 23-24; 33-34): 8 A slow blow (STOP 1: 47-48; 57-58): 6.3 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Fuse rating of the signalling outputs:	500 mA (internal electronic protection F3)
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	–25 °C ... +60 °C
Storage and transport temperature:	–40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
Cable section:	0.25 ... 2.5 mm ²
Dimensions (Height x Width x Depth):	100 x 45 x 121 mm

Approvals



Ordering details

SRB 324ST-24V V.3

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e; STOP 1: up to d
Category:	STOP 0: up to 4; STOP 1: up to 3
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h; STOP 1: ≤ 2.00 x 10 ⁻⁷ /h
SIL:	STOP 0: up to 3; STOP 1: up to 2
Mission time:	20 years

The PFH values of 2.00 x 10⁻⁸/h and 2.00 x 10⁻⁷/h apply to the combinations of contact load

(current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below.

At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts.

Diverging applications upon request.

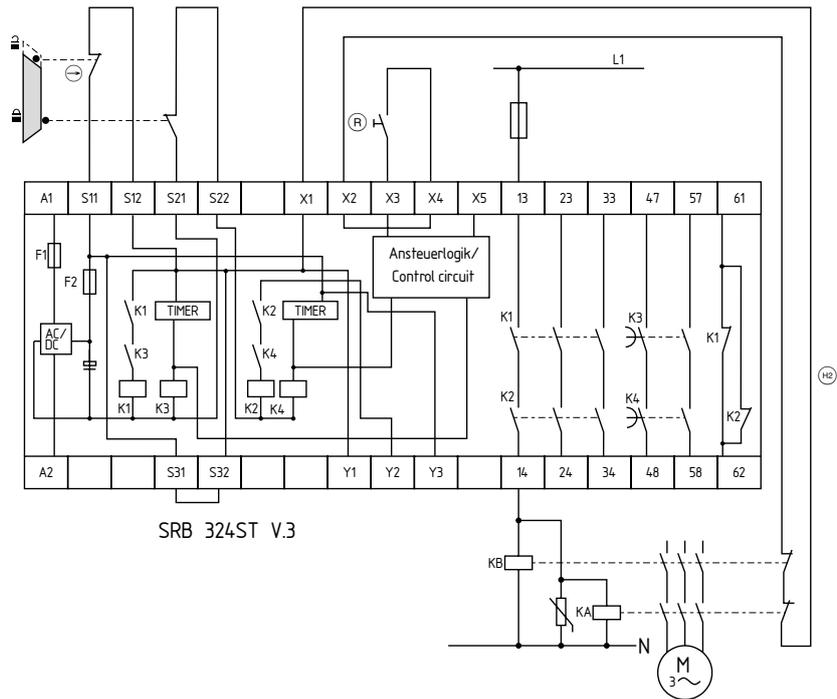
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Standard applications STOP 0 / STOP 1

Note

- 2 channel control shown for a guard-door monitor with two contacts A and B, of which at least one contact has positive break, with external reset button (R).
- 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.
- (H) = Feedback circuit
- The control recognises cross-short, cable break and earth leakages in the monitoring circuit.
- The time-delayed safety enabling circuits 47-48 and 57-58 meet STOP category 1 to EN 60204-1.
The non-delayed safety enabling circuits meet STOP category 0 to EN 60204-1.
- The drop-out delay is set through DIP switches, located underneath the cover installed at the front of the enclosure.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Position relay K3
- Position relay K4
- Supply voltage U_B
- Internal operating voltage U_i

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

Up-to-date without fail.
The online product catalogue



For detailed information, check out
www.schmersal.net

PROTECT SRBs

Input and output expanders



- PROTECT PE _____ Page 26
- SRB 402EM _____ Page 28
- SRB 401EM _____ Page 30

The input expanders of a safety relay module primarily offer the advantage of enhanced diagnostics. Here, each connected sensor is assigned to an auxiliary output on the module connected upstream. The 2-channel output only switches when all connected sensors are in a safe status, i.e. are closed. With the PROTECT-PE series, Schmersal is offering an input expander product range for different input sensors, various subsequent safety control modules and different connection terminals.

The purpose of the expanders is to duplicate the enable contacts of the safety control module. The modules available here differ in power supply. While the SRB 402EM requires a 24 VAC/DC supply, the SRB 401EM requires a supply voltage of 115 VAC or 230 VAC.

Input and output expanders

PROTECT-PE

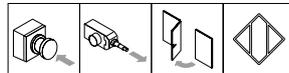


- Possibility to connect up to 4 sensors per interface, e.g. safety magnetic switches of the BNS type, emergency stop control devices, interlocking devices, etc.
- Wiring of up to 4 sensors per interface with signals connected to the potential possible, e.g. CSS products from Schmersal and AOPD's (only PROTECT-PE-02).
- Current and voltage limitation of the input circuits
- Connection of sensors with 2 NC contacts (PROTECT-PE-02) or of sensors with NC/NO contacts (PROTECT-PE-11)
- Cross-wire monitoring of the input circuits (only PROTECT-PE-02)
- Signalling output for each sensor (monitoring of both circuits of one sensor) and of all sensors (Y5, summation signal)
- Signalling output 32-33, 33-34
- Cascading possible for the connection of up to 80 sensors
- Width 65.5 mm
- 6 LED to show operating conditions
- Cage clamps or plug-in screw terminals (ordering suffix -SK)
- With antivalent output contacts, ordering suffix -AN

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC/EN 61508
Start conditions:	automatic
Feedback circuit (Y/N):	no
ON delay with automatic start:	typ. 10 ms
Drop-out delay in case of emergency stop:	≤ 10 ms
Drop-out delay on „supply failure“:	≤ 60 ms
Rated operating voltage U _e :	24 VDC -15%/+20%, residual ripple max. 10%
Fuse rating for the operating voltage:	Internal electronic trip, tripping current > 300 mA
Internal electronic protection (Y/N):	yes
Power consumption:	max. 1.7 W; plus signalling outputs
Monitored inputs:	
- Short-circuit recognition:	PROTECT-PE-11: option; PROTECT-PE-02: yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	PROTECT-PE-11: 1; PROTECT-PE-02: 2
Number of NO contacts:	PROTECT-PE-11: 1; PROTECT-PE-02: 0
Outputs:	
Stop category:	0
Number of auxiliary contacts:	2 (13-14; 23-24)
Number of signalling outputs:	7 (Y1-Y5; 32-33; 33-34)
Max. switching capacity of the safety contacts:	24 V, 2 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of signalling outputs:	24 VDC, 100 mA
Utilisation category to EN 60947-5-1:	DC-13
Fuse rating of the safety contacts:	2 A slow blow
Fuse rating of the signalling outputs:	Internal electronic trip, tripping current > 750 mA
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +55 °C
Storage and transport temperature:	-25 °C ... +70 °C
Protection class:	Enclosure: IP20, Terminals: IP20, Clearance: IP20
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Cage clamps or ordering suffix -SK: plug-in screw terminals
- min. cable section:	Cage clamps: 0.08 mm ² ; Plug-in screw terminals: 0.14 mm ²
- max. cable section:	Cage clamps: 2.5 mm ² ; Plug-in screw terminals: 1.5 mm ²
Weight:	160 g
Dimensions (Height x Width x Depth):	126 x 48 x 43 mm

Approvals



Ordering details

PROTECT-PE-①-②

No.	Option	Description
①	02	Connection of sensors with 2 NC contacts
	11	Connection of sensors with NC/NO contacts
	11-AN	Connection of sensors with NC/NO contacts and antivalent output contacts
②		Cage clamps
	SK	Plug-in screw terminals

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to d
Category:	STOP 0: up to 3
PFH value:	STOP 0: 2.00 x 10 ⁻⁷ /h
SIL:	STOP 0: up to 2
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁷/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

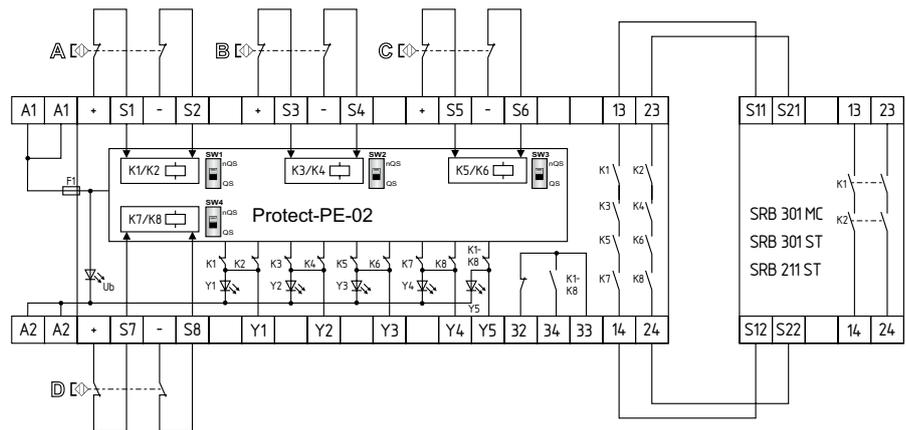
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Input and output expanders

Note

- Start level:
Depends on the wiring of the safety relay module.
- Sensor level:
Dual-channel control of magnetic safety switches according to IEC 60947-5-3.
- Output level:
Dual-channel control of a downstream safety relay module.
- Cross-shorts, wire breakage and earth leakage in the control circuits are detected.
- If the inputs S1, S3, S5 and S7 are not used, they have to be bridged to plus.
- If the inputs S2, S4, S6 and S8 are not used, they have to be bridged to minus.
- The safety relay modules must be suitable signal processing for single or dual-channel floating NC-contacts.
- Start and actuator configuration has to be effected in accordance with the data sheet.
- The obtainable performance level and category according to EN ISO 13849-1 depends on type and wiring of the used safety relay module.

Wiring diagram



LED

- LED's or signalling outputs signalise an opened protective device or emergency stops.
- Monitoring effected on both contact circuits of the sensor.
- When the protective device or the emergency stop circuit is opened a signal of 24 V will be wired the regarding output (Y1...Y5) and the dedicated LED lights.

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Position relay K3
- Position relay K4
- Internal operating voltage U_i

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Input and output expanders

SRB 402EM



- Expander module for contact expansion
- 4 safety contacts, STOP 0
- 2 signalling outputs (NC contact)
- 1 LED to show operating conditions
- PL e and category 4 depending on the connected safety relay module
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 30 ms
Drop-out delay in case of emergency stop:	≤ 35 ms
Rated operating voltage U_e :	24 VDC –15%/+20%, residual ripple max. 10%; 24 VAC –15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	internal T 1.0 A (5 x 20 mm)
Internal electronic protection (Y/N):	no
Power consumption:	1.0 VA
Monitored inputs:	
- Short-circuit recognition:	no
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	1
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	4 (13-14; 23-24; 33-34; 43-44)
Number of auxiliary contacts:	2 (51-52; 61-62)
Max. switching capacity of the safety contacts:	250 VAC, 6 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15; DC-13; EN 60947-5-1: 2007
Fuse rating of the safety contacts:	6 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	–25 °C ... +45 °C
Storage and transport temperature:	–40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	215 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 402EM-24V

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

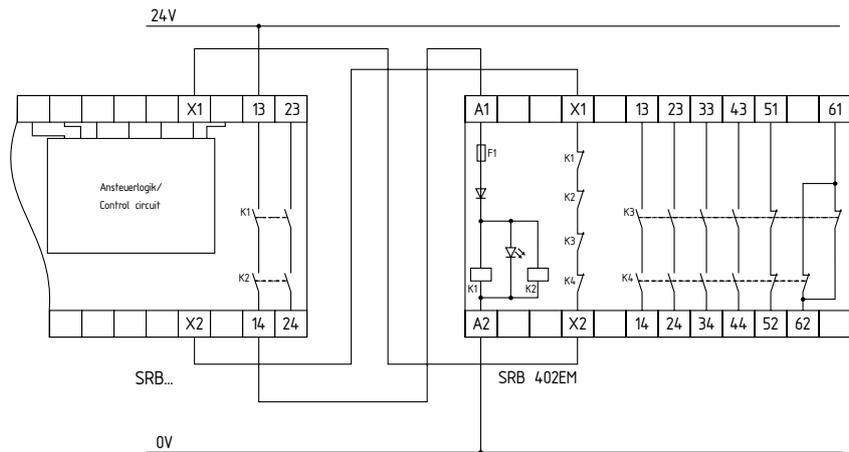
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Input and output expanders

Note

- Relay outputs: 1-channel control of the expander module is suitable for contact reinforcement or multiplication of the connected safety relay module.
- Terminals X1 and X2 of the expander module must be connected to the feedback circuit or reset circuit of the safety relay module.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1/K2

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

Input and output expanders

SRB 401EM



- Expander module for contact expansion
- 4 safety contacts, STOP 0
- 1 signalling output (NC contact)
- 1 LED to show operating conditions
- PL e and category 4 depending on the connected safety relay module
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 30 ms
Drop-out delay in case of emergency stop:	≤ 35 ms
Rated operating voltage U_e :	version 115 V: 115 VAC –15%/+6%; version 230 V: 230 VAC –15%/+6%
Rated operating current I_e :	0.05 A
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	internal T 1.0 A (5 x 20 mm)
Internal electronic protection (Y/N):	no
Power consumption:	1.0 VA
Monitored inputs:	
- Short-circuit recognition:	no
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	1
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	4 (13-14; 23-24; 33-34; 43-44)
Number of auxiliary contacts:	1 (51-52)
Max. switching capacity of the safety contacts:	250 VAC, 8 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15; DC-13; EN 60947-5-1: 2007
Fuse rating of the safety contacts:	8 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	–25 °C ... +50 °C
Storage and transport temperature:	–40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	260 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 401EM-①

No.	Option	Description
①	115V 230V	115 VAC 230 VAC

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

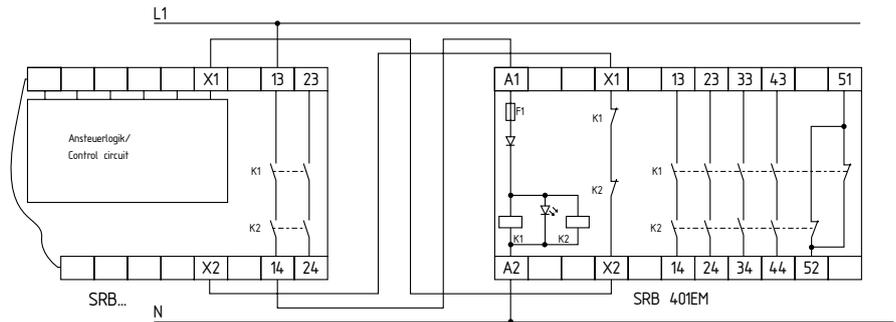
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Input and output expanders

Note

- Relay outputs: 1-channel control of the expander module is suitable for contact reinforcement or multiplication of the connected safety relay module.
- Terminals X1 and X2 of the expander module must be connected to the feedback circuit or reset circuit of the safety relay module.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1/K2

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

A basket full of solutions.

Food



For detailed information, check out
www.schmersal.com

PROTECT SRBs

Two-hand applications



- SRB 201ZH _____ Page 34
- SRB 301HC/R _____ Page 36

The special feature of the two-hand modules in the PROTECT series is that the circuitry is simple and inexpensive. A special mode of operation allows the circuit structure to be fully simplified while satisfying the requirements of the highest safety category III / C according to EN 574.

The two-hand modules are intended for connecting two control actuators, which are each fitted with a NC and NO contactor antivalent. Both controls must be operated simultaneously within a period of ≤ 0.5 s according to EN 574 type III / C requirements. If the time is exceeded, the two actuators must both trip before a restart can be initiated.

Two-hand applications

SRB 201ZH



Monitoring two-hand control panels to EN 574 III C

- 2 safety contacts, STOP 0
- 1 auxiliary NC contact with antivalent functioning principle (auxiliary contacts are not to be used in safety circuits)
- With feedback circuit
- With electronic protection
- 2 LEDs to show operating conditions
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1, EN 60947-5-1, EN ISO 13849-1, IEC 61508
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 50 ms
Drop-out delay:	typ. 30 ms
Rated operating voltage U_e :	24 VDC -15%/+10% residual ripple max. 10%
Fuse rating for the operating voltage:	Internal electronic trip, tripping current F1/F2: > 0.2 A, tripping current F3: > 0.6 A
Internal electronic protection (Y/N):	yes
Power consumption:	1.2 W
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	2
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	2
Number of auxiliary contacts:	1
Max. switching capacity of the safety contacts:	250 VAC, 6 A ohmic (inductive in case of appropriate protective wiring); min. 10 V, 10 mA
Utilisation category to EN 60947-5-1:	AC-15; DC-13
Fuse rating of the safety contacts:	6.3 A trage
Fuse rating of the auxiliary contacts:	2 A trage
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +45 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	200 g
Dimensions (Height x Width x Depth):	120 x 22.5 x 121 mm

Approvals



Ordering details

SRB 201ZH-24VDC

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: $\leq 2.00 \times 10^{-8}/h$
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of $2.00 \times 10^{-8}/h$ applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

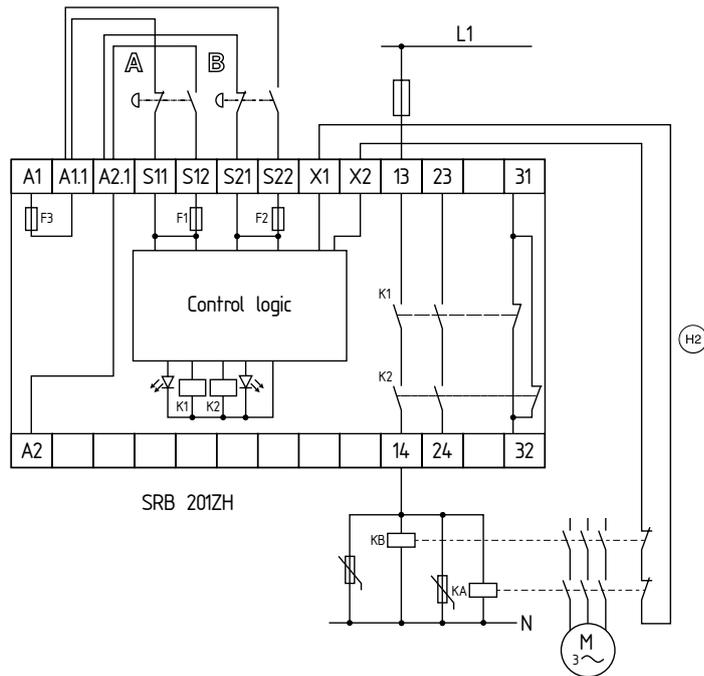
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Two-hand applications

Note

- Button A and B: 1 NC contact / 1 NO contact (note: the NC contact of the buttons A and B must be opened, before the NO contact closes. No overlapping contacts to avoid triggering of fuse F1 und F2).
- 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.
- H2 = Feedback circuit
- The control recognises cross-short, cable break and earth leakages in the monitoring circuit.
- Simultaneity monitoring 0.5 seconds

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Two-hand applications

SRB 301HC/R

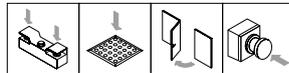


- Suitable for signal processing of potential-free outputs, e.g. emergency stop command devices, interlocking devices, two-hand control panels and safety mats
- 3 safety contacts, STOP 0
- 1 additional acknowledgement output
- Automatic reset, manual reset with edge detection
- Short-circuit recognition
- 4 LEDs to show operating conditions
- Plug-in screw terminals

Technical data

Standards:	EN ISO 13849-1; IEC 61508; EN 60947-5-1; DIN EN 1760-1; DIN EN 574; EN 60204-1
Start conditions:	Start button (monitored)
Feedback circuit (Y/N):	yes
ON delay with reset button:	typ. 50 ms
Drop-out delay in case of emergency stop:	≤ 20 ms
Drop-out delay on „supply failure“:	typ. 100 ms
Rated operating voltage U_e :	version 230 VAC: 48 ... 240 VAC; version 24 VAC/DC: 24 VDC -15%/+20%, residual ripple max. 10%; 24 VAC -15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current F1: > 500 mA; version 230 VAC: primary side: Safety fuse T1A; version 24 VAC/DC: secondary side: Internal electronic protection, tripping current > 0.12 A
Internal electronic protection (Y/N):	yes
Power consumption:	version 230 VAC: 1.6 W; 4.2 VA; version 24 VAC/DC: 1.4 W; 3.3 VA
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	3 (13-14; 23-24; 33-34)
Number of auxiliary contacts:	1 (41-42)
Max. switching capacity of the safety contacts:	250 VAC, 8 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15; DC-13
Fuse rating of the safety contacts:	8 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +60 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	version 230 VAC: 340 g; version 24 VAC/DC: 320 g
Dimensions (Height x Width x Depth):	100 x 45 x 121 mm

Approvals



Ordering details

SRB 301HC/R-①

No.	Option	Description
①	24V	24 VAC/DC
	230V	48 ... 240 VAC

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

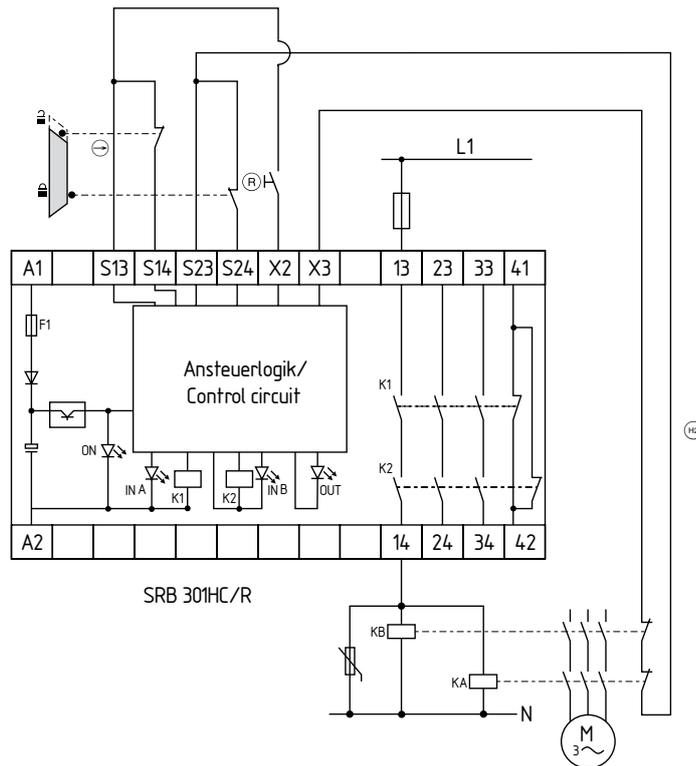
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Two-hand applications

Note

- 2 channel control shown for a guard-door monitor with two contacts, of which at least one contact has positive break, with external reset button (R).
- 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.
- (H) = Feedback circuit
- The control recognises cross-short, cable break and earth leakages in the monitoring circuit.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Supply voltage U_b

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

Up-to-date without fail.
Online on the worldwide web



For detailed information, check out
www.schmersal.com

PROTECT SRBs

Muting Applications



■ SRB 202MSL _____ Page 40

This special safety relay module is used to temporarily automatically bypass one or more safety functions during the normal operation of a machine (see EN 60 204-1). That is, the module bypasses the output signal of a safety device in order to ride safely through a danger zone (protected with safety light barriers and safety multiple infrared beam barriers for example) on an unmanned automatic transport system. The difference between whether a person is approaching the danger area or whether a transport system is travelling in or leaving the danger zone is determined via detection sensors in the form of conventional proximity switches, light barriers or limit switches (see also EN 61496-1).

Although a muting function is now often an integral part of safety multiple infrared beam barriers etc. not all applications can be covered. For example, it may be less expensive to install muting functions with several different safety light barriers.

The PROTECT-SRB 202MSL module is available for problems of this kind.

The special features include

- A lamp current monitor for the muting indicator with alarm output and
- A "simultaneity" signal output for the connected muting sensors.

Muting Applications

SRB 202MSL

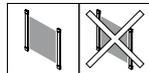


- Lamp current monitoring of the muting signalling device, optionally (upon request) without this function
- Muting signalling device monitoring
- Short-circuit recognition
- 2 safety contacts, STOP 0
- 1 signalling output „Muting signalling device“
- 1 signalling output „Simultaneity monitoring“
- 8 LEDs to show operating conditions
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	External muting sensors
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 200 ms
Drop-out delay in case of emergency stop:	≤ 20 ms
Drop-out delay on „supply failure“:	typ. 60 ms
Rated operating voltage U _e :	24 VDC -15%/+20% residual ripple max. 10%
Fuse rating for the operating voltage:	Internal electronic protection, tripping current > 1.25 A, reset after approx. 1 sec
Internal electronic protection (Y/N):	yes
Power consumption:	5.6 W, plus signalling outputs
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	2 St. (13-14; 23-24)
Number of signalling outputs:	2 St. (L54-L84; LA1-LA2)
Max. switching capacity of the safety contacts:	24 VDC, 4 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of the signalling outputs:	L54-L84: max. 50 mA; LA1-LA2: 24 VDC, max. 500 mA, min. 150 mA
Utilisation category to EN 60947-5-1:	DC-13; EN 60947-5-1: 2007
Fuse rating of the safety contacts:	4 A slow blow
Fuse rating of the auxiliary contacts:	T 0.5 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +45 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	400 g
Dimensions (Height x Width x Depth):	100 x 45 x 121 mm

Approvals



Ordering details

SRB 202MSL

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

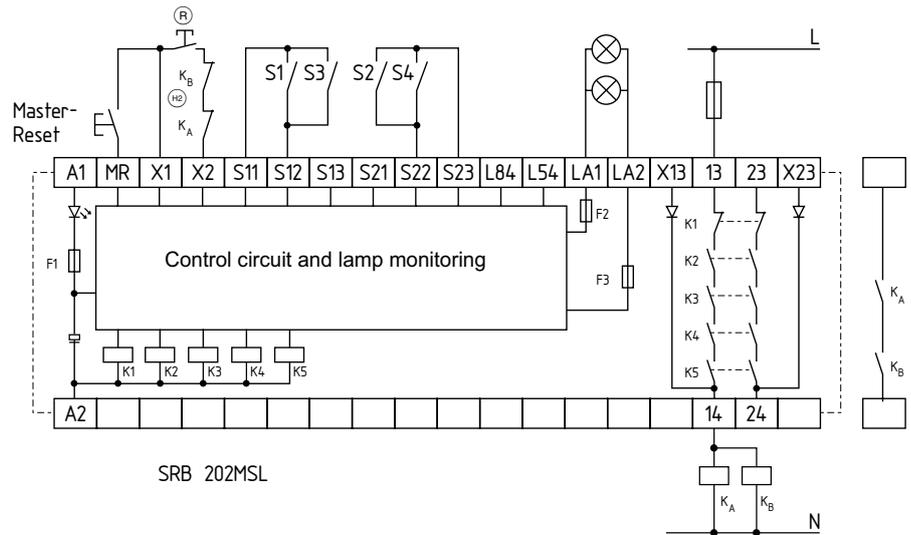
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Muting Applications

Note

- The example shows a 2-channel control of 2 muting sensors and an external master reset button.
- 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.
- HE = Feedback circuit
- The control recognises cross-short, cable break and earth leakages in the monitoring circuit.
- F1 = Electronic fuse
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Position relay K3
- Position relay K4
- Position relay K5
- Supply voltage U_b
- Internal operating voltage U_i
- Position of the muting signalling device LA1-LA2

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

Humanity first and foremost.
Safety Consulting



For detailed information, check out
www.schmersal.com

PROTECT SRBs

Safety mat applications



- SRB 301HC/T _____ Page 44
- SRB 301HC/R _____ Page 36

Safety mats, such as the SMS 4 and SMS 5 series from Schmersal, which operate according to the short-circuit principle (i.e. two conductive contact surfaces are brought together when operated and set off a short-circuit at the evaluation unit) require a special evaluation circuit.

The multifunctional safety control modules SRB 301HC/T or SRB 301HC/R in this case meet the requirements for safety mat evaluation, standard applications (EMERGENCY STOP and guard-door monitoring) and two-hand applications (see relevant data sheet). The two modules mainly differ in startup behaviour - while the SRB 301HC/T is used for applications with automatic start, the SRB 301HC/R monitors the falling edge of the reset signal.

Safety mat applications

SRB 301HC/T



- Suitable for signal processing of potential-free outputs, e.g. emergency stop command devices, interlocking devices and safety mats
- 3 safety contacts, STOP 0
- 1 additional acknowledgement output
- Automatic reset, manual reset without edge detection
- Short-circuit recognition
- 4 LEDs to show operating conditions
- Plug-in screw terminals

Technical data

Standards:	EN ISO 13849-1; IEC 61508; EN 60947-5-1; DIN EN 1760-1
Start conditions:	Automatic or start button
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 200 ms
Drop-out delay in case of emergency stop:	≤ 20 ms
Drop-out delay on „supply failure“:	typ. 100 ms
Rated operating voltage U _e :	version 230 VAC: 48 ... 240 VAC; version 24 VAC/DC: 24 VDC –15%/+20%, residual ripple max. 10%; 24 VAC –15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current F1: > 500 mA; version 230 VAC: primary side: Safety fuse T1A; version 24 VAC/DC: secondary side: Internal electronic protection, tripping current > 0.12 A
Internal electronic protection (Y/N):	yes
Power consumption:	version 230 VAC: 2.0 W; 5.1 VA; version 24 VAC/DC: 1.6 W; 3.7 VA

Monitored inputs:

- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω

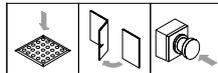
Outputs:

Stop category:	0
Number of safety contacts:	3 (13-14; 23-24; 33-34)
Number of auxiliary contacts:	1 (41-42)
Max. switching capacity of the safety contacts:	250 VAC, 8 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15; DC-13
Fuse rating of the safety contacts:	8 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations

Ambient conditions:

Ambient temperature:	-25 °C ... +60 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	version 230 VAC: 300 g; version 24 VAC/DC: 290 g
Dimensions (Height x Width x Depth):	100 x 45 x 121 mm

Approvals



Ordering details

SRB 301HC/T-①

No.	Option	Description
①	24V	24 VAC/DC
	230V	48 ... 240 VAC

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

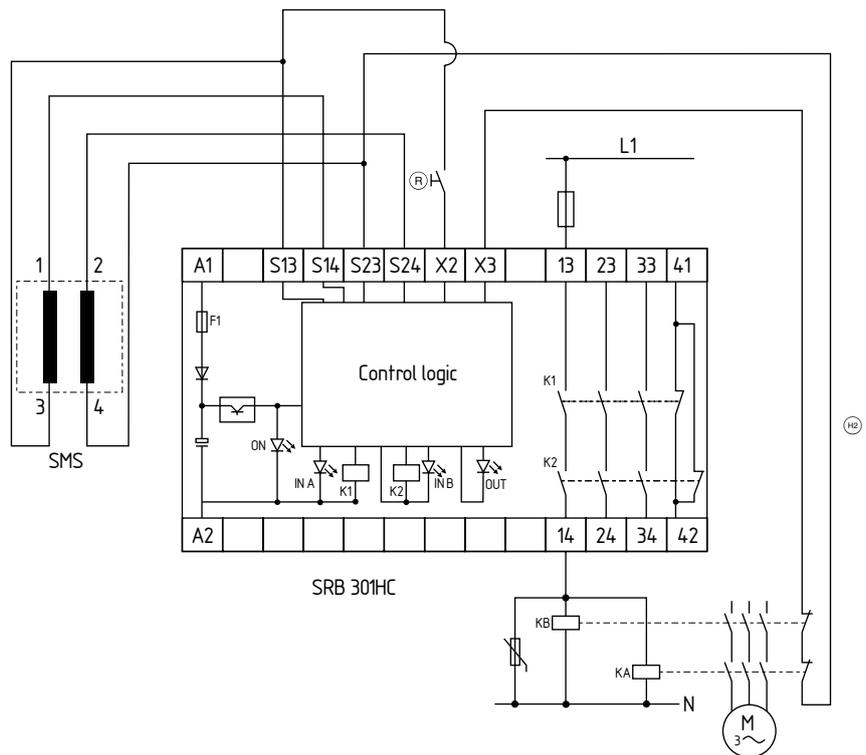
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Safety mat applications

Note

- Protection of a safety mat
- Start button with edge detection
- Feedback circuit (H2) to monitor the external contactors
- Series-wiring of multiple safety mats possible
- Reset button (R)

Wiring example



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Supply voltage U_b

Note

- The wiring example is shown with the safety mat in non-actuated and de-energised condition.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit

Up-to-date without fail.
The online product catalogue



For detailed information, check out
www.schmersal.net

PROTECT SRBs

Double reset



■ SRB 100DR _____ Page 48

The mode of operation of the PROTECT-SRB 100DR module ensures that machine controller can only be restarted,

- When the operator first locks a reset or a restart button 1 inside the machine and, after leaving the walk-in area, an isolation safety device again
- Then a reset or restart button 2, which is located outside the walk-in area, has been activated.

In order to carry out this so-called "double reset", an adjustable (via DIP switch) time window of 3 - 30 seconds is provided during which the two buttons must be pressed in the order 1 and 2 only. The time window must be guided by the operational procedures.

If the operator does not press button 1 or button 2 within the time window, for example, because the process of re-starting the machine could not be carried out quickly enough, the double reset must be repeated.

Proper acknowledgment generates an enable signal in the SRB 100DR module which is then processed by a standard safety control module from the PROTECT series, for example, as a start signal. The signals from both buttons are processed with the additional safety feature of detection of the falling edge.

Double reset

SRB 100DR



- Suitable for signal processing of potentialfree outputs, e.g. command devices
- 2 channel control
- 1 safety contact, STOP 0
- Time adjustable from 3 s to 30 s
- Signal processing with trailing edge
- Electronic fuse
- Switching capacity of the safety contacts 8 A
- Extended temperature range
- 4 LEDs to show operating conditions

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Feedback circuit (Y/N):	no
ON delay with reset button:	typ. 50 ms
Rated operating voltage U_e :	24 VDC -15%/+20% residual ripple max. 10% 24 VAC -15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current > 500 mA, reset after approx. 1 sec
Internal electronic protection (Y/N):	yes
Power consumption:	3.2 W; 6.0 VA
Monitored inputs:	
- Short-circuit recognition:	no
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Number of safety contacts:	1 St. (13-14)
Max. switching capacity of the safety contacts:	250 VAC, 8 A ohmic (inductive in case of appropriate protective wiring)
Utilisation category to EN 60947-5-1:	AC-15; DC-13: EN 60947-5-1: 2007
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +60 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	250 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 100DR

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: $\leq 2.00 \times 10^{-8}/h$
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of $2.00 \times 10^{-8}/h$ applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

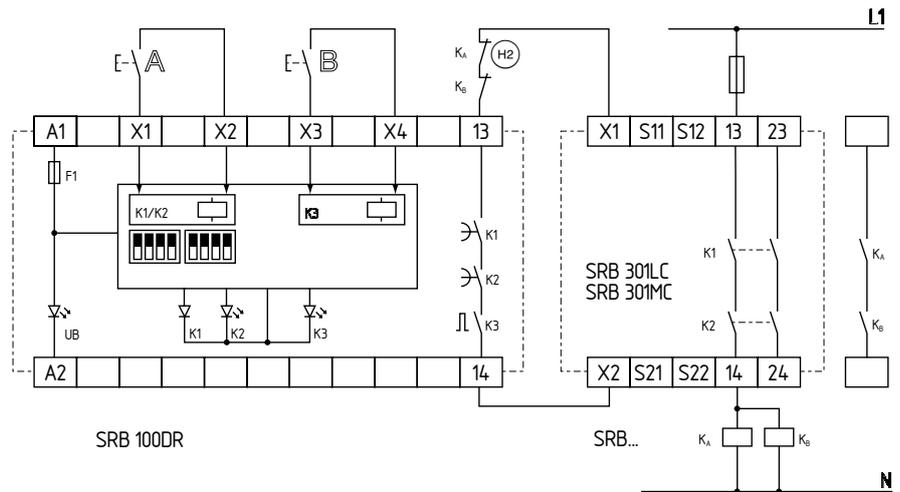
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Double reset

Note

- Start configuration: 2 time-dependent reset/on switches 1st and 2nd monitoring time between the 1st and 2nd reset button from 3 ... 30 seconds adjustable through DIP switches
- The monitoring time is set through DIP switches located below the cover of the enclosure front. (Factory setting: 3 seconds)
- Actuator configuration: 1-channel control (output impulse approx. 200 ms) of the reset input of a downstream safety relay module
-  = Feedback circuit
- Edge detection:
After the device is reset, the trailing edge is evaluated, so that errors, e.g. welded contacts or manipulations cannot lead to dangerous situations.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Position relay K3
- Supply voltage U_b

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

A basket full of solutions.

Food



For detailed information, check out
www.schmersal.com

PROTECT SRBs

Antivalent input circuit



- SRB 301AN _____ Page 52
- SRB 211AN V.2 _____ Page 54

The BNS series safety magnetic switches, or other safety switches supplied by Schmersal for guard door monitoring, either switch 2 NC contacts or antivalent, i.e. 1 NC contact and 1 NO contact, to signal the status of the safety device.

Safety control modules are required for the antivalent input circuitry for this particular type of evaluation system, as they offer the types SRB 301AN and SRB 211AN V.2. The two devices mainly differ in the drop-out delay behaviour of an enabling path

Antivalent input circuit

SRB 301AN

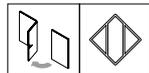


- Monitoring of BNS range magnetic safety sensors
- 3 safety contacts, STOP 0
- 1 Signalling output
- With hybrid fuse
- Short-circuit recognition
- Feedback circuit to monitor external relays
- Start function with trailing edge (optional)
- Operating voltage 24 VDC
- Additional contacts by means of output expander
- 3 LEDs to show operating conditions
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic or start button (monitored)
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 120 ms
ON delay with reset button:	typ. 30 ms
Drop-out delay in case of emergency stop:	(STOP 0: 13-14; 23-24) ≤ 25 ms
Drop-out delay on „supply failure“:	typ. 20 ms
Rated operating voltage U _e :	24 VDC –15%/+20%, residual ripple max. 10%; 24 VAC –15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current > 500 mA, reset after approx. 1 sec
Internal electronic protection (Y/N):	yes
Power consumption:	2.1 W; 3.5 VA
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	1
Number of NO contacts:	1
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	3 (13-14; 23-24; 33-34)
Number of auxiliary contacts:	1 (41-42)
Max. switching capacity of the safety contacts:	250 VAC, 6 A ohmic (inductive in case of appropriate protective wiring); min. 10 V, 10 mA
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15; DC-13; EN 60947-5-1: 2007
Fuse rating of the safety contacts:	6 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +45 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	235 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 301AN

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

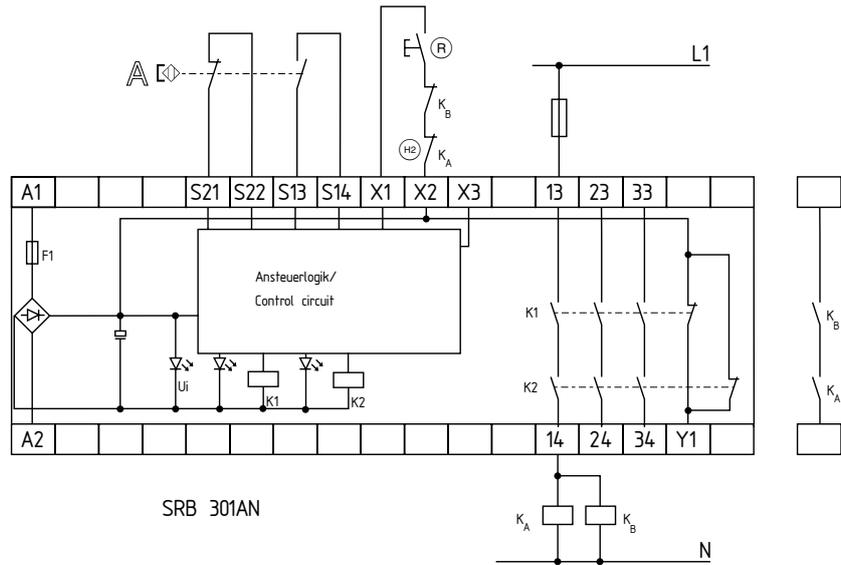
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Antivalent input circuit

Note

- Monitors a guard door to PL e and category 4.
- Monitoring 1 guard door(s), each with a magnetic safety sensor of the BNS range
- Start button $\text{\textcircled{R}}$ with edge detection
- The feedback circuit monitors the position of the contactors K_A and K_B .
- Automatic start:
The automatic start is programmed by connecting the feedback circuit to the terminals X1/X3. If the feedback circuit is not required, establish a bridge
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Internal operating voltage U_i

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

Antivalent input circuit

SRB 211AN V.2

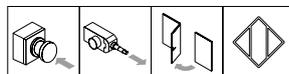


- Suitable for signal processing of potential-free outputs, e.g. emergency stop command devices and interlocking devices
- Fit for signal evaluation of outputs of safety magnetic switches
- 2 channel control
- 2 safety contacts, STOP 0
- 1 safety contact, STOP 1
- 1 signalling output
- Switching capacity of the safety contacts 6 A
- Automatic reset, manual reset with edge detection
- 6 LEDs to show operating conditions
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic or start button (monitored)
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 120 ms
ON delay with reset button:	typ. 25 ms
Drop-out delay in case of emergency stop:	(STOP 0: 13-14; 23-24) ≤ 20 ms
Drop-out delay on „supply failure“:	typ. 55 ms
Rated operating voltage U_e :	24 VDC –15%/+20% residual ripple max. 10% 24 VAC –15%/+10%
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	Internal electronic protection, tripping current F1: > 750 mA; F2: > 75 mA; reset after disconnection of supply voltage; tripping current F3: > 140 mA
Internal electronic protection (Y/N):	yes
Power consumption:	2.4 W; 5.9 VA plus signalling output
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	1
Number of NO contacts:	1
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0/1
Number of safety contacts:	3 (STOP 0: 13-14; 23-24) (STOP 1: 37-38)
Number of signalling outputs:	1 (Y1)
Max. switching capacity of the safety contacts:	(STOP 0: 13-14; 23-24) 250 VAC, 8 A ohmic; min. 5 V, 5 mA (STOP 1: 37-38) 250 VAC, 6 A ohmic; min. 10 V, 10 mA (inductive in case of appropriate protective wiring)
Max. switching capacity of the signalling outputs:	24 VDC, 100 mA
Utilisation category to EN 60947-5-1:	AC-15; DC-13
Fuse rating of the safety contacts:	(STOP 0: 13-14; 23-24) 8 A slow blow (STOP 1: 37-38) 6.3 A slow blow
Fuse rating of the signalling outputs:	Internal electronic protection, tripping current F4: 100 mA
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	–25 °C ... +60 °C
Storage and transport temperature:	–40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 211AN V.2

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e; STOP 1: up to d
Category:	STOP 0: up to 4; STOP 1: up to 3
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h; STOP 1: ≤ 2.00 x 10 ⁻⁷ /h
SIL:	STOP 0: up to 3; STOP 1: up to 2
Mission time:	20 years

The PFH values of 2.00 x 10⁻⁸/h and 2.00 x 10⁻⁷/h apply to the combinations of contact load

(current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below.

At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts.

Diverging applications upon request.

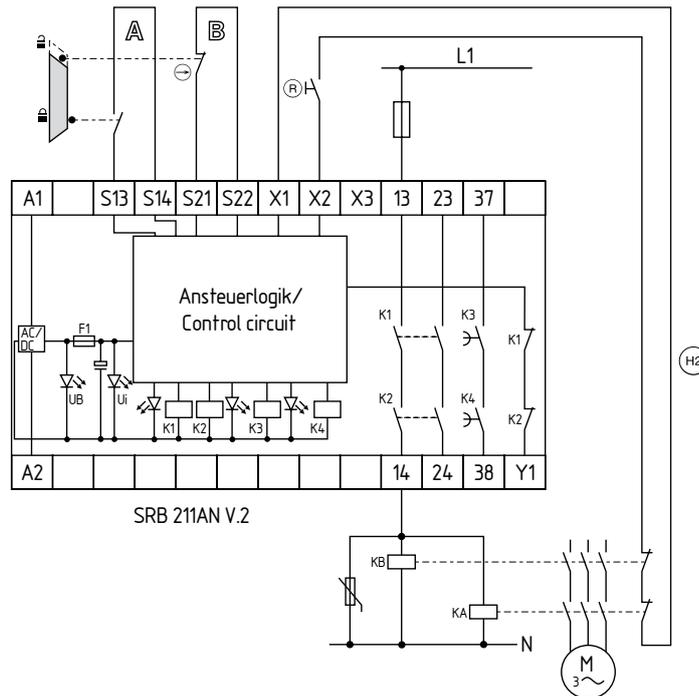
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Antivalent input circuit

Note

- Input level: The example shows a 2-channel control of a guard door monitoring with two position switches, whereof one with positive break, external reset button (R) and feedback circuit (H2).
- The control recognises cross-short, cable break and earth leakages in the monitoring circuit.
- F1 = hybrid fuse
- 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.
- Time delay: The time-delayed safety enable 37/38 is adjustable for 1 to 30 seconds drop-out delay (see setting instructions).
- The safety enabling circuit 37/38 conforms to EN 60204-1 for STOP Category 1. The safety enabling circuits 13/14 and 23/24 conform to EN 60204-1 for STOP Category 0.
- Setting of the drop-out delay time is carried out by means of a potentiometer from the front of the enclosure.
- Automatic start: The automatic start is programmed by connecting the feedback circuit to the terminals X1/X3. If the feedback circuit is not required, establish a bridge.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Position relay K3
- Position relay K4
- Supply voltage U_B
- Internal operating voltage U_f

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.

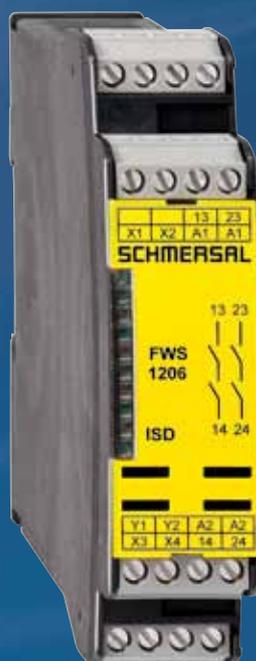
Up-to-date without fail.
Online on the worldwide web



For detailed information, check out
www.schmersal.com

PROTECT SRBs

Standstill monitoring



- AZR 31S1 (sensorless) _____Page 58
- FWS 1206 (proximity switch) ____Page 60

Schmersal offers a comprehensive product portfolio of different technologies for standstill and drive monitoring:

- The sensorless standstill monitor AZR 31S1 is connected in parallel to the motor winding of 1 or 3-phase AC motors and evaluates the frequency proportional to speed of motors running down.
- Signals, typically from 2 PNP proximity switches which are structurally fixed to the drive axle of a machine so that they produce a frequency proportional to the speed via perforated discs, for example, are evaluated by the standstill monitor FWS 1206.

Standstill monitoring

AZR 31S1



- Engine voltage range 0 ... 400 V
- No adjustment required
- Suitable for a frequency converter:
 - rotary hysteresis 0 ... 1000 Hz;
 - switching frequency of the end level : ≤ 16 kHz
- 3 safety contacts, STOP 0
- 1 signalling output (NC contact)
- No reference value setting required
- Wire-breakage monitoring of measuring inputs
- Self-test with fault memory
- Cyclic self-testing
- 5 LEDs to show operating conditions
- ON delay approx. 7 seconds after the detection of the standstill (optionally 2 seconds)

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 7 seconds after detection of the standstill version -2sec: typ. 2 seconds after detection of the standstill
Drop-out delay in case of emergency stop:	immediately after the detection of a rotary movement
Rated operating voltage U_e :	version 24 VDC: 24 VDC -15%/+20% residual ripple max. 10% version 24 VAC: 24 VAC -15%/+20%; version 115 VAC: 115 VAC -15%/+10%; version 230 VAC: 230 VAC -15%/+10%
Fuse rating for the operating voltage:	version 24 VAC/24 VDC: internal T 315 mA (5 x 20 mm); version 115 VAC: internal T 64 mA (5 x 20 mm); version 230 VAC: internal T 32 mA (5 x 20 mm)
Internal electronic protection (Y/N):	no
Power consumption:	version 24 VDC: max. 3.2 VA version 24 VAC/115 VAC/230 VAC: max. 4.0 VA
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	0
Number of NO contacts:	0
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	3 St. (13-14; 23-24; 33-34)
Number of auxiliary contacts:	1 St. (41-42)
Max. switching capacity of the safety contacts:	250 VAC, 6 A ohmic (inductive in case of appropriate protective wiring); min. 10 V, 10 mA
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15; DC-13; EN 60947-5-1: 2007
Fuse rating of the safety contacts:	6.3 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +45 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	version 24 VAC/DC: 380 g; version 115/230 VAC: 400 g
Dimensions (Height x Width x Depth):	73.2 x 45 x 121 mm

Approvals



Ordering details

AZR 31S1 ①②

No.	Option	Description
①	24VDC	24 VDC
	24VAC	24 VAC
	115VAC	115 VAC
	230VAC	230 VAC
②		ON delay approx. 7 seconds
	2sec	ON delay approx. 2 seconds

Function table

Test cycle time: Time between the standstill detection and enabling of the safety contacts

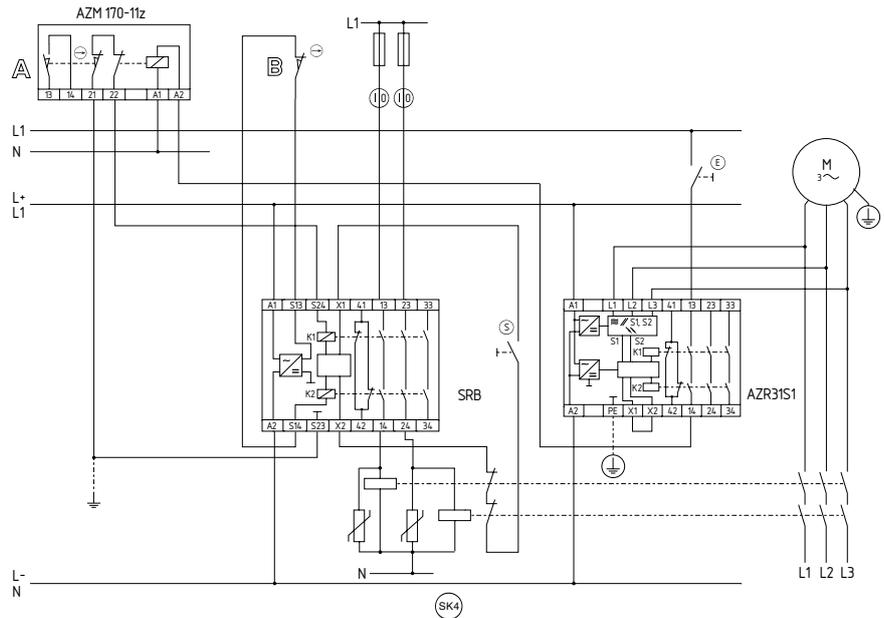
Pole pair/ Number of motors	Zero-axis crossing, per revolution	Standstill detection, device with 2 s test cycle time [h/min]	Standstill detection, device with 7 s test cycle time [h/min]
1	2	15.00	3.75
2	4	7.50	1.88
4	8	3.75	0.94
6	12	2.50	0.63
8	16	1.88	0.47

Standstill monitoring

Note

- The sensor-free standstill monitor checks the e.m.f. of the three phase motor.
- Monitors one guard door
- The SRB range guard door monitor checks the position of the guard door.
- Monitoring the guard door using a solenoid interlock and a safety switch with separate actuator (A and B).
- Release takes place by means of the NO contact (E) only when the run-down movement has been terminated.
- After release has taken place, the guard door must be opened.
- The wiring diagram is shown with guard doors closed and in de-energised condition.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.
- This fail-safe standstill monitor has the particular advantage that no adjustment for a required-value is needed during commissioning.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- A: Input signal channel A, red
- B: Input signal channel B, red
- ERR: Error, red
- OUT: Authorized operation, green
- ON: Supply voltage, green

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: $\leq 2.00 \times 10^{-8}/h$
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of $2.00 \times 10^{-8}/h$ applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Standstill monitoring

FWS 1206



- Detects standstill using 1 or 2 impulse sensors
- Uses additional standstill signal, e.g. PLC as second input channel
- 2 safety contacts, STOP 0
- 2 signalling outputs
- Operating voltage 24 VDC
- Reset input
- 2 short-circuit proof additional transistor outputs
- ISD Integral System Diagnostics
- 2 channel microprocessor controlled
- Customer-specific standstill frequencies possible

Technical data

Standards:	EN 60204-1, EN ISO 13849-1, IEC 61508, BG-GS-ET-20
Feedback circuit (Y/N):	yes
Standstill frequency:	version A: inputs X1/X2: 1 Hz / 2 Hz; version C: inputs X1/X2: 1 Hz / 1 Hz
Rated operating voltage U_e :	24 VDC \pm 15%
Rated operating current I_e :	0.2 A
Internal electronic protection (Y/N):	no
Power consumption:	< 5 W
Monitored inputs:	
- Short-circuit recognition:	no
- Wire breakage detection:	yes
- Earth connection detection:	yes
Hysteresis:	10% of standstill frequency
Max. input frequency:	4000 Hz
Min. pulse duration:	125 μ s
Outputs:	
Stop category:	0
Number of safety contacts:	2
Number of auxiliary contacts:	0
Number of signalling outputs:	2
Max. switching capacity of the safety contacts:	6 A
Utilisation category to EN 60947-5-1:	AC-15: 230 V / 3 A; DC-13: 24 V / 2 A
Mechanical life:	20 million operations
LED display:	ISD
Ambient conditions:	
Ambient temperature:	0 °C ... +55 °C
Storage and transport temperature:	-25 °C ... +70 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals
- min. cable section:	0.2 mm ²
- max. cable section:	2.5 mm ² , solid strand or multi-strand (incl. conductor ferrules)
Weight:	190g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to d
Category:	up to 3
PFH value:	1.0 x 10 ⁻⁷ /h
SIL:	up to 2
Mission time:	20 years

Approvals



Ordering details

FWS 1206 ①

No.	Option	Description
①		Standstill frequencies inputs X1/X2:
	A	1 Hz/2 Hz
	C	1 Hz/1 Hz

Function table

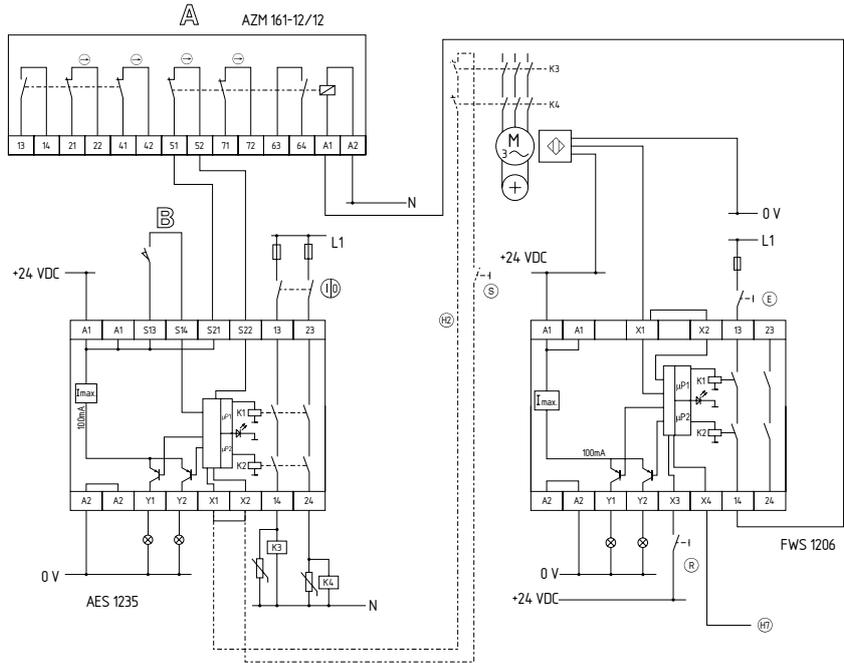
Additional transistor output:	Function:
Y1	Authorized operation, safety contacts closed
Y2	Fault, high signal

Standstill monitoring

Note

- To monitor one guard door at plants with dangerous run-on movements up to PL d and category 3
- Standstill monitoring for unlocking solenoid interlocks
- The solenoid interlock can be opened, when the standstill monitor has detected the end of the run-on movement by means of one or two inductive proximity switches as well as the supplementary standstill signal (HT). When the button (E) is actuated, the coil of the solenoid interlock is energised.
- If only one inductive proximity switch is connected to the standstill monitor, the standstill frequencies must be identical and inputs X1 and X2 must be bridged (only version C).
- For suitable IFL range p-type inductive proximity switches, refer to „Schmersal Catalogue Automation technology“.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



ISD

The following faults are registered by the safety monitoring modules and indicated by ISD

- Interruption of the connections to the inductive proximity switches
- Failure of the proximity switches
- Failure of one channel being evaluated
- Failure of the safety relay to pull-in or drop-out
- Fault on the input circuits or the relay control circuits of the safety monitoring module

Note

- The wiring diagram is shown with guard doors closed and in de-energised condition.
- The ISD tables (Integral System Diagnostics) for analysis of the fault indications and their causes are shown in the appendix.

Humanity first and foremost.
Safety Consulting



For detailed information, check out
www.schmersal.com

PROTECT SRBs

Differential switch-off behaviour



- SRB 202C _____ Page 64
- SRB 400C _____ Page 66

The special feature of the circuitry of these modules (SRB 202 and SRB 400) is their dual functionality.

"Dual functionality" means that two safety devices can be connected to a module in parallel and the safety enables switch off differentially depending on which safety device a safety function is requested from. If an EMERGENCY STOP control device and a guard-door lock are connected on the sensor level, the EMERGENCY STOP device acts on all safety enables as the master and the locking device only on some.

With module SRB 202, 2 safety enables (plus two signal contacts) are available and with module SRB 400, a total of 4 safety enables are available. One or two enables can be switched off differentially depending on the module.

Differential switch-off behaviour

SRB 202C.

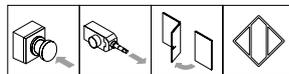


- Two-functions safety monitoring module (double evaluation)
- 2 enabling paths with different shut-down behaviour, e.g. emergency exit opens both enabling paths (Level 1); guard door monitoring only opens the second enabling path (Level 2)
- Suitable for signal processing of potential-free contacts, e.g. Emergency Stop command devices (Level 1), position switches with safety function, solenoid interlocks and safety sensors (Level 2)
- 2 signalling outputs: NC contacts (2 Levels)
- Short-circuit recognition (optional)
- Level 1: reset with or without edge detection (option) or automatic start; Level 2: reset without edge detection or automatic start
- 1 or 2 channel control
- 6 LEDs to show operating conditions
- NC/NC contact or NC/NO contact signal evaluation in Level 2 optionally
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic or start button
Feedback circuit (Y/N):	yes
ON delay with reset button:	typ. 40 ms (Level 1) typ. 500 ms (Level 2)
Drop-out delay in case of emergency stop:	≤ 50 ms
Rated operating voltage U_e :	24 VDC -15%/+20% residual ripple max. 10%
Fuse rating for the operating voltage:	Internal electronic protection, tripping current > 1 A, reset after approx. 1 sec
Internal electronic protection (Y/N):	yes
Power consumption:	4.4 W
Monitored inputs:	
- Short-circuit recognition:	no, suffix Q: yes (depending level 1)
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	suffix CA: 3; suffix CS: 2
Number of NO contacts:	suffix CA: 1; suffix CS: 2
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	2 (13-14; 13-24)
Number of auxiliary contacts:	2 (31-32; 31-42)
Max. switching capacity of the safety contacts:	230 VAC, 4 A ohmic (inductive in case of appropriate protective wiring)
Max. switching capacity of the auxiliary contacts:	24 VDC, 2 A
Utilisation category to EN 60947-5-1:	AC-15: 230 V / 4 A; DC-13: 24 V / 4 A
Fuse rating of the safety contacts:	4 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +45 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	235 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 202C.

Refer to table right

Ordering details

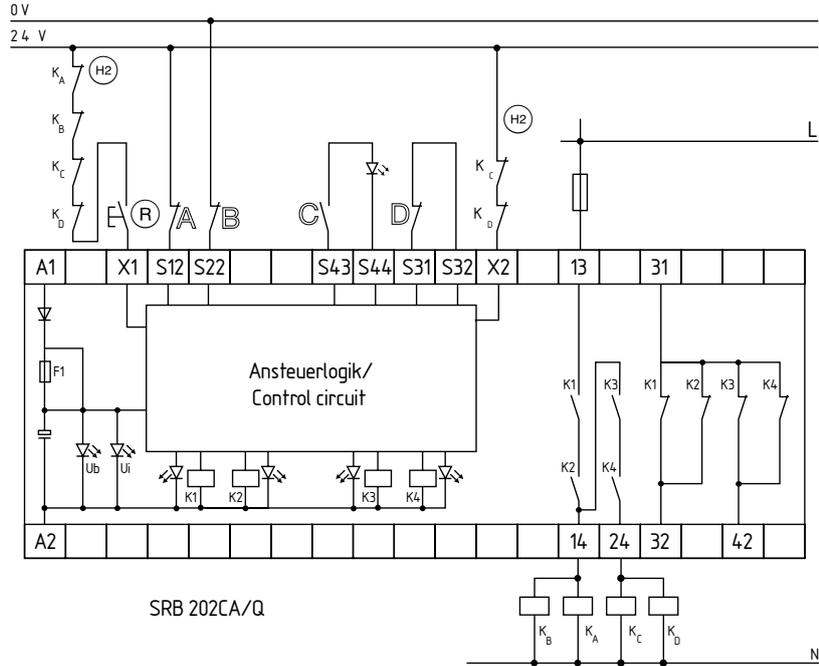
	Level 1	Level 2
	Sensor: NC contact/NC contact	Start conditions: Reset without edge detection, optionally with automatic reset
SRB 202CS/T SRB 202CS	Reset with trailing edge, Reset without edge detection, optionally with automatic reset	NC contact/NC contact NC contact/NC contact
SRB 202CA/T SRB 202CA/QT	Reset with trailing edge, Reset with trailing edge, Cross-wire monitoring	NC contact/NO contact NC contact/NO contact
SRB 202CA	Reset without edge detection, optionally with automatic reset	NC contact/NO contact
SRB 202CA/Q	Reset without edge detection, optionally with automatic reset, Cross-wire monitoring	NC contact/NO contact

Differential switch-off behaviour

Note

- Input level: the example shows a 2-channel control of an Emergency Stop command device (Level 1) with external reset button (R), and guard door monitoring (Level 2) with feedback circuit (H2).
- The control recognises cross-short, cable break and earth leakages in the monitoring circuit.
- 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.
- Automatic start:
 Level 1: the automatic start is programmed by connecting the feedback circuit to the terminals X1/+24VDC.
 Level 2: the automatic start is programmed by connecting the feedback circuit to the terminals X2/+24VDC. If the feedback circuit is not required, establish a bridge
- 1 NC contact each time communicates the status of Level 1 and Level 2
- The wiring diagram is shown with guard doors closed and in de-energised condition.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Position relay K3
- Position relay K4
- Supply voltage U_b
- Internal operating voltage U_i

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: $\leq 2.00 \times 10^{-8}/h$
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of $2.00 \times 10^{-8}/h$ applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Differential switch-off behaviour

SRB 400C.

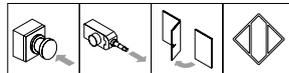


- Two-functions safety monitoring module (double evaluation)
- 2 x 2 enabling paths with different shut-down behaviour, e.g. Emergency Stop opens both enabling paths (Level 1) guard door monitoring only opens the second enabling path (Level 2)
- Suitable for signal processing of potentialfree contacts, e.g. Emergency Stop command devices (Level 1), position switches with safety function, solenoid interlocks and safety sensors (Level 2)
- Short-circuit recognition (optional)
- Level 1: reset with or without edge detection (option) or automatic start; Level 2: reset without edge detection or automatic start
- 1 or 2 channel control
- 6 LEDs to show operating conditions
- NC/NC contact or NC/NO contact signal evaluation in Level 2 optionally
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1; EN 60947-5-1; EN ISO 13849-1; IEC 61508
Start conditions:	Automatic or start button
Feedback circuit (Y/N):	yes
ON delay with reset button:	typ. 40 ms (Level 1) typ. 500 ms (Level 2)
Drop-out delay in case of emergency stop:	≤ 50 ms
Rated operating voltage U _e :	24 VDC -15%/+20%, residual ripple max. 10%;
Fuse rating for the operating voltage:	Internal electronic protection, tripping current > 1.0 A, reset after approx. 1 sec
Internal electronic protection (Y/N):	yes
Power consumption:	4.4 W
Monitored inputs:	
- Short-circuit recognition:	no (depending level 1) suffix Q: yes (depending level 1)
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	3; suffix S: 2
Number of NO contacts:	1; suffix S: 2
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	4 (13-14; 13-24; 33-34; 33-44)
Max. switching capacity of the safety contacts:	230 VAC, 4 A ohmic (inductive in case of appropriate protective wiring)
Utilisation category to EN 60947-5-1:	AC-15; DC-13; EN 60947-5-1: 2007
Fuse rating of the safety contacts:	4 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	-25 °C ... +45 °C
Storage and transport temperature:	-40 °C ... +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	235 g
Dimensions (Height x Width x Depth):	100 x 22.5 x 121 mm

Approvals



Ordering details

SRB 400C.

Refer to table right

Ordering details

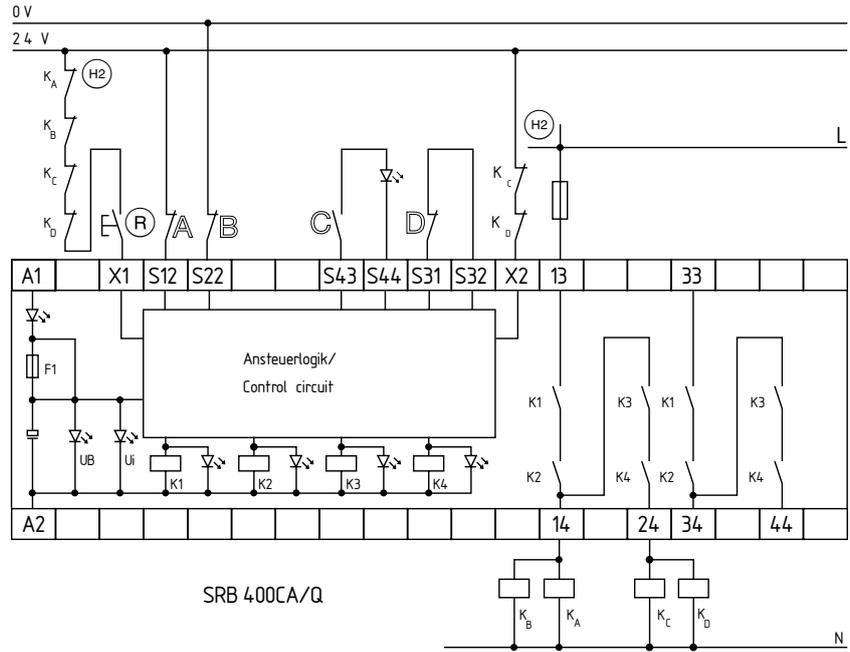
	Level 1	Level 2
	Sensor: NC contact/NC contact	Start conditions: Reset without edge detection, optionally with automatic reset
SRB 400CS/T SRB 400CS	Reset with trailing edge, Reset without edge detection, optionally with automatic reset	NC contact/NC contact NC contact/NC contact
SRB 400CA/T SRB 400CA/QT	Reset with trailing edge, Reset with trailing edge, Cross-wire monitoring	NC contact/NO contact NC contact/NO contact
SRB 400CA	Reset without edge detection, optionally with automatic reset	NC contact/NO contact
SRB 400CA/Q	Reset without edge detection, optionally with automatic reset, Cross-wire monitoring	NC contact/NO contact

Differential switch-off behaviour

Note

- Input level: the example shows a 2-channel control of an Emergency Stop command device (Level 1) with external reset button (R), and guard door monitoring (Level 2) with feedback circuit (H2).
- The control recognises cross-short, cable break and earth leakages in the monitoring circuit.
- 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.
- Automatic start:
 Level 1: the automatic start is programmed by connecting the feedback circuit to the terminals X1/+24VDC.
 Level 2: the automatic start is programmed by connecting the feedback circuit to the terminals X2/+24VDC. If the feedback circuit is not required, establish a bridge
- The wiring diagram is shown with guard doors closed and in de-energised condition.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Position relay K3
- Position relay K4
- Supply voltage U_b
- Internal operating voltage U_i

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: $\leq 2.00 \times 10^{-8}/h$
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of $2.00 \times 10^{-8}/h$ applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Up-to-date without fail.
The online product catalogue



For detailed information, check out
www.schmersal.net

PROTECT SRBs

Potentially explosive atmospheres



- SRB 101Exi _____ Page 70
- SRB 200Exi _____ Page 72

The SRB EXi modules have been developed in line with ATEX Directive 94/9/EC and the European standards EN 60 079 et seq.

The safety control modules listed in this chapter are able to monitor the sensors connected in EX zones 1/2 and 21/22 with the ignition protection type intrinsic safety. These devices can also be installed in the gas-explosion hazardous areas of Zone 2.

Potentially explosive atmospheres

PROTECT SRB 101EXi-...



- 1 or 2 channel control
- 1 safety contact
- Suitable for signal processing of emergency stop control devices, interlocking equipment, etc.
- 1 additional signalling contact (auxiliary contacts must not be used in safety circuits)
- Trailing edge (version -1R)
- Automatic reset function (version -1A)
- Optionally cross-wire short recognition (through switch)
- Current and voltage limitation of the input circuits (intrinsically safe)
- Green LED indications for relays K1, K2, U_B, U_i and U_{EXi}
- DIN rail mounting to DIN EN 60715:2001
- Thermoplastic enclosure to UL-94-V-0, graphite black RAL 9011
- Certification to DIN EN ISO 13849-1:2007
- Certification to ATEX 94/9/EG
- Electric circuits up to zone 1/21
- Installation in zone 2 possible

Technical data

Equipment category, explosion protection type:	Gas: Ⓜ II 3 G Ex nAnC IIC T5 (SRB in zone 2); Gas/dust: Ⓜ II (2) GD [Ex ib] IIC/[Ex ibD] [Ex ib] IIC/[Ex ibD]
Inputs (S11-S12, S21-S22, X1-X2/X3):	
Temperature class:	T5
Voltage U _o :	33.6 V
Current I _o :	57.0 mA
Capacity P _o :	478.8 mW (linear characteristic)
Maximum safety voltage U _m :	253 VAC
Isolation:	safe separation to EN 60079-11: Amplitude of the voltage 375 V
Rated operating voltage:	24 VDC -15%/+20%, residual ripple max. 10%
Recommended fuse for the operating voltage:	internal fuse F1: T 50 mA/250 V; internal fuse F2: T 100 mA/250 V
Protection class:	enclosure: IP40 Terminals: IP20 Wiring compartment: IP54
Power consumption:	max. 3.0 W
Switching capacity of the enabling paths:	230 V; 3 A ohmic (inductive with suitable protective circuit) AC-15: 230 VAC/3 A DC-13: 24 VDC/3 A
Recommended fuse for the enabling paths:	3.15 A slow blow
Min. switching capacity:	min. 10 V/10 mA
Contact resistance:	max. 100 mΩ in new state
Contact material/contacts:	AgSnO, self-cleaning, positive drive
Switching capacity of the auxiliary contacts (21-22):	24 VDC, 2 A
Recommended fuse for the auxiliary contacts:	2 A slow blow
Current and voltage at S11-S12, S21-S22:	24 VDC, 5 mA
Current limitation at S11-S12, S21-S22:	15 mA
Pull-in delay:	approx. 300 ms (Version -1A) approx. 20 ms (Version -1R)
Drop-out delay:	in case of emergency stop: approx. 20 ms; in case of voltage drop: approx. 20 ms
Bridging in case of voltage drops:	approx. 15 ms
Air clearances and creepage distances:	EN 60664-1:2003 (DIN VDE 0110-1), 4 kV/2; EN 60079-11:2007 (VDE 0170/0171 Part 7)
Max. total line resistance:	30 Ohm
Ambient operating:	-25 °C ... +60 °C
Storage temperature:	-40 °C ... +85 °C
EMV:	EN 61000-6-2:2005
Vibrations:	EN 60068-2-6:1996
Frequency:	10 ... 55 Hz
Amplitude:	0.35 mm
Climatic resistance:	EN 60068-2-3:1986
Mechanical life:	10 ⁷ operations
Weight:	230 g
Dimensions:	22.5 x 100 x 121 mm

Approvals



Ordering details

SRB 101EXi-1①

No.	Option	Description
①	R	Trailing edge
	A	Automatic reset function

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

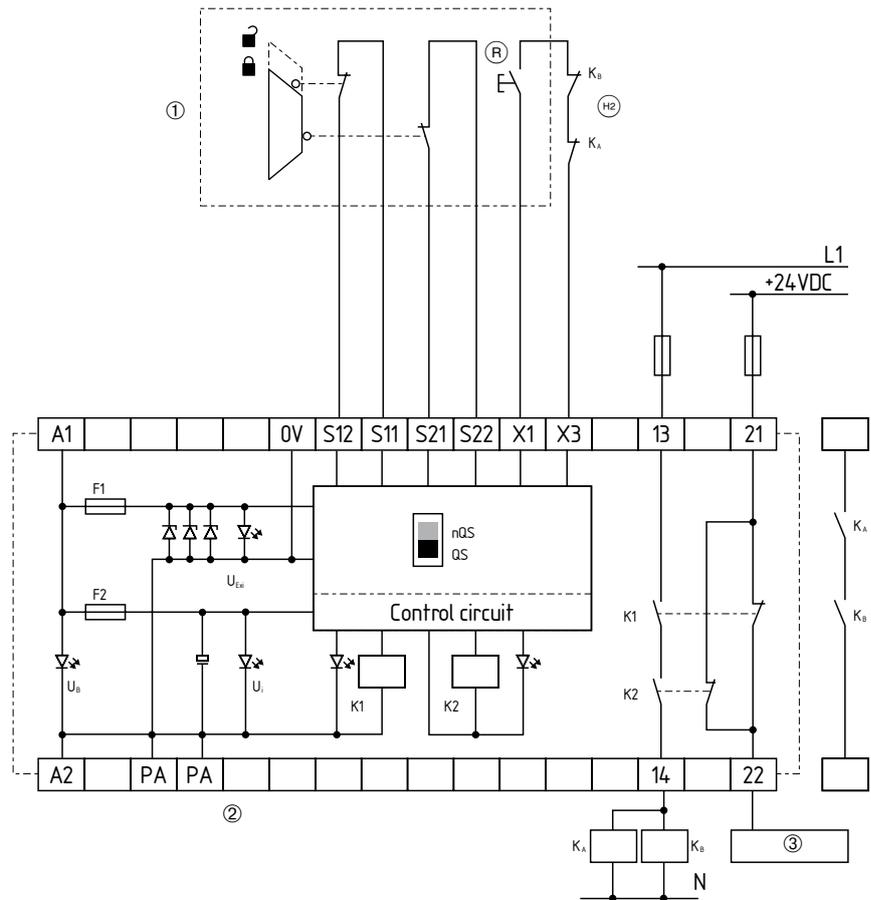
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Potentially explosive atmospheres

Note

- 2-channel control, shown for a guard door monitor with two position switches where one has a positive break contact; with external reset button (R).
- Relay outputs: 2-channel control, suitable for contact reinforcement or multiplication by means of contactors or relays with positive-drive contacts.
- (H) = Feedback circuit
- The control recognizes cable break, cross-wire shorts (switch in position "QS") and earth leakages in the monitoring circuit.
- The safety function is defined as the opening of release 13-14 when the inputs S11-S12 or S21-S22 are opened.

Wiring diagram



Note

- Cable connections:
 - single strand: rigid or flexible (with or without conductor ferrules) 0.25 ... 2.5 mm²;
 - multi-strand with identical section:
 - rigid or flexible (with conductor ferrules without plastic) 0.25 ... 2.5 mm²;
 - flexible (without or with TWIN conductor ferrules) 0.5 ... 1.5 mm²

Legend

- ① Sensor: Installation in zone 1/21
- ② SRB Exi: Installation in zone 2
- ③ Control

Potentially explosive atmospheres

PROTECT SRB 200EXi-...



- 1 or 2 channel control
- 2 safety contacts
- Suitable for signal processing of emergency stop control devices, interlocking equipment, etc.
- Trailing edge (version -1R)
- Automatic reset function (version -1A)
- Optionally cross-wire short recognition (through switch)
- Current and voltage limitation of the input circuits (intrinsically safe)
- Green LED indications for relays K1, K2, U_B, U_i and U_{EXi}
- DIN rail mounting to DIN EN 60715:2001
- Thermoplastic enclosure to UL-94-V-0, graphite black RAL 9011
- Certification to DIN EN ISO 13849-1:2007
- Certification to ATEX 94/9/EG
- Electric circuits up to zone 1/21
- Installation in zone 2 possible

Technical data

Equipment category, explosion protection type:	Gas: Ⓜ II 3 G Ex nAnC IIC T5 (SRB in zone 2) Gas/dust: Ⓜ II (2) GD [Ex ib] IIC/[Ex ibD] [Ex ib] IIC/[Ex ibD]
Inputs (S11-S12, S21-S22, X1-X2/X3):	T5
Temperature class:	T5
Voltage U _o :	33.6 V
Current I _o :	57.0 mA
Capacity P _o :	478.8 mW (linear characteristic)
Maximum safety voltage U _m :	253 VAC
Isolation:	safe separation to EN 60079-11: Amplitude of the voltage 375 V
Rated operating voltage:	24 VDC -15%/+20%, residual ripple max. 10%
Recommended fuse for the operating voltage:	internal fuse F1: T 50 mA/250 V; internal fuse F2: T 100 mA/250 V
Protection class:	enclosure: IP40 Terminals: IP20 Wiring compartment: IP54
Power consumption:	max. 3.0 W
Switching capacity of the enabling paths:	230 V; 3 A ohmic (inductive with suitable protective circuit) AC-15: 230 VAC/3 A DC-13: 24 VDC/3 A
Recommended fuse for the enabling paths:	3.15 A slow blow
Min. switching capacity:	min. 10 V/10 mA
Contact resistance:	max. 100 mΩ in new state
Contact material/contacts:	AgSnO, self-cleaning, positive drive
Current and voltage at S11-S12, S21-S22:	24 VDC, 5 mA
Current limitation at S11-S12, S21-S22:	15 mA
Pull-in delay:	approx. 300 ms (Version -1A) approx. 20 ms (Version -1R)
Drop-out delay:	in case of emergency stop: approx. 20 ms; in case of voltage drop: approx. 20 ms
Bridging in case of voltage drops:	approx. 15 ms
Air clearances and creepage distances:	EN 60664-1:2003 (DIN VDE 0110-1), 4 kV/2; EN 60079-11:2007 (VDE 0170/0171 Part 7)
Max. total line resistance:	30 Ohm
Ambient operating:	-25 °C ... +60 °C
Storage temperature:	-40 °C ... +85 °C
EMV:	EN 61000-6-2:2005
Vibrations:	EN 60068-2-6:1996
Frequency:	10 ... 55 Hz
Amplitude:	0.35 mm
Climatic resistance:	EN 60068-2-3:1986
Mechanical life:	10 ⁷ operations
Weight:	230 g
Dimensions:	22.5 x 100 x 121 mm

Approvals



Ordering details

SRB 200EXi-1①

No.	Option	Description
①	R	Trailing edge
	A	Automatic reset function

Classification

Safety parameters:

Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10 ⁻⁸ /h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10⁻⁸/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

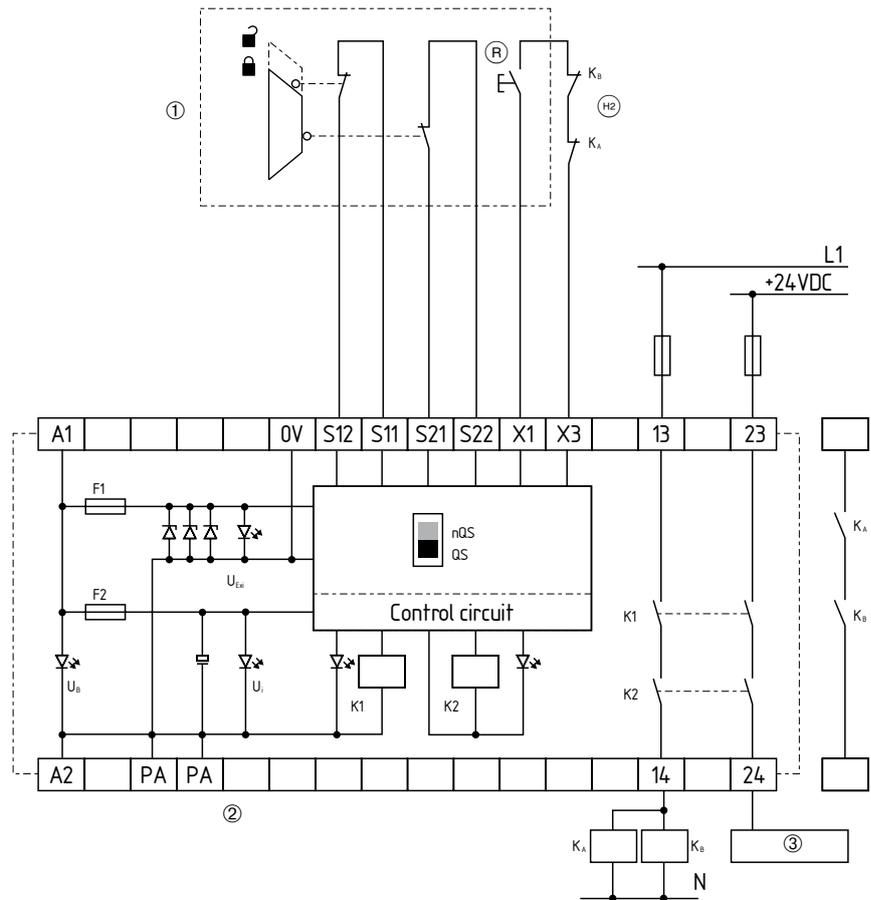
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Potentially explosive atmospheres

Note

- 2-channel control, shown for a guard door monitor with two position switches where one has a positive break contact; with external reset button (R).
- Relay outputs: 2-channel control, suitable for contact reinforcement or multiplication by means of contactors or relays with positive-drive contacts.
- (H) = Feedback circuit
- The control recognizes cable break, cross-wire shorts (switch in position "QS") and earth leakages in the monitoring circuit.
- The safety function is defined as the opening of release 13-14 when the inputs S11-S12 or S21-S22 are opened.

Wiring diagram



Note

- Cable connections:
 single strand: rigid or flexible (with or without conductor ferrules) 0.25 ... 2.5 mm²;
 multi-strand with identical section:
 rigid or flexible (with conductor ferrules without plastic) 0.25 ... 2.5 mm²;
 flexible (without or with TWIN conductor ferrules) 0.5 ... 1.5 mm²

Legend

- ① Sensor: Installation in zone 1/21
- ② SRB Exi: Installation in zone 2
- ③ Control

A basket full of solutions.

Food



For detailed information, check out
www.schmersal.com

PROTECT SELECT

Compact safety controller



■ PROTECT SELECT _____ Page 76

The compact safety controller PROTECT SELECT offers engineers high flexibility for configuring safety devices and for integrating safety devices into machine functions.

Four different basic programs are available. Each program can easily be adapted to the respective application via menu navigation and cleartext messages. Programming skills are not required. Thus e.g. the drop-out delay and debouncing times can be set individually and numerous parameters such as cross-circuit monitoring can be configured according to the requirements – a clear advantage compared to safety control modules.

All of the four programs offer numerous functions, including the following:

- Connection of up to 6 dual-channel safety switching devices (with or without potential) up to PL e/ SIL 3
- Safety semi-conductor and relay outputs with Stop 0 or Stop 1 (adjustable)
- Safe analog monitoring of temperature and other process variables
- Free assignment of feedback circuit, start-up tests, periodic tests, auto start, manual start
- Cross-circuit detection via clock outputs
- Display of cleartext messages during troubleshooting
- Input filter for safety devices with contact bounce

Compact safety controller

PROTECT SELECT



- Suitable for signal processing of potential-free outputs, e.g. emergency stop command devices, position switches, solenoid interlocks with and without interlocking function and magnetic safety switches
- Suitable for the signal treatment of potential-loaded outputs, e.g. electronic safety sensors with p-type semi-conductor outputs as well as safety light grids and light curtains
- 1 or 2 channel control
- Safety outputs with Stop 0/1 function and free adjustable fail-safe timer
- Automatic or manual reset function
- Optionally with short-circuit recognition
- Input filter for safety devices with contact bounce
- LEDs to show operating conditions

Technical data

Standards:	EN ISO 13849-1; IEC 61508; EN 62061; EN 60204-1; EN 60947-5-1
Start conditions:	Automatic or manual (adjustable)
Feedback circuit (Y/N):	adjustable
Rated operating voltage U_e :	24 VDC \pm 10%
Fuse rating for the operating voltage:	3 A slow blow, external
Internal electronic protection (Y/N):	yes
Digital safety inputs:	
- Short-circuit recognition:	optional
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts, 2 channel:	application dependent, max. 6
Number of NC/NO contacts:	application dependent, max. 6
Max. conduction resistance:	max. 300 Ω
Safe analogue inputs:	
Number:	2
Measurement range:	0 ... 10 VDC
Accuracy:	typ. 3 % (max. cable length < 30 m)
Resolution:	12 Bit
Safety semi-conductor outputs:	
Stop category:	0 or 1 (adjustable)
Number (p-/n-type):	1
Number (p-type):	2
Max. switching capacity:	24 VDC at 0.7 A; ohmic load, short-circuit proof
Safety relay outputs:	
Number:	2 (common access)
Contact load capacity:	AC-1: 250 V / 4 A; AC-15: 230 V / 3 A; DC-1: 24 V / 4 A; DC-13: 24 V / 4 A / 0.1 Hz
Signalling outputs:	
Number:	optional 4
Max. switching capacity:	24 VDC at 0.1 A; ohmic load, short-circuit proof
Clock outputs:	
Number:	3
Max. current at:	24 VDC at 0.1 A; ohmic load, short-circuit proof
Switch-off test pulse:	< 1.5 ms
Ambient conditions:	
Ambient temperature:	-25 °C ... +55 °C
Storage and transport temperature:	-40 °C ... +85 °C
Installation:	vertical, no condensation
Installation compartment:	Earthed, lockable switch cabinet with class of protection IP54
Protection class:	IP20
Mounting:	Snaps onto standard DIN rail to DIN EN 60715
Connection type:	Cage clamps or screw terminals
- min. cable section:	0.25 mm ²
- max. cable section:	2.5 mm ²
Weight:	300 g
Dimensions (Height x Width x Depth):	100 x 52.5 x 118 mm

Approvals



Ordering details

PROTECT SELECT-①

No.	Option	Description
①	SK	Screw terminals
	CC	Cage clamps

Classification

Safety parameters:

Standards:	EN ISO 13849-1; IEC 61508; IEC 62061; EN 60947-5-1
PL:	up to e
Category:	up to 4
DC:	high
CCF:	> 65 points
SIL CL:	up to 3
SFF:	> 90%
PFF _d :	1,6 x 10 ⁻⁸ /h (Valid for dual channel and 60% relay load)
Mission time:	20 years
Hardware fault tolerance:	1
Request rate:	High and continuous
MTTF _d (inputs+logic + semi-conductor outputs):	>100 years
B _{10d} value (for one channel of the relay output):	Small load range: 20%: 10.000.000 40%: 7.500.000 60%: 2.500.000 80%: 1.000.000 Maximum load: 100%: 400.000

Compact safety controller

Application program 1

One safety area with operating mode switch / enabling switch

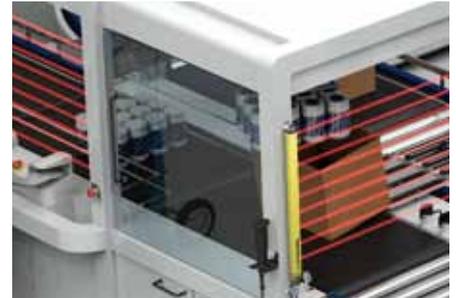
The program 1 allows to connect up to four dual-channel safety switching devices, each of which can be bridged by means of operating mode switches and enabling switches. The program is ideally suited for hazardous areas where additional operating modes such as "setting-up mode" and "process monitoring" are facilitating tasks like setting up a machine or troubleshooting.

- Up to 4 safety switching devices can be bridged in conformance with standards
- Additional emergency stop function
- Direct control of a solenoid interlock (lock/unlock)



Clear view onto process

Additional operating modes can be useful e.g. when a machine needs to be set-up or adjusted after a tool change.



Setting-up mode and process monitoring

Operating modes such as the setting-up mode and process monitoring can be realised with PROTECT SELECT and application program 1.

Application program 2

Two safety areas

It is often useful to provide two separate safety areas for the particular workplaces on machines. Program 2 has been developed for this application. Here is an example from the packaging machine industry: The upper part of the machine is the work area, where packaging units are fed and packaged.

The lower part of the machine houses the material feed mechanism and the drive units. It must only be accessed for maintenance purposes, but must still be monitored with a safety switching devices. This functionality can be achieved with application program 2 of PROTECT SELECT.

- For up to 2 or 3 safety switching devices per safety area
- Start/reset function for each safety area
- Feedback circuits for each safety area
- Prioritised emergency stop with independent reset function



Work area

The work area can be protected by up to 3 safety switching devices which can be configured individually.



Service / material supply

The area below (or above) the work area is considered to be an independent safety area and is thus configured separately.

Compact safety controller

Application program 3

One safety area with up to six safety switching devices

Program 3 can be used for processing signals of up to 6 safety switching devices. The application program allows to assign a separate reset function to one of the safety switching devices. This way even the most complex safety areas which are monitored by several safety switching devices can be conveniently configured.

- For up to 6 safety switching devices
- Direct control of a solenoid interlock (lock / unlock)
- Prioritised emergency stop with independent reset function



Many switching devices – one evaluation
PROTECT SELECT operating in program 3 replaces up to 6 safety control modules and thus helps saving money and space in the control cabinet.



Multi-purpose use

Program 3 is e.g. ideally suited for safety areas which are monitored by several safety switching devices.

Application program 4

One safety area with safe bridging (muting)

In order to ensure a material transport into and out of a safety area without provoking a machine stop, an optoelectronic safety device which is bridged automatically and for a limited amount of time should be used.

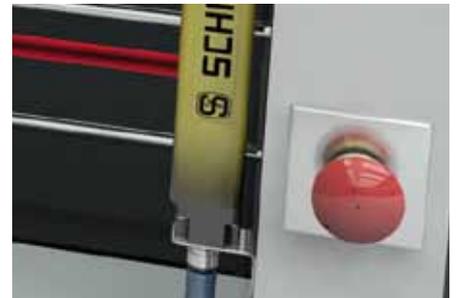
Usually a safety light-grid with integrated muting function is required for this purpose. When PROTECT SELECT is used, the muting function can be monitored directly via standard safety light-grids and sensors. In addition, signals from 2 other safety switching devices can be processed. This enables the user to realise a complete muting application with e.g. an additional guard door and an emergency stop function.

- Muting function with standard optoelectronic safety devices
- Flexible muting time parameterization
- Connection of additional emergency stop and safety switching device
- Direct control of a solenoid interlock (lock / unlock)



Muting boosts productivity

The muting function enables safe monitoring of the access to the hazardous area without interruptions of the material flow or the work flow.

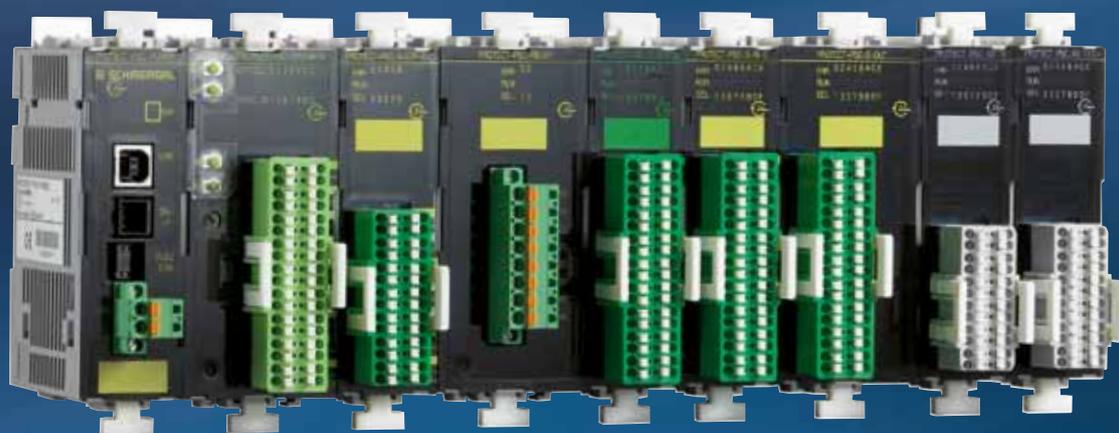


All functions combined in one module

All safety functions for safety areas with muting are controlled via one PROTECT SELECT unit – including e.g. a solenoid interlock and an emergency stop function.

PROTECT PSC

Multifunctional applications



■ PROTECT PSC _____ Page 80

Users who need to monitor several safety functions in their machines or systems have, for cost reasons in particular, the option of using one compact safety controller or one modular safety system here instead of several safety control modules. The Schmersal Group offers the following alternatives:

■ PROTECT-PSC

A modular, programmable safety system. The user has the option of assembling his own system, depending on the number of required inputs and outputs. A flexible and convenient KOP programming software is available if safe function modules are used

Programmable modular safety system

PROTECT PSC

The programmable PROTECT-PSC modular safety control system is mainly used in modern production systems or on complex stand-alone machines.

PROTECT-PSC is suitable both for reliable analysis and interconnection of several safety-related signals, such as those from EMERGENCY-STOP command devices, guard door monitoring, safety multiple infra-red beam barriers (AOPDs) or Schmersal CSS or MZM or AZM 200 series safety sensors.

The modular design of the PROTECT-PSC is a major advantage which makes it very versatile. As far as cost is concerned, the user can provide the optimum solution to each requirement without leaving too many inputs or outputs unused unnecessarily. The very high density of terminals also helps save space in the cabinet.

With PROTECT-PSC, it is possible to realise control category 4 applications according to EN 954-1, Performance Level "e" according to EN 13849-1 and SIL 3 according to EN IEC 61508.

A special feature of PROTECT-PSC is that it also offers the possibility of operational (non-safe) signal processing in addition to safe signal processing.

If programming is abandoned entirely, with PROTECT-PSC, a safe zone area-disconnection must be realised according to the order of the modules on the top-hat rail alone, like a system of safety control modules.

Connectable devices (sensor level)

- EMERGENCY STOP devices with floating contacts
- Safety switches with floating contacts, ditto locking devices (with and without interlock) and enabling switches etc.
- Safety magnetic switches, e.g. Schmersal BNS
- Safety devices with floating contacts, such as opto-electronic safety devices (AOPDs) etc.
- Schmersal series CSS safety sensors and Schmersal series non-contact interlocks AZM 2xx

The main features summarised:

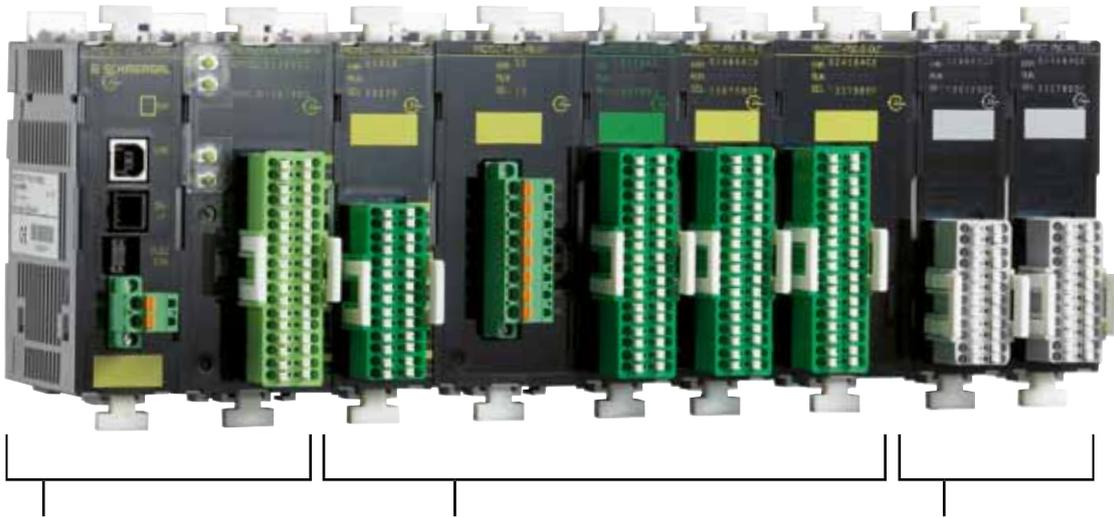
- Modular design
- Integration of safe and operational signals
- Free programming according to IEC 61 131 via standard USB interface

or

- Signal combination via external wiring without programming
- Connection option for external gateway (Profibus, DeviceNet or CC-Link)
- Response time 22 ms (semiconductor outputs) or 37 ms (relay outputs)
- Visualisation and status display on module or PC
- Simple DIN top-hat rail mounting



System overview of PROTECT-PSC



The PSC power and PSC-CPU-MON modules with 8 safe inputs and 6 safe outputs form the basic configuration for PROTECT-PSC

(for description, see next page)

Expand safely with:

- Safe input modules
PSC-S-IN-E and PSC-S-IN-LC
- Safe output modules
PSC-S-IN-OUT and PSC Relay
- Safe input/output modules
PSC-SUB-MON, PSC-STP-E,
PSC-S-STP-LC and PSC-S-STP-ELC

Expand operationally
(right, grey terminals) with:

- Operational input modules
PSC-NS-IN
- Operational output modules
PSC-NS-OUT



Gateway

Diagnostic status via gateways to the following bus systems:

- Profibus DP
- DeviceNet
- CC-link
- Modbus RTU
- CANopen
- EtherCat
- Profinet IO
- EtherNet IP
- Modbus TCP

Programmable modular safety system

PROTECT-PSC module overview

The individual devices of the PROTECT-PSC modular safety system generally differ in their number of safe and operational inputs and outputs. Other differences in terms of the sensor technology (floating or non-floating contacts) are met on the input side or on the output side in terms of semiconductor and relay outputs and maximum switching current.

Module	Number of single-channel inputs			Number of single-channel outputs			
	Operational floating	Safe		Operational 0.3 A**	Safe		
		Floating*	Non-floating*		Transistor		Relays
					0.5 A**	0.3 A**	
PSC-CPU-MON	–	4	4	–	6	–	–
PSC-CPU-OP-MON	–	–	–	–	–	–	–
PSC-SUB-MON	–	4	4	–	6	–	–
PSC-S-STP-E	–	4	2	–	4	–	–
PSC-S-STP-LC	–	–	6	–	4	–	–
PSC-S-STP-ELC	–	2	4	–	4	–	–
PSC-S relay	–	–	–	–	–	–	2 × 2
PSC-S-IN-E	–	16	–	–	–	–	–
PSC-S-IN-LC	–	–	16	–	–	–	–
PSC-S-OUT	–	–	–	–	–	16	–
PSC-NS-IN	16	–	–	–	–	–	–
PSC-NS-OUT	–	–	–	16	–	–	–
PSC power	–	–	–	–	–	–	–
PSC booster	–	–	–	–	–	–	–

* The floating or non-floating data refer to the technical characteristic of the input signals:
floating input signals: e.g. from EMERGENCY STOP control devices, safety switches, interlocks and safety magnetic switches etc.

non-floating input signals: e.g. from opto-electronic safety devices such as safety multiple infra-red beam barriers and laser scanners etc., and also from type CSS or AZM 200 safety sensors. Signals from floating sensors can also be connected to these inputs but then cross-circuit monitoring is not possible.

** Maximum current per output with resistive load.

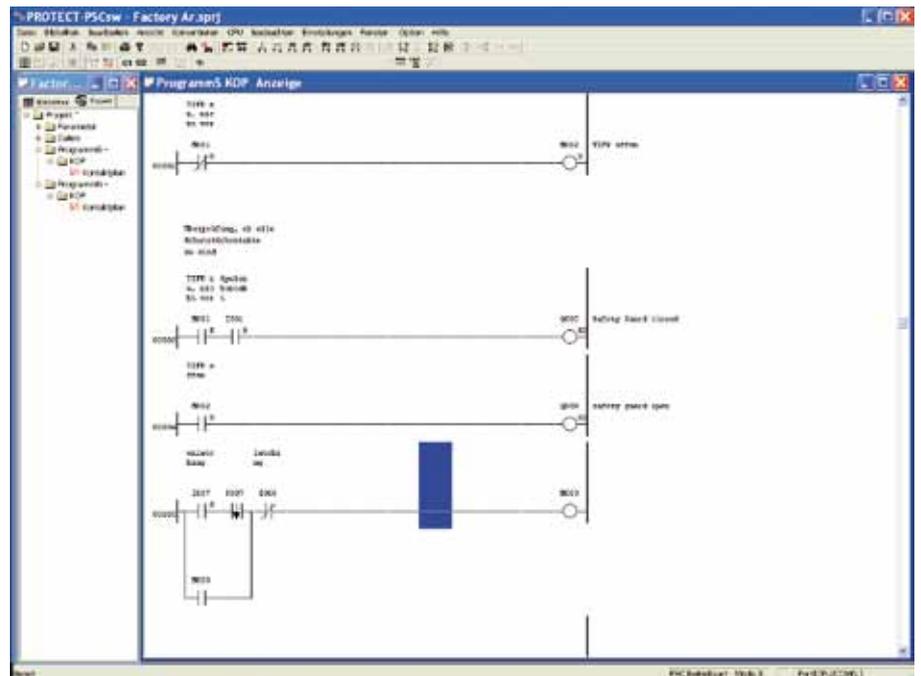


PROTECT-PSCsw system software

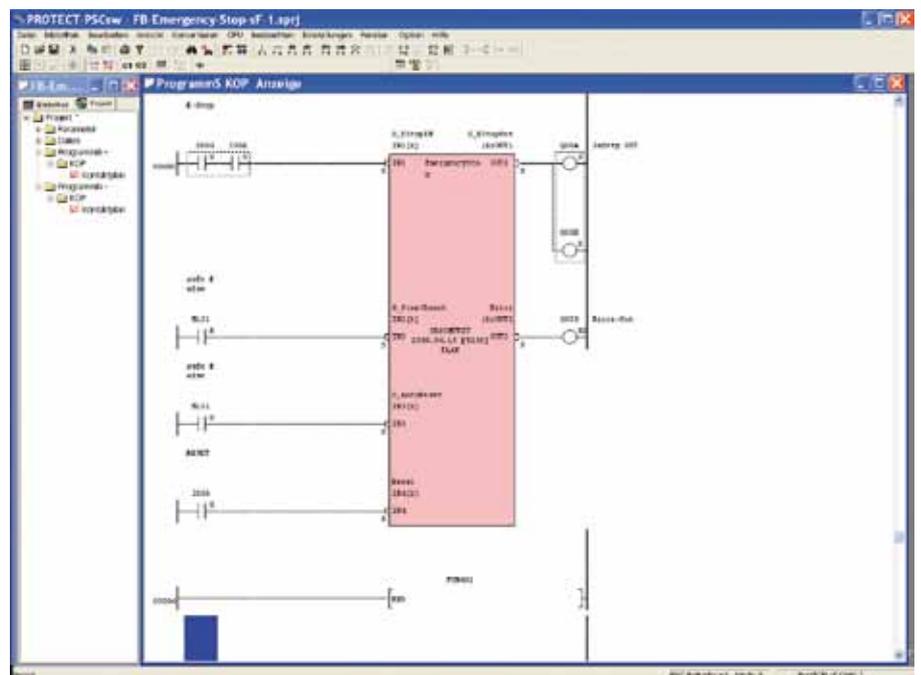
The advantage of the PROTECT-PSCsw programming interface is that the user can freely program in ladder diagram with maximum flexibility according to IEC 61131 or very easily by including safety and certificated function modules.

There is also the possibility storing their own function modules, such as recurring program blocks, in a library and quickly retrieving them to include in the particular program when needed.

Flexible programming according to ladder diagram according to IEC 61131



Easy programming involving safe and certificated function modules based on PLCopen.





The Schmersal Group

For many years the privately owned Schmersal Group has been developing and manufacturing products to enhance occupational safety. What started out with the development and manufacture of a very wide variety of mechanical and non-contact switchgear has now become the world's largest range of safety systems and solutions for the protection of man and machine. Over 1,200 employees in more than 50 countries around the world are developing safety technology solutions in close cooperation with our customers, thus contributing to a safer world.

Motivated by the vision of a safe working environment, the Schmersal Group's engineers are constantly working on the development of new devices and systems for every imaginable application and requirement of the different industries. New safety concepts require new solutions and it is necessary to integrate new detection principles and to discover new paths for the transmission and evaluation of the information provided by these principles. Furthermore, the set of ever more complex standards, regulations and directives relating to machinery safety also requires a change in thinking from the manufacturers and users of machines.

These are the challenges which the Schmersal Group, in partnership with machinery manufacturers, is tackling and will continue to tackle in the future.

Product ranges



Safe switching and monitoring

- Guard door monitoring safety switches
- Command devices with safety function
- Tactile safety devices
- Optoelectronic safety devices

Safe signal processing

- Safety monitoring modules
- Safety controllers
- Safety bus systems

Automation

- Position detection
- Command and signalling devices

Industries



- Elevators and escalators
- Packaging
- Food
- Machine tools
- Wood working
- Heavy industry

Services



- Application advice
- CE conformity assessment
- Risk assessment in accordance with the Machinery Directive
- Stop time measurements
- Training courses

Competences



- Machine safety
- Automation
- Explosion protection
- Hygienic design

All data mentioned in this flyer have been carefully checked.
Technical modifications and errors excepted.

www.schmersal.com

