

Electronic Safety Sensors and Solenoid Interlocks

Product Information



SCHMERSAL

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Contents

Technology and user advantages	Page 4
Electronic safety sensors	
Safety sensor CSS 34	Page 11
Safety sensor CSS 180	Page 15
Electronic Safety Sensors and Interlocks	
Safety switch with separate actuator AZ 200	Page 19
Solenoid interlock AZM 200	Page 22
Actuator and accessories AZ/AZM 200	Page 24
Serial diagnosis for functional monitoring	
SD gateway for PROFIBUS SD-I -DP-V0	Page 27
Safety controllers for electronic sensors and interlocks	
AES 1135/1136	Page 33
AES 1235/1236	Page 34
AZR 321 AR	Page 35
SRB 301 LC/B	Page 36
SRB 324 ST	Page 37
SRB-NA-RC-22	Page 38
Wiring schematics	Page 39
Connection of sensors and interlocks to various safety controllers	Page 47

Non-contact



The electronic monitoring of moving safety guard, including actuation in non-contact solenoid interlocks, enables the wear-free and non-contacting detection of the respective actuator. The patented pulse-echo technology permits large tolerances in the approach of the coded actuator, both in the switching distance as well as in the misalignment. Despite this, the switching points and hysteresis are extremely repeatable and constant.

The performance capabilities of the safety sensors and solenoid interlocks are verified by the following applied testing standards:

- Defined behaviour under fault conditions accord. to EN 60947-5-3, self-monitoring classification PDF-M.
- Requirements on safety related parts according to EN 954-1, Control Category 4.
- Requirements on IEC 61508 / use up to SIL 3 applications.

The requirements of IEC61508 furthermore guarantee the user extreme interferences immunity. In addition, with certain faults the standard enables the output of a signal before the machinery is switched off. The machinery can be put into its idle state before being switched off.

The microprocessor technology facilitates an intelligent diagnosis with simple and rapid fault finding, e.g. in the case of a cross short or wiring error.

The safety channels on the electronic sensors and interlocks can be wired in series to form a chain of from 16 to 31 devices depending on the type of devices used. Due to an independent functional check, Control Category 4 is retained with this wired chain. The chain can also be set up mixed with the safety sensors and interlocks described here.

Mode of operation

The products in the CSS range are generally of similar design. To detect the actuator they make use of the pulse-echo technology patented by Schmersal.

In this technology the sensor emits an electromagnetic pulse. When the actuator approaches the sensor, the actuator oscillates at its pre-determined resonant frequency due to the induced energy. This oscillation is in turn read in by the sensor. While doing this, the sensor evaluates its distance to the actuator and the actuator coding. The actuator identified by the sensor is interpreted as a closed safety guard and the safety outputs are switched on.

Due to this working principle, the sensor cannot be mounted behind metal walls, e.g. behind stainless steel covers. The oscillation to be detected cannot penetrate the metal.





Application and field of use

The electronic safety sensors and interlocks provide monitoring of moving safety guard. When the safety guards open, the machine stops and the dangerous restarting of the machine is in all cases suppressed.

It's significant advantage lies in the non-contacting detection of the guard position. They are therefore completely free of wear and are insensitive to the offset of the sensor and actuator.

Electronic safety sensors

Due to their compactness, there are numerous applications for CSS sensors. It can be fitted to the most varied types of safety guards, but can also be employed for position monitoring on machine axes, because they feature high repeatability, an extremely low hysteresis and also without double switching point in the range of actuation (refer to the illustration).

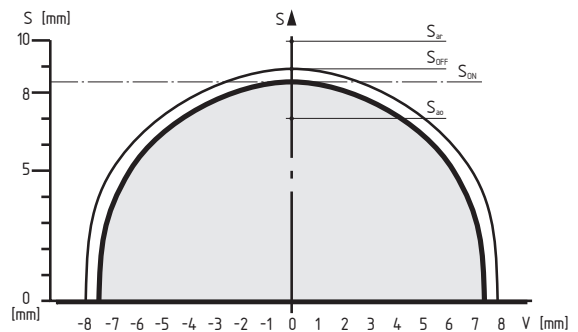
The possible applications, particularly for the CSS 34, are further extended by its four different approach directions.

In particular, mounting on aluminium profile section is carried out quickly and easily with just two screws using the integral mounting plate. Rotating slotted washers in the mounting plate facilitate easy, exact alignment even with inaccurate mounting holes.

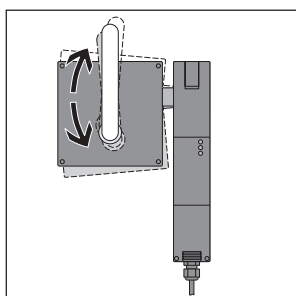
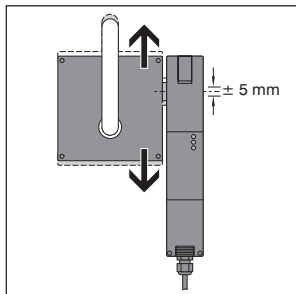
Also, the sensors can be used in almost all places as required. The encapsulated sensors and actuators are insensitive to shock, vibration and dirt.

Consequently, the CSS safety sensors can be used anywhere, but in particular where protection against dangerous machine stop delay is not required.

Actuating curve of the CSS 180 safety sensor



Kept safe



Electronic solenoid interlocks

With dangerous machine movements after switching off, the safety guards must be kept closed until the machine has stopped. For this reason no safety sensors can or may be used here for monitoring, but rather solenoid interlocks must be employed (EN 1088).

But here too a door offset of ± 5 mm is permitted with the use of CSS sensors. The mechanical design of the actuator also enables the complete actuator housing to be swivelled, which is normally mounted on the safety guard.

Uneven drooping of the door can then be compensated between wide limits, i.e. the actuator can still be easily inserted into the switch (AZ 200) or into the interlock (AZM 200) even with these application problems.

This mechanical design means that the device is not damaged despite the offset of the actuator and device, which leads to greater machine and plant availability.

Due to the separate actuator unit, which facilitates an intuitive and ergonomic operation of the safety guard, the AZ and AZM 200 are especially suitable for use on safety guards, barrier fencing and machine housings.

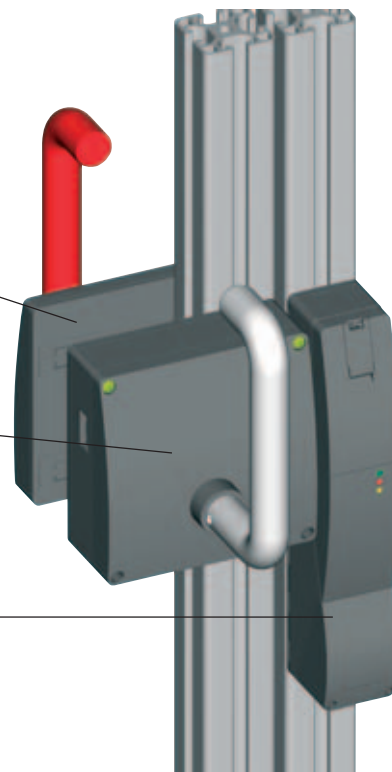
This actuator unit also enables the integration of an additional sensor used for the door detection. With the aid of this second sensor, **Control Category 4 according to EN 954-1 is realised with only one interlock or with only one switch** on the safety guard. This unique feature replaces the second switch. Additional costs for the switch and its fitting are also saved.

AZ/AZM 200

Emergency exit with panic handle

Actuator unit with door handle and door detection sensor

AZM 200 Solenoid Interlock incl. door detection sensor



y shut

The optional exit release has also been developed especially for use on safety guards for barrier fencing and housings. It enables the unlocking and opening of the safety guards by turning the emergency handle located within the danger zone with just one hand movement.

Principally, differentiation must be made between the following types of interlock release:

Manual release

Machinery fitted with spring to lock solenoid interlocks normally have a way of opening the safety guard during a power failure, usually by means of a tool such as a triangular key. The Schmersal solenoid interlocks are fitted with such an auxiliary unlocking mechanism, the so-called "manual release".

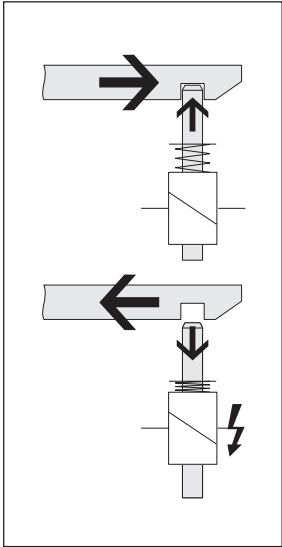
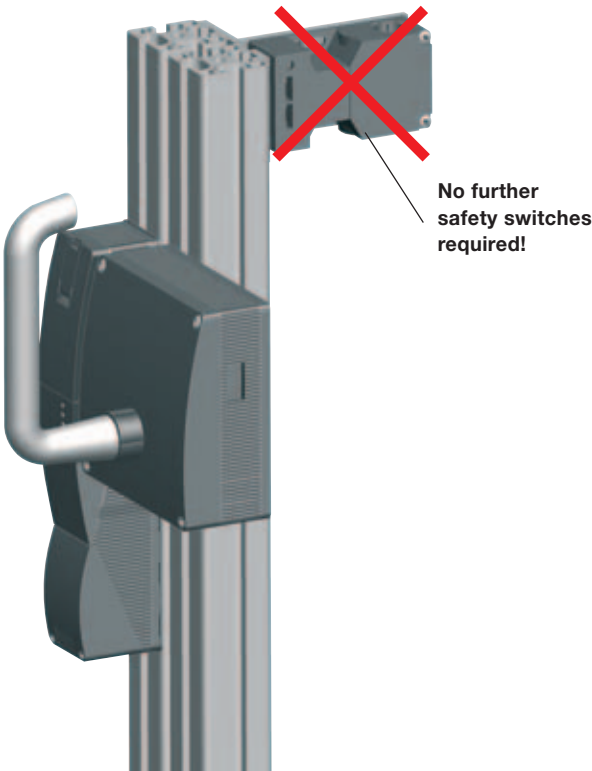
Emergency exit

The emergency exit allows an intentional opening of the safety guard from inside the machine without tools, for example when personnel are trapped inside a machine

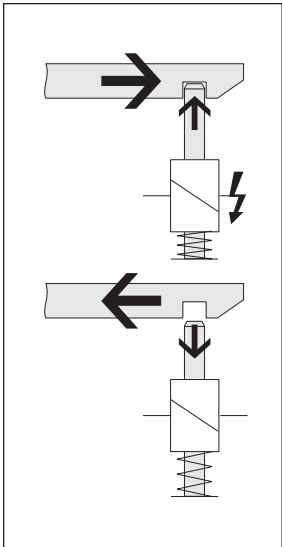
A differentiation is made between two functioning principles of the interlocks. One is the spring to lock principle and the other is the power to lock principle. With the spring to lock principle the safety guard is mechanically locked in the de-energised condition by a spring. With the power to lock principle the safety guard is mechanically locked by the magnetic force. These systems are therefore known as interlocks locked by spring and magnetic force. Since in the de-energised condition an interlock according to the

power to lock principle can be unlocked and the safety guard opened, the spring to lock principle is preferred for personnel safety.

The AZM 200 is available as a spring to lock and as a power to lock version.



Spring to lock principle



Power to lock principle

Detection and

With the electronic safety sensors and the electronic solenoid interlocks, the integral electronics allows extensive diagnosis of the respective operating status. The diagnosis is available in each individual device, but it can also be used with the series connection of different safety devices in the CSS range.

This operating status is indicated by the easily visible diagnostic LED located on the device. It is additionally supplied via a diagnostic line. Here, there is a choice of two options - the conventional signal output or the serial diagnostic line.

The following table shows the diagnosis of the AZM 200 electronic solenoid interlock. It is of the same type as in the electronic sensors CSS 180, CSS 34 or in the electrical safety switch AZ 200, but it is adapted to the respective function. Further details can be found in the data sheets in the product section.

The table shows that the diagnostic output for existing faults changes to 0 V, but the safety outputs are still at 24 V. A connected PLC can evaluate this special signal combination and brings the machine into its specific idle state before the machine is switched off. This prevents the breakage of tools and workpieces and increases the machine availability.



LED's	AZM status	Diagnostic output	Safety outputs
Green	No actuator	0 V	0 V
Yellow	Locked	24 V *	24 V ** (when X1=X2=24 V **)
Flashes yellow	Door closed and not locked	24 V *	0 V
Flashes red (1-9 pulses)	Fault: refer to flash codes	3 s delay: 24 V * -> 0 V	30 min delay: 24 V ** -> 0 V

* U_{e2}
** U_{e1}

Display (red)	Flash codes	Designation
1 flash pulse		Fault, output Y1
2 flash pulses		Fault, output Y2
3 flash pulses		Cross short
4 flash pulses		Overtemperature
5 flash pulses		Target error
6 flash pulses		Error, target combination
7 flash pulses		Error, AD values
8 flash pulses		Fault, transmitter voltage
9 flash pulses		Channel error
Continuous red		Internal error

Display

The serial diagnosis

Sensors / interlocks with a serial diagnostic line possess a serial input and output line instead of the conventional signal output. If these SD devices are wired in series, then apart from the safety channels, the serial diagnostic lines are also wired in series. The "group line" of diagnostic information thus created is passed to a serial diagnostic gateway for evaluation.

A maximum of 31 devices can be wired consecutively in this way, also as a series circuit of different devices.

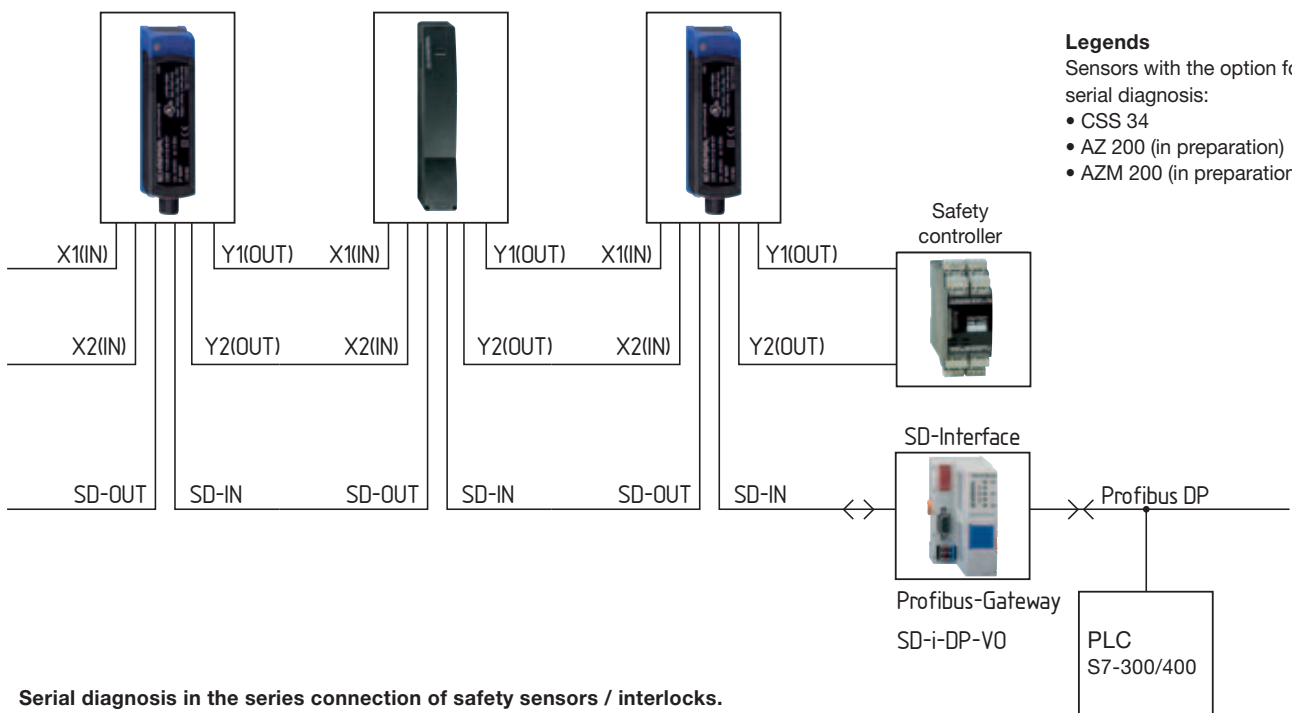
Serial diagnostic gateway for PROFIBUS SD-I-DP-V0

The PROFIBUS Gateway SD-I-DP-V0 converts the serial signals to the PROFIBUS DP-V0 protocol. This serial diagnostic interface is integrated as a slave into an existing PROFIBUS DP system. In this way the diagnostic signals can be evaluated by a PLC.

Operating status can be read and also control commands, e.g. for unlocking a solenoid interlock, can be output to the devices in the series connected chain.

The basic information for the device function is automatically loaded into the linked PLC. For more comprehensive information a CD is enclosed with a selection of prepared function blocks for S7-300.

The advantage of this concept is not just in a substantially reduced amount of wiring, but rather also in the useful information about each participating sensor and in the control of individual interlock releases from the connected PLC. This function can considerably reduce machine downtime.



Download now



Data sheets, mounting and wiring instructions, declaration of conformity and other information at:
www.schmersal.com



Overview of the features:

Advantages of actuation

- Non-contacting principle, no mechanical wear
- 4 actuating directions
- Side faces can be rotated in 3 positions
- Rated switching distance at the head 12 mm, at the side faces 14 mm
- Sensor functioning with max. 36 mm misalignment with regard to the actuator
- High repeat accuracy of the switching points

Advantages of wiring

- 2 short-circuit proof PNP safety outputs (24 VDC per 500 mA)
- Self-monitored series-wiring of max. 31 sensors for Control Category 4 accord. to EN 954-1
- Max. length of the sensor chain 200 m
- Integral cross short, wire-breakage and external voltage monitoring of the safety cables up to the control cabinet

Advantages of diagnosis

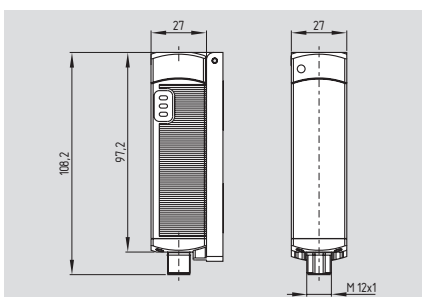
- Detailed status information through LED's and diagnostic output
- Optionally serial diagnostic lines for series-wiring
- Increased availability: pre-signalling of errors during machine operation, e.g. sagging of the safety guard

Approvals

- Classification PDF-M accord. to EN 60947-5-3
- Control Category 4 accord. to EN 954-1
- Up to SIL 3 applications accord. to IEC 61508, PFH value in preparation
- BG-approval in preparation

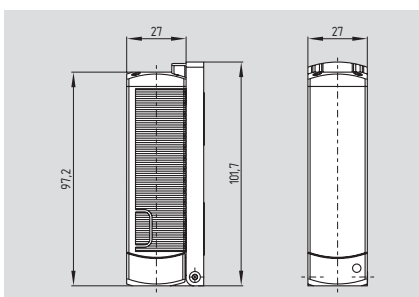
Electronic safety sensor CSS 34

Sensor CSS 34



- Thermoplastic enclosure
- Control Category 4 accord. to EN 954-1
- Classification PDF-M accord. to EN 60947-5-3
- Up to SIL 3 applications accord. to IEC 61508, PFH value in preparation
- 2 short-circuit proof PNP safety outputs (24 VDC per 500 mA)
- Self-monitored series-wiring of max. 31 sensors for Control Category 4 accord. to EN 954-1
- Max. length of the sensor chain 200 m
- Integral cross short, wire-breakage and external voltage monitoring of the safety cables up to the control cabinet
- Sensor with connecting cable or with integrated connector

Actuator CST 34



- CSS 34 sensor and CST 34 actuator are isometric

Technical data

Standards: EN 60947-5-3, EN 954-1, IEC 61508
 Enclosure: glass-fibre reinforced thermoplastic
 Protection class: IP 65, IP 67
 Mode of operation: inductive
 Actuator: coded CST 34, CST 180-1, CST 180-2

Switching distances accord. to EN 60947-5-3:

Device head: S_{ao} : 10 mm
 S_N : 12 mm
 S_{ar} : 15 mm
 Side face: S_{ao} : 12 mm
 S_N : 14 mm
 S_{ar} : 17 mm

Hysteresis: min. 1 mm
 Repeat accuracy: 0.5 mm

Series wiring: max. 31 devices

Cable length: max. 200m

Ambient conditions:

Ambient temperature T_u : -25 °C ... + 70 °C
 Storage and transport temperature: -25 °C ... + 85 °C
 Resistance to vibration: 10 ... 55 Hz, amplitude 1 mm

Resistance to shock: 30 g / 11 ms
 Switching frequency f: 3 Hz
 Response time: < 30 ms
 Duration of risk: < 30 ms

Electrical data:

U_e : 24 VDC (-15% / +10%)
 I_e : 0.6 A
 U_i : 32 V
 U_{imp} : 1000 V
 I_o : 0.05 A
 I_r : < 0.5 mA
 Protection class: II
 Overvoltage category: III
 Degree of pollution: 3
 Safety outputs: normally-open function, dual-channel, short-circuit proof, p-type
 Output current: max. 0.25 A per output
 Voltage drop output: max. 0.5 V
 Utilisation category: DC-12, DC-13
 Signal output: short-circuit proof, p-type
 U_{e2} : max. 5 V under U_e
 I_{e2} : max. 0.05 A
 Utilisation category: DC-12, DC-13
 EMC rating: to EN 61000-6-2

Approvals



Approvals



Ordering details

CSS-①-34-②-③-M-④ Safety sensor

No.	Replace	Description
①	12	Switching distance S_N (mm) for head actuation
	14	Switching distance S_N (mm) for sideways actuation
②	S	Sideways actuation
	V	Head actuation
③	D	Signal output
	SD	Serial diagnosis
④	L	Cable (Y-UL 2517) 8 x 0.35 mm ² , 2m length
	ST	Integrated connector *, 8 poles

Ordering details

CST-34-①-1 Actuator

No.	Replace	Description
①	S	Sideways actuation
	V	Head actuation

Note

Sensor and actuator must be ordered separately.

* Cable for connector version -ST with pre-wired female connector
 8 x 0.25 mm², 2.5 m length 1184290
 5.0 m length 1184291
 10 m length 1184292

Electronic safety sensor CSS 34

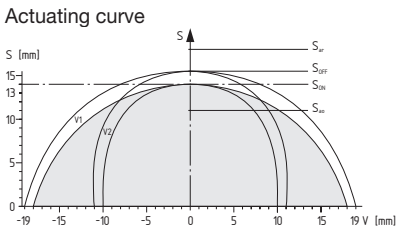
Actuating directions

The actuating curves represent the points at which the CSS 34 sensor switches on and off upon the approach of the actuator.

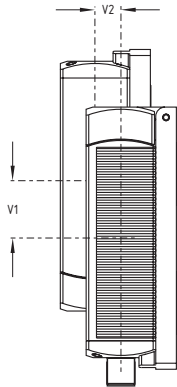
- Legend**
- S Switching distance
 - V, V1, V2 Possible misalignment (see schematic)
 - S_{ON} Switch-on point
 - S_{OFF} Switch-off point
 - S_H Hysteresis area
 - S_{ON} < S_H < S_{OFF}
 - S_{ao} Assured operation point
 - S_{ar} Assured release point accord. to EN 60947-5-3

Switch-on/-off diagram

Actuation sideways

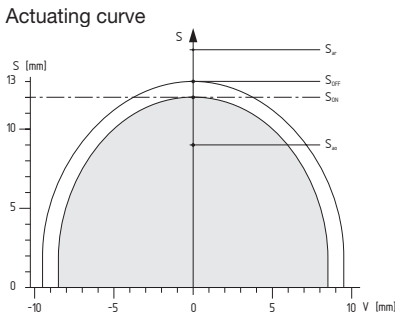


Sideways misalignment
horizontal: max. ± 10 mm (V2)
vertical: max. ± 18 mm (V1)

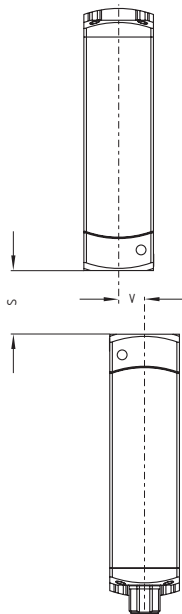


Switch-on/-off diagram

Actuation from the top



Top misalignment
horizontal: max. ± 8.5 mm (V)



Safety controller

Requirements for the safety controller
Dual-channel safety input, suitable for p-type sensors with normally-open function. The internal function tests of the sensors cause the outputs to cyclicly switch off for max. 0.5 ms, which must be tolerated by the safety controller. The safety controller must not be equipped with a cross-wire detection function.

The programme of suitable safety controllers for these applications can be found on **page 32 ff.**

Connection

Wiring of the device cable or the integrated connector.

Cable colour	Wiring of sensor with signal output	Wiring of sensor with serial diagnosis	Pin configuration
BN (brown)	A1 Ue	A1 Ue	Pin 1
BU (blue)	A2 GND	A2 GND	Pin 3
WH (white)	X1 Safety input 1	X1 Safety input 1	Pin 2
VT (violet)	X2 Safety input 2	X2 Safety input 2	Pin 6
BK (black)	Y1 Safety output 1	Y1 Safety output 1	Pin 4
RD (red)	Y2 Safety output 2	Y2 Safety output 2	Pin 7
GY (grey)	Signal output	SD Output	Pin 5
PK (pink)	Without function	SD Input	Pin 8



Electronic safety sensor CSS 34

Diagnosis of the electronic safety sensor CSS 34 with signal output

When the safety guard is opened, the safety outputs of the CSS 34 are immediately disabled.

A cross short or any error that does not immediately affect the function of a safety sensor will lead to a 30 min. delayed shutdown of the safety channels. The diagnostic output however will be disabled instantaneously.

The downstream control can use the different signal combinations of the safety channel and the diagnostic output to set the machine safely to a hold position instead of immediately interrupting the production process.

Function of the sensor LED's and the diagnostic output

Sensor function	LED's in the sensor housing	Signal output (24 VDC, 50 mA)	Safety outputs
No target	green	0 V	0 V
Actuated	yellow	24 V *	24 V **
Actuated in limit area	flashes yellow	2 Hz pulsed	24 V **
Fault	flashes red	24 V * -> 0 V	30 min delay: 24 V ** -> 0 V

* U_{e2}
** U_{e1}

Display (red)	Flash codes	Designation
1 flash pulse		Fault, output Y1
2 flash pulses		Fault, output Y2
3 flash pulses		Cross short
4 flash pulses		Overtemperature
5 flash pulses		Fault actuator

Diagnosis of the electronic safety sensor CSS 34 with serial diagnosis

Sensors with a serial diagnostic line possess a serial input and output line instead of a diagnostic output. If CSS sensors are wired in series, the safety channels as well as the serial diagnostic lines are wired in series.

Max. 31 CSS 34 sensors can be wired in series. For the evaluation of the serial diagnostic line, the serial Diagnostic Gateway for PROFIBUS DP SD-I-DP-V0 is used. This serial Diagnostic Interface is integrated as slave into Profibus DP system. In this way, the diagnostic signals can be evaluated by a PLC.

The following operational information is automatically and continuously written in an input byte for each CSS 34 sensor in the series-wired chain:

- Bit 0: Safety outputs released
- Bit 1: Sensor actuated, actuator identified
- Bit 4: Safety inputs energised
- Bit 5: Sensor actuated in the hysteresis area
- Bit 6: Error pre-signalling, switch-off delay activated
- Bit 7: Error, safety outputs disabled

Function of the diagnostic LED's, the serial status signals and the safety outputs

Flash code as for version above

Sensor function	Diagnostic LED's	Safety outputs	Serial diagnostic byte 7 6 5 4 3 2 1 0
Supply voltage on	green	0 V	
No target	green	0 V	0 0 0 1 0 0 0 0
Actuated	yellow	24 V **	0 0 0 1 0 0 1 1
Actuated in limit area	flashes yellow	24 V **	0 0 1 1 0 0 1 1
Warning	flashes red	24 V **	0 1 0 1 0 0 1 1
Fault	flashes red	0 V	1 0 0 1 0 0 1 0

* U_{e2}
** U_{e1}

Error pre-signalling, error messages through module

Bit Nr.	Error pre-signalling	Bit Nr.	Error messages
0	error output Y1	0	error output Y1
1	error output Y2	1	error output Y2
2	cross short outputs	2	cross short outputs
3	temperature too high	3	temperature too high
4	–	4	incorrect or defective actuator
5	internal error	5	interner Fehler
6	initialisation error SD slave	6	–
7	communication error SD slave	7	–

Electronic safety sensor CSS 180



Overview of the features:

Advantages of actuation

- Non-contacting principle, no mechanical wear
- Suitable for concealed mounting
- Rated switching distance 8 mm
- Misaligned actuation possible
- High repeat accuracy of the switching points

Advantages of wiring

- 2 short-circuit proof PNP safety outputs (24 VDC per 500 mA)
- Self-monitored series-wiring of max. 31 sensors for Control Category 4 accord. to EN 954-1
- Max. length of the sensor chain 200 m
- Integral cross short, wire-breakage and external voltage monitoring of the safety cables up to the control cabinet

Advantages of diagnosis

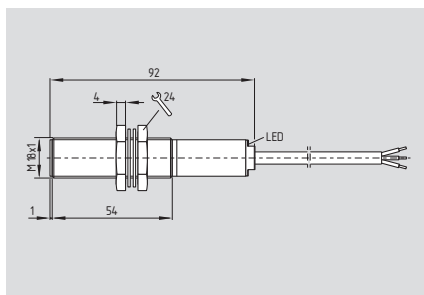
- Detailed status information through LED's and diagnostic output
- Increased availability: pre-signalling of errors during machine operation, e.g. sagging of the safety guard
- Controlled shutdown of the machine under observance of the running processes in case of emergency

Approvals

- Classification PDF-M accord. to EN 60947-5-3
- Control Category 4 accord. to EN 954-1
- Up to SIL 3 applications accord. to IEC 61508, PFH value $< 6.1 \times 10^{-9}$
- BG-approved

Electronic safety sensor CSS 180

CSS 180

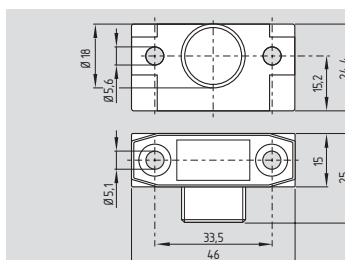


- Thermoplastic enclosure
- Control Category 4 accord. to EN 954-1
- Classification PDF-M accord. to EN 60947-5-3
- Up to SIL 3 applications accord. to IEC 61508, PFH value $< 6.1 \times 10^{-9}$
- Electronic contact-free, coded system
- Particularly large switching distance
- Misaligned actuation possible
- High repeat accuracy of the switching points
- Self-monitored series-wiring of max. 16 sensors
- Max. length of the sensor chain 200 m
- Comfortable diagnostics through sensor LED and electronic signal output
- Early warning when operating near the limit of the sensor's hysteresis range
- 2 short-circuit proof PNP safety outputs (24 VDC per 500 mA)

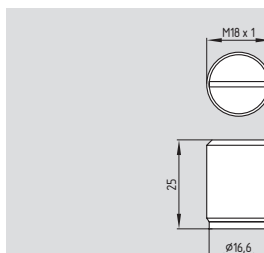
Technical data

Standards:	IEC 60947-5-3, EN 954-1
Design:	IEC 61508 cylindrical
Enclosure:	glass-fibre reinforced thermoplastic
Protection class:	IP 65 and IP 67 to EN 60529
Connection:	cable or cable with connector M12x1
Cable section:	according to execution: 4 x 0.5 mm ² , 5 x 0.34 mm ² , 7 x 0.25 mm ²
Cable length:	max. 200 m
Mode of operation:	inductive
Actuator:	CST-180-1, CST-180-2
Control category:	4 to EN 954-1
Classification:	up to PDF-M to IEC 60947-5-3
SIL classification:	up to SIL 3 applications to IEC 61508, PFH $< 6.1 \times 10^{-9}$
Rated switching distance S_n :	8 mm
S_{ao} :	7 mm
S_{ar} :	10 mm
Hysteresis:	≤ 0.7 mm
Repeat accuracy R:	≤ 0.2 mm
Response time:	< 30 ms
Duration of risk:	≤ 30 ms
U_e :	24 VDC – 15 % / + 10 %
I_e :	1.0 A
I_o :	0.05 A
Leakage current I_i :	≤ 0.5 mA
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
U_{imp} :	0.8 kV
U_i :	32 VAC/DC
Safety outputs:	short-circuit proof, p-type
Output current:	max. 0.5 A per output
U_d :	max. 0.5 V
I_e/U_e :	0.5 A / 24 VDC
Signal output:	short-circuit proof, p-type
I_e/U_e :	0.05 A / 24 VDC
Utilisation category:	DC-12, DC-13
Ambient temperature:	– 25 °C ... + 60 °C
Storage and transport temp.:	– 25 °C ... + 85 °C
Switching frequency f:	ca. 3 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55 Hz, amplitude 1 mm

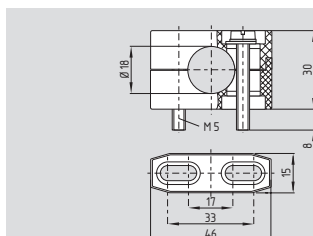
System components



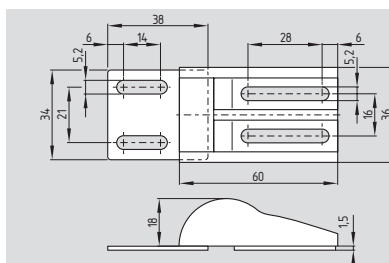
Actuator CST-180-1



Actuator CST-180-2



Terminal mounting H 18



Magnetic ball catch CSA-M-1

Approvals

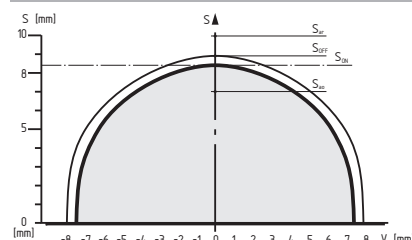


Ordering details

CSS 8-180-①-②-③

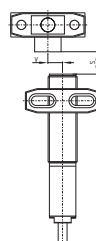
No.	Replace	Description
①	2P 2P+D	2 PNP safety outputs 2 PNP safety outputs and 1 PNP signal output (diagnostic)
②	E Y M	End or individual device Series-wiring device Multifunction device
③	L LST	Pre-wired cable Pre-wired cable and connector

Note



Legend

S	Switching distance
V	Misalignment
S_{on}	Switch-on point
S_{off}	Switch-off point
S_h	Hysteresis area
S_{ao}	Assured operation point
S_{ar}	Assured release point accord. to EN 60947-5-3



Ordering details

Actuator	CST-180-1
Actuator	CST-180-2
Terminal mounting	H 18
Magnetic ball catch	CSA-M-1

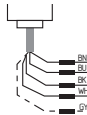
Actuators must be ordered separately.

Electronic safety sensor CSS 180

Connection

End or individual device:

CSS- 8-180-2P+...-E-L...



Cable:

2 m length;

cable section 4 poles: 4 x 0.5 mm²,
5 poles: 5 x 0.35 mm²

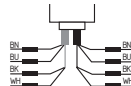
Connector: (option)

Connector male M12 x 1, 4 poles

Connector male M12 x 1, 5 poles

Series-wiring device:

CSS-8-180-2P-Y-L...



Cable:

Inputs (IN), grey cable 0.25 m length;

4 poles: 4 x 0.5 mm²,

Outputs (OUT), black cable 2 m length;

4 poles: 4 x 0.5 mm²

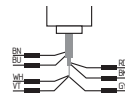
Connector: (option)

Inputs (IN): Connector female M12 x 1, 4 poles

Outputs (OUT): Connector male M12 x 1,
4 poles

Multifunction device:

CSS-8-180-2P+D-M-L...



Cable:

2 m length;

cable section 7 poles: 7 x 0.25 mm²

Connector: (option)

Connector male M12 x 1, 8 poles

Wiring

Cable colour

Wiring

Pin

configuration

BN (brown)

A1 Ue

Pin 1

BU (blue)

A2 GND

Pin 3

BK (black)

Y1 Safety output 1

Pin 4

WH (white)

Y2 Safety output 2

Pin 2

GY (grey)

Only 5 pole version: Signal output (option)

Pin 5



Cable colour

Wiring

grey cable (IN)

black cable (OUT)

Pin

configuration

BN (brown)

A1 Ue

A1 Ue

Pin 1

BU (blue)

A2 GND

A2 GND

Pin 3

BK (black)

X1 Safety input 1

Y1 Safety output 1

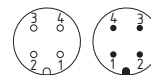
Pin 4

WH (white)

X2 Safety input 2

Y2 Safety output 2

Pin 2



Connector
female male

Cable colour

Wiring

Pin

configuration

BN (brown)

A1 Ue

Pin 1

BU (blue)

A2 GND

Pin 3

VT (violet)

X1 Safety input 1

Pin 6

WH (white)

X2 Safety input 2

Pin 2

BK (black)

Y1 Safety output 1

Pin 4

RD (red)

Y2 Safety output 2

Pin 7

GY (grey)

Signal output

Pin 5

-

spare

Pin 8



Safety controller

Requirements for the safety controller

Dual-channel p-type safety input. The internal function tests of the sensors cause the outputs to cyclicly switch off for max. 2 ms, which must be tolerated by the safety controller.

The programme of suitable safety controllers for these applications can be found on page 32 ff.

Note

- Series-wiring of sensors:
16 self-monitoring CSS 180 safety sensors can be wired in series without loss of control category 4 accord. to EN 954-1. The redundant output of the first sensor is wired into the input of the next sensor.
- The voltage drop over a long sensor chain should be taken into account when planning cable routing. It depends on several factors which are operating voltage, cable length, ambient temperature, number of sensors series connected, and input load of the safety control monitor.



Diagnosis of the electronic safety sensor CSS 180

The diagnostic function of the CSS 180 safety sensor

The safety sensor indicates the operating condition and faults in three colours in the transparent end cap.

The electronic diagnostic output signals errors before the safety outputs are disabled, thus enabling a controlled shutdown in case of emergency.

When a safety guard is opened, the safety outputs of the CSS sensor are immediately disabled.

A cross short or any error that does not immediately affect the function of a safety sensor leads to a 1-minute delayed shutdown. The diagnostic output however is instantaneously disabled.

The downstream control can use the different signal combinations of the safety channel and the diagnostic output to set the machine safely to a hold position instead of immediately interrupting the production process.

Diagnostics function of the electronic safety sensor CSS 180

Sensor function	LED's in the sensor housing	Signal output (24 VDC, 50 mA)	Safety outputs
No target	green	0 V	0 V
Actuated	yellow	24 V *	24 V **
Actuated in limit area	flashes yellow	2 Hz pulsed	24 V **
Fault	flashes red	3 s delay: 24 V * -> 0 V	1 min delay: 24 V ** -> 0 V

* U_{e2}
** U_{e1}

Display (red)	Flash codes	Designation
1 flash pulse		Fault, output Y1
2 flash pulses		Fault, output Y2
3 flash pulses		Cross short, fault safety outputs 1 and 2
4 flash pulses		Overtemperature
5 flash pulses		Fault actuator, coding

Electronic solenoid interlock AZM 200 and electronic safety switch with separate actuator AZ 200



Overview of the features:

Advantages

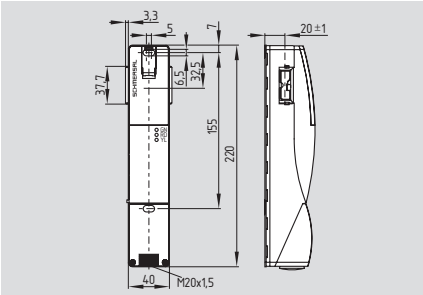
- Sensor technology permits an offset of ± 5 mm between actuator and interlock
- Intelligent diagnosis
- Modern and ergonomic design
- Simple mounting
- Accurate adjustment through slotted holes
- 3 LED's to show operating conditions (see tabel)
- 1 or 3 signal outputs

Approvals

- Control category 4 accord. to EN 954-1 with door detection sensor (without additional second switch)
- Up to SIL 3 applications accord. to IEC 61508, PFH value 4.3×10^{-9}

Electronic safety switch with separate actuator AZ 200

AZ 200



- Thermoplastic enclosure
- Sensor technology permits an offset of ± 5 mm between actuator and interlock
- Control category 4 accord. to EN 954-1 with door detection sensor (without additional second switch)
- Up to SIL 3 applications accord. to IEC 61508
- Intelligent diagnosis
- Modern and ergonomic design
- Simple mounting
- Accurate adjustment through slotted holes
- 3 LED's to show operating conditions (see tabel)
- 1 or 3 signal outputs

Technical data

Standards: IEC/EN 60947-5-1
EN 954-1
IEC/EN 61508

Enclosure: glass-fibre reinforced thermo-plastic, self-extinguishing

Mechanical life: ≥ 1 million operations

F_{max}: 2000 N

Latching force: 30 N

Protection class: IP 67 to EN 60529

Protection class: II, □

Overvoltage category: III

Degree of pollution: 3

Connection: screw terminals
or cage clamps

Cable section: min. 0.25 mm²
max. 1.5 mm²
(incl. conductor ferrules)

Cable entry: M20 x 1.5

Series wiring: max. 31 devices

Cable length: max. 200m
(Cable length and cable section alter the voltage drop depending on the output current)

Ambient conditions:

Ambient temperature: - 25 °C ... + 70 °C

Storage and transport temperature: - 25 °C ... + 85 °C

Resistance to vibration: 10 ... 55 Hz,
amplitude 1 mm

Resistance to shock: 30 g / 11 ms

Switching frequency f: 1 Hz

Response time: < 30 ms

Duration of risk: < 90 ms

Time to readiness: < 2 s

Electrical data:

U_e: 24 VDC -15%/+10%

I_e: 1 A

I₀: max. 0.5 mA

U_{imp}: 800 V

U_i: 32 VDC

Fuse rating: internally short-circuit proof

Device insulation: to UL 508 ≤ 4 A;
depending on the number of devices and loads (Y1, Y2 and OUT)

Leakage current I_r: ≤ 0.5 mA

Technical data

Safety inputs X1 and X2:

Voltage range - 3V ... 5V: Low

Voltage range 15V ... 30V: High

> 2 mA at 24 V

Safety outputs Y1 and Y2:

short-circuit proof, p-type

U_{e1}: 0 V to 4 V under U_e

I_{e1}: max. 0.25 A

Utilisation category: DC-13

Signal output OUT:

short-circuit proof, p-type

U_{e2}: 0 V to 4 V under U_e

I_{e2}: max. 0.05 A / 0.1 A

Utilisation category: DC-13

Classification:

to EN 954-1: up to control category 4
(with appropriate circuit)

to IEC 61508: PFH value 4.3 x 10⁻⁹,
up to SIL 3 applications

Approvals

UL SP in preparation

CE

Ordering details

AZ 200①-②-③2P		
No.	Replace	Description
①	SK	Screw terminals
	CC	Cage clamps
	ST	Connector (M23)
②		without door detection sensor
	T	with door detection sensor
③	1P	1 Signal output
	3P	3 Signal outputs

Note

The actuators and other accessories can be found on page 24 and 25.

The safety switch/solenoid interlock and the actuator unit must be ordered separately!

Electronic safety switch with separate actuator AZ 200

Diagnosis of the AZ 200 with 1 or 3 signal outputs

The **AZ 200.-.1P2P** solenoid interlock has only one diagnostic output:

OUT

The **AZ 200.-.3P2P** has three diagnostic outputs:

OUT Actuator inserted, locking enabled or locked

OUT2 Signals errors before the safety outputs are disabled, thus allowing for a controlled shutdown of the machine

OUT3 Guard closed, actuator not inserted

LED functions:

green supply voltage on
yellow locked
red error

Function of the sensor LED's and the diagnostic output

Door function	LED's	Safety outputs 24 VDC, 250 mA per output Y1, Y2	Signal outputs AZ 200 .-.3P2P 24 VDC, Σ 100 mA				-.1P2P 50 mA OUT
			OUT	OUT2	OUT3	OUT	
Door open	green	0 V	0 V	0 V	0 V	0 V	
Door closed	green	0 V	0 V	0 V	24 V *	0 V	
Door closed, actuator inserted	yellow + green	24 V **	24 V *	0 V	24 V *	24 V *	
Actuator inserted, fault	flashes red (refer to flash codes)	24 V **	24 V *	24 V *	24 V *	0 V	

* U_{e2}

** U_{e1}

Display	Flash codes	Designation	Autonomous shutdown after
1 flash pulse		Fault, output Y1	30 min
2 flash pulses		Fault, output Y2	30 min
3 flash pulses		Cross short	30 min
4 flash pulses		Overtemperature	30 min
5 flash pulses		Target error	0 min
6 flash pulses		Error, target combin.	0 min
7 flash pulses		Error, AD values	30 min
8 flash pulses		Fault, transmit. voltage	0 min
9 flash pulses		Channel error	0 min
Continuous red		Internal error	0 min

Safety controller

The programme of suitable safety controllers for these applications can be found on **page 32 ff.**

The achievable control category accord. to EN 954-1 safety controllers depends on the safety controller as well as the structure of the entire safety circuit.

Connection

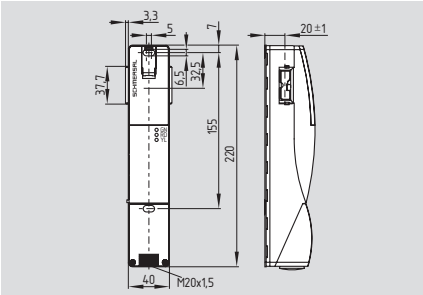
Wiring diagram for the device cable or the integrated connector

Cable colour	Wiring of the safety switch with 1 signal output	Wiring of the safety switch with 3 signal outputs	Pin configuration
BN (brown)	24 V	24 V	Pin 1
BU (blue)	GND	GND	Pin 3
WH (white)	X1 Safety input 1	OUT2 Signal output	Pin 2
VT (violet)	X2 Safety input 2	OUT3 Signal output	Pin 6
BK (black)	Y1 Safety output 1	Y1 Safety output 1	Pin 4
RD (red)	Y2 Safety output 2	Y2 Safety output 2	Pin 7
GY (grey)	OUT Signal output	OUT Signal output	Pin 5
PK (pink)	spare	spare	Pin 8
–	spare	spare	Pin 9



Electronic solenoid interlock AZM 200

AZM 200



- Thermoplastic enclosure
- Sensor technology permits an offset of ± 5 mm between actuator and interlock
- Control category 4 accord. to EN 954-1 with door detection sensor (without additional second switch)
- Up to SIL 3 applications accord. to IEC 61508
- Intelligent diagnosis
- Modern and ergonomic design
- Simple mounting
- Accurate adjustment through slotted holes
- 3 LED's to show operating conditions (see tabel)
- Manual release from both sides
- 1 or 3 signal outputs

Technical data

Standards: IEC/EN 60947-5-1, EN 954-1
IEC/EN 61508

Enclosure: glass-fibre reinforced thermo-plastic, self-extinguishing

Mechanical life: ≥ 1 million operations

F_{max} : 2000 N

Latching force: 30 N

Protection class: IP 67 to EN 60529

Protection class: II, $\square$

Overvoltage category: III

Degree of pollution: 3

Connection: screw terminals or cage clamps

Cable section: min. 0.25 mm²
max. 1.5 mm²
(incl. conductor ferrules)

Cable entry: M20 x 1.5

Series wiring: max. 31 devices

Cable length: max. 200m
(Cable length and cable section alter the voltage drop depending on the output current)

Ambient conditions:

Ambient temperature: Spring to lock principle : $-25^{\circ}\text{C} \dots +60^{\circ}\text{C}$
Power to lock principle : $-25^{\circ}\text{C} \dots +50^{\circ}\text{C}$

Storage and transport temperature : $-25^{\circ}\text{C} \dots +85^{\circ}\text{C}$

Resistance to vibration: 10 ... 55 Hz, amplitude 1 mm

Resistance to shock: 30 g / 11 ms

Switching frequency f: 1 Hz

Response time: < 30 ms

Duration of risk: < 90 ms

Time to readiness: < 2 s

Electrical data:

U_e : 24 VDC $-15\%/+10\%$

I_e : 1 A

I_0 : max. 0.5 mA

U_{imp} : 800 V

U_i : 32 VDC

Fuse rating: internally short-circuit proof

Device insulation: to UL 508 ≤ 4 A;
depending on the number of devices and loads (Y1, Y2 and OUT)

Leakage current I_r : ≤ 0.5 mA

Technical data

Safety inputs X1 and X2:

Voltage range $-3\text{V} \dots 5\text{V}$: Low

Voltage range 15V ... 30V: High

> 2 mA at 24 V

Safety outputs Y1 and Y2:

short-circuit proof, p-type

U_{e1} : 0 V to 4 V under U_e

I_{e1} : max. 0.25 A

Utilisation category: DC-13

Signal output OUT:

short-circuit proof, p-type

U_{e2} : 0 V to 4 V under U_e

I_{e2} : max. 0.05 A / 0.1 A

Utilisation category: DC-13

Solenoid control IN:

Voltage range $-3\text{V} \dots 5\text{V}$: Low

Voltage range 15V ... 30V: High

> 5 mA at 24 V

100% ED

Solenoid:

Classification:

to EN 954-1: up to control category 4
(with appropriate circuit)

to IEC 61508: PFH value 4.3×10^{-9} ,
up to SIL 3 applications

Approvals

in preparation

Ordering details

AZM 200①-②-③2P④		
No.	Replace	Description
①	SK CC ST	Screw terminals Cage clamps Connector (M23)
②	T	without door detection sensor with door detection sensor
③	1P 3P	1 Signal output 3 Signal outputs
④	a	Spring to lock principle Power to lock principle

Note

The actuators and accessories can be found at page 24 and 25.

The safety switches/solenoid interlocks and the actuator unit must be ordered separately!

Electronic solenoid interlock AZM 200

Diagnosis of the AZM 200 with 1 or 3 signal outputs

The **AZM 200.-.1P2P** solenoid interlock has only one diagnostic output:

OUT

The **AZM 200.-.3P2P** has three diagnostic outputs:

OUT Actuator inserted, locking enabled or locked

OUT2 Signals errors before the safety outputs are disabled, thus allowing for a controlled shutdown of the machine

OUT3 Guard closed, actuator not inserted

LED functions:

green supply voltage on
yellow locked
red error

Function of the sensor LED's and the diagnostic output

Door function	LED's	Safety outputs 24VDC, 250 mA per output Y1, Y2	Signal outputs				Solenoid control	
			AZ 200 .-.3P2P 24 VDC, Σ 100 mA		-.1P2P 50 mA		Spring to lock IN	Power to lock IN
Door open	green	0 V	0 V	0 V	0 V	0 V	0 V	0 V
Door closed	green	0 V	0 V	0 V	24 V *	0 V	0 V	0 V
Door closed, actuator inserted	yellow	0 V	24 V *	0 V	24 V *	24 V *	0 V	0 V
Guard closed	yellow	24 V **	24 V *	0 V	24 V *	0 V	0 V	24 V
Guard closed, fault	flashes red (refer to flash codes)	24 V **	24 V *	24 V *	24 V *	0 V	0 V	24 V

* U_{e2}

** U_{e1}

Display	Flash codes	Designation	Autonomous shutdown after
1 flash pulse		Fault, output Y1	30 min
2 flash pulses		Fault, output Y2	30 min
3 flash pulses		Cross short	30 min
4 flash pulses		Overtemperature	30 min
5 flash pulses		Target error	0 min
6 flash pulses		Error, target combin.	0 min
7 flash pulses		Error, AD values	30 min
8 flash pulses		Fault, transmit. voltage	0 min
9 flash pulses		Channel error	0 min
Continuous red		Internal error	0 min

Safety controller

The programme of suitable safety controllers for these applications can be found on **page 32 ff.**

The achievable control category accord. to EN 954-1 safety controllers depends on the safety controller as well as the structure of the entire safety circuit.

Connection

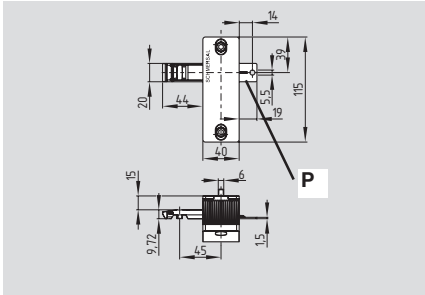
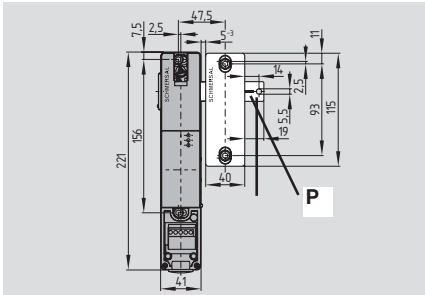
Wiring diagram for the device cable or the integrated connector

Cable colour	Wiring of the solenoid interlock with signal output	Wiring of the solenoid interlock with serial diagnosis	Pin configuration
BN (brown)	24 V	24 V	Pin 1
BU (blue)	GND	GND	Pin 3
WH (white)	X1 Safety input 1	X1 Safety input 1	Pin 2
VT (violet)	X2 Safety input 2	X2 Safety input 2	Pin 6
BK (black)	Y1 Safety output 1	Y1 Safety output 1	Pin 4
RD (red)	Y2 Safety output 2	Y2 Safety output 2	Pin 7
GY (grey)	Signal output OUT	SD output	Pin 5
PK (pink)	Input IN	SD input	Pin 8
–	spare	spare	Pin 9



Actuators AZ/AZM 200

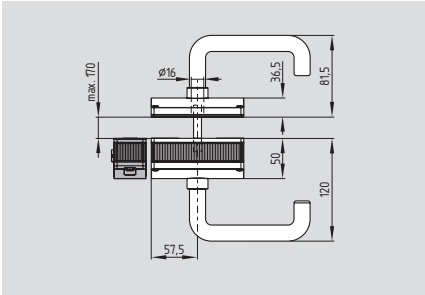
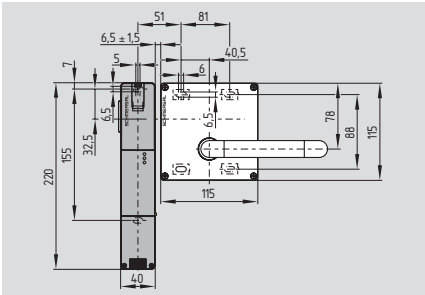
AZ/AZM 200-B1-...



- Suitable for sliding guards
- Actuators with return spring
- Spring offset up to 5 mm
- With or without emergency exit (P0) possible

The safety switch/solenoid interlock and the actuator unit must be ordered separately!

AZ/AZM 200-B30-...



- Suitable for hinged guards
- One-hand emergency release, even in de-energised condition
- Easy and intuitive operation
- No risk of injury from a protruding actuator
- No supplementary door handle required
- Does not protrude into the door opening
- Various handles available
- With or without emergency exit possible

The safety switch/solenoid interlock and the actuator unit must be ordered separately!

Technical data

Standards: IEC/EN 60947-5-3
EN 954-1, IEC/EN 61508

Material:

Actuator unit: Glass-fibre reinforced thermo-plastic, auto-extinguishing, fixing holes with metal washer

Emergency exit: Glass-fibre reinforced thermo-plastic, auto-extinguishing, fixing holes with metal washer

B1-Enclosure: Grivory

Door handle: anodized aluminium

Panic handle: plastic coated aluminium

Actuator: zinc die-cast

Mechanical life: ≥ 1 million operations

F_{max}: 2000 N

Approvals



Ordering details

AZ/AZM 200-B1-①②③		
No.	Replace	Description
①	L	Actuating direction left
	R	Actuating direction right
②		Without door detection sensors
	T	With door detection sensors
③		Without emergency exit
	P0	With emergency exit

Approvals



Ordering details

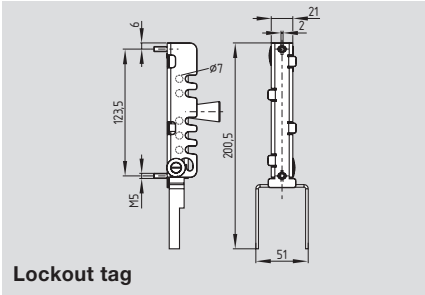
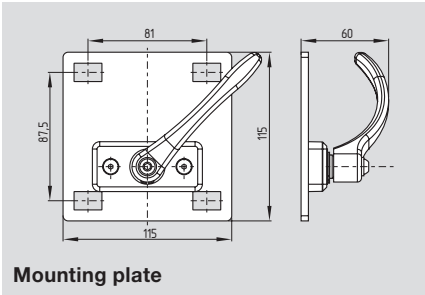
AZ/AZM 200-B30-①②A③④		
No.	Replace	Description
①	L	Door hinge on left-hand side
	R	Door hinge on right-hand side (view point towards the hazardous area)
②		Without
	T	With door detection sensors
③	G0	Without handle
	G1	Door handle
	G2	Rotary button
④		Without emergency exit
	P1	With emergency exit
	P20	With emergency exit incl. mounting plate

Accessoires AZ/AZM 200

System components



System components



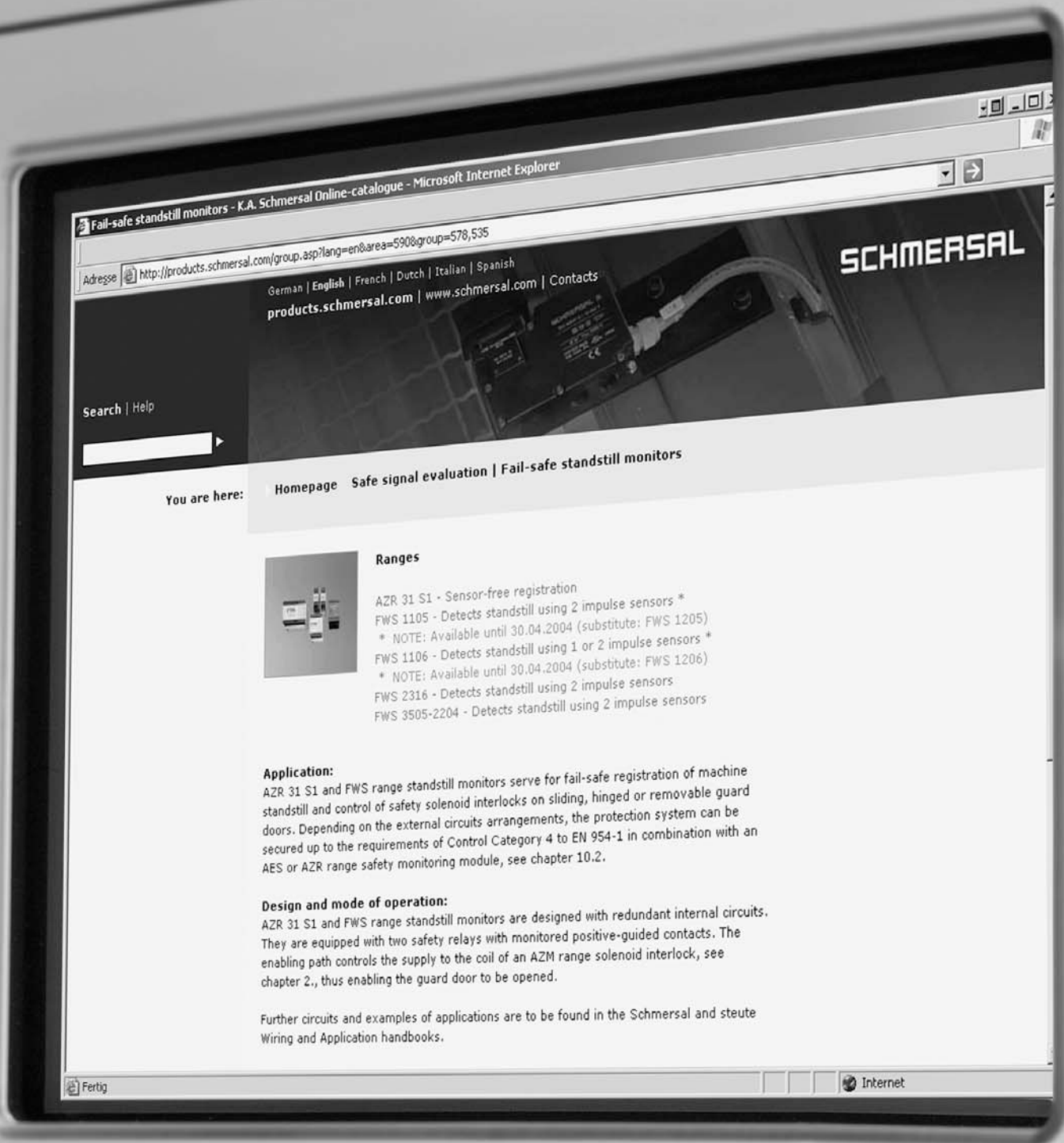
Ordering details

Emergency exit, red
Door handle
Rotary button

Ordering details

P1	Mounting plate with	
G1	emergency exit, metal	P20
G2	Lockout tag	SZ 200

More Details



Detailed technical information at:
www.schmersal.com

SD gateway for PROFIBUS SD-I-DP-V0

To convert serial diagnostic signals to the PROFIBUS DP Protocol



Overview of the features:

Advantages of serial diagnosis

- Diagnostic lines of max. 31 safety components can be wired in series
- Series wiring of different devices possible (CSS 34, AZ 200 and AZM 200 under preparation)
- Diagnostic line is suitable for series wiring or Daisy-Chaining, thus reducing the cabling effort
- Bidirectional communication, i.e. reading operational data and unlocking of a solenoid interlock in the chain

Advantages of the integration into the Profibus system

- PROFIBUS configuration
- PROFIBUS DP slave
- GSD file for system configuration in S7-300/400 systems

Advantages for the communication set-up

- Automatic addressing of the safety switchgear through the serial input
- Automatic, continuous transmission of the operational data of each participant in the diagnostic chain. To this end, 1 input and output byte is automatically reserved in the S7 PLC.
- On request, other pre-signalling and error messages are loaded in the functional blocks of the PLC

Advantages of the diagnostic in the PLC system

- Mapping of the operational data of the series-wired safety sensors and solenoid interlocks
- Control commands for unlocking all connected solenoid interlocks
- Fast and accurate error messages with detailed information about the malfunction
- Increased availability: pre-signalling of errors during machine operation, e.g. sagging of the safety guard

SD-Gateway for PROFIBUS SD-I-DP-V0

SD-I-DP-V0



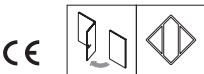
- Profibus Gateway SD-I-DP-V0 to convert serial diagnostic signals to the PROFIBUS DP protocol
- Protection class IP 10 device for control cabinet mounting, for standard DIN rails

Technical data

Profibus interface:	9-pole SUB-D connector, default Profibus connection (DP-A, DP-B, 5V, GND)
Protocol:	Profibus-DP –V0 upwards compatible
Short-circuiting device:	internal fuse to EN 60127 PolySwitch 0.5 A / 60 V
LED indications:	see table below
DIP switch 8-pole:	S1...S7: addressing as Profibus slave S8: automatic addressing of the serial devices
Power supply SD bus:	+ 5 VDC
Rated operating voltage U_e :	24 VDC, –15 % / +20 %
Rated operating current I_e :	typ. 180 mA, max. 250 mA
Rated insulation voltage U_i :	32 V
Rated impulse withstand voltage U :	0.5 kV
Overvoltage category:	II
Degree of pollution:	2
Storage temperature range:	– 25 °C ... + 85 °C, non-condensing
Operating temperature range:	– 5 °C ... + 55 °C, non-condensing
Humidity:	5% - 95%, non-condensing
Protection class:	IP 10
Resistance to vibration:	5 ... 9 Hz / 3.5 mm (to IEC 60068-2-6) 9 ... 150 Hz / 1 g
Resistance to shock:	15 g / 11 ms (to IEC 60068-2-27)
EMC rating:	accord. to EN 61000-6-2 (2002)
accord. to EN 61000-4-2 (ESD):	4 kV / 8 kV
accord. to EN 61000-4-3:	10 V/m / 80% AM
accord. to EN 61000-4-4 (Burst):	2 kV DC supply / 1 kV PROFIBUS & SD-Interface
accord. to EN 61000-4-5 (Surge):	500 V DC supply / 1 kV PROFIBUS & SD-Interface
accord. to EN 61000-4-6:	10 V / 80 % AM
EMC interfering radiation:	to EN 61000-6-4 (2002)
Industrial interfering radiation:	37 dBµV/m

Electrical connection	
SD	Connection for max. 31 devices in the serial diagnostics
24 V	+ 24 VDC power supply 0 V, GND of the power supply and GND of the diagnostic line, 24 VDC power supply, approx. 300 mA, PELV power supply

Approvals



Ordering details

SD-I-DP-V0 SD Gateway for PROFIBUS

LED signals

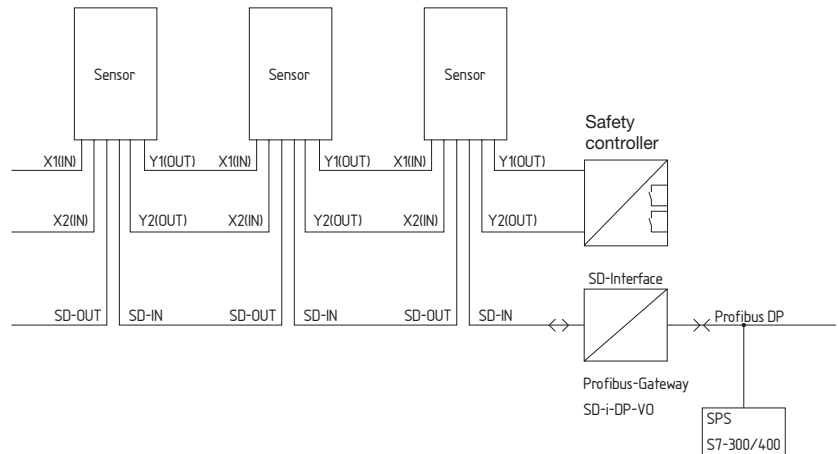
„PB“	Continuous signal red	Profibus error
	Flashing signal	Profibus initialisation
„SD“	Continuous signal red	SD Gateway error
	Flashing signal	SD Gateway initialisation
“T”	Continuous signal yellow	SD initialisation error, teaching required
	Flashing signal	Initialization error SD device addresses, teaching required
„ON“	Continuous signal green	Power supply on

SD-Gateway for PROFIBUS SD-I-DP-V0

Note

- Serial diagnostics of series-wired safety sensors/solenoid interlocks
- Devices with serial diagnostic option:
 - CSS 34
 - AZ 200 (in preparation)
 - AZM 200 (in preparation)

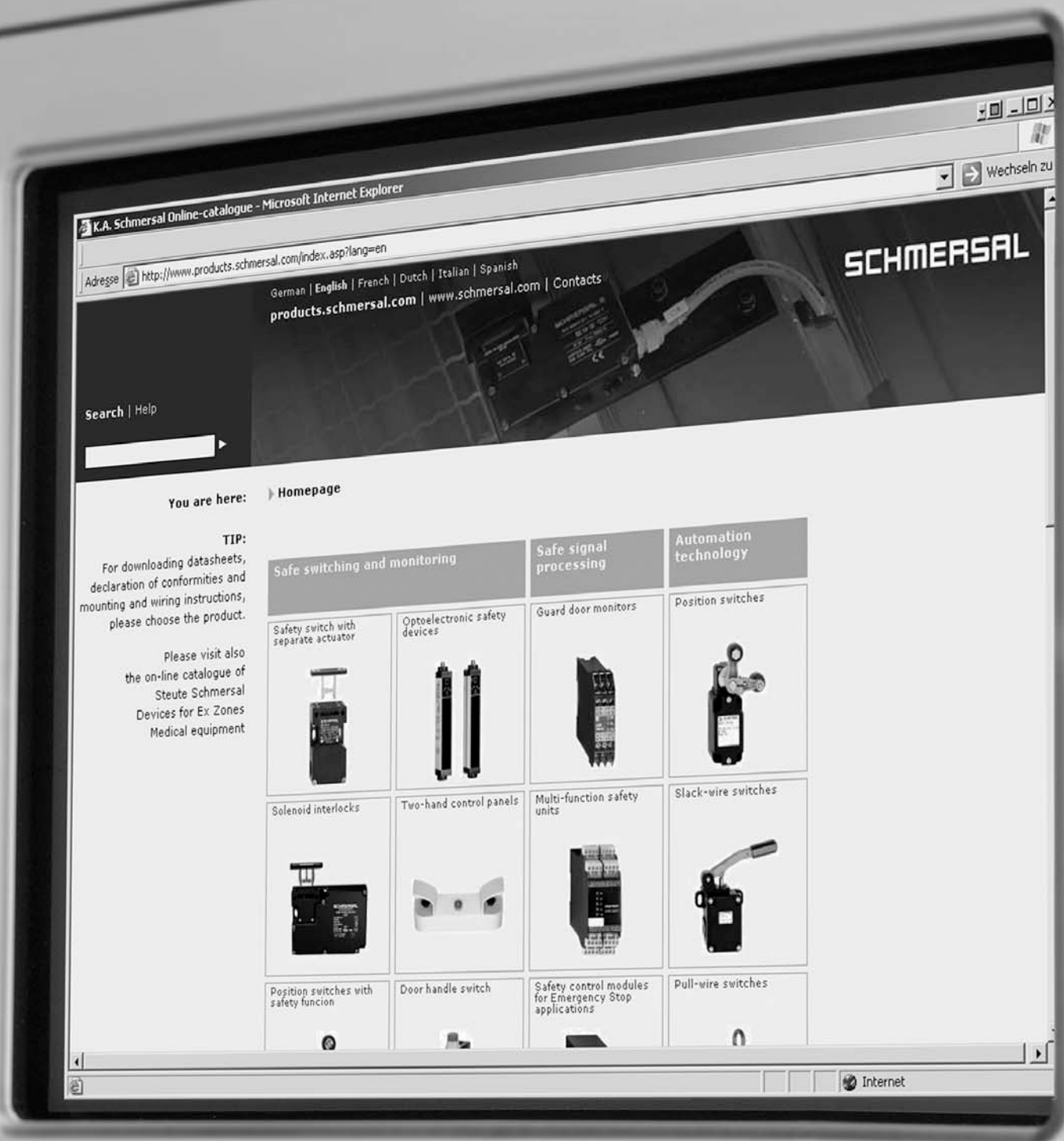
Wiring example



Note

Detailed functions, see programming and configuration manual of the SD Gateway

Around the clock



Always there for you, the Online Catalogue at:
www.schmersal.com

Safety controllers for electronic sensors and interlocks



Overview of the features:

Apart from the conventional safety controllers, the Schmersal Group also offers microprocessor-controlled safety technology.

Depending on the complexity and the number of safety circuits, integral solutions with safety monitoring modules, safety controls or safety field bus systems featuring many visualisation and diagnostic possibilities are available.

Safety controllers for electronic sensors and interlocks

Selection table

Type	Operating voltage	Category EN 954-1	Sensor inputs	Stop category	Signal contacts	Signal outputs	Reset options	Refer to page
AES 1135	24 VDC	3	2P	1 x Stop 0	–	2 x 100 mA	• Manual without edge detection • Automatic	32
AES 1235	24 VDC	3	2P	2 x Stop 0	–	2 x 100 mA	• Manual without edge detection • Automatic	33
AZR 321AR	24 VDC	4	2P	3 x Stop 0 2 x Stop 1 1...30 s delay	–	1 x 200 mA	• Manual with edge detection • Automatic	34
SRB 324 ST	24 VDC	4	2P	3 x Stop 0 2 x Stop 1 1...30 s delay	1x 2A	3 x 100 mA	• Manual with edge detection • Automatic	36
SRB 301LC/B	24 VDC	4	2P	3 x Stop 0	1x 2A	–	• Manual without edge detection • Automatic	35
SRB-NA-R-C.22	24 VDC	4	2P	3 x Stop 0 2 x Stop 1	–	3 x 200 mA	• Manual with edge detection • Automatic	37

Further details about suitable safety controllers can be found at www.elan.de

Safety monitoring module for electronic sensors and interlocks

AES 1135



- Control Category 3 to EN 954-1
- Classification PDF-M to EN 60947-5-3 in combination with BNS safety sensors
- 1 enabling path
- Enable delay time can be modified
- Also suitable for monitoring of BNS range magnetic safety sensors
- Can be changed from NO/NC to NC/NC contact combination
- Cross-wire monitoring with NO-NC contact combination
- ISD Integral System Diagnostics
- Operating voltage 24 VDC
- Short-circuits proof additional transistor output
- Connection of input expander possible

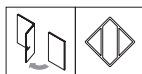
Technical data

Standards:	IEC/EN 60204-1, EN 60947-5-3, EN 954-1, BG-GS-ET-14, BG-GS-ET-20
Stop category	0
Control category:	3
Start conditions:	Automatic
Start-up test:	no
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Mounting:	snaps onto standard DIN rail to EN 50022
Connection:	screw terminals
Cable section:	max. 2.5 mm ² (incl. conductor ferrules)
Protection class:	IP 20 to EN 60529
U _e :	24 VDC ± 15%
I _e :	0.2 A
Monitored inputs	1 NC / 1 NO or 2 NC
Feedback circuit:	no
Input resistance:	approx. 4 kΩ to ground
Input signal „1“:	10 ... 30 VDC
Input signal „0“:	0 ... 2 VDC
Max. cable length:	1000 m of 0.75 mm ² conductor
Enabling contacts:	1 enabling path
Utilisation category:	AC-15, DC-13
I _e /U _e :	3 A / 230 VAC 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 6 A (cos φ = 1)
Max. fuse rating:	6 A gG D-fuse
Signal output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
Function display:	LED (ISD)
EMC rating:	conforming to EMC Directive
Max. switching frequency:	1 Hz
Overvoltage category:	II to DIN VDE 0110
Degree of pollution:	3 to DIN VDE 0110
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm, ± 15 %
Resistance to shock:	30 g / 11 ms
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 25 °C ... + 70 °C
Dimensions:	22.5 x 100 x 121 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Approvals



 in preparation



Ordering details

AES 1135

Function table

Additional transistor output:	Function / Switching condition:
Y1	Authorized operation, enabling paths closed
Y2	No authorized operation, enabling paths open

The following faults are recognised by safety monitoring module and indicated by means of ISD

- Failure of door contacts to open or close
- Cross-wire or short-circuit monitoring of the switch connections
- Interruption of the switch connections
- Failure of the safety relay to pull-in or drop-out
- Faults on the input circuits or on the relay control of the safety monitoring module

Safety monitoring module for electronic sensors and interlocks

AES 1235

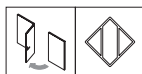


- Control Category 3 to EN 954-1
- Classification PDF-M to EN 60947-5-3 in combination with BNS safety sensors
- 2 enabling paths
- Enable delay time can be modified
- Also suitable for monitoring of BNS range magnetic safety sensors
- Cross-wire monitoring with NO-NC contact combination
- ISD Integral System Diagnostics
- Short-circuits proof additional transistor output
- Feedback circuit to monitor external relays
- Start function
- Operating voltage 24 VDC
- Can be changed from NO/NC to NC/NC contact combination
- Connection of input expander possible
- Additional contacts by means of output expander

Technical data

Standards:	IEC/EN 60204-1, EN 60947-5-3, EN 954-1, BG-GS-ET-14, BG-GS-ET-20
Stop category	0
Control category:	3
Start conditions:	automatic or start button
Start-up test:	no
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Mounting:	snaps onto standard DIN rail to EN 50022
Connection:	screw terminals
Cable section:	max. 2.5 mm ² (incl. conductor ferrules)
Protection class:	IP 20 to EN 60529
U _e :	24 VDC ± 15%
I _e :	0.2 A
Monitored inputs	1 NC / 1 NO or 2 NC
Feedback circuit:	yes
Input resistance:	approx. 4 kΩ to ground
Input signal „1“:	10 ... 30 VDC
Input signal „0“:	0 ... 2 VDC
Max. cable length:	1000 m of 0.75 mm ² conductor
Enabling contacts:	2 enabling paths
Utilisation category:	AC-15, DC-13
I _e /U _e :	3 A / 230 VAC 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 6 A (cos φ = 1)
Max. fuse rating:	6 A gG D-fuse
Signal output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
Function display:	LED (ISD)
EMC rating:	conforming to EMC Directive
Max. switching frequency:	1 Hz
Overvoltage category:	II to DIN VDE 0110
Degree of pollution:	3 to DIN VDE 0110
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm, ± 15 %
Resistance to shock:	30 g / 11 ms
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 25 °C ... + 70 °C
Dimensions:	22.5 x 100 x 121 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Approvals



Ordering details

AES 1235

Function table

Additional transistor output:	Function / Switching condition:
Y1	Authorized operation, enabling paths closed
Y2	No authorized operation, enabling paths open

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

- Failure of door contacts to open or close
- Cross-wire or short-circuit monitoring of the switch connections
- Interruption of the switch connections
- 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

Safety monitoring module for electronic sensors and interlocks

AZR 321 AR

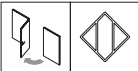


- Suitable for signal processing of potential-free outputs, e.g. emergency-stop command devices, interlocking equipment etc.
- Suitable for signal processing of outputs connected to potentials (AOPD's)
- 1 or 2 channel control
- 3 enabling paths, Stop 0
- 2 enabling paths, Stop 1, adjustable up to 30 s
- Optionally cross-wire detection
- Manual reset with edge detection
- Automatic reset function
- Control Category 4 to EN 954-1
- Green LED indications for relay K1, K2, K3, K4, supply voltage U_B and internal fuse U_i

Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Stop category	3x Stop 0; 2 x Stop 1
Control category:	4
Start conditions:	reset button without edge detection, auto start
Enclosure:	glass-fibre reinforced thermoplastic
Connection:	plug-in, screw terminals
Cable section:	min. 0.6 mm ² , max. 2.5 mm ² solid or multi-strand lead (incl. conductor ferrules)
U_e :	24 VDC -15% / +20%, residual ripple max. 10% 24 VAC -15% / +6%
Frequency range:	50/60 Hz (on AC operational voltage)
I_e :	max. 0.11 A
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
Power consumption:	max. 4.0 VA plus additional contact 66
Max. fuse rating:	Glass fuse F1, tripping current 0.5 A
Monitored inputs	2 channels
Feedback circuit:	yes
Drive circuits:	S11/S12, S21/S22: max. 28 VDC
Enabling contacts:	3 enabling paths
Utilisation category:	AC-15, DC-13
Switching capacity:	enabling paths: 4 A/230 VAC, 6 A/24 VDC
Fuse rating:	enabling paths: 4 A gG D-fuse
Max. switching frequency:	5 Hz
Contact material:	AgNi, AgSnO, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	≤ 30 ms
Drop-out delay:	≤ 60 ms
Air clearances and creepage distances:	DIN VDE 0110-1 (04.97), 4 kV/2
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Ambient temperature:	- 25 °C ... + 45 °C (Derating curve on request)
Mechanical life:	10 million operations
Function indication:	3 LED
Weight:	480 g
Dimensions:	83 x 45 x 140 mm

Approvals



Ordering details

AZR 321 AR

Function indication

The integrated LED's 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

Safety monitoring module for electronic sensors and interlocks

SRB 301 LC/B

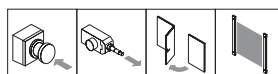


- Signal processing of potential-free outputs, e.g. emergency stop command devices, interlocking devices, etc.
- Signal processing of outputs of safety magnetic switches (built-in current and voltage limitation for this purpose)
- Restrictedly suitable for signal processing (no reset with edge detection) of outputs connected to potentials (AOPD's), e.g. safety light grids/curtains
- 1 or 2 channel control
- 3 enabling paths, Stop 0
- 1 indication contact (NC)
- Manual reset without edge detection
- Automatic reset function
- Green LED indications for relay K1, K2, supply voltage U_B and internal fuse U_i
- Control Category 4 to EN 954-1

Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Stop category	3x Stop 0
Control category:	4
Start conditions:	reset button without edge detection, auto start
Enclosure:	glass-fibre reinforced thermoplastic
Connection:	self-opening screw terminals
Cable section:	min. 0.2 mm ² , max. 2.5 mm ² solid or multi-strand lead (incl. conductor ferrules)
U_e :	24 VDC -15%/+20%, residual ripple max. 10% 24 VAC -15%/+10%
Frequency range:	50/60 Hz (on AC operational voltage)
I_e :	max. 0.08 A
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
Power consumption:	max. 1.9 VA, 1.7 W
Max. fuse rating:	Glass fuse F1, tripping current 1.25 A
Monitored inputs	1 or 2 channels
Feedback circuit:	yes
Drive circuits:	S11/S12, S21/S22: max. 28 VDC
Enabling contacts:	3 enabling paths
Utilisation category:	AC-15, DC-13
Switching capacity:	enabling paths: 6 A/230 VAC, 6 A/24 VDC
Fuse rating:	enabling paths: 6 A gG D-fuse
Max. switching frequency:	5 Hz
Signal contacts:	1 NC contact
Switching capacity:	Indicating contact: 2 A/24 VDC
Contact material:	AgNi, AgSnO, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	≤ 30 ms
	≤ 30 ms (Auto-start/Reset button)
Drop-out delay:	≤ 50 ms
Air clearances and creepage distances:	DIN VDE 0110-1 (04.97), 4 kV/2
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Ambient temperature:	- 25 °C ... + 45 °C (Derating curve on request)
Mechanical life:	10 million operations
Function display:	4 LED
Weight:	230 g
Dimensions:	22.5 x 100 x 121 mm

Approvals



Ordering details

SRB 301 LC/B

Function indication

The integrated LED's indicate the following operational states.

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

Safety monitoring module for electronic sensors and interlocks

SRB 324 ST

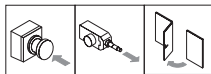


- Suitable for signal processing of potential-free outputs, e.g. emergency-stop command devices, interlocking equipment etc.
- Suitable for signal processing of outputs connected to potentials (AOPD's), e.g. safety light grids/curtains
- 1 or 2 channel control
- 5 enabling paths, two delayed 1...30 s
- 3 signal contacts (transistor output)
- With hybrid fuse
- Optionally
 - Cross-wire detection
 - Automatic reset function
 - Manual reset with edge detection in fail-safe circuit
- Control Category 4 to EN 954-1
- Green LED indications for relay K1, K2, K3, K4, supply voltage U_B and internal fuse U_i

Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Stop category	3x Stop 0, 2x Stop 1 (1 ... 30 s delayed)
Control category:	4
Start conditions:	start, reset button (trailing edge), autostart
Enclosure:	glass-fibre reinforced thermoplastic
Connection:	plug-in, screw terminals
Cable section:	min. 0.2 mm ² , max. 2.5 mm ² solid or multi-strand lead (incl. conductor ferrules)
U_e :	24 VDC –15%/+20%, residual ripple max. 10% 24 VAC –15%/+10%
Frequency range:	50/60 Hz (on AC operational voltage)
I_e :	max. 0.2 A (DC version), plus signal outputs Y1-Y3
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
Power consumption:	max. 7.8 VA; 4.8 W plus signal outputs Y1-Y3
Max. fuse rating:	internal electronic trip F1, tripping current > 0.5 A, reset after disconnection of supply voltage
Monitored inputs	1 or 2 channels
Feedback circuit:	yes
Drive circuits:	S11/S12, S21/S22: max. 28 VDC
Enabling contacts:	5 enabling paths
Utilisation category:	AC-15, DC-13
Switching capacity:	enabling paths "Stop 0": 6 A/230 VAC, 6 A/24 VDC enabling paths "Stop 1": 3 A/230 VAC, 2 A/24 VDC
Fuse rating:	enabling paths: 6 A gG D-fuse 61/62:
Auxiliary contacts:	auxiliary contacts: 2 A/24 VDC
Switching capacity:	Y1 - Y3: 8 transistor outputs 100 mA total, short-circuit proof
Signal output:	5 Hz
Max. switching frequency:	5 Hz
Contact material:	AgNi, AgSnO, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	≤ 30 ms
Drop-out delay:	≤ 30 ms
Air clearances and creepage distances:	DIN VDE 0110-1 (04.97), 4 kV/2
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Ambient temperature:	– 25 °C ... + 45 °C (Derating curve on request)
Mechanical life:	10 million operations
Function display:	6 LED
Weight:	480 g
Dimensions:	45 x 100 x 121 mm

Approvals



Ordering details

SRB 324 ST

Function indication

The integrated LED's 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

Safety monitoring module for electronic sensors and interlocks

SRB-NA-RC-22



- Relay outputs 3 NO and 1 diagnostic output with normally closed function (diagnostic outputs must not be used in safety circuits)
- Feedback circuit / Start circuit
- 5 enabling paths
- Possibility to connect an emergency stop switch or a guard monitoring device
- Green LED indications for relay K1, K2, supply voltage U_B and internal fuse U_i
- 45 mm enclosure in thermoplastic to UL-94-V-0, red RAL 3000
- Top hat section rail mounting DIN EN 50 022

Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Stop category	3x Stop 0; 2 x Stop 1
Control category:	4
Start conditions:	reset button without edge detection, auto start
Enclosure:	glass-fibre reinforced thermoplastic
Connection:	plug-in, screw terminals
Cable section:	min. 0.6 mm ² , max. 2.5 mm ² solid or multi-strand lead (incl. conductor ferrules)
U_e :	24 VDC -15%/+20%, residual ripple max. 10% 24 VAC -15%/+6%
Frequency range:	50/60 Hz (on AC operational voltage)
I_e :	max. 0.11 A
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
Power consumption:	max. 4.0 VA, plus signal outputs L62
Max. fuse rating:	Glass fuse F1, tripping current 0.5 A
Monitored inputs	2 channels
Feedback circuit:	yes
Drive circuits:	S11/S12, S21/S22: max. 28 VDC
Enabling contacts:	5 enabling paths
Utilisation category:	AC-15, DC-13
Switching capacity:	230 VAC, 4 A ohmic (inductive in case of appropriate protective wiring) NO contact 43/44, 53/54 DC-13: 24 VDC/2 A AC-15: 230 VAC/3 A
Auxiliary contacts:	L62: max. 500 mA
Fuse rating:	enabling paths: 4 A gG D-fuse
Max. switching frequency:	5 Hz
Contact material:	AgNi, AgSnO, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	≤ 30 ms
Drop-out delay:	≤ 60 ms
Air clearances and creepage distances:	DIN VDE 0110-1 (04.97), 4 kV/2
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Ambient temperature:	- 25 °C ... + 45 °C (Derating curve on request)
Mechanical life:	10 million operations
Function indication:	3 LED
Weight:	480 g
Dimensions:	83 x 45 x 140 mm

Approvals



Ordering details

SRB-NA-RC-22

Function indication

The integrated LED's indicate the following operating states.

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

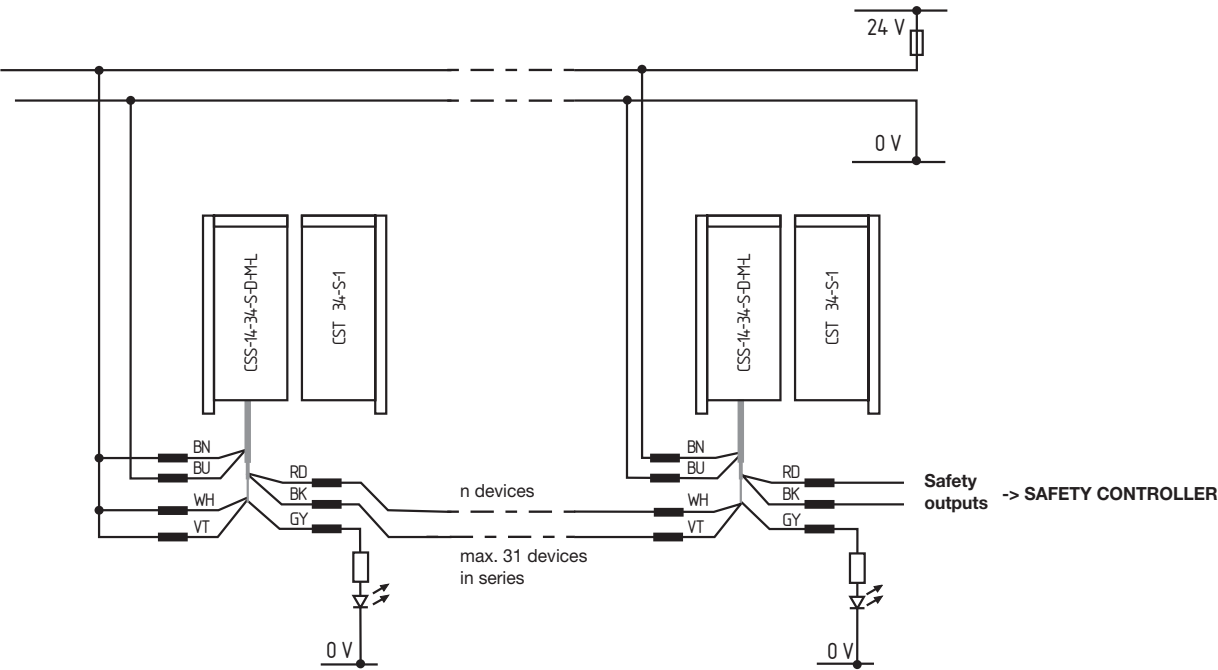
Wiring schematics



Series wiring

Circuit diagrams for various electronic sensors

Series wiring of the CSS 34 with signal output



The voltage is supplied to both safety inputs of the last sensor of the chain (starting from the safety controller).
The safety outputs of the first sensor are wired to the safety controller.

Product selection

This example applies for all sensor types with conventional signal output

Safety sensor	Active face	Cable
CSS – 14 – 34 – S – D – M – L	on the side	8 wire
CSS – 12 – 34 – V – D – M – L	on top	8 wire
Safety sensor	Active face	Integrated connector
CSS – 14 – 34 – S – D – M – ST	on the side	8 poles
CSS – 12 – 34 – V – D – M – ST	on top	8 poles
Actuator	Active face	
CST – 34 – S – 1	on the side	
CST – 34 – V – 1	on top	

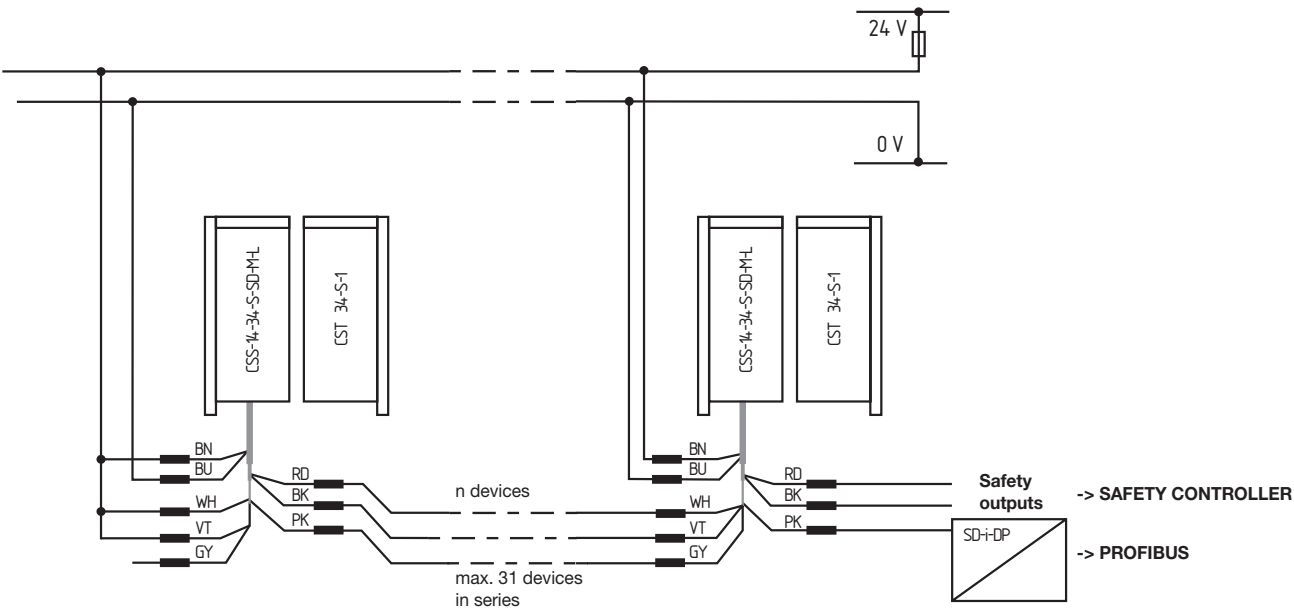
Description

Wiring diagram for the device cable or the integrated connector

Cable colour	Wiring of the CSS 34 sensor with signal output	Pin configuration
BN (brown)	A1 Ue	Pin 1
BU (blue)	A2 GND	Pin 3
WH (white)	X1 Safety input 1	Pin 2
VT (violet)	X2 Safety input 2	Pin 6
BK (black)	Y1 Safety output 1	Pin 4
RD (red)	Y2 Safety output 2	Pin 7
GY (grey)	Signal output	Pin 5
PK (pink)	Without function	Pin 8



Series wiring of the CSS 34 with serial diagnosis



The safety inputs of the first sensor are wired to the safety controller.
 The serial diagnostic gateway is connected to the serial diagnostic input of the first sensor.

Product selection

This example applies for all sensor types with serial diagnosis

Safety sensor	Active face	Cable
CSS – 14 – 34 – S – SD – M – L	on the side	8 wire
CSS – 12 – 34 – V – SD – M – L	on top	8 wire
Safety sensor	Active face	Integrated connector
CSS – 14 – 34 – S – SD – M – ST	on the side	8 poles
CSS – 12 – 34 – V – SD – M – ST	on top	8 poles
Actuator	Active face	
CST – 34 – S – 1	on the side	
CST – 34 – V – 1	on top	

Description

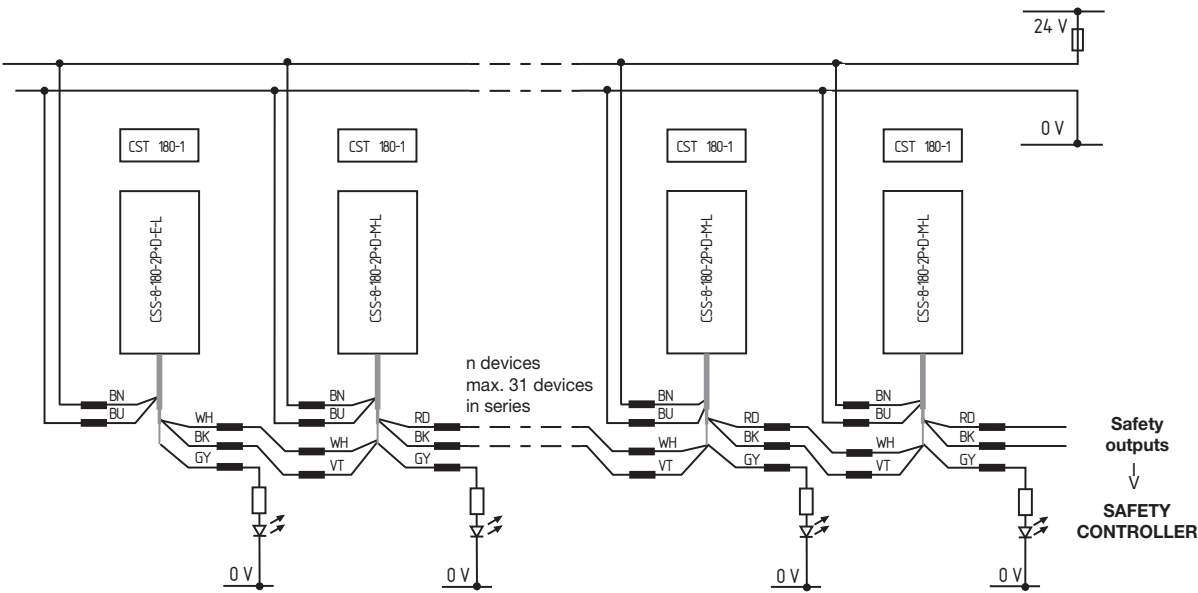
Wiring diagram for the device cable or the integrated connector

Cable colour	Wiring of the CSS 34 sensor with serial diagnosis	Pin configuration
BN (brown)	A1 Ue	Pin 1
BU (blue)	A2 GND	Pin 3
WH (white)	X1 Safety input 1	Pin 2
VT (violet)	X2 Safety input 2	Pin 6
BK (black)	Y1 Safety output 1	Pin 4
RD (red)	Y2 Safety output 2	Pin 7
GY (grey)	SD output	Pin 5
PK (pink)	SD input	Pin 8



Series wiring of the CSS 180 with the same wire for safety inputs and outputs

With end device of a sensor chain



The first end sensor CSS-8-180...-E-L has no safety inputs

Product selection

This example requires E and M type sensors

Safety sensor	Connection
CSS - 8 - 180 - 2P - E - L	Pre-wired cable, 4 wire
CSS - 8 - 180 - 2P - E - LST	Pre-wired cable, 4 wire with connector M12 x 1, 4 poles
CSS - 8 - 180 - 2P + D - E - L	With diagnostic output, pre-wired cable 5 wire
CSS - 8 - 180 - 2P + D - E - LST	With diagnostic output, pre-wired cable 5 wire with connector M12 x1, 5 poles
CSS - 8 - 180 - 2P + D - M - L	With diagnostic output, pre-wired cable 7 wire
CSS - 8 - 180 - 2P + D - M - LST	With diagnostic output, pre-wired cable 7 wire, with connector M12 x 1, 8 poles

Description

Wiring diagram for the CSS 180 safety sensors with an “E” in the ordering code.

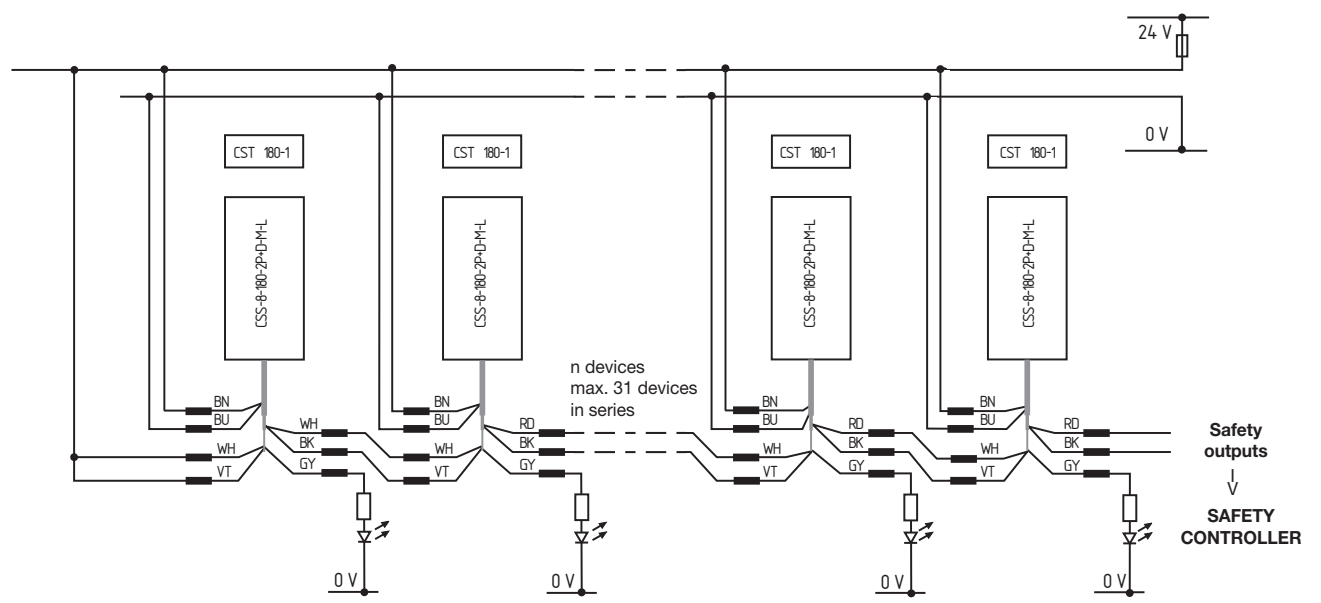
Cable colour	Wiring	Pin configuration
BN (brown)	A1 Ue	Pin 1
BU (blue)	A2 GND	Pin 3
BK (black)	Y1 Safety output 1	Pin 4
WH (white)	Y2 Safety output 2	Pin 2
Only 5 pole version:		
GY (grey)	Signal output (option)	Pin 5



Wiring diagram for the M-type sensors (multifunctional connection), see next page

Series wiring of the CSS 180 with the same wire for safety inputs and outputs

Without end device of a sensor chain



The safety inputs of the last sensor (M-type) starting from the safety controller are also used for the series wiring. The voltage for the safety channels is supplied here.

Product selection

This example exclusively requires M-type sensors
Single device or end device of a sensor chain

Safety sensor	Connection
CSS - 8 - 180 - 2P + D -M - L	With diagnostic output, pre-wired cable 7 wire
CSS - 8 - 180 - 2P + D -M - LST	With diagnostic output, pre-wired cable 7 wire , with connector M12 x 1, 8 poles

Description

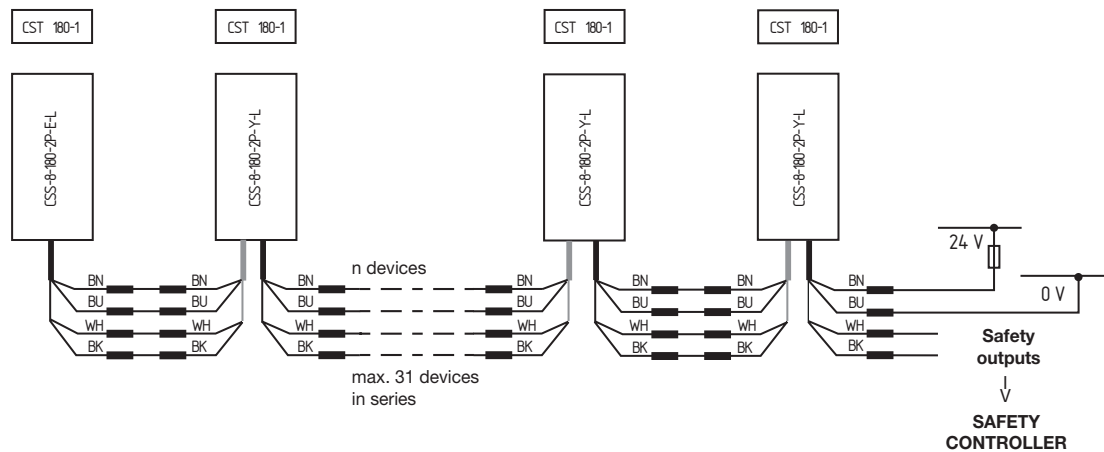
Wiring diagram for the CSS 180 safety sensors with an “M” in the ordering code (device with multifunctional connection)

Cable colour	Wiring	Pin configuration
BN (brown)	A1 Ue	Pin 1
BU (blue)	A2 GND	Pin 3
VT (violet)	X1 Safety input 1	Pin 6
WH (white)	X2 Safety input 2	Pin 2
BK (black)	Y1 Safety output 1	Pin 4
RD (red)	Y2 Safety output 2	Pin 7
GY (grey)	Signal output	Pin 5
-	spare	Pin 8



Series wiring of the CSS 180 with different wire for safety inputs and outputs

without signal output



The first CSS-8-180-...-E-L end sensor has no safety inputs.

Product selection

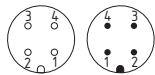
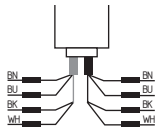
This example applies for the CSS 180 safety sensors with a “Y” in the ordering code.

Safety sensor	Connection
CSS - 8 - 180 - 2P - Y - L	2 cables, 4 wire
CSS - 8 - 180 - 2P - Y -LST	2 cables with connetor male / female, M12 x 1, 4 poles

Description

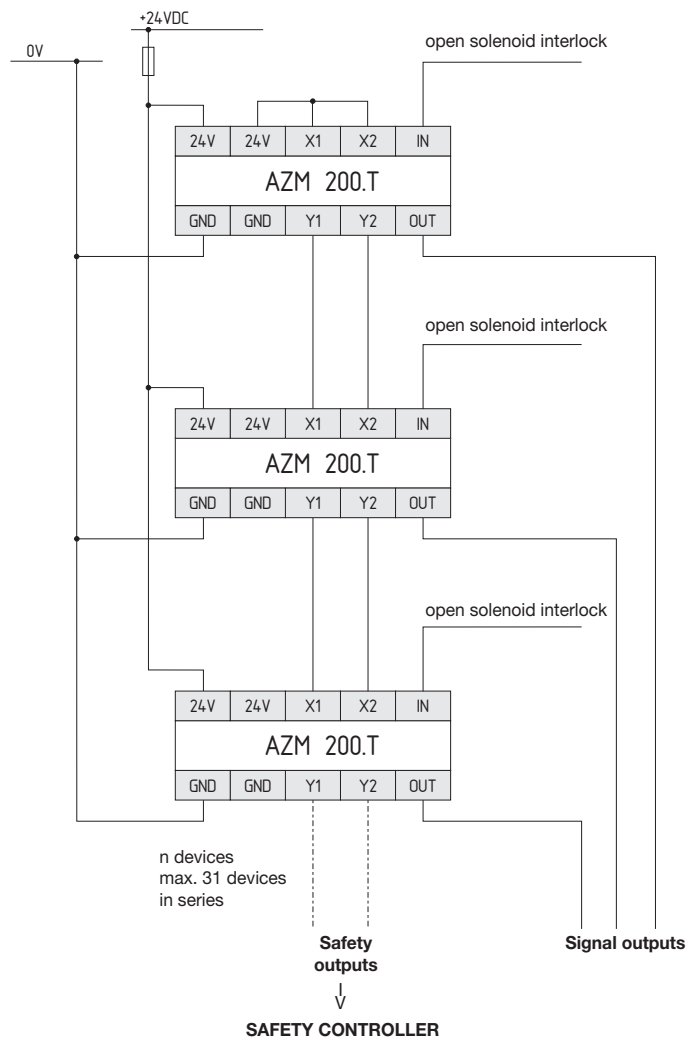
Wiring diagram for the CSS 180 safety sensors with a “Y” in the ordering code (series-wiring device)

Cable colour	Wiring of the grey cable (IN)	black cable (OUT)	Pin configuration
BN (brown)	A1 Ue	A1 Ue	Pin 1
BU (blue)	A2 GND	A2 GND	Pin 3
BK (black)	X1 Safety input 1	Y1 Safety output 1	Pin 4
WH (white)	X2 Safety input 2	Y2 Safety output 2	Pin 2



Connector
female male

Series wiring of the electronic solenoid interlock AZM 200



With the represented spring-to-lock principle, the solenoid is energized to enable the opening.
With the alternative power-to-lock principle, the solenoid must be energized to keep the device in closed condition.

Product selection

This example applies to the AZM 200 electronic solenoid interlock

Solenoid interlock	Description
AZM 200...-1P2P	1 signal output with spring to lock principle
AZM 200...-1P2Pa	1 signal output with power to lock principle

Description

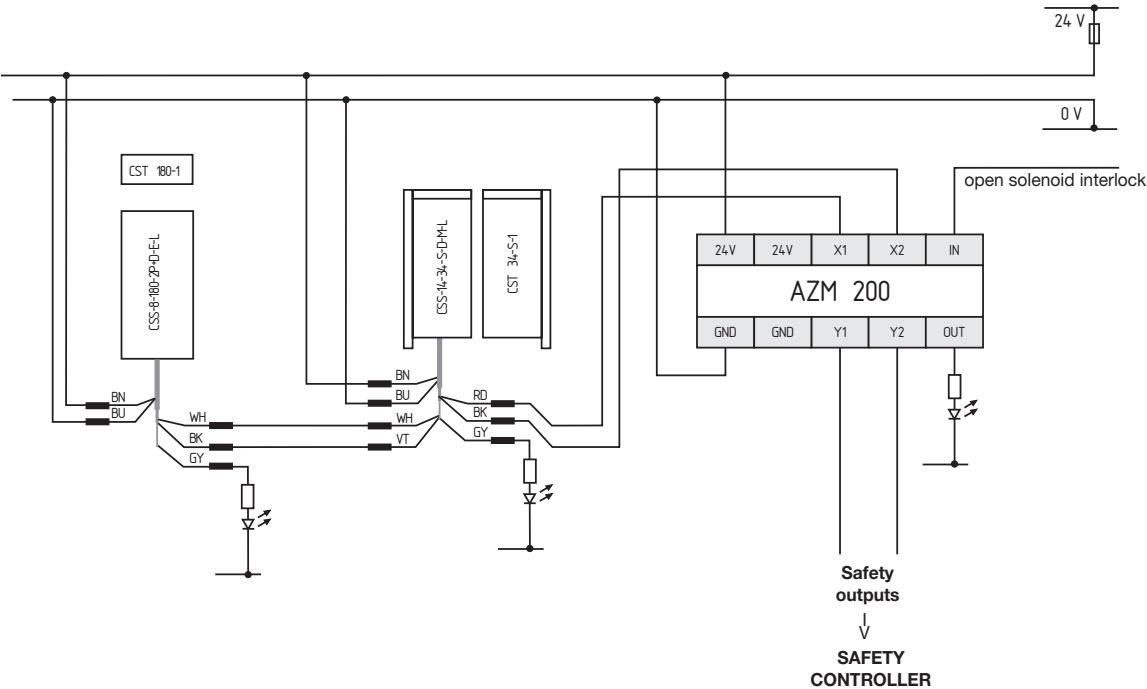
Wiring diagram for the AZM 200 electronic solenoid interlock

Clamp	Wiring of AZM 200	Pin configuration
24V	Operating voltage 24VDC	Pin 1
GND	Ground	Pin 3
X1	Safety input 1	Pin 2
X2	Safety input 2	Pin 6
Y1	Safety output 1	Pin 4
Y2	Safety output 2	Pin 7
OUT	Signal output	Pin 5
IN	Solenoid control	Pin 8
-	spare	Pin 9



Wiring diagram for the AZ 200 electronic safety switch with separate actuator
Identical to the previous wiring diagram for the AZM 200, only the “solenoid interlock IN” control becomes inoperative

Series wiring of various sensors and interlocks with signal output



The CSS 180, CSS 34, AZ 200 and AZM 200 can be wired in series in any desired combination. For the CSS 180, 16 devices can be wired in series, for the other devices, max. 31 devices can be wired in series. If the CSS 180 is used in a "mixed" series wiring, the number of series-wired devices is limited to 16.

Product selection		Description
This example applies to the following series-wired devices		
Device	Description	
CSS - 8 - 180 - 2P + D - E - L with CST - 180 - 1	With diagnostic output, pre-wired cable 5 wire Actuator	
CSS - 14 - 34 - S - D - M - L with CST - 34 - S - 1	Position of the active face: on side, pre-wired cable 7 wire Actuator, on the side	
AZM 200...-1P2Pa	1 signal output with power to lock principle	
		Wiring diagram of the represented devices: see previous pages:
		Wiring diagram of the CSS 180: see page 42
		Wiring diagram of the CSS 34: see page 40
		Wiring diagram of the AZM 200: see page 45 and 49 ff.

Connection of sensors and interlocks to various safety controllers



Circuit examples

Connection of sensors and interlocks to various safety controllers

Connection of sensors and interlocks to various safety controllers

Safety outputs Y1/Y2 of CSS 180 and CSS 34

The safety outputs Y1/Y2 of the CSS 180 and CSS 34 safety sensors must be connected to the safety controller in the following way

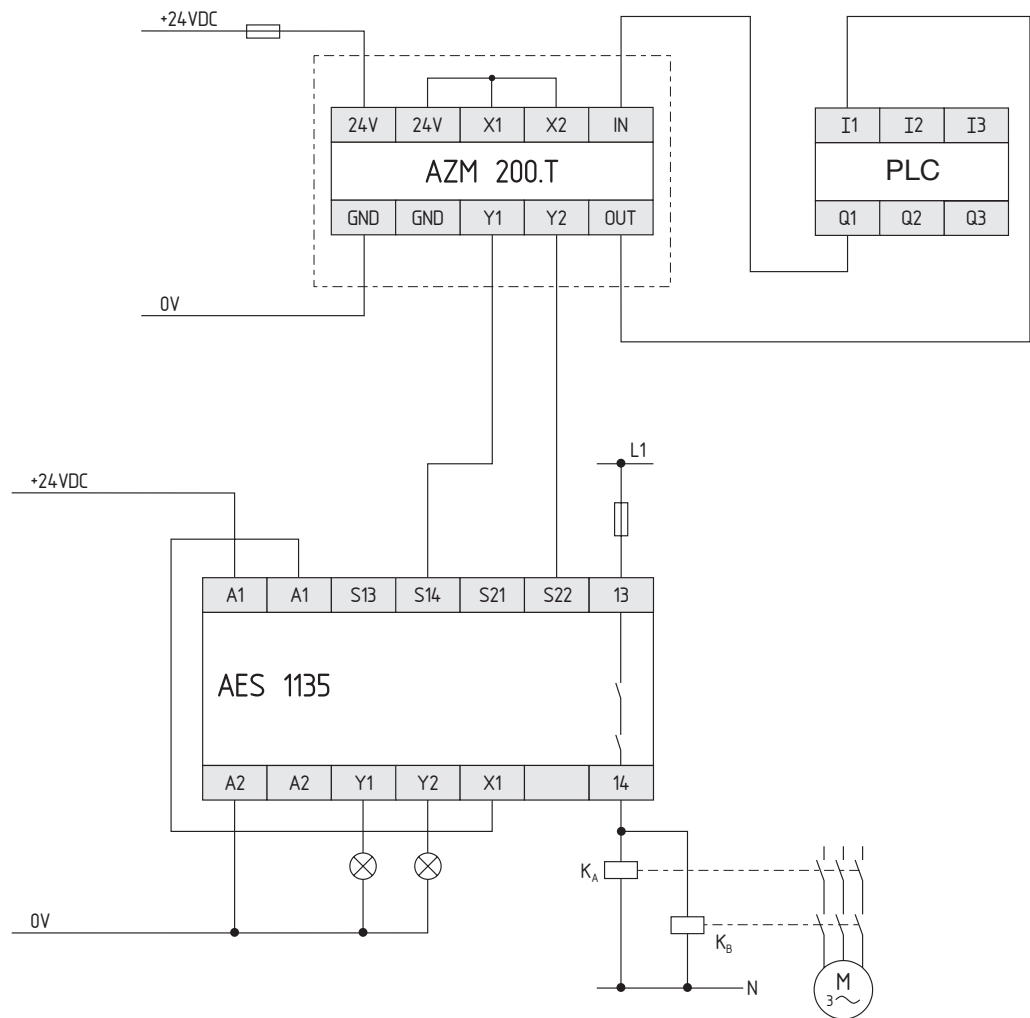
Sensors	Safety output 1	Safety output 2				
CSS 180	Y1	Y2				
CSS 34	Y1	Y2				
to be connected to						
Safety controller	Safety channel 1	Safety channel 2	Feedback/start contact connection	Start contact	Remarks	Refer to page
AES 1135	S 14	S 22	–	–	A1 - X2	49
AES 1235	S 14	S 22	A1 - X1	–	A1 - X2	50
AZR 321 AR	S 12	S 22	T33 - T44	–	Qs=0	51
SRB 301 LC/B	S 12	S 22	X1 - X2	–	–	52
SRB 324 ST	S 12	S 22	X1 - X2	X3 - X4	–	53
SRB-NA-RC.22	S 1	S 2	X2.2 - X1	–	Qs=0	54

Notes:

GND of the sensor power supply and the safety controller must be bridged.

The safety outputs of the AZM 200 solenoid interlock are wired in the same way.
The following drawings therefore are also applying for the wiring of the sensors.

Connection of an interlock AZM 200 to the safety controller AES 1135



The wiring example is shown with safety guards closed and in de-energized condition.
AES 1135 requires a bridge between A1 and X1 to work with two NC contacts (AZM 200)

Product selection

This example applies for the following series-wired devices.

Device	Remarks
AZ 200...-1P2P	Series wiring possible IN = spare
AZM 200...-1P2P	Series wiring possible IN = Solenoid control
AZ 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3
AZM 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3

Description

Wiring diagram of the AZ and AZM 200

Clamp	Wiring of AZM 200	Pin configuration
24V	Operating voltage 24VDC	Pin 1
GND	Ground	Pin 3
X1 / OUT2	Safety input 1 or signal output 2	Pin 2
X2 / OUT3	Safety input 2 or signal output 3	Pin 6
Y1	Safety output 1	Pin 4
Y2	Safety output 2	Pin 7
OUT	Signal output 1	Pin 5
IN	Solenoid control	Pin 8

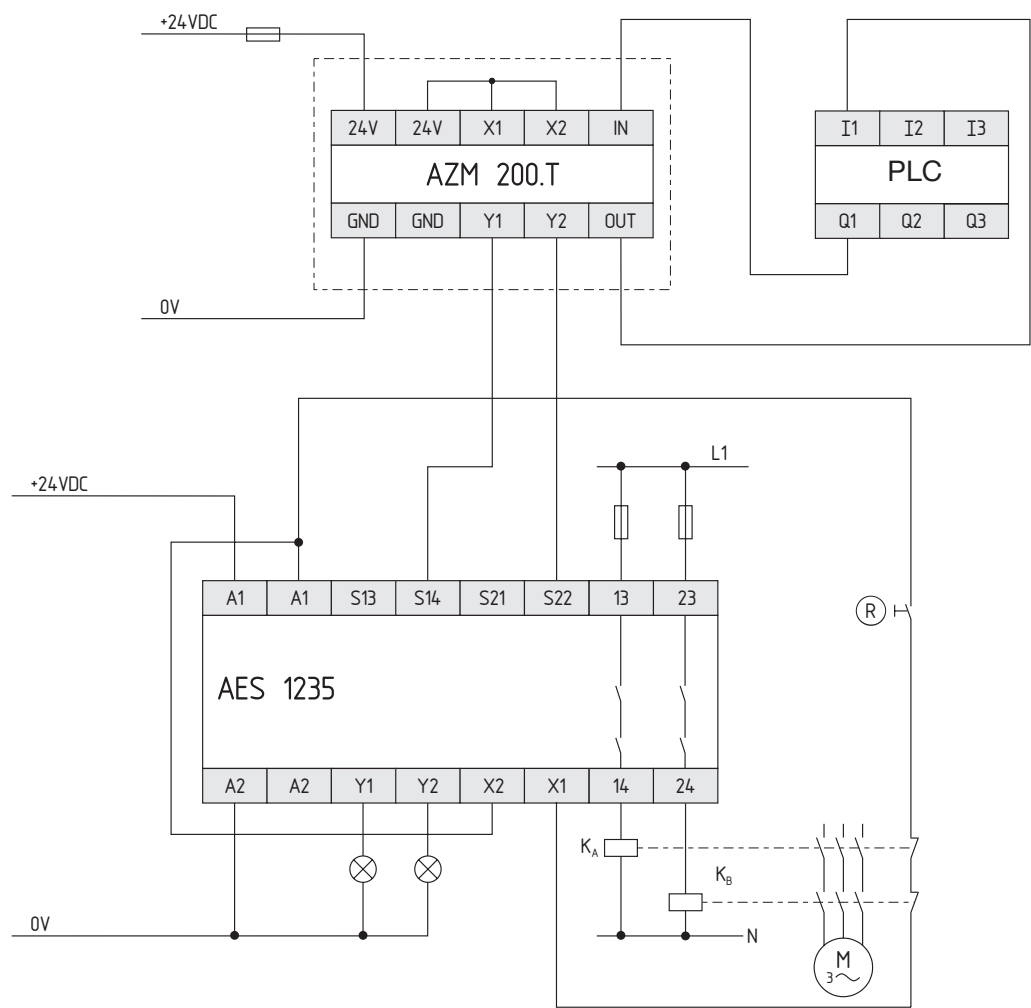


The wiring diagram for the AZ 200 is identical to the AZM 200's,
only the "solenoid interlock IN" control becomes inoperative.

The CSS 180 and CSS 34 are connected to the safety controller
in the same way. The function assignment to the wire colours of
the CSS safety sensor is included in the CSS device description.

Connection of sensors and interlocks to various safety controllers

Connection of an interlock AZM 200 to the safety controller AES 1235



The wiring example is shown with safety guards closed and in de-energized condition.
AES 1235 requires a bridge between A1 and X1 to work with two NC contacts (AZM 200)

Product selection

This example applies for the following series-wired devices.

Device	Remarks
AZ 200...-1P2P	Series wiring possible IN = spare
AZM 200...-1P2P	Series wiring possible IN = Solenoid control
AZ 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3
AZM 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3

Description

Wiring diagram of the AZ and AZM 200

Clamp	Wiring of AZM 200	Pin configuration
24V	Operating voltage 24VDC	Pin 1
GND	Ground	Pin 3
X1 / OUT2	Safety input 1 or signal output 2	Pin 2
X2 / OUT3	Safety input 2 or signal output 3	Pin 6
Y1	Safety output 1	Pin 4
Y2	Safety output 2	Pin 7
OUT	Signal output 1	Pin 5
IN	Solenoid control	Pin 8

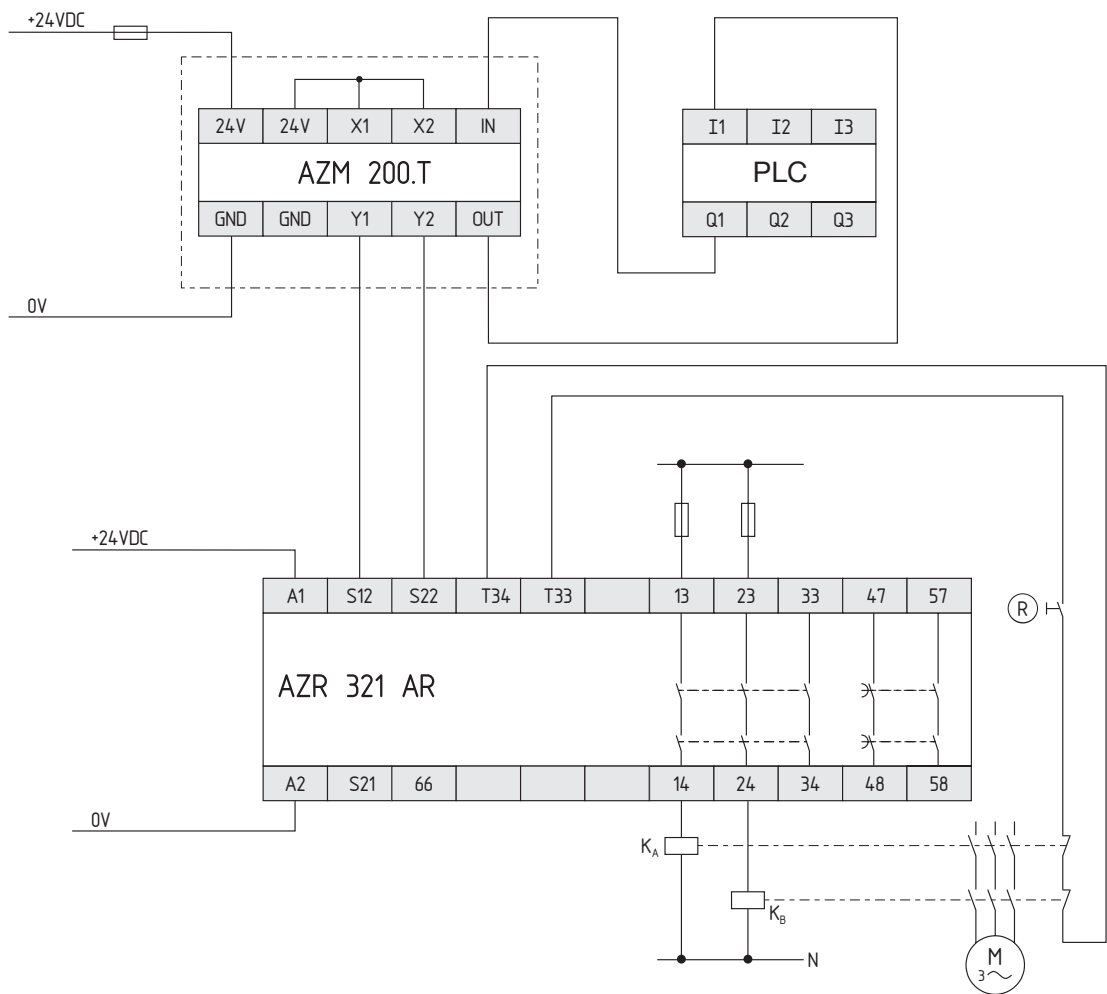


The wiring diagram for the AZ 200 is identical to the AZM 200's, only the "solenoid interlock IN" control becomes inoperative.

The CSS 180 and CSS 34 are connected to the safety controller in the same way. The function assignment to the wire colours of the CSS safety sensor is included in the CSS device description.

Connection of sensors and interlocks to various safety controllers

Connection of an interlock AZM 200 to the safety controller AZR 321 AR



The wiring example is shown with safety guards closed and in de-energized condition. Cross-wire detection must be deactivated on the rear side of the safety controller.

Product selection

This example applies for the following series-wired devices.

Device	Remarks
AZ 200...-1P2P	Series wiring possible IN = spare
AZM 200...-1P2P	Series wiring possible IN = Solenoid control
AZ 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3
AZM 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3

Description

Wiring diagram of the AZ and AZM 200

Clamp	Wiring of AZM 200	Pin configuration
24V	Operating voltage 24VDC	Pin 1
GND	Ground	Pin 3
X1 / OUT2	Safety input 1 or signal output 2	Pin 2
X2 / OUT3	Safety input 2 or signal output 3	Pin 6
Y1	Safety output 1	Pin 4
Y2	Safety output 2	Pin 7
OUT	Signal output 1	Pin 5
IN	Solenoid control	Pin 8

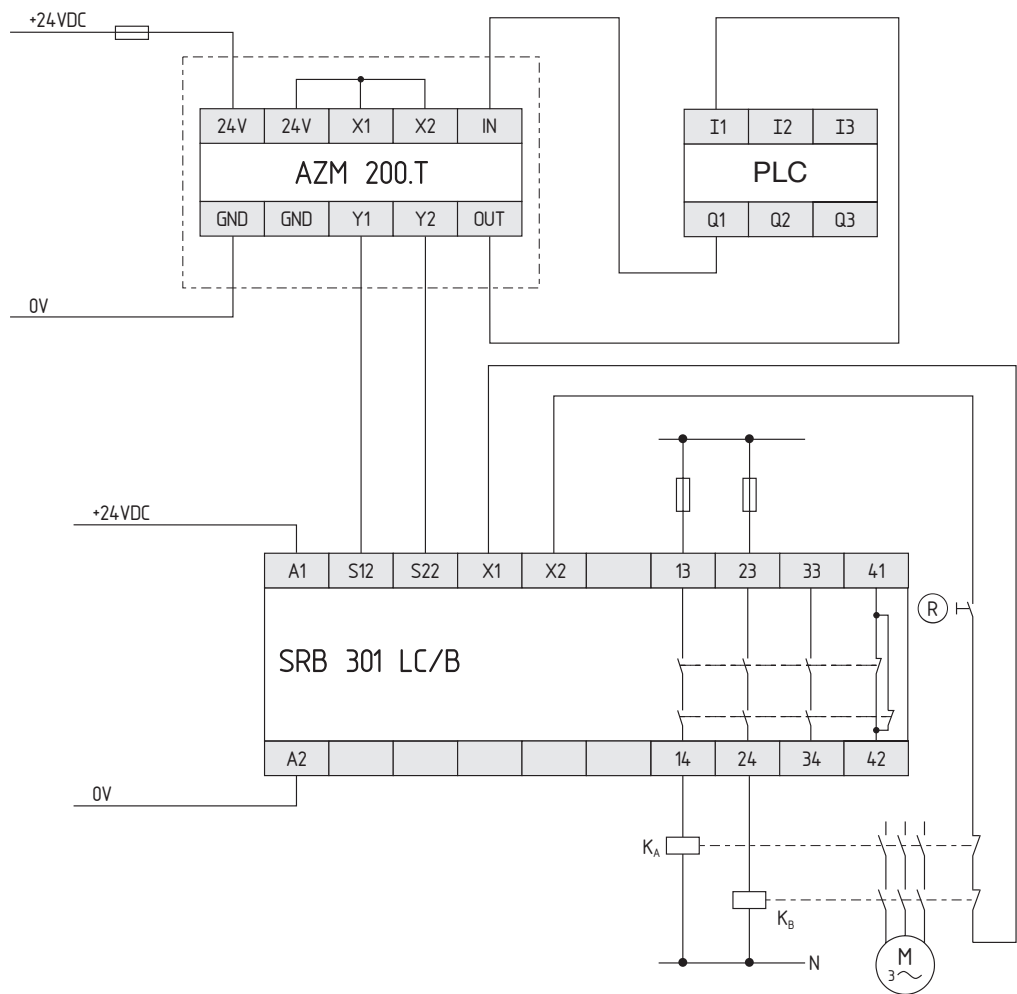


The wiring diagram for the AZ 200 is identical to the AZM 200's, only the "solenoid interlock IN" control becomes inoperative.

The CSS 180 and CSS 34 are connected to the safety controller in the same way. The function assignment to the wire colours of the CSS safety sensor is included in the CSS device description.

Connection of sensors and interlocks to various safety controllers

Connection of an interlock AZM 200 to the safety controller SRB 301 LC/B



The wiring example is shown with safety guards closed and in de-energized condition.

Product selection

This example applies for the following series-wired devices.

Device	Remarks
AZ 200...-1P2P	Series wiring possible IN = spare
AZM 200...-1P2P	Series wiring possible IN = Solenoid control
AZ 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3
AZM 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3

Description

Wiring diagram of the AZ and AZM 200

Clamp	Wiring of AZM 200	Pin configuration
24V	Operating voltage 24VDC	Pin 1
GND	Ground	Pin 3
X1 / OUT2	Safety input 1 or signal output 2	Pin 2
X2 / OUT3	Safety input 2 or signal output 3	Pin 6
Y1	Safety output 1	Pin 4
Y2	Safety output 2	Pin 7
OUT	Signal output 1	Pin 5
IN	Solenoid control	Pin 8

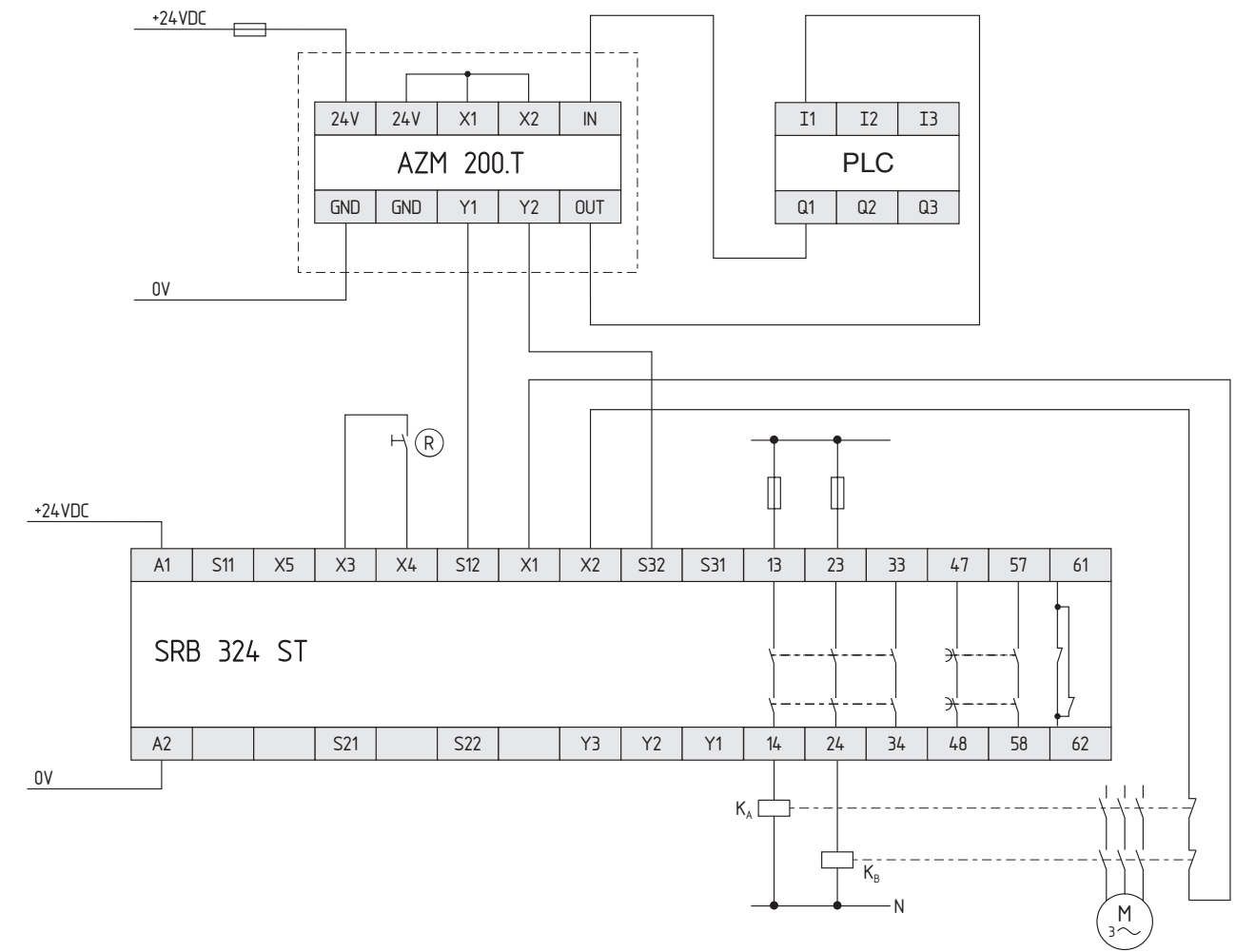


The wiring diagram for the AZ 200 is identical to the AZM 200's, only the "solenoid interlock IN" control becomes inoperative.

The CSS 180 and CSS 34 are connected to the safety controller in the same way. The function assignment to the wire colours of the CSS safety sensor is included in the CSS device description.

Connection of sensors and interlocks to various safety controllers

Connection of an interlock AZM 200 to the safety controller SRB 324 ST



The wiring example is shown with safety guards closed and in de-energized condition.

Product selection

This example applies for the following series-wired devices.

Device	Remarks
AZ 200...-1P2P	Series wiring possible IN = spare
AZM 200...-1P2P	Series wiring possible IN = Solenoid control
AZ 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3
AZM 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3

Description

Wiring diagram of the AZ and AZM 200

Clamp	Wiring of AZM 200	Pin configuration
24V	Operating voltage 24VDC	Pin 1
GND	Ground	Pin 3
X1 / OUT2	Safety input 1 or signal output 2	Pin 2
X2 / OUT3	Safety input 2 or signal output 3	Pin 6
Y1	Safety output 1	Pin 4
Y2	Safety output 2	Pin 7
OUT	Signal output 1	Pin 5
IN	Solenoid control	Pin 8

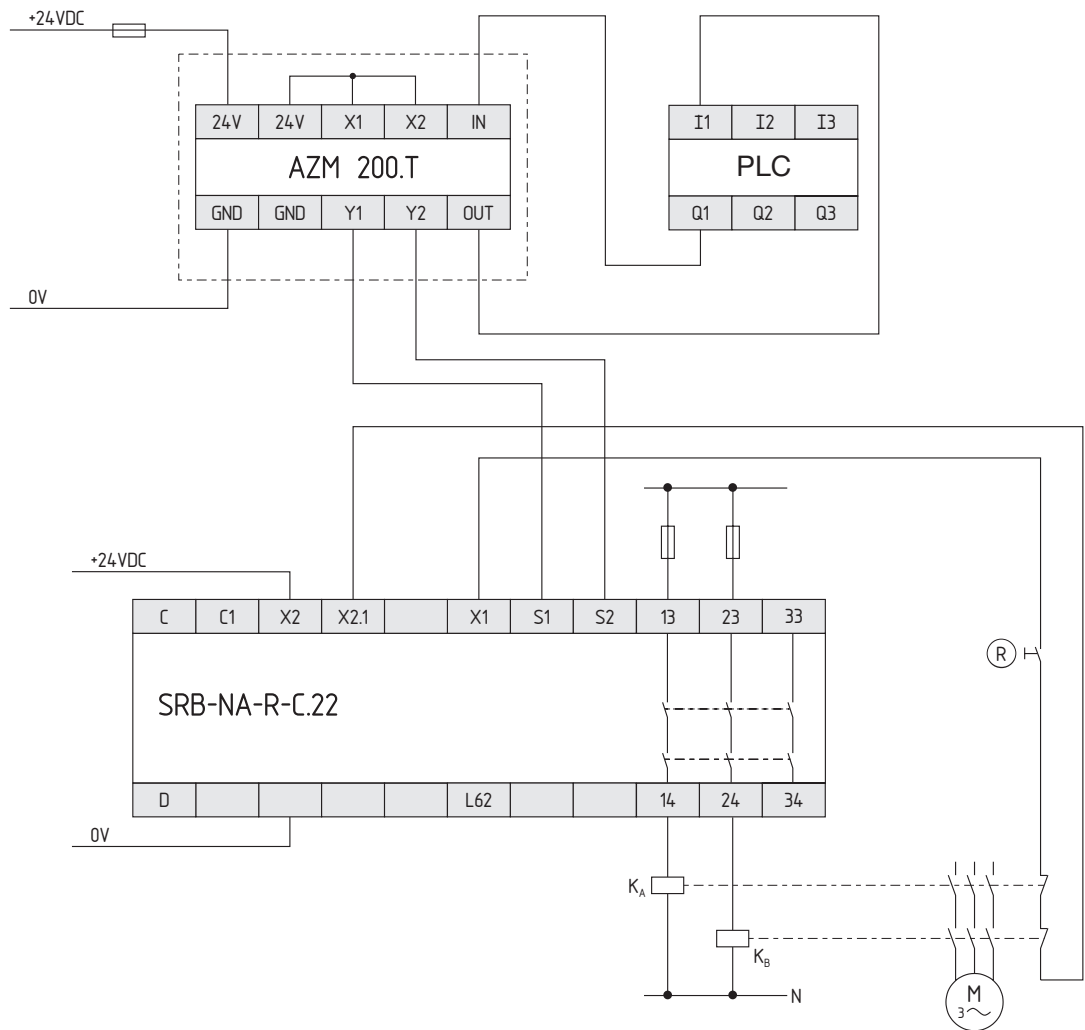


The wiring diagram for the AZ 200 is identical to the AZM 200's, only the "solenoid interlock IN" control becomes inoperative.

The CSS 180 and CSS 34 are connected to the safety controller in the same way. The function assignment to the wire colours of the CSS safety sensor is included in the CSS device description.

Connection of sensors and interlocks to various safety controllers

Connection of an interlock AZM 200 to the safety controller SRB-NA-RC-22



The wiring example is shown with safety guards closed and in de-energized condition. Cross-wire detection must be deactivated on the rear side of the evaluation module.

Product selection

This example applies for the following series-wired devices.

Device	Remarks
AZ 200...-1P2P	Series wiring possible IN = spare
AZM 200...-1P2P	Series wiring possible IN = Solenoid control
AZ 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3
AZM 200...-3P2P	Series wiring not possible, X1= OUT2; X2= OUT3

Description

Wiring diagram of the AZ and AZM 200

Clamp	Wiring of AZM 200	Pin configuration
24V	Operating voltage 24VDC	Pin 1
GND	Ground	Pin 3
X1 / OUT2	Safety input 1 or signal output 2	Pin 2
X2 / OUT3	Safety input 2 or signal output 3	Pin 6
Y1	Safety output 1	Pin 4
Y2	Safety output 2	Pin 7
OUT	Signal output 1	Pin 5
IN	Solenoid control	Pin 8



The wiring diagram for the AZ 200 is identical to the AZM 200's, only the "solenoid interlock IN" control becomes inoperative.

The CSS 180 and CSS 34 are connected to the safety controller in the same way. The function assignment to the wire colours of the CSS safety sensor is included in the CSS device description.

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