

17. Safety-monitoring modules

Description

Safety relay modules SRB

Area of application

The safety relay modules of the PROTECT SRB - series are for the safe evaluation of switching signals. Signalling devices are mounted to the side on slideable, rotating or removable safety equipment and can, for example be an EMERGENCY STOP button, an electromechanical position switch, a safety switch, or a solenoid interlock. Also for optoelectronic protective devices (AODPs) the PROTECT SRB modules are available.

The modules can be used universally, regardless of the manufacturer of the safety switchgear, whose signals are monitored.

The PROTECT SRB-program also includes input and output extensions, as well as safety relay modules with intrinsically safe monitoring circuits (ignition protection "Intrinsically Safe" according to EN 60079-11) for the use of safety switchgear in potentially explosive atmospheres.

Design and operating principle

The PROTECT SRB-devices operate with conventional relay technology and are internally set up redundantly. They contain up to five safety relays with positively driven contacts. The series-connected NO contacts of the relay are the enabling paths.

All PROTECT SRB-modules share the same enclosure form of 22.5 and 45 mm overall width, developed by Schmersal, which allow easy installation with plug-in terminals and optional codeable connection terminals. The modules can be configured from the front, the 'snap on' resource identifiers (BMK) also increase the ease-of-use.

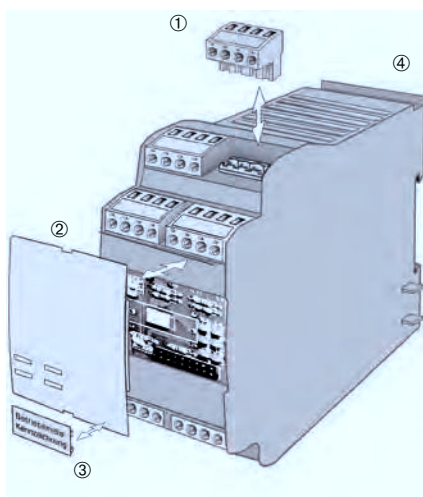
Design Execution

All PROTECT SRB's are constructively the same and have their own enclosure forms with 22.5 mm and 45 mm overall width, which in particular offer the following functional advantages:

- ① Pluggable and with coding optional via screw terminals (0.25 to 2.5 mm²), so that you can work with pre-fabricated cable harnesses faster and also servicing is quicker;
- ② Front-accessible setting options with a cover to protect against access for unauthorised third parties;
- ③ Snap-fit resource identifiers (BMK);
- ④ Can be used in applications with high ambient temperatures, thanks to the ventilation slits in the enclosure.

In addition, the enclosure design allows the following alternative connection techniques (on request):

- Connector with spring tension or screw terminals for conductor cross-sections 0.25 mm² to 2.5 mm²
- Without prejudice to the connection technology, the so-called TWIN - wire end ferrules are allowed, also two (flexible) conductors for cable cross-section of 0.5 mm² to 1.0 mm² can be connected.





Safety-monitoring modules AES

Area of application

The safety modules of the AES series were developed for safe signal processing of non-contact safety-solenoid switches, such as the BNS series developed by Schmersal.

The use of safety-solenoid switches offers, compared to electromechanical safety switches, the advantage that the switchgear can be hidden when mounted (e.g. behind plastic covers). In addition, safety-solenoid switches because of their smooth surfaces are easy to clean. Depending on the design, they achieved very high degrees of protection, and a regular cleaning with steam, or with a high-pressure water jet as used in the food industry is possible, and this does not affect the service life of the safety sensors.

Design and operating principle

The AES-modules monitor the status of the safety-solenoid switches. More precisely they monitor the reed-contact, that serves as the mechanical contacts, which are opened or closed by an external magnetic field.

At the same time the control unit functions also as a current limiter for the reed-contact. This is necessary, because a too high current can lead to the welding of the reed-contacts and therefore to a malfunction of the safety sensors. In addition, the evaluation units take into account the bounce of the reed-contacts and the possible residual vibration of the protection device, which can lead to a premature shutdown of the safety circuit.

Because of these additional functions, more AES module evaluation units are used in connection with safety-solenoid switches, which are designed specifically for this electro-sensitive safety switching devices.

Depending on the model, the AES-modules can be used in applications up to a Performance Level PL e in accordance with EN ISO 13849-1.

17. Safety-monitoring modules

Description

Standstill monitors FWS / AZR

Area of application

The standstill monitor of the series AZR 31 S1 and HF are for the reliable detection of the machine standstill and also for the activation of the connected solenoid interlock. Depending on the external wiring in connection with a safety module it is possible to build protective equipment up to category 4, PL e (series AZR 31 S1) in accordance with EN ISO 13849-1.

Design and operating principle

The standstill monitor of the series AZR 31 S1 and FWS are internally set up redundantly. They contain two safety relays with monitored positively driven contacts. The relay series-connected contacts are the output contacts. After machine standstill, the standstill monitor solenoid interlock can be actuated via the output contacts and the protection equipment can be opened.

AZR 31 S1 series

The sensorless standstill monitor AZR 31 S1 is connected directly to a three-phase AC motor and measures the frequency of the induced voltage.

Once the three-phase motor is at a standstill ($f = 0$) the enabling paths are closed.























The standstill monitor is equipped with LEDs for displaying the operating conditions.

FWS series

With the standstill monitor Series HF the pulses generated by the rotation are evaluated, these are detected for example by inductive proximity switches. If the measured impulses are below the limit frequency, the enabling path is closed. The Series FWS standstill monitors are equipped with an integrated system diagnostics ISD for fast and simple error detection. The multifunction LED informs the user about the switching status of the standstill monitor and the connected pulse generator.



Overview

Series	Area of application		Page
SRB-E	Applications adjustable	Emergency stop monitoring 	222
		Safety guard monitoring 	
		Pull-wire emergency stop switch, position switch 	
		Safety sensors 	
		AOPD monitoring 	
		Input expander module 	
		Two-hand control panels 	
SRB	Emergency stop monitoring 	228	
	Safety guard monitoring 		
	Pull-wire emergency stop switch, position switch 		
	Safety sensors 		
	AOPD monitoring 		
	Switch mat monitoring 		
	Two-hand control panels 		
	Output expander module 		
	Input expander module 		
	Muting 		
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AES	Emergency stop monitoring 	240	
	Safety guard monitoring 		
	Magnetic safety sensors BNS 		
FWS / AZR	Safe standstill monitoring 	248	

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SRB - Function overview and ordering details

Series Standard	Applications												Output contacts			
													safe		not safe	
SRB301MC	■	■	■	■	■								3	0	1	0
SRB301MA-24V	■	■	■	■	■								3	0	1	0
SRB201LC	■	■	■		■								2	0	0	1
SRB301ST V.2	■	■	■	■	■								3	0	1	0
SRB301ST 230V	■	■	■										3	0	1	0
SRB301SQ 230V	■	■	■										3	0	1	0
SRB301HC/T	■	■				■							3	0	1	0
	■	■				■										
SRB301HC/R	■	■				■	■						3	0	1	0
	■	■				■	■									
SRB301AN	■	■		■	■								3	0	1	0
SRB211ST V.2	■	■	■	■	■								2	1	0	1
SRB211AN V.2	■	■	■	■									2	1	0	1
	■	■	■	■												
SRB324ST V.3	■	■	■	■	■								3	2	1	3

Series for special applications

SRB201ZH							■						2	0	1	0
SRB100DR												■	0	1	0	0
SRB202MSL											■		2	0	0	3

Input and output expander module

SRB402EM							■						4	0	2	0
PROTECT-PE	■	■	■	■	■						■		2	0	2	5
	■	■	■	■	■						■					
	■	■	■	■							■					
	■	■	■	■							■					
	■	■	■	■							■					

Key see next page



	Input signals				Start conditions		Operating voltage	Type designation	Material number
					Start button / autostart	Start button with edge detection			
	■	■		▲	■		24 VDC / 24 VAC	SRB301MC-24V	101190684
	■	■		▲		■	24 VDC / 24 VAC	SRB301MA-24VAC/DC	101212415
	■	■			■		24 VDC / 24 VAC	SRB201LC	101212555
	■	■		▲	■	■	24 VDC / 24 VAC	SRB301ST-24VDC V.2	101195622
	■	■		▲	■	■	48 ... 240 VAC	SRB301ST-230V	101170099
		■		■	■	■	48 ... 240 VAC	SRB301SQ-230V	101170100
		■		■	■		24 VDC / 24 VAC	SRB301HC/T-24V	101190593
		■		■	■		48 ... 240 VAC	SRB301HC/T-230V	101190595
		■		■	■	■	24 VDC / 24 VAC	SRB301HC/R-24V	101190594
		■		■	■	■	48 ... 240 VAC	SRB301HC/R-230V	101190596
			■	■	■	■	24 VDC / 24 VAC	SRB301AN	101162240
	■	■		▲	■	■	24 VDC / 24 VAC	SRB211ST V.2	101208309
			■	■	■	■	24 VDC / 24 VAC	SRB211AN V.2	101209242
			■	■	■	■	24 VDC / 24 VAC	SRB211AN/PC-24V V.2	101209274
	■	■		▲	■	■	24 VDC / 24 VAC	SRB324ST-24V	101195504

			■	■	■		24 VDC	SRB201ZH-24VDC	101163440
		■				■	24 VDC / 24 VAC	SRB100DR	101186279
		■		▲	■		24 VDC	SRB202MSL-24V	101181998

	■	■			■		24 VDC / 24 VAC	SRB402EM-24V	101170840
	■	■		▲	■		24 VDC	PROTECT-PE-02-SK	101210949
	■	■		▲	■			PROTECT-PE-02	101210948
			■	■	■			PROTECT-PE-11-AN	101210944
			■	■	■			PROTECT-PE-11-AN-SK	101210946
			■	■	■			PROTECT-PE-11	101210943
			■	■	■			PROTECT-PE-11-SK	101210945

17. Safety-monitoring modules

SRB - Function overview and ordering details

Combined module for 2 safety features	Safety function 1 Applications										Start conditions		Safety function 2 Applications					
												Start button / autostart	Start button with edge detection					
SRB202C.	■	■	■								■							
											■							
											■		■					
SRB400C.	■	■	■								■							
											■							
											■		■					

Key

- Safety guard monitoring
- Magnetic safety sensors BNS
- Emergency stop monitoring
- Pull-wire emergency stop switch / position switch
- AOPD monitoring
- Switch mat monitoring
- Output expander module
- Input expander module

- Two-hand control panels
- Safe standstill monitoring
- Muting
- Double acknowledgement/reset
- Safety output contacts, STOP 0
- Safety output contacts, STOP 1
- Not safe output contacts: Auxiliary contacts
- Not safe output contacts: Semi-conductor

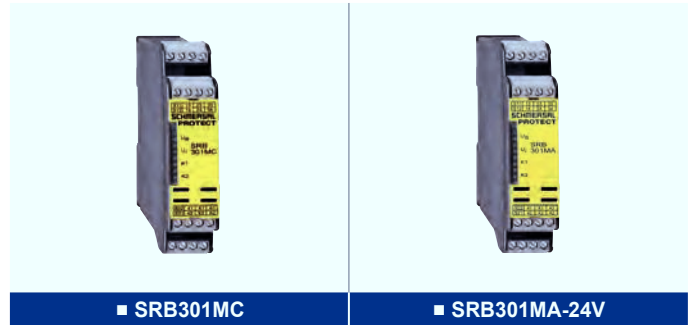
- Input signals: 1-channel
- Input signals: 2-channel
- Input signals: antivalent
- Cross-wire detection
- Yes
- ▲ Optional



Input signals				Start conditions		Output contacts				Operating voltage	Type designation	Material number
				Start button / autostart	Start button with edge detection	safe		not safe				
		■	■	■		2	0	2	0	24 VDC	SRB202CA 24VDC	101176197
		■	■								SRB202CA/Q 24VDC	101176212
		■	■								SRB202CA/QT 24VDC	101176214
		■	■								SRB202CA/T 24VDC	101176199
▲	■										SRB202CS 24VDC	101176208
▲	■										SRB202CS/T 24VDC	101176210
		■	■								■	
		■	■	SRB400CA/Q 24VDC	101176213							
		■	■	SRB400CA/QT 24VDC	101176215							
		■	■	SRB400CA/T 24VDC	101176201							
▲	■			SRB400CS 24VDC	101176209							
▲	■			SRB400CS/T 24VDC	101176211							

17. Safety-monitoring modules

SRB - Overview of the series



Key Features

- Function STOP 0
- 1 or 2 channel control
- Start button / autostart
- 3 safety contacts
- 1 auxiliary contact

- Function STOP 0
- 1 or 2 channel control
- Start with edge detection
- 3 safety contacts
- 1 auxiliary contact

Technical features

Electrical characteristics		
Operating voltage	24 VDC -15% / +20% 24 VAC -15% / +10%	24 VDC -15% / +20% 24 VAC -15% / +10%
Operating current	0.1 A	0.1 A
Electronic fuse	■	■
Hybrid fuse	-	-
Pull-in delay (typ.) automatic start	100 ms	-
with reset-button / start button	15 ms	15 ms
Max. switching capacity of the safety contacts	250 VAC / 8 A	250 VAC / 8 A
of the auxiliary contacts	24 VDC / 2 A	24 VDC / 2 A
of the signalling outputs	-	-
Switching capacity AC15, DC13		
STOP 0	230 VAC / 6 A, 24 VDC / 6 A	230 VAC / 6 A, 24 VDC / 6 A
STOP 1	-	-
Drop-out delay (typ.) in case of emergency stop	20 ms	10 ms
Mechanical data		
With removable terminals	-	-
Dimensions (H x W x D)	22.5 x 121 x 100 mm	22.5 x 121 x 100 mm
Ambient conditions		
Ambient temperature	-25 °C ... +60 °C	-25 °C ... +60 °C

Safety classification

Standards	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
PL	e	e
Category	4	4
PFH-value	$\leq 2.0 \times 10^{-8}/h$	$\leq 2.0 \times 10^{-8}/h$
SIL	3	3
Certificates		



To get detailed information about the products and certificates, visit www.schmersal.net.



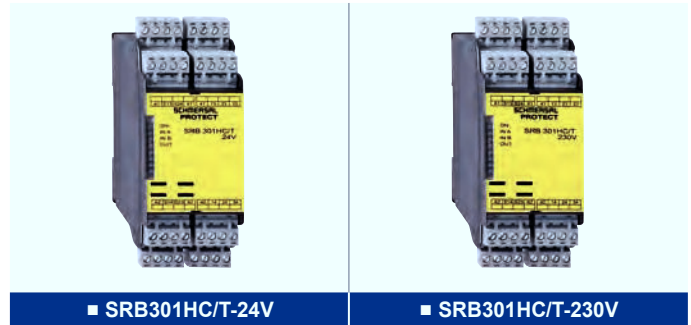
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|---|---|---|--|
| <ul style="list-style-type: none"> • Function STOP 0 • 1 or 2 channel control • Start button / autostart • 2 safety contacts • 1 signalling output | <ul style="list-style-type: none"> • Function STOP 0 • 1 or 2 channel control • Start button / autostart • Start with edge detection • 1 auxiliary contact | <ul style="list-style-type: none"> • Function STOP 0 • 1 or 2 channel control • Start button / autostart • Start with edge detection • 1 auxiliary contact | <ul style="list-style-type: none"> • Function STOP 0 • 2 channel control • Start button / autostart • Start with edge detection • 1 auxiliary contact |
|---|---|---|--|

24 VDC -15% / +20%	24 VDC -15% / +20%	48 ... 240 VAC	48 ... 240 VAC
24 VAC -15% / +10%	24 VAC -15% / +10%		
0.1 A	0.1 A	0.12 A	0.12 A
■	■	■	■
-	■	-	-
100 ms	100 ms	30 ms	30 ms
-	15 ms	15 ms	-
250 VAC / 4 A	250 VAC / 8 A	250 VAC / 6 A	250 VAC / 6 A
-	24 VDC / 2 A	24 VDC / 2 A	24 VDC / 2 A
24 VDC / 100 mA	-	-	-
230 VAC / 2 A, 24 VDC / 1 A	230 VAC / 6 A, 24 VDC / 6 A	230 VAC / 6 A, 24 VDC / 6 A	230 VAC / 6 A, 24 VDC / 6 A
-	-	-	-
25 ms	25 ms	20 ms	30 ms
-	■	■	■
22.5 x 121 x 100 mm	22.5 x 121 x 120 mm	22.5 x 121 x 120 mm	22.5 x 121 x 100 mm
-25 °C ... +60 °C	-25 °C ... +60 °C	-25 °C ... +45 °C	-25 °C ... +45 °C

EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
e	e	e	e
4	4	4	4
$\leq 2.0 \times 10^{-8}/h$	$\leq 2.0 \times 10^{-8}/h$	$\leq 2.0 \times 10^{-8}/h$	$\leq 2.0 \times 10^{-8}/h$
3	3	3	3

17. Safety-monitoring modules

SRB - Overview of the series



Key Features

- Function STOP 0
- 2 channel control
- Start button / autostart
- Optional safety switch mats
- 1 auxiliary contact

- Function STOP 0
- 2 channel control
- Start button / autostart
- Optional safety switch mats
- 1 auxiliary contact

Technical features

Electrical characteristics		
Operating voltage	24 VDC -15% / +20% 24 VAC -15% / +10%	48 ... 240 VAC
Operating current	0.1 A	0.1 A
Electronic fuse	■	■
Hybrid fuse	-	-
Pull-in delay (typ.) automatic start	200 ms	200 ms
with reset-button / start button	-	-
Max. switching capacity of the safety contacts	250 VAC / 8 A	250 VAC / 8 A
of the auxiliary contacts	24 V DC / 2 A	24 V DC / 2 A
of the signalling outputs	-	-
Switching capacity AC15, DC13		
STOP 0	230 VAC / 6 A, 24 VDC / 6 A	230 VAC / 6 A, 24 VDC / 6 A
STOP 1		
Drop-out delay (typ.) in case of emergency stop	20 ms	20 ms
Mechanical data		
With removable terminals	■	■
Dimensions (H x W x D)	45 x 121 x 100 mm	45 x 121 x 100 mm
Ambient conditions		
Ambient temperature	-25 °C ... +60 °C	-25 °C ... +60 °C

Safety classification

Standards	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
PL	e	e
Category	4	4
PFH-value	≤ 2.0 x 10 ⁻⁸ /h	≤ 2.0 x 10 ⁻⁸ /h
SIL	3	3
Certificates		



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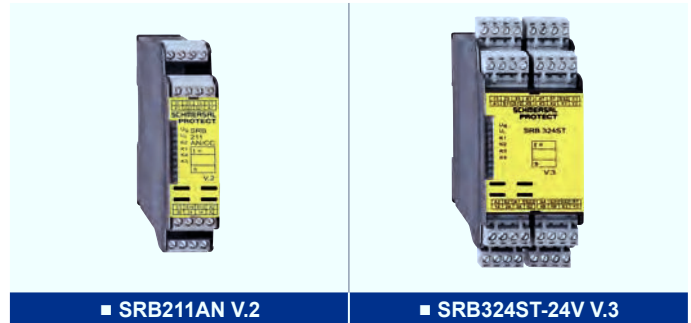
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|---|---|--|---|
| <ul style="list-style-type: none"> • Function STOP 0 • 2 channel control • Start with edge detection • Optional two-hand control type IIIC • 1 auxiliary contact | <ul style="list-style-type: none"> • Function STOP 0 • 2 channel control • Start with edge detection • Optional two-hand control type IIIC • 1 auxiliary contact | <ul style="list-style-type: none"> • Function STOP 0 • 2 channel control, antivalent • Start button / autostart • Start with edge detection • 1 signalling output | <ul style="list-style-type: none"> • Function STOP 0/1 • 1 or 2 channel control • Start button / autostart • Start with edge detection • Drop-out delay 1 ... 30 s |
|---|---|--|---|

24 VDC -15% / +20% 24 VAC -15% / +10%	48 ... 240 VAC	24 VDC -10% / +20% 24 VAC -15% / +10%	24 VDC -15% / +20% 24 VAC -15% / +10%
0.06 A	0.1 A	0.1 A	0.1 A
■	■	■	■
-	-	-	■
-	-	170 ms	120 ms
50 ms	50 ms	25 ms	10 ms
250 VAC / 8 A	250 VAC / 8 A	250 VAC / 6 A	250 VAC / 8 A (STOP 0) 250 VAC / 6 A (STOP 1)
24 V DC / 2 A	24 V DC / 2 A	24 VDC / 2 A	-
-	-	-	24 VDC / 100 mA
230 VAC / 2 A, 24 VDC / 1 A	230 VAC / 2 A, 24 VDC / 1 A	230 VAC / 6 A, 24 VDC / 6 A	230 VAC / 6 A, 24 VDC / 5 A 230 VAC / 3 A, 24 VDC / 2 A
20 ms	20 ms	15 ms	15 ms
■	■	-	■
45 x 121 x 100 mm	45 x 121 x 100 mm	22.5 x 121 x 100 mm	22.5 x 121 x 120 mm
-25 °C ... +60 °C	-25 °C ... +60 °C	-25 °C ... +45 °C	-25 °C ... +60 °C

EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
e	e	e	e (STOP 0) / d (STOP 1)
4	4	4	4 (STOP 0) / 3 (STOP 1)
≤ 2.0 x 10 ⁻⁸ /h	≤ 2.0 x 10 ⁻⁸ /h	≤ 2.0 x 10 ⁻⁸ /h	≤ 2.0 x 10 ⁻⁸ /h (STOP 0) ≤ 2.0 x 10 ⁻⁷ /h (STOP 1)
3	3	3	3 (STOP 0) / 2 (STOP 1)

17. Safety-monitoring modules

SRB - Overview of the series



Key Features

- Function STOP 0/1
- 2 channel control, antivalent
- Start button / autostart
- Start with edge detection
- Drop-out delay 1 ... 30 s

- Function STOP 0/1
- 1 or 2 channel control
- Start button / autostart
- Start with edge detection
- Drop-out delay 1 ... 30 s

Technical features

Electrical characteristics		
Operating voltage	24 VDC -15% / +20% 24 VAC -15% / +10%	24 VDC -15% / +20% 24 VAC -15% / +10%
Operating current	0.1 A	0.30 A
Electronic fuse	■	■
Hybrid fuse	■	■
Pull-in delay (typ.) automatic start	120 ms	250 ms
with reset-button / start button	10 ms	20 ms
Max. switching capacity of the safety contacts	250 VAC / 8 A (STOP 0) 250 VAC / 6 A (STOP 1)	250 VAC / 8 A (STOP 0) 250 VAC / 6 A (STOP 1)
of the auxiliary contacts	-	24 VDC / 2 A
of the signalling outputs	24 VDC / 100 mA	24 VDC / 100 mA
Switching capacity AC15, DC13		
STOP 0	230 VAC / 6 A, 24 VDC / 5 A	230 VAC / 6 A, 24 VDC / 6 A
STOP 1	230 VAC / 3 A, 24 VDC / 2 A	230 VAC / 3 A, 24 VDC / 2 A
Drop-out delay (typ.) in case of emergency stop	15 ms	30 ms
Mechanical data		
With removable terminals	■	■
Dimensions (H x W x D)	22.5 x 121 x 120 mm	45 x 121 x 100 mm
Ambient conditions		
Ambient temperature	-25 °C ... +60 °C	-25 °C ... +60 °C

Safety classification

Standards	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
PL	e (STOP 0) / d (STOP 1)	e (STOP 0) / d (STOP 1)
Category	4 (STOP 0) / 3 (STOP 1)	4 (STOP 0) / 3 (STOP 1)
PFH-value	≤ 2 x 10 ⁻⁸ /h (STOP 0) ≤ 2 x 10 ⁻⁷ /h (STOP 1)	≤ 2 x 10 ⁻⁸ /h (STOP 0) ≤ 2 x 10 ⁻⁷ /h (STOP 1)
SIL	3 (STOP 0) / 2 (STOP 1)	3 (STOP 0) / 2 (STOP 1)
Certificates		



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- | | | | |
|---|---|---|--|
| <ul style="list-style-type: none"> • 2x function STOP 0 • 1 or 2 channel control • Start button / autostart • Start with edge detection • 2 x 1 safety contact | <ul style="list-style-type: none"> • 2x function STOP 0 • 1 or 2 channel control • Start button / autostart • Start with edge detection • 2x 2 safety contacts | <ul style="list-style-type: none"> • Function two-hand control type IIIC • 2x 2 channel control • 2 safety contacts • 1 auxiliary contact | <ul style="list-style-type: none"> • Double acknowledgement/reset • 2x start with edge detection • Time monitoring 3 ... 30 s • Adjustable time window • 1 safety contact (impulse) |
|---|---|---|--|

24 VDC -15% / +20%	24 VDC -15% / +20%	24 VDC -10% / +10%	24 VDC -15% / +20% 24 VAC -15% / +10%
0.18 A	0.18 A	0.05 A	0.14 A
■	■	■	■
-	-	-	-
-	-	50 ms	-
Switch-off level 1: 40 ms switch-off level 2: 0.5 sec.	Switch-off level 1: 40 ms switch-off level 2: 0.5 sec.	-	Dependent on time monitoring
250 VAC / 6 A	230 VAC / 4 A	250 VAC / 6 A	250 VAC / 8 A
24 VDC / 2 A	-	24 VDC / 2 A	-
-	-	-	-
230 VAC / 1.5 A, 24 VDC / 1.2 A	230 VAC / 1.5 A, 24 VDC / 1.2 A	230 VAC / 6 A, 24 VDC / 6 A	230 VAC / 3 A, 24 VDC / 2 A
50 ms	50 ms	30 ms	-
■	■	■	■
22.5 x 121 x 100 mm	22.5 x 121 x 100 mm	22.5 x 121 x 100 mm	22.5 x 121 x 100 mm
-25 °C ... +45 °C	-25 °C ... +45 °C	-25 °C ... +60 °C	-25 °C ... +60 °C

EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
e	e	e	e
4	4	4	4
≤ 2.0 x 10 ⁻⁸ /h	≤ 2.0 x 10 ⁻⁸ /h	≤ 2.0 x 10 ⁻⁸ /h	≤ 2.0 x 10 ⁻⁸ /h
3	3	3	3

17. Safety-monitoring modules

SRB - Overview of the series





Key Features

- | | |
|--|--|
| <ul style="list-style-type: none"> • Muting function • 2 or 4 muting sensors • Lamp current monitoring • 2 safety contacts • 2 signalling outputs | <ul style="list-style-type: none"> • Contact multiplication • 4 safety contacts • 2 auxiliary contacts • Feedback contacts |
|--|--|

Technical features

Electrical characteristics		
Operating voltage	24 VDC -15% / +20%	24 VDC -15% / +20% 24 VAC -15% / +10%
Operating current	0.24 A	0.05 A
Electronic fuse	■	-
Hybrid fuse	-	-
Pull-in delay (typ.) automatic start	200 ms	30 ms
with reset-button / start button	-	-
Max. switching capacity of the safety contacts	24 VDC / 4 A	250 VAC / 6 A
of the auxiliary contacts	-	24 VDC / 2 A
of the signalling outputs	24 VDC / 0.05 A	-
Switching capacity AC15, DC13		
STOP 0	24 VDC / 1.2 A	230 VAC / 6 A, 24 VDC / 6 A
STOP 1		
Drop-out delay (typ.) in case of emergency stop	20 ms	25 ms
Mechanical data		
With removable terminals	■	■
Dimensions (H x W x D)	45 x 121 x 100 mm	22.5 x 121 x 120 mm
Ambient conditions		
Ambient temperature	-25 °C ... +45 °C	-25 °C ... +45 °C

Safety classification

Standards	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
PL	e	e
Category	4	4
PFH-value	$\leq 2.0 \times 10^{-8}/h$	$\leq 2.0 \times 10^{-8}/h$
SIL	3	3
Certificates		



To get detailed information about the products and certificates, visit www.schmersal.net.



■ PROTECT-PE-..

- Input expander module
- 4 x 2 channel control
- 2 safety contacts
- 5 signalling outputs
- 2 auxiliary contacts

24 VDC -12% / +20%

0.1 A

■

-

10 ms

-

24 VDC / 2 A

24 VDC / 2 A

24 VDC / 100 mA

-

10 ms

■

65.5 x 61 x 126 mm

-25 °C ... +55 °C

EN ISO 13849-1, IEC 61508

d

3












$\leq 2 \times 10^{-7}/h$

2



17. Safety-monitoring modules

AES - Function overview and ordering details

Series	Applications			Number of sensors that can be connected				Output contacts			Input signals				
				1	2	3	4 - 6								
AES 1337	■	■	■	■				3	0	1				■	■
AES 113x	■	■	■	■				1		2	▲	▲		■	▲
AES 116x	■	■	■		■			1						■	■
AES 123x	■	■	■	■				2	0	2	▲	▲		■	
AES 126x	■	■	■		■			2	0	2				■	■
AES 213x	■	■	■	■				1	0	2	▲	▲		■	▲
AES 233x	■	■	■	■				3	0	2	▲	▲		■	▲
AES 236x	■	■	■		■			3	0	2				■	■
AES 253x	■	■	■	■				4	1	2	▲	▲		■	▲
AES 2285	■	■	■				■	2	1	6				■	■
AES 3075			■				■	2	0	5		▲		■	▲
AES 118x	■	■	■			■		1	0	0				■	■
AES 1112			■		■			1					■	■	
AES 1102			■	■				1					■	■	

Key



Safety guard monitoring



Magnetic safety sensors BNS



Emergency stop monitoring



Safety output contacts, STOP 0



Not safe output contacts:
Auxiliary contacts



Not safe output contacts:
Semi-conductor



Input signals: 1-channel



Input signals: 2-channel



Input signals: 3-channel



Cross-wire detection



Yes



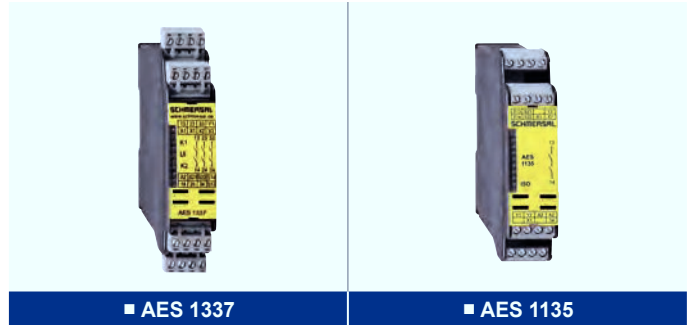
Optional



	Start conditions			Operating voltage	Type designation	Material number
	Start button / autostart	Start button with edge detection	Start-up test			
	■	▲		24 VDC / 24 VAC	AES 1337	101172215
	■		■	24 VDC	AES 1135	101170036
					AES 1136	101170038
					AES 1136-2185	101172221
	■		■	24 VDC	AES 1165	101170045
					AES 1165-2250	101170048
					AES 1166	101170046
	■		■	24 VDC	AES 1235	101170049
					AES 1236	101170050
	■		■	24 VDC	AES 1265	101170051
					AES 1266	101170052
	■		■	24 ... 230 VAC/DC	AES 2135	101180842
					AES 2136	101181677
	■		■	24 ... 230 VAC/DC	AES 2335	101180843
					AES 2336	101181678
	■		■	24 ... 230 VAC/DC	AES 2365	101181686
					AES 2366	101181687
	■		■	24 ... 230 VAC/DC	AES 2535	101180845
					AES 2536	101181681
	■			24 VDC	AES 2285	101172219
	■			24 VDC	AES 3075	101138576
	■			24 VDC	AES 1185	101131903
				24 VAC	AES 1185.3	101131929
	■			24 VDC	AES 1112	101128982
				110 VAC	AES 1112.1	101128798
				230 VAC	AES 1112.2	101128799
				24 VAC	AES 1112.3	101128800
				42 VAC	AES 1112.4	101126153
	■			24 VDC	AES 1102	101128981
				110 VAC	AES 1102.1	101128795
				230 VAC	AES 1102.2	101128796
				24 VAC	AES 1102.3	101128797
				42 VAC	AES 1102.4	101126152

17. Safety-monitoring modules

AES - Overview of the series



Key Features

- | | |
|--|--|
| <ul style="list-style-type: none"> • 2 channel control, antivalent • Start button / autostart • Start with edge detection • 3 safety contacts • 1 auxiliary contact | <ul style="list-style-type: none"> • 1 or 2 channel control • Optionally antivalent • Autostart or start-up test • 1 safety contact • Integral System Diagnostics |
|--|--|

Technical features

Electrical characteristics		
Operating voltage	24 VDC -10% / +20%	24 VDC ±15%
Operating current	0.1 A	0.2 A
Electronic fuse	■	-
Hybrid fuse	■	-
Pull-in delay (typ.) automatic start	120 ms	adjustable 0.1 / 1.0 second
with reset-button / start button	30 ms	-
Max. switching capacity of the safety contacts	250 VAC / 6 A	250 VAC / 6 A
of the auxiliary contacts	-	-
of the signalling outputs	24 VDC / 100 mA	24 VDC / 100 mA
Switching capacity AC15, DC13	230 VAC / 6 A, 24 VDC / 6 A	230 VAC / 3 A, 24 VDC / 2 A
Drop-out delay (typ.) in case of emergency stop	20 ms	50 ms
Mechanical data		
With removable terminals	■	-
Dimensions (H x W x D)	22.5 x 121 x 100 mm	22.5 x 121 x 100 mm
Ambient conditions		
Ambient temperature	-25 °C ... +45 °C	0 °C ... +55 °C

Safety classification

Standards	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
PL	e	d
Category	4	3
PFH-value	5.0 x 10 ⁻⁹ /h	1.6 x 10 ⁻⁷ /h
SIL	3	2
Certificates		



To get detailed information about the products and certificates, visit www.schmersal.net.



■ AES 1165



■ AES 1235



■ AES 1265

- 2 channel control, antivalent
- Autostart or start-up test
- 1 safety contact
- Integral System Diagnostics

- 1 or 2 channel control
- Optionally antivalent
- Autostart or start-up test
- 2 safety contacts
- Integral System Diagnostics

- 2 channel control, antivalent
- 2 Sensors
- Autostart or start-up test
- 2 safety contacts
- Integral System Diagnostics

24 VDC ±15%	24 VDC ±15%	24 VDC ±15%
0.2 A	0.2 A	0.2 A
-	-	-
-	-	-
adjustable 0.1 / 1.0 second	adjustable 0.1 / 1.0 second	adjustable 0.1 / 1.0 second
-	-	-
250 VAC / 6 A	250 VAC / 6 A	250 VAC / 6 A
-	-	-
24 VDC / 100 mA	24 VDC / 100 mA	24 VDC / 100 mA
230 VAC / 3 A, 24 VDC / 2 A	230 VAC / 3 A, 24 VDC / 2 A	230 VAC / 3 A, 24 VDC / 2 A
300 ms	50 ms	50 ms
-	-	-
22.5 x 121 x 100 mm	22.5 x 121 x 100 mm	22.5 x 121 x 100 mm
0 °C ... +55 °C	0 °C ... +55 °C	0 °C ... +55 °C

EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
d	d	d
3	3	3
$1.6 \times 10^{-7}/h$	$1.6 \times 10^{-7}/h$	$1.6 \times 10^{-7}/h$
2	2	2

17. Safety-monitoring modules

AES - Overview of the series







Key Features

- | | |
|--|---|
| <ul style="list-style-type: none"> • 1 or 2 channel control • Optionally antivalent • Autostart or start-up test • 1 safety contact • Integral System Diagnostics | <ul style="list-style-type: none"> • 1 or 2 channel control • Optionally antivalent • Autostart or start-up test • 3 safety contacts • Integral System Diagnostics |
|--|---|

Technical features

Electrical characteristics		
Operating voltage	24 ... 230 VAC/DC	24 ... 230 VAC/DC
Operating current	0.3 A	0.3 A
Electronic fuse	-	-
Hybrid fuse	-	-
Pull-in delay (typ.) automatic start	adjustable 0.1 / 1.0 second	adjustable 0.1 / 1.0 second
with reset-button / start button	-	-
Max. switching capacity of the safety contacts	250 VAC / 4 A	250 VAC / 6 A
of the auxiliary contacts	-	-
of the signalling outputs	24 VDC / 100 mA	24 VDC / 100 mA
Switching capacity AC15, DC13	230 VAC / 3 A, 24 VDC / 2 A	230 VAC / 3 A, 24 VDC / 2 A
Drop-out delay (typ.) in case of emergency stop	50 ms	30 ms
Mechanical data		
With removable terminals	-	-
Dimensions (H x W x D)	22.5 x 121 x 100 mm	45 x 121 x 100 mm
Ambient conditions		
Ambient temperature	0 °C ... +55 °C	0 °C ... +55 °C

Safety classification

Standards	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
PL	d	d
Category	3	3
PFH-value	$1.9 \times 10^{-7}/h$	$1.9 \times 10^{-7}/h$
SIL	2	2
Certificates	 	 



To get detailed information about the products and certificates, visit www.schmersal.net.



■ AES 2365



■ AES 2535



■ AES 2285

- 2 channel control, antivalent
- 2 Sensors
- Autostart or start-up test
- 3 safety contacts
- Integral System Diagnostics

- 1 or 2 channel control
- Optionally antivalent
- Autostart or start-up test
- 4 safety contacts
- Integral System Diagnostics

- 2 channel control, antivalent
- 6 Sensors
- Start button / autostart
- Start with edge detection
- 3 safety contacts

24 ... 230 VAC/DC	24 ... 230 VAC/DC	24 VDC -10% / +20%
0.3 A	0.3 A	0.125 A
-	-	■
-	-	-
adjustable 0.1 / 1.0 second	adjustable 0.1 / 1.0 second	120 ms
-	-	30 ms
250 VAC / 6 A	250 VAC / 6 A	250 VAC / 6 A
-	-	24 VDC / 2 A
24 VDC / 100 mA	24 VDC / 100 mA	24 VDC / 20 mA
230 VAC / 3 A, 24 VDC / 2 A	230 VAC / 3 A, 24 VDC / 2 A	230 VAC / 6 A, 24 VDC / 6 A
50 ms	30 ms	20 ms
-	-	■
45 x 121 x 100 mm	45 x 121 x 100 mm	45 x 121 x 100 mm
0 °C ... +55 °C	0 °C ... +55 °C	-25 °C ... +45 °C

EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
d	d	d
3	3	3
$1.9 \times 10^{-7}/h$	$1.9 \times 10^{-7}/h$	$3.1 \times 10^{-7}/h$
2	2	2

17. Safety-monitoring modules

AES - Overview of the series



Key Features

- 2 channel control, antivalent
- 4 Sensors
- Start button / autostart
- 2 electronic safety contacts
- Integral System Diagnostics

- 2 channel control, antivalent
- 3 Sensors
- Autostart
- 1 safety contact
- Integral System Diagnostics

Technical features

Electrical characteristics		
Operating voltage	24 VDC ± 15%	24 VDC ±15%
Operating current	0.3 A	0.2 A
Electronic fuse	-	-
Hybrid fuse	-	-
Pull-in delay (typ.) automatic start	adjustable 0.1 / 1.0 second	adjustable 0.1 / 1.0 second
with reset-button / start button	-	-
Max. switching capacity of the safety contacts	24 VDC / 700 mA	250 VAC / 4 A
of the auxiliary contacts	-	-
of the signalling outputs	24 VDC / 250 mA	-
Switching capacity AC15, DC13	-	230 VAC / 2 A, 24 VDC / 2 A
Drop-out delay (typ.) in case of emergency stop	50 ms	50 ms
Mechanical data		
With removable terminals	-	-
Dimensions (H x W x D)	75 x 110 x 100 mm	22.5 x 110 x 75 mm
Ambient conditions		
Ambient temperature	0 °C ... +55 °C	0 °C ... +55 °C

Safety classification

Standards	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
PL	d	d
Category	3	3
PFH-value	3.3 x 10 ⁻⁷ /h	1.6 x 10 ⁻⁷ /h
SIL	2	2
Certificates		



To get detailed information about the products and certificates, visit www.schmersal.net.



■ AES 1102





■ AES 1112

- 3 channel control, antivalent
- 2 Sensors
- Autostart
- 1 safety contact






- 3 channel control, antivalent
- Autostart
- 1 safety contact

24 VDC ±15%	24 VDC ±15%
0.1 A	0.1 A
-	-
-	-
100 ms	100 ms
-	-
250 VAC / 4 A	250 VAC / 4 A
-	-
-	-
230 VAC / 1.5 A, 24 VDC / 1 A	230 VAC / 3 A, 24 VDC / 2 A
50 ms	50 ms
-	-
22.5 x 110 x 75 mm	22.5 x 110 x 75 mm
0 °C ... +55 °C	0 °C ... +55 °C

EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
c	c
1	1
$1.2 \times 10^{-6}/h$	$1.2 \times 10^{-6}/h$
1	1
	

17. Safety-monitoring modules

FWS / AZR - Function overview and ordering details

Series Standstill monitor	Application 	Standstill frequency				Integral System Diagnostics	Output contacts			
		Channel 1, 1 Hz Channel 2, 1 Hz	Channel 1, 2 Hz Channel 2, 2 Hz	Channel 1, 1 Hz Channel 2, 2 Hz	Sensorless standstill detection		safe 		not safe 	
FWS 1205	■			■		■	2	0	0	2
		■	■							
FWS 1206	■			■		■	2	0	0	2
		■								
FWS 2105	■			■		■	1	0	0	2
		■								
FWS 2505	■			■		■	4	0	1	2
		■								
AZR 31 S1	■				■		3	0	1	0

Key



Safe standstill monitoring



Safety output contacts, STOP 0



Safety output contacts, STOP 1



Not safe output contacts:
Auxiliary contacts



Not safe output contacts:
Semi-conductor



Yes



Optional



	Input signals (detect standstill)				Start conditions		Operating voltage	Type designation	Material number
	1 impulse generator	2 impulse generators	AC motors	Add. standstill signal	Autostart	Feedback circuit			
	■	■			■		24 VDC	FWS 1205A	101170053
								FWS 1205B	101170054
								FWS 1205C	101170056
	■	■		■	■		24 VDC	FWS 1206A	101170057
								FWS 1206C	101170058
		■			■		24 ... 230 VAC/DC	FWS 2105A	101181691
								FWS 2105C	101181696
		■			■		24 ... 230 VAC/DC	FWS 2505A	101181693
								FWS 2505C	101181697
			■		■	■	24 VDC	AZR31S1/24VDC	101049677
							24 VAC	AZR31S1/24VAC	101049678
							115 VAC	AZR31S1/115VAC	101049676
							230 VAC	AZR31S1/230VAC	101049665

17. Safety-monitoring modules

FWS / AZR - Overview of the series



■ FWS 1205

■ FWS 1206

Key Features

- 2 Sensors (2-channel)
- Function Reset
- 2 safety contacts
- 2 signalling outputs

- 2 Sensors (2-channel)
- Additional standstill signal
- Function Reset
- 2 safety contacts
- 2 signalling outputs

Technical features

Electrical characteristics		
Operating voltage	24 VDC	24 VDC
Operating current	0.2 A	0.2 A
Electronic fuse	-	-
Sensors	NO contact, p-type	NO contact, p-type
Max. motor voltage	-	-
Max. input frequency	4000 Hz	4000 Hz
Min. impulse duration	125 µs	125 µs
Input signal "1"	10...30 VDC	10...30 VDC
Input signal "0"	0...2 VDC	0...2 VDC
Max. switching capacity of the safety contacts	250 VAC / 6 A	250 VAC / 6 A
of the auxiliary contacts	-	-
of the signalling outputs	24 VDC / 100 mA	24 VDC / 100 mA
Switching capacity AC15, DC13	230 VAC / 3 A, 24 VDC / 2 A	230 VAC / 3 A, 24 VDC / 2 A
Mechanical data		
With removable terminals	-	-
Dimensions (H x W x D)	22.5 x 121 x 100 mm	22.5 x 121 x 100 mm
Ambient conditions		
Ambient temperature	0 °C ... +55 °C	0 °C ... +55 °C

Safety classification

Standards	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
PL	d	d
Category	3	3
PFH-value	$2.0 \times 10^{-7}/h$	$2.0 \times 10^{-7}/h$
SIL	2	2
Certificates		



To get detailed information about the products and certificates, visit www.schmersal.net.



■ FWS 2105



■ FWS 2505



■ AZR 31 S1

- 2 Sensors (2-channel)
- Function Reset
- 1 safety contact
- 2 signalling outputs

- 2 Sensors (2-channel)
- Function Reset
- 4 safety contacts
- 2 signalling outputs
- 1 auxiliary contact

- Sensorless monitoring (EMK)
- Motor voltage range ≤ 400 VAC
- Feedback circuit
- 3 safety contacts
- 1 auxiliary contact

24 ... 230 VAC/DC	24 ... 230 VAC/DC	24 VDC, 24 VAC, 115 VAC, 230 VAC
0,4 A	0,4 A	0.14 A
-	-	-
NO contact, p-type	NO contact, p-type	Sensorless monitoring (EMK)
-	-	400 VAC +10%
4000 Hz	4000 Hz	-
125 μ s	125 μ s	-
10...30 VDC	10...30 VDC	-
0...2 VDC	0...2 VDC	-
250 VAC / 6 A	250 VAC / 6 A	250 VAC / 6 A
-	24 VDC / 100 mA	24 VDC / 2 A
24 VDC / 100 mA	24 VDC / 100 mA	-
230 VAC / 3 A, 24 VDC / 2 A	230 VAC / 3 A, 24 VDC / 2 A	230 VAC / 6 A, 24 VDC / 6 A
-	-	■
45 x 121 x 100 mm	45 x 121 x 100 mm	45 x 121 x 73.2 mm
0 °C ... +55 °C	0 °C ... +55 °C	-25 °C ... +45 °C

EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508	EN ISO 13849-1, IEC 61508
d	d	e
3	3	4
$1.0 \times 10^{-7}/h$	$1.0 \times 10^{-7}/h$	$\leq 3.0 \times 10^{-8}/h$
2	2	3