Electronic Safety Sensors and Solenoid Interlocks

Product information | Release 03

SCHMERSAL

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Non-cont

The electronic monitoring of moving safety guards including actuation in non-contact solenoid interlocks enables the wear-free and non-contact 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 and the misalignment.
Despite this, the switching points and hysteresis are extremely repeatable and constant.

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

- Defined behaviour under fault conditions to EN 60947-5-3, self-monitoring classification PDF-M
- Requirements on safety-related parts up to PL e to EN ISO 13849-1 or control category 4 to EN 954-1
- Requirements of EN 61508/ use up to SIL 3 applications

The requirements of DIN EN 61508 furthermore guarantee the user extremely high EM interference immunity. In addition, the standard allows that a signal is given for certain failures before the machinery completely switched off. This enables putting the machinery safely to a hold position before being switched off.

The using of microprocessor technology allows an intelligent diagnostic as well as a smooth and fast failure detection, e.g. in case of cross-shorts or wiring errors.

The safety channels of the electronic sensors and electronic solenoid interlocks can be wired in series to build a chain of up to 31 components, depending on the type of device used. Because of the independent functional check, control category 4 to EN 954-1 is retained for this series-wired chain. The chains can also consist of a mix of the safety sensors and solenoid interlocks described in this brochure.

Operating principle
All products of the CSS series have the same operating principle.
They use the pulse-echo technology patented by Schmersal to detect the actuator.

The sensor emits electromagnetic pulses. When the actuator approaches the sensor, the actuator starts oscillating at a predetermined resonant frequency due to the induced energy.

These oscillations are in turn read by the sensor. While doing this, the sensor evaluates the distance with regard to the actuator as well as the coding of the actuator. The actuator identified by the sensor is interpreted as a closed safety guard and the safety outputs are enabled.

Due to this operating principle, the sensor is not suitable for mounting behind metal walls, e.g. stainless steel covers, considering that the oscillation to be detected cannot penetrate the metal.

act

Application
The electronic safety sensors and solenoid interlocks are used for monitoring moving safety guards. When the safety guard is opened, the machine is stopped and the dangerous restart of the machine is in all cases suppressed.

Their essential advantage is in the non-contact detection of the safety guard's position. They therefore are completely wear-free and insensitive to misalignment or offset of the sensor and the actuator.

Electronic safety sensors
Due to their compactness, there are numerous applications for CSS sensors. Because of their high repeatability, an extremely low hysteresis and the absence of double switching points in the actuation range, they can be fitted to a wide variety of safety guards or they can be employed for position monitoring on machines axes.

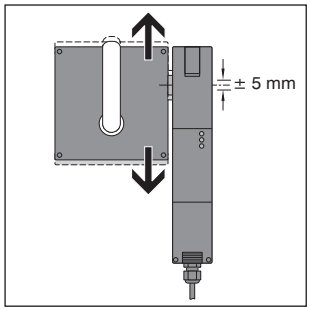
The application possibilities of the CSS 34 are considerably extended by its four different approach directions.

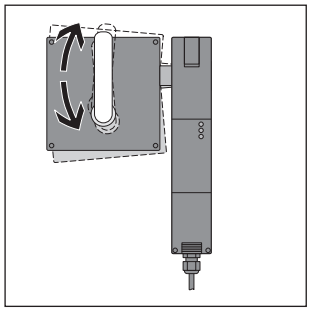
Mounting on aluminium profiles is in particular carried out smoothly and quickly by means of just two screws using the integral mounting plate. Rotating slotted washers in the mounting plate facilitate an accurate alignment, even with inaccurate mounting holes.

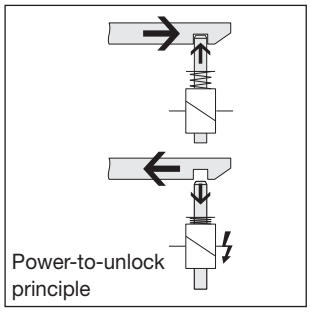
In this way, the sensors can be used in almost any place where required.
The encapsulated sensors and their actuator are insensitive to shocks, vibrations and dirt.

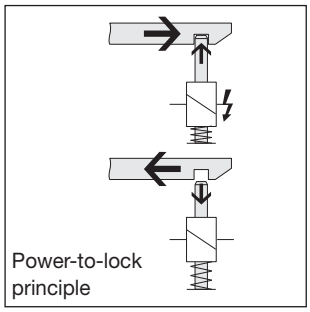
The CSS safety sensors consequently can be used anywhere, especially where protection against dangerous run-down movements of the machine is not required.

Safe lock









Electronic solenoid interlocks
Hazardous areas on machinery and plants must remain inaccessible until all dangerous machine movements have come to a standstill. For this reason, safety sensors may not be used. According to EN 1088 solenoid interlocks have to be fitted.

A door offset of approximately 5 mm is permitted with the CSS sensors. The mechanical design of the actuator furthermore enables the swivelling of the complete enclosure, which is fitted to the safety guard.

In this way, irregular sagging of the safety guard can be compensated within large limits, i.e. in this situation, the actuator still can be smoothly and accurately inserted in the switch (AZ 200) or in the solenoid interlock (AZM 200).

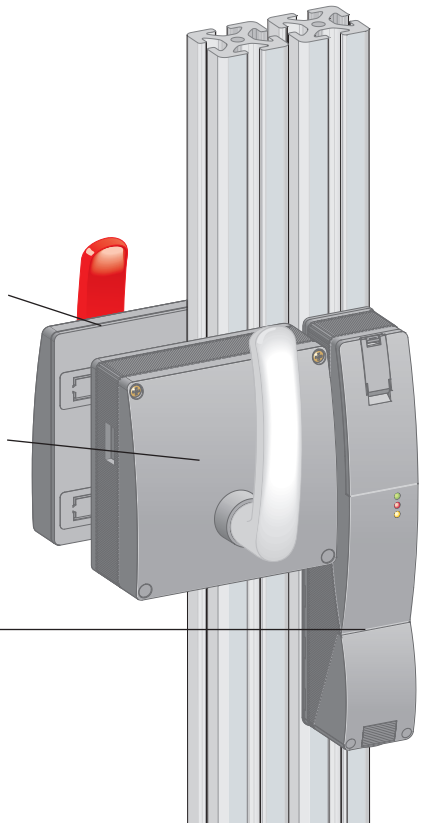
This mechanical design feature ensures that the component is not damaged despite the offset of the actuator and the component; this in turn leads to a higher machinery and plant productivity.

Because of their separate actuator unit, facilitating the intuitive and ergonomic operation of the safety guard, the AZ and the AZM 200 are particularly suitable for use on safety guards, protective fencing or machine housings.

The actuator unit also enables the integration of an additional sensor, which is used for safety guard monitoring. With the help of this second sensor, PL e to EN ISO 13849-1 or control category 4 to EN 954-1 is realised **with only one interlock and one switch on the safety guard**. This unique feature replaces the second switch. This saves additional costs for the switch and its fitting.

Also the optional emergency exit has been developed especially for use on safety guards, protective fencing and machine housings. It enables the unlocking and opening of the safety guard with just one hand movement by simply turning the emergency handle located on the inside of the hazardous area.

AZ/AZM 200



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Since solenoid interlocks are either locked or unlocked by a solenoid, they require different solutions for manual unlocking in a power-off condition than for unlocking during machine operation.

Interlocks basically can be equipped with the following unlocking features:

Manual release
Machinery fitted with power-to-unlock solenoid interlocks normally have a way of opening the safety guard in case of power failure, usually by means of a tool such as a triangular key.
The Schmersal solenoid interlocks are fitted with this kind of auxiliary unlocking mechanism, the so-called “manual release”.

Emergency exit
An emergency exit allows an intentional opening of the safety guard from inside the machine without tools, for example when staff are trapped inside a machine.

The solenoid interlocks have two different operating principles: the power-to-unlock principle and the power-to-lock principle.

With the power-to-unlock principle, the safety guard is mechanically locked in de-energised condition by a spring and unlocked by energizing the solenoid.
With the power-to-lock principle, the safety guard is mechanically locked by magnetic force (i.e. by energizing the solenoid) and unlocked by spring force.
As the power-to-lock solenoid interlock can be unlocked in de-energised condition, thus enabling the safety guard to be opened immediately, the use of power-to-unlock solenoid interlocks is strongly recommended for the protection of personnel against hazardous stored energy (e.g. run-on movements).

The AZM 200 is available both as power-to-unlock and as power-to-lock version.

MZM 100 electronic magnetic interlock
In this new generation of magnetic interlocks, the actuator simultaneously is the armature of the magnet, which is attracted with a force that can be monitored. This interlock can be used for monitoring guard doors or flaps.

The special features of this component are the monitoring of the potential holding force between the armature and the electromagnet means of a measurement of the magnetic parameters and the detection of the armature by means of the CSS principle. This “non-contact” operating principle offers extended adjustment possibilities for both units. The actuator unit (armature) and the interlocking unit (magnet) build a closed circuit.

Interlocking unit
The interlocking unit is installed on the safety guard; the actuator unit directly on the moveable guard door. To lock the actuator unit, the armature plate must be on the pole shoes of the current-carrying magnet.

The permanent monitoring of the magnetic parameters guarantees a safe holding force. The component is unlocked by switching off the magnet current.

The interlocking unit is equipped with a dual-channel processor system with redundant structure to measure the holding force and to detect the actuator in the actuator unit; this system furthermore monitors both enabling paths.

These outputs are capable of controlling two contactors or one safety relay combination. They also can be monitored by a safety controller.

The pulse-echo technology prevents defeating of the component by simple means.

MZM 100

Detecting and

The integral electronics of the electronic safety sensors and the electronic solenoid interlocks allows an extensive diagnostic of the respective operating conditions.

The diagnostic is available in each individual component, but it can also be used when different safety components of the CSS range are series-wired.

The operating status is displayed by the easily visible diagnostic LED's located on the component. It is additionally provided through a diagnostic output. To this end, two options can be chosen: the conventional diagnostic output or the serial diagnostic cable.

The diagnostics in the electronic safety sensors CSS 180, CSS 34, the solenoid interlocks AZM 200 and MZM 100 or the electric safety switch AZ 200 is identical, however adapted to the respective function. Further details can be found in the product data sheets in the product section.

Failure
Failures, which no longer guarantee the proper functioning of the AZM 200 solenoid interlock, the MZM or CSS sensors (internal failures), will result in an immediate deactivation of the safety outputs. Failures, which do not immediately affect the safety function of the solenoid interlock, magnetic interlock or CSS sensor will result in a delayed switch-off.

Failure warning
The safety outputs initially remain enabled in order to enable a controlled shut-down of the process and set the machine safely to a hold position.
This prevents the breakage of tools and work pieces and increases the machine productivity.

LED functions

Green	supply voltage on
Yellow	operating status
Red	error (refer to flash codes)

Example of the diagnostic function of the AZM 200 solenoid interlock

Display (red)	Flash codes	Meaning	Autonomous switch-off after
1 flash pulse		Failure (warning) output Y1	30 min
2 flash pulses		Failure (warning) output Y2	30 min
3 flash pulses		Failure (warning) cross-wire	30 min
4 flash pulses		Failure (warning) over-temperature	30 min
5 flash pulses		Actuator (target) error	0 min
6 flash pulses		Error target combination	0 min
Continuous red		Internal failure	0 min

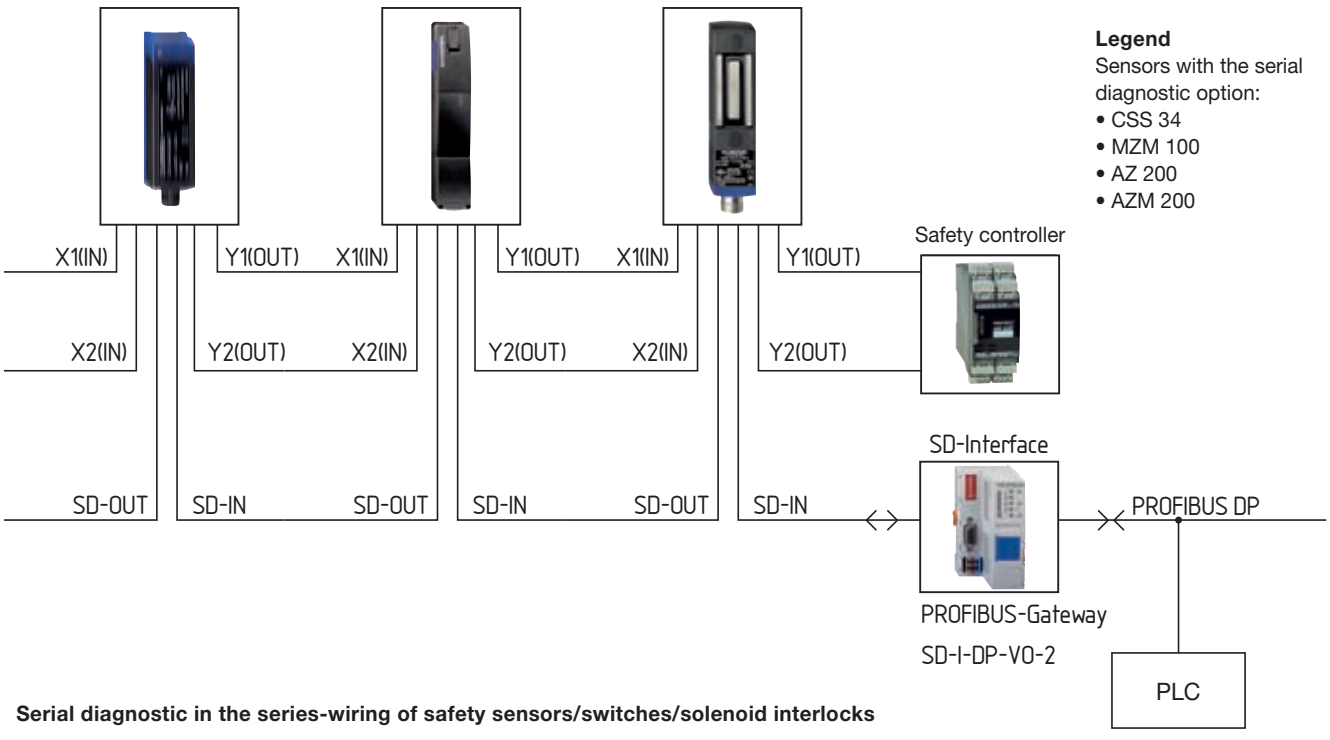
displaying

The serial diagnostic
Sensors / interlocks with serial diagnostic output have a serial input and output cable instead of the conventional diagnostic (signal) output. If these SD components are daisy-chained, the safety channels as well as the serial diagnostic cables are wired in series. The thus created “bus line” or “collecting main” of diagnostic information is passed to a serial diagnostic gateway for monitoring. In this way, a maximum of 31 components can be consecutively daisy-chained, also as series-wiring of different components.

Serial diagnostic gateway for PROFIBUS SD-I-DP-V0-2
The PROFIBUS Gateway SD-I-DP-V0-2 converts the serial signals into the PROFIBUS DP-V0 protocol. This serial Diagnostic Interface is integrated as slave into an existing PROFIBUS DP System. In this way, the diagnostic signals can be monitored by a PLC.

Every connected safety sensor/ solenoid interlock loads status signals, warning or failure messages to the linked PLC. The PLC sends control commands to the components of the series-connected chain, e.g. to unlock a solenoid interlock.

This concept has multiple advantages: not only the amount of wiring is considerably reduced, it furthermore provides useful information about each participating sensor and the control of the individual interlock releases from the connected PLC. This function can considerably reduce machine downtime.



Legend
Sensors with the serial diagnostic option:
- CSS 34
- MZM 100
- AZ 200
- AZM 200

Serial diagnostic in the series-wiring of safety sensors/switches/solenoid interlocks

Download now

Data sheets, mounting and wiring instructions, declarations of conformity and much more at:
www.products.schmersal.com

Electronic safety sensor CSS 34

Overview of the features

Actuation advantages
- Non-contact 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

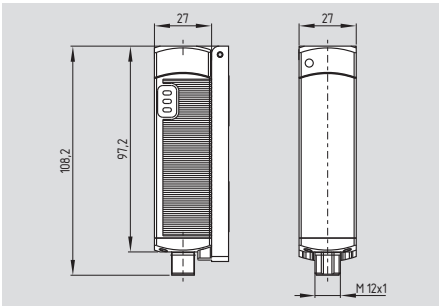
Wiring advantages
- 2 short-circuit proof p-type safety outputs (24 VDC per 250 mA)
- Self-monitored series-wiring of up to 31 sensors in control category 4 to EN 954-1
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety cables up to the control cabinet

Diagnostic advantages
- Detailed status information through LED and diagnostic output
- Optionally serial diagnostic cables for series-wiring
- Increased availability by pre-signalling of failures during machine operation, e.g. sagging of a safety guard

Classification
- Classification PDF-M to EN 60947-5-3
- Performance Level PL e to EN ISO 13849-1
- Control category 4 to EN 954-1
- Up to SIL 3 applications to IEC 61508, PFH value 3.6 x 10^{-9} / h

Electronic safety sensor CSS 34

Sensor CSS 34



- Thermoplastic enclosure
- Classification PDF-M to EN 60947-5-3
- PL e to EN ISO 13849-1
- Control category 4 to EN 954-1
- Up to SIL 3 applications to IEC 61508
- 2 short-circuit proof p-type safety outputs (24 VDC per 250 mA)
- Self-monitored series-wiring of up to 31 sensors in control category 4 to EN 954-1
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety cables up to the control cabinet
- Sensor with connecting cable or with integrated connector

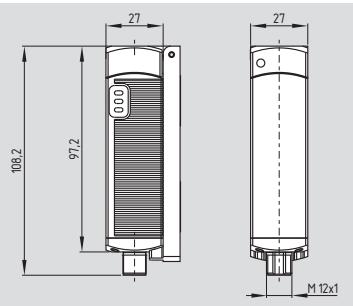
Approvals

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	for sideways actuation
②	S	Lateral actuating surface
	V	Frontal actuating surface
③	D	with diagnostic output
	SD	with serial diagnostic cable
④	L	with connecting cable
	ST	with integrated connector

Sensor CSS 34F0/F1



Additional functions of the CSS 34F0/F1:

- To control positive-guided relays without downstream safety controller
- Suitable as individual or end device in series-wired chains of standard sensors to replace the safety controller
- Self-monitored series-wiring of up to 30 CSS 34 sensors and one CSS 34F. sensor in control category 4 to EN 954-1
- CSS 34F. sensor with integrated connector

- **CSS 34F0:** without edge monitoring of the enabling button, suitable for automatic start
- **CSS 34F1:** with edge monitoring of the reset button

Approvals

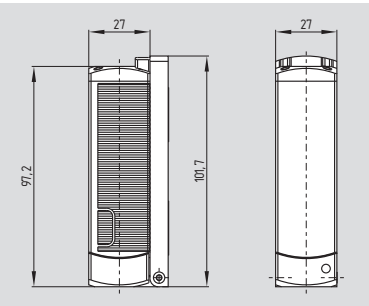
* Under preparation

Ordering details

CSS ①-34②-③-D-M-ST Safety sensor

No.	Replace	Description
①	12	Switching distance S_N (mm) for head actuation
	14	For sideways actuation
②		Standard version
	F0	Input for enabling button, suitable for automatic start
	F1	Input for reset button, with edge monitoring
③	S	Lateral actuating surface
	V	Frontal actuating surface

Actuator CST 34



- CSS 34 sensor and CST 34 actuator are isometric
- Sensor and actuator must be ordered separately

Approvals

Ordering details

CST 34-①-1 Actuator

No.	Replace	Description
①	V	Rounded frontal actuating surface
	S	Lateral actuating surface

Electronic safety sensor CSS 34

Technical data

Standards:		EN 60947-5-3, EN ISO 13849-1, EN 954-1, IEC 61508
Enclosure:		glass-fibre reinforced thermoplastic
Mode of operation:		inductive
Actuator:		coded CST 34
Series-wiring:		**max. 31 components**
Cable length:		max. 200m
Switching distances to EN 60947-5-3:		
Device head:	S_n:	12 mm
	S_{ao}:	10 mm
	S_{ar}:	15 mm
Side face:	S_n:	14 mm
	S_{ao}:	12 mm
	S_{ar}:	17 mm
Hysteresis:		max. 1.5 mm
Repeat accuracy:		< 0.5 mm
Switching frequency f:		3 Hz
Connecting cable:		Y-UL 2517 / 8 x AWG 22 8 x 0.35 mm², 2 m long
Temperature resistance of the cable:		
At rest:		– 30 °C … + 105 °C
In movement:		– 10 °C … + 105 °C
Connector:		M12 x 1, 8-pole In the enclosure**
Ambient conditions:		
Ambient temperature Tu:		
For output current		
≤ 0.1 A/output		– 25 °C … + 70 °C
≤ 0.25 A/output		– 25 °C … + 65 °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
Protection class:		IP 65, IP 67 to EN 60529
Electrical data:		
U_e:		24 VDC -15% / +10% (stabilised PELV)
I_e:		0.6 A
Required rated short-circuit current:		100 A
Fuse (circuit breaker):		for cables
Up to 45°C:		4.0 A
Up to 60°C:		3.15 A
At 65°C:		2.5 A
At 70°C:		2.0 A
For connectors:		2.0 A

The cable section of the interconnecting cable must be observed for both wiring variants!

Technical data

U_i:	32 VAC/DC
U_{imp}:	800 V
I_0:	0.1 A
Response time:	< 30 ms
Duration of risk:	< 60 ms
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
EMC rating:	to EN 61000-6-2
EMC interfering radiation:	environment A
Safety outputs Y1/Y2:	NO function, dual-channel, short-circuit proof, p-type
Voltage drop:	< 1 V
U_{e1}:	min. (U_e – 1 V)
Leakage current I_r:	< 0.5 mA
I_{e1}:	max. 0.25 A, ambient temperature-dependent
Minimum operating current I_m:	0.5 mA
Utilisation category:	DC-12, DC-13
U_{e1}/I_{e1}:	24 VDC / 0.25A
Diagnostic output:	p-type, short-circuit proof
Voltage drop:	< 5 V
U_{e2}:	min. (U_e –5 V)
I_{e2}:	max. 0.05 A
Utilisation category:	DC-12, DC-13
U_{e2}/I_{e2}:	24 VDC / 0.05A
Wiring capacitance for serial diagnostic:	max. 50 nF
Classification:	
To EN ISO 13849-1:	PL e
To EN 954-1:	control category 4
To EN 60947-5-3:	PDF-M
To IEC 61508:	suitable for SIL 3 applications PFH value: 3.6 x 10^{-9} / h Service life: 20 years

Note

Accessories for series-wiring with serial diagnostic see page 31 ff.

The diagnostic tables for the CSS 34 can be found on page 46.

Safety controller

Requirements for the safety controller
Dual-channel safety input, suitable for p-type sensors with normally-open (NO) function. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 0.5 ms, this must be tolerated by the safety controller. The safety controller must not be equipped with cross-wire detection.

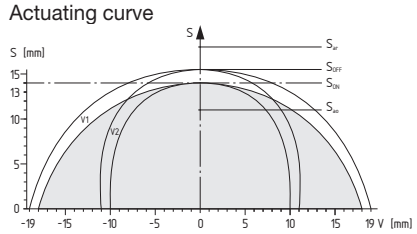
The programme of suitable safety controllers can be found on page 49 ff.

Electronic safety sensor CSS 34

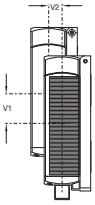
Sideways misalignment

Actuation through the rotating side face of sensor and actuator

Actuating curve

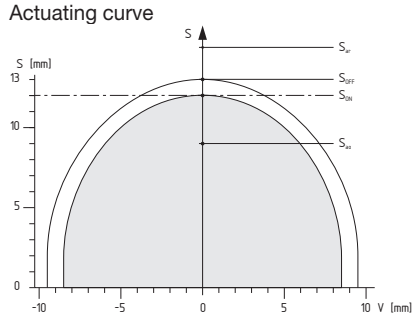


Possible misalignment

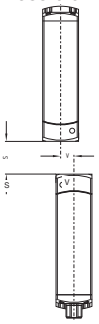


Head actuation of sensor and actuator

Actuating curve



Possible misalignment



Connection

Wiring of the CSS 34 safety sensor with connecting cable (ordering suffix -L)

Sensor with diagnostic output	Sensor with serial diagnostic	Colour of the connecting cable (ordering suffix -L)
A1 Ue	A1 Ue	BN (brown)
A2 GND	A2 GND	BU (blue)
X1 Safety input 1	X1 Safety input 1	WH (white)
X2 Safety input 2	X2 Safety input 2	VT (violet)
Y1 Safety output 1	Y1 Safety output 1	BK (black)
Y2 safety output 2	Y2 safety output 2	RD (red)
Diagnostic output	SD output	GY (grey)
Without function	SD input	PK (pink)

Wiring of the CSS 34 and CSS 34F0/F1 safety sensors with connector (ordering suffix -ST)

Connecting cable with mould connector (female) M12x1, 8-pole
8x0,23 mm², 2,5 m long article n° **1193608**
5 m long article n° **1193609**
10 m long article n° **1193610**

Sensor with diagnostic output	Sensor with serial diagnostic*	Pin configuration connector	Colour of the connecting cable
A1 Ue	A1 Ue	Pin 1	BN (brown)
A2 GND	A2 GND	Pin 3	BU (blue)
X1 Safety input 1	X1 Safety input 1	Pin 2	WH (white)
X2 Safety input 2	X2 Safety input 2	Pin 6	VT (violet)
Y1 Safety output 1	Y1 Safety output 1	Pin 4	BK (black)
Y2 Safety output 2	Y2 Safety output 2	Pin 7	RD (red)
Diagnostic output	SD output	Pin 5	GY (grey)
Without function	SD input	Pin 8	PK (pink)

* currently not available for CSS 34F0/F1

Connecting cable with mould connector (female) M12x1, 8-pole
Note: these cables with yellow tape are no longer available.
8x0,23 mm², 2,5 m long article n° **1184290**
5 m long article n° **1184291**
10 m long article n° **1184292**

Sensor with diagnostic output	Sensor with serial diagnostic*	Pin configuration connector	Colour of the connecting cable
A1 Ue	A1 Ue	Pin 1	WH (white)
A2 GND	A2 GND	Pin 3	RD (red)
X1 Safety input 1	X1 Safety input 1	Pin 2	BN (brown)
X2 Safety input 2	X2 Safety input 2	Pin 6	BK (black)
Y1 Safety output 1	Y1 Safety output 1	Pin 4	VT (violet)
Y2 Safety output 2	Y2 Safety output 2	Pin 7	BU (blue)
Diagnostic output	SD output	Pin 5	GY (grey)
Without function	SD input	Pin 8	PK (pink)

Sideways misalignment

The long side allows for a maximum displacement of 36 mm of sensor and actuator (e.g. mounting tolerance or safety guard sagging).

The long side allows for a maximum transverse misalignment of max. ± 8 mm.

Actuating directions

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

Legend

S Switching distance

Possible misalignment
V from front, through the rounded faces
V1 through the long side with identification plate
V2 through the small side with identification plate

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 to EN 60947-5-3

Electronic safety sensor CSS 180

Overview of the features

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

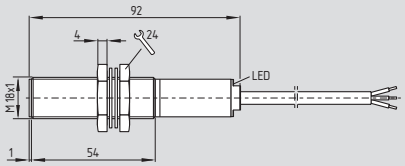
Wiring advantages
- 2 short-circuit proof p-type safety outputs (24 VDC per 500 mA)
- Self-monitored series-wiring of max. 16 sensors in control category 4 to EN 954-1
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety cables up to the control cabinet

Diagnostic advantages
- Detailed status information through LED and diagnostic output
- Increased availability by pre-signalling of failures during machine operation, e.g. sagging of a safety guard
- Controlled shutdown of the machine under observation of the running processes in case of emergency

Classification
- Classification PDF-M to EN 60947-5-3
- Control category 4 to EN 954-1
- Up to SIL 3 applications to IEC 61508, PFH value < 6.1 x 10^{-9} / h

Electronic safety sensor CSS 180

CSS 180



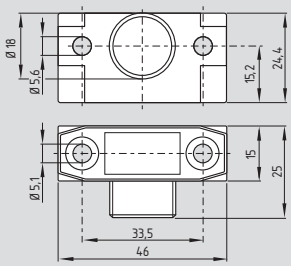
- Thermoplastic enclosure
- Classification PDF-M to EN 60947-5-3
- Control category 4 to EN 954-1
- Up to SIL 3 applications to IEC 61508, PFH value < 6.1 x 10^{-9} / h
- Electronic, non-contact, coded system
- Large switching distance
- Misaligned actuation possible
- High repeat accuracy of the switching points
- Self-monitored series-wiring of max. 16 sensors
- Max. length of the sensor chain 200 m
- Comfortable diagnose through sensor LED and diagnostic output
- Early warning when operating near the limit of the sensor's hysteresis range
- 2 short-circuit proof, p-type safety outputs (24 VDC per 500 mA)

Approvals

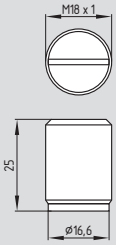
Technical data

Standards:	EN 60947-5-3, EN 954-1, IEC 61508
Design:	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 mm², 5 x 0.34 mm², 7 x 0.25 mm²
Cable length:	max. 200 m
Mode of operation:	inductive
Actuator:	CST-180-1, CST-180-2
Rates 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
Io:	0.05 A
Leakage current I_r:	≤ 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
Diagnostic 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 temperature:	– 25 °C … + 85 °C
Switching frequency f:	approx. 3 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55Hz, amplitude 1 mm
Classification:	
To EN 954-1:	control category 4
To EN 60947-5-3:	up to PDF-M
To IEC 61508:	suitable for SIL 3 applications PFH value: < 6.1 x 10^{-9} / h

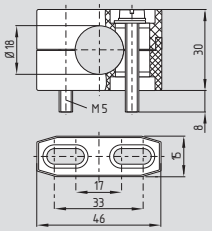
System components



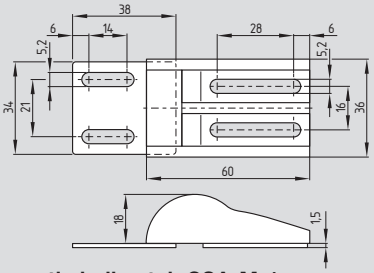
Actuator CST-180-1



Actuator CST-180-2



Terminal mounting H 18



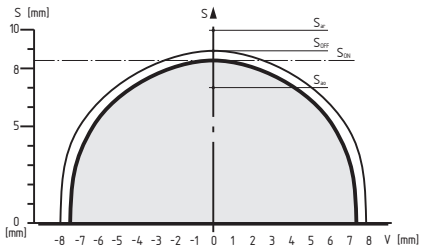
Magnetic ball catch CSA-M-1

Ordering details

CSS 8-180-①-②-③

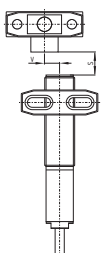
No.	Replace	Description
①	2P	2 p-type safety outputs
	2P+D	2 p-type safety outputs and 1 p-type signal contact (diagnostic)
②	E	End or single device
	Y	Device for series-wiring
	M	Multifunction device
③	L	Connecting cable
	LST	Connecting cable and connector

Note



Legend

S	Switching distance
V	Misalignment
S_{on}	Switch-on point
S_{off}	Switch-off point
S_h	Hysteresis area
S_{ao}	Assured switch-on point
S_{ar}	Assured switch-off point 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**

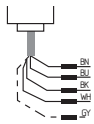
Actuators must be ordered separately.

Accessories for series-wiring with serial diagnostic see page 31 ff.

Electronic safety sensor CSS 180

Connection

End or single device:
CSS- 8-180-2P+…-**E**-L…

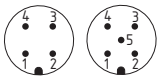


Connecting cable:
2 m long;
Cable section 4-pole: 4 x 0.5 mm^2,
5-pole: 5 x 0.35 mm^2

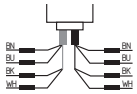
Connector: (option)
Connector male M12 x 1, 4-pole
Connector male M12 x 1, 5-pole

Wiring

Colour of the connecting cable	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: diagnostic output (option)	Pin 5



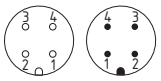
Series-wiring device:
CSS-8-180-2P-**Y**-L…



Connecting cable:
Inputs (IN), grey cable 0.25 m long;
4-pole: 4 x 0.5 mm^2,
Outputs (OUT), black cable 2 m long;
4-pole: 4 x 0.5 mm^2

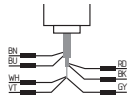
Connector: (option)
IN: connector female M12 x 1, 4-pole
OUT: connector male M12 x 1, 4-pole

Colour of the connecting cable	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

Multifunction device:
CSS-8-180-2P+D-**M**-L…



Connecting cable:
2 m long;
Cable section 7-pole: 7 x 0.25 mm^2

Connector: (option)
Connector male M12 x 1, 8-pole

Colour of the connecting cable	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)	diagnostic 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 cyclically switch off for max. 2 ms, this must be tolerated by the safety controller.

The programme of suitable safety controllers can be found on page 49 ff.

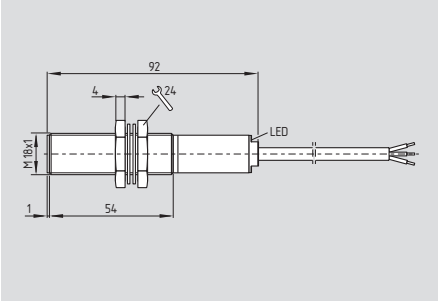
Note

- Series-wiring of sensors:
  A chain of 16 self-monitored CSS 180 safety sensors can be wired in series without loss of control category 4 to EN 954-1. In this configuration, 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 and section, ambient temperature, number of series-wired sensors and the input load of the safety controller.

The diagnostic tables for the CSS 180 can be found on page 48.

Electronic safety sensor CSS 180LC

CSS 180LC



- Thermoplastic enclosure
- Classification PDF-M to EN 60947-5-3
- Control category 3 to EN 954-1
- Up to SIL 3 applications to IEC 61508, PFH value < 10^{-8} / h
- Electronic non-contact, coded system
- Particularly large switching distance
- Misaligned actuation possible
- High repeat accuracy of the switching points
- Suitable as single device or as end device in the sensor chain
- Diagnostic through sensor LED
- Early warning when operating near the limit of the sensor's hysteresis range
- 2 short-circuit proof p-type safety outputs (24 VDC per 250 mA)

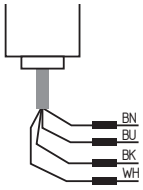
Approvals

Technical data

Standards:	EN 60947-5-3, EN 954-1, IEC 61508
Design:	cylindrical
Enclosure:	glass-fibre reinforced thermoplastic
Protection class:	IP 65 and IP 67 to EN 60529
Connection:	cable
Cable section:	4 x 0.5 mm^2
Cable length:	max. 200 m
Mode of operation:	inductive
Actuator:	CST-180-1, CST-180-2
Rated switching distance S_n:	7 mm
S_{ao}:	6 mm
S_{ar}:	9 mm
Hysteresis:	≤ 0.7 mm
Repeat accuracy R:	≤ 0.5 mm
Response time:	< 30 ms
Duration of risk:	≤ 30 ms
U_e:	24 VDC – 15 % / + 10 %
I_e:	0.6 A
I_0:	0.05 A
Leakage current I_r:	≤ 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. 0.25 A per output
U_d:	max. 0.5 V
I_e/U_e:	0.25 A / 24 VDC
Utilisation category:	DC-12, DC-13
Ambient temperature:	– 25 °C … + 60 °C
Storage and transport temperature:	– 25 °C … + 85 °C
Switching frequency f:	approx. 3 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55Hz, amplitude 1 mm
Classification:	
To EN 954-1:	control category 3
To EN 60947-5-3:	up to PDF-M
To IEC 61508:	suitable for SIL 3 applications PFH value: < 10^{-8} / h

Connection

Connecting cable: 2 m long;
Cable section: 4 x 0.5 mm^2



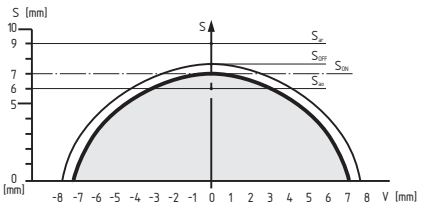
Colour of the connecting cable	Wiring
BN (brown)	A1 Ue
BU (blue)	A2 GND
BK (black)	Y1 Safety output 1
WH (white)	Y2 safety output 2

Ordering details

CSS-7-180LC-2P-E-L

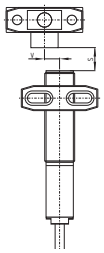
Only available with connecting cable and without diagnostic output

Note



Legend

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



Note

Actuators must be ordered separately (ordering details, refer to previous page).

Accessories for series-wiring with serial diagnostic see page 31 ff.

The programme of suitable safety controllers can be found on page 49 ff.

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

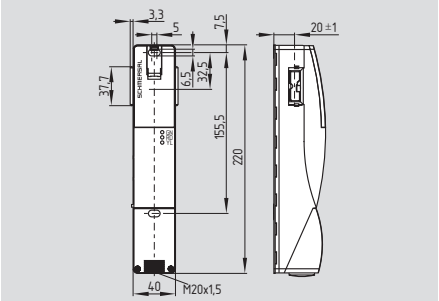
Overview of the features

Advantages
- Sensor technology permits an offset of ± 5 mm between actuator and interlock
- Intelligent diagnostic
- Modern and ergonomic design
- Simple mounting
- Accurate adjustment through slotted holes
- 3 LED's to show the operating status
- 1 or 3 diagnostic outputs

Classification
- Classification PDF-M to EN 60947-5-3
- Up to PL e to EN ISO 13849-1
- Control category 4 to EN 954-1
- Up to SIL 3 applications to IEC 61508, PFH value 4.0 x 10^{-9} / h

Safety switch with separate actuator AZ 200

AZ 200



- Thermoplastic enclosure
- Sensor technology permits an offset of ± 5 mm between actuator and safety switch
- Up to PL e to EN ISO 13849-1
- Control category 4 to EN 954-1 with door detection sensor T (without additional second switch)
- Up to SIL 3 applications to IEC 61508
- Intelligent diagnostic
- Modern and ergonomic design
- Simple mounting
- Accurate adjustment through slotted holes
- Series-wiring of max. 31 components, without detriment to the control category to EN 954-1
- 3 LED's to show the operating status (refer to table)
- 1 or 3 diagnostic outputs
- Holding force 30 N
- Available with AS-Interface Safety at Work

Approvals

TÜV cULus CE

Technical data

Standards:	EN 60947-5-3, EN ISO 13849-1, EN 954-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations
Holding 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 or connector M12 or M23
Cable section:	min. 0.25 mm² max. 1.5 mm² (incl. conductor ferrules)
Cable entry:	M20 x 1.5
Series-wiring:	**max. 31 components (not applicable for -3P2P)**
Cable length:	max. 200m (Cable length and cable section alter the voltage drop depending on the output current)
Switching distances to EN 60947-5-3:	
S_n:	6.5 mm
S_{ao}:	4.0 mm
S_{ar}:	30 mm
Hysteresis:	max. 1.5 mm
Repeat accuracy:	< 0.5 mm
Switching frequency f:	1 Hz
Ambient conditions:	
Ambient temperature:	– 25 °C … + 70 °C
Storage and transport temperature:	– 25 °C … + 85 °C
Relative humidity:	30% … 95%, non-condensing
Resistance to vibration:	10 ... 55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 60 ms
Duration of risk:	< 120 ms
Time to readiness:	< 4 s
Actuating speed:	≤ 0.2 m/s
Electrical data:	
U_e:	24 VDC –15%/+10% (stabilised PELV)
I_e:	0.7 A
I_0:	max. 0.1 A
U_{imp}:	800 V
U_i:	32 VDC

Technical data

Fuse rating:	internally short-circuit proof
Screw terminals or cage clamps:	≤ 4 A when used to UL 508;
Connector M12:	≤ 2 A;
Connector M23:	≤ 4 A
EMC rating:	to EN 61000-6-2
Safety inputs	
X1 and X2:	**only for -1P2P and -SD2P**
$U_{e3/Low}$:	– 3V … 5V
$U_{e3/High}$:	15V … 30V
I_{e3}:	> 2 mA at 24 V
Safety outputs Y1 and Y2:	p-type, short-circuit proof
U_{e1}:	0 V up to 4 V under Ue
I_{e1}:	max. 0.25 A
Utilisation category:	DC-13
Leakage current I_r:	≤ 0.5 mA
Diagnostic output OUT/OUT2/OUT3:	p-type, short-circuit proof
U_{e2}:	0 V up to 4 V under Ue
I_{e2}:	-1P2P: max. 0.05 A -3P2P: max. 0.1 A ($I_{OUT} + I_{OUT2} + I_{OUT3} \leq I_{e2}$)
Utilisation category:	DC-13
Wiring capacitance for -SD2P:	max. 50 nF
Classification:	
To IEC/EN 60947-5-3:	PDF-M
To EN ISO 13849-1:	up to PL e
To EN 954-1:	up to control category 4
To IEC/EN 61508:	up to SIL 3
	PFH value: 4.0 x 10^{-9} / h Service life: 20 years

Ordering details

AZ 200①-T-②

No.	Replace	Description
①	SK	Screw terminals
	CC	Cage clamps
	ST1	Connector M23 x 1, (8+1)-pole
	ST2	Connector M12 x 1, 8-pole
②		**Outputs:** (1st digit = number of diagnostic outputs, 2nd digit = number of safety outputs)
	1P2P	1 diagnostic output and 2 safety outputs, all p-type
	3P2P	3 diagnostic outputs and 2 safety outputs, all p-type
	SD2P	serial diagnostic output and 2 safety outputs, p-type

Note

Note

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

Actuators and accessories can be found on page 24 and 35.

Accessories for series-wiring with serial diagnostic see page 31 ff.

Suitable connecting cables with mould connector can be found on page 30.

Safety switch with separate actuator AZ 200

Note

LED functions

Green	Supply voltage on
Yellow	Operating status
Red	Error (refer to flash codes)

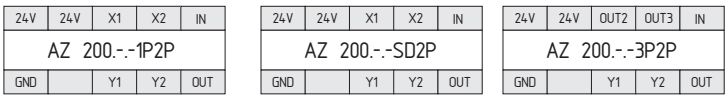
The diagnostic tables for the AZ 200 can be found on page 40.

Connection

Wiring diagram for device with integrated connector

Pin configuration	Wiring of the safety switch ...-1P2P	Wiring of the safety switch ...-SD2P	Wiring of the safety switch ...-3P2P
Pin 1	24V Operating voltage	24V Operating voltage	24V Operating voltage
Pin 2	X1 Safety input 1	X1 Safety input 1	OUT2 Diagnostic output 2
Pin 3	GND Ground	GND Ground	GND Ground
Pin 4	Y1 Safety output 1	Y1 Safety output 1	Y1 Safety output 1
Pin 5	OUT Diagnostic output	OUT SD output	OUT Diagnostic output 1
Pin 6	X2 Safety input 2	X2 Safety input 2	OUT3 Diagnostic output 3
Pin 7	Y2 Safety output 2	Y2 Safety output 2	Y2 Safety output 2
Pin 8	IN (do not wire)	IN SD input	IN (do not wire)
Pin 9	spare	spare	spare

Ordering suffix -SK -CC



Integrated connector M23, (8+1)-pole (Ordering suffix -ST1)

M12, 8-pole (Ordering suffix -ST2)

Safety controller

The programme of suitable safety controllers can be found on page 49 ff.

The control category 4 to EN 954-1 and PL e to EN ISO 13849-1 achievable with these safety controllers depends on the safety controller as well as on the structure of the entire safety circuit.

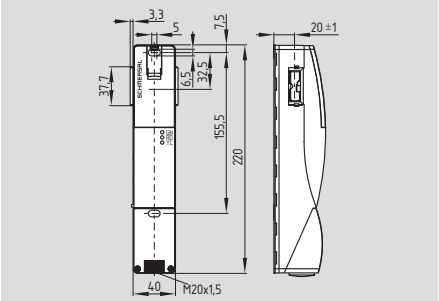
Note

Detailed information about the use of serial diagnostic can be found in the mounting and wiring instructions of the PROFIBUS-Gateway SD-I-DP-V0-2 and in the instructions for integration of the PROFIBUS-Gateway.

A detailed description of the PROFIBUS-Gateway SD-I-DP-V0-2 can be found on page 31 of this catalogue.

Electronic solenoid interlock AZM 200

AZM 200



- Thermoplastic enclosure
- Sensor technology permits an offset of ± 5 mm between actuator and interlock
- Up to PL e to EN ISO 13849-1
- Control category 4 to EN 954-1 with door detection sensor T (without additional second switch)
- Up to SIL 3 applications to IEC 61508
- Intelligent diagnostic
- Modern and ergonomic design
- Simple mounting
- Accurate adjustment through slotted holes
- Series-wiring (max. 31 components), without detriment to the control category to EN 954-1
- 3 LED's to show the operating status (refer to table)
- Manual release from both sides
- 1 or 3 diagnostic outputs
- Holding force 30 N
- Available with AS-Interface Safety at Work

Approvals

TÜV cULus CE

Technical data

Standards:	EN 60947-5-1, EN ISO 13849-1, EN 954-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations
Fmax:	2000 N
Holding 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 or connector M12 or M23
Cable section:	min. 0.25 mm² max. 1.5 mm² (incl. conductor ferrules)
Cable entry:	M20 x 1.5
Series-wiring:	**max. 31 components**
Cable length:	max. 200m (Cable length and cable section alter the voltage drop depending on the output current)
Ambient conditions:	
Ambient temperature:	– 25 °C … + 60 °C
Storage and transport temperature:	– 25 °C … + 85 °C
Relative humidity:	30% … 95%, non-condensing
Resistance to vibration:	10…55 Hz, amplitude 1mm
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 60 ms
Duration of risk:	< 120 ms
Time to readiness:	< 4 s
Actuating speed:	≤ 0.2 m/s
Electrical data:	
U_e:	24 VDC -15% / +10% (stabilised PELV)
I_e:	1.2 A
I_0:	max. 0.6 A
U_{imp}:	800 V
U_i:	32 VDC
Fuse rating:	internally short-circuit proof
Screw terminals or cage clamps:	≤ 4 A when used to UL 508;
Connector M12:	≤ 2 A;
Connector M23:	≤ 4 A

Technical data

Safety inputs X1 and X2:	
$U_{e3/Low}$:	– 3V … 5V
$U_{e3/High}$:	15V … 30V
I_{e3}:	> 2 mA at 24 V
Safety outputs Y1 and Y2:	p-type, short-circuit proof
U_{e1}:	0 V to 4 V under Ue
I_{e1}:	max. 0.25 A
Utilisation category:	DC-13
Leakage current I_r:	≤ 0.5 mA
Diagnostic outputs OUT/OUT2/OUT3:	p-type, short-circuit proof
U_{e2}:	0 V to 4 V under Ue
I_{e2}:	max. 0.05 A ($I_{OUT} + I_{OUT2} + I_{OUT3} \leq I_{e2}$)
Utilisation category:	DC-13
Wiring capacitance for -SD2P:	max. 50 nF
Solenoid control IN:	
$U_{e4/Low}$:	– 3V … 5V
$U_{e4/High}$:	15V … 30V
I_{e4}:	typically 10 mA at 24 V, dynamically 20 mA
Solenoid:	100% ED
Classification:	
To EN ISO 13849-1:	up to PL e
To EN 954-1:	up to control category 4
To IEC/EN 61508:	up to SIL 3
	PFH value: 4.0 x 10^{-9} / h
	Service life: 20 years

Ordering details

AZM 200 ① ②-T-③④

No.	Replace	Description
①		Solenoid interlock monitoring
	B	Actuator monitoring
②	SK	Screw terminals
	CC	Cage clamps
	ST1	Connector M23 x 1, (8+1)-pole
	ST2	Connector M12 x 1, 8-pole
③		**Outputs:** (1st digit = number of diagnostic outputs, 2nd digit = number of safety outputs)
	1P2P	1 diagnostic output and 2 safety outputs, all p-type
	1P2PW	as for -1P2P, combined diagnostic signal: safety guard closed **and** solenoid interlock locked
	SD2P	serial diagnostic output and 2 safety outputs, p-type
④		Power-to-unlock
	a	Power-to-lock

Note

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

The actuators and accessories can be found on page 24 and 35.

Accessories for series-wiring with serial diagnostic see page 31 ff.

Suitable connecting cables with mould connector can be found on page 30.

Note

LED functions
Green Supply voltage on
Yellow Operating status
Red Error (refer to flash codes)

Operating principle of the diagnostic outputs
The short-circuit proof diagnostic output OUT can be used for central indicating or control functions, e.g. in a PLC.

The diagnostic output is not a safety-relevant output!

Depending on the used variant, the following diagnostic signals are transmitted:

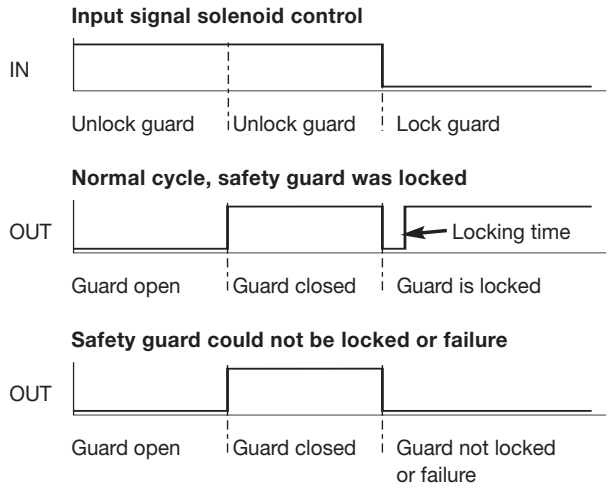
1P2P variant:
OUT Safety guard closed

1P2PW variant:
OUT Combined diagnostic signal:
safety guard closed **and**
solenoid interlock locked

The diagnostic tables for the AZM 200 can be found on page 42.

Diagram of the W-variant

Behaviour of the diagnostic output of the W-variant
(Example: power-to-unlock version)

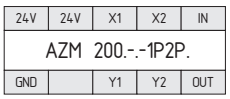


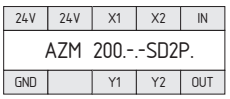
Connection

Wiring diagram for devices with integrated connector

Pin configuration	Wiring of the solenoid interlock ...-1P2P.	Wiring of the solenoid interlock ...-SD2P
Pin 1	24V Operating voltage	24V Operating voltage
Pin 2	X1 Safety input 1	X1 Safety input 1
Pin 3	GND Ground	GND Ground
Pin 4	Y1 Safety output 1	Y1 Safety output 1
Pin 5	OUT Diagnostic output	OUT SD output
Pin 6	X2 Safety input 2	X2 Safety input 2
Pin 7	Y2 Safety output 2	Y2 Safety output 2
Pin 8	IN Solenoid control	IN SD input
Pin 9	spare	spare

Ordering suffix **-SK** **-CC**





Integrated connector M23, (8+1)-pole (Ordering suffix -ST1)

M12, 8-pole (Ordering suffix -ST2)

Safety controller

The programme of suitable safety controllers can be found on page 49 ff.

The control category 4 to EN 954-1 and PL e to EN ISO 13849-1 achieved with these safety controllers depend on the safety controller as well as on the structure of the entire safety circuit.

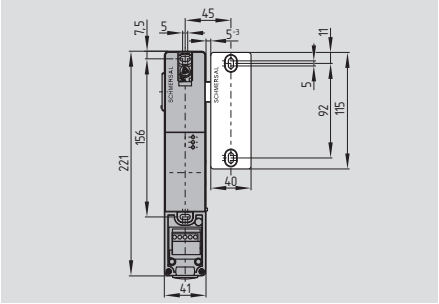
Note

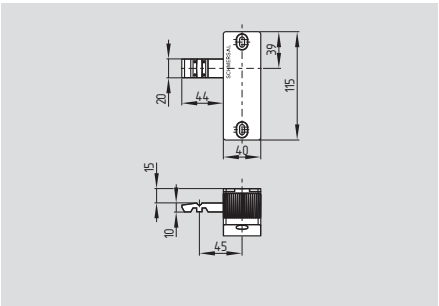
As long as the actuator unit is inserted in the solenoid interlock, the unlocked safety guard can be relocked. In this case, the safety outputs are re-enabled; **opening the safety guard is not required.**

Detailed information about the use of serial diagnostic can be found in the mounting and wiring instructions of the PROFIBUS-Gateway SD-I-DP-V0-2 and in the instructions for integration of the PROFIBUS-Gateway.

A detailed description of the PROFIBUS-Gateway SD-I-DP-V0-2 can be found on page 31 of this catalogue.

AZ/AZM 200-B1-...





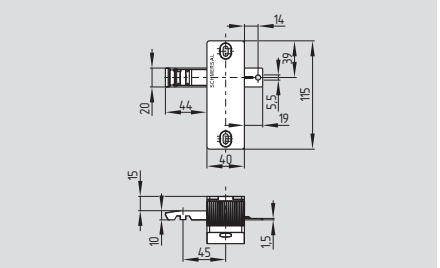
- **Actuator for sliding guards**
- Actuator with return spring
- Tolerates overtravel of up to max. 5 mm
- Available with or without emergency exit (P0)

Technical data

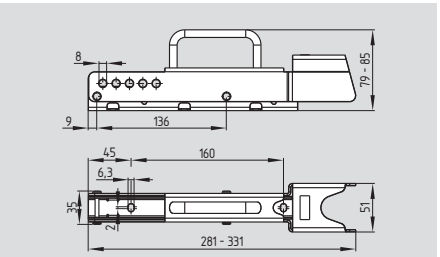
Material:

B1 enclosure:	Grivory
Actuator:	zinc die-cast
Mechanical life:	≥ 1 million operations
F_{max}:	2000 N

System components



Actuator B1 with emergency exit P0



Lockout tag SZ 200

Approvals

TÜV Approvals only in combination with switches AZ/AZM 200

Ordering details

AZ/AZM 200-B1-①T②

No.	Replace	Description
①	L	Actuating direction left
	R	Actuating direction right
②		Without emergency exit
	P0	With emergency exit

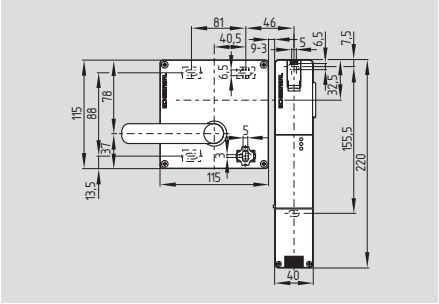
Note

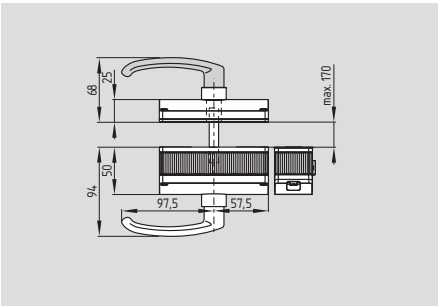
The safety switches/solenoid interlocks and the actuator unit must be ordered separately!

Ordering details

Actuator B1 with emergency exit	**AZ/AZM 200-B1-..-P0**
Lockout tag	**SZ 200**

AZ/AZM 200-B30-...





- **Actuator for hinged guards**
- One-hand emergency exit, even in de-energised condition
- Easy and intuitive operation
- NO risk of injury from protruding actuator
- No supplementary door handles required
- Does not protrude into the door opening
- Various handles available
- Can be fitted with or without emergency exit

Approvals

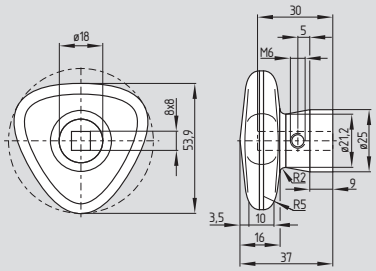
TÜV Approvals only in combination with switches AZ/AZM 200

Technical data

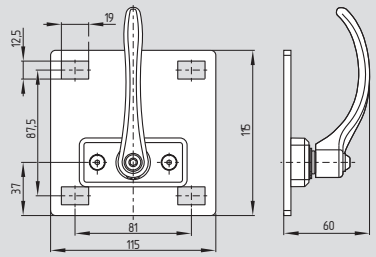
Material:

Actuator unit B30:	glass-fibre reinforced thermoplastic, self-extinguishing, fixing holes with metal washer
Emergency exit P1:	glass-fibre reinforced thermoplastic, self-extinguishing, fixing holes with metal washer
Door handle G1, G2:	anodised aluminium
Panic handle P1, P20, P25:	plastic coated aluminium
Actuator:	zinc die-cast
Mechanical life:	≥ 1 million operations
F_{max}:	2000 N

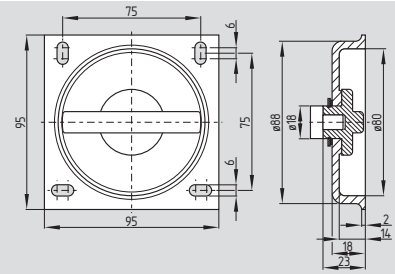
System components



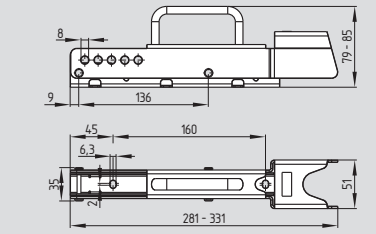
Rotary button



Emergency exit metal



Inset handle



Lockout tag SZ 200

Ordering details

AZ/AZM 200-B30-①TA②③

No.	Replace	Description
①	L	Door hinge on left-hand side
	R	on right-hand side
②	G1	With door handle
	G2	With rotary button
③	P1	With emergency exit
	P20	With emergency exit metal
	P25	With emergency exit with inset handle

Note

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

Ordering details

Actuator B30	
with rotary button	**AZ/AZM 200-B30-..-G2**
with emergency exit metal	**AZ/AZM 200-B30-..-P20**
with inset handle	**AZ/AZM 200-B30-..-P25**
Lockout tag	**SZ 200**

More Details

Detailed technical information at:
www.products.schmersal.com

Electronic magnetic interlock MZM 100

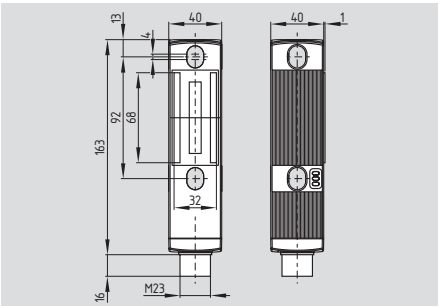
Overview of the features

Advantages
- Modern and ergonomic design
- Simple mounting, accurate adjustment through slotted holes
- Magnetic interlock (for the protection of man) with innovating and unique operating principle
- Patented
- Smoot surfaces provide for the simplicity of cleaning
- Low risk of injury
- Actuator free from play, i.e. neutralisation of undesired noises
- Automatic latching (30 N), no mechanical latching required
- Sensor technology permits an offset between actuator and interlock of ± 5 mm vertically and ± 3 mm horizontally
- Intelligent diagnostic signalling of failures
- Series-wiring (up to 31 components, without detriment to the control category
- 3 LED's to show the operating status (refer to table in appendix)

Classification
- Up to PL e to EN ISO 13849-1
- Control category 4 to EN 954-1 with door detection sensor T (without additional second switch)
- Up to SIL 3 applications to IEC 61508, PFH value: 4.3 x 10^{-9} / h

Electronic magnetic interlock MZM 100

MZM 100



- Modern and ergonomic design
- Simple mounting, accurate adjustment through slotted holes
- Magnetic interlock for the protection of man with innovating and unique operating principle
- Patented
- Power-to-lock principle
- Smooth surfaces provide for the simplicity of cleaning
- Low risk of injury
- Automatic latching (30 N), no mechanical latching required
- Sensor technology permits an offset between actuator and interlock of ± 5 mm vertically and ± 3 mm horizontally
- Intelligent diagnostic signalling of failures
- Series-wiring (max. 31 components), without detriment to the control category to EN 954-1
- 3 LED's to show the operating status (refer to table in appendix)

Approvals

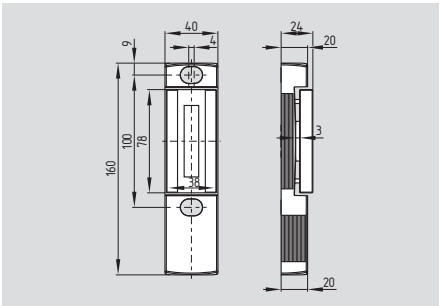
* Under preparation

Ordering details

MZM 100ST-①②-a Magnetic interlock

No.	Replace	Description
①		**Outputs:** (1st digit = number of diagnostic outputs, 2nd digit = number of safety outputs)
	1P2P	1 diagnostic output and 2 safety outputs, all p-type
	1P2PW	As for -1P2P, combined diagnostic signal: safety guard closed **and** magnetic interlock locked
	SD2P	Serial diagnostic output and 2 safety outputs, p-type
②		Without latching
	r	With latching

Actuator MZM 100-B1



- The magnetic interlocks and the actuator unit must be ordered separately!
- Actuator free from play, i.e. neutralisation of undesired noises

Approvals

Ordering details

MZM 100-B1 Actuator

Technical data

Standards:	EN 60947-5-1, EN ISO 13849-1, EN 954-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations (for guards ≤ 5 kg; actuating speed ≤ 0.5 m/s)
$F_{max.}$:	500 N
Holding force:	typically 30 N
Protection class:	IP 67
Protection class:	II, ⧈
Overvoltage category:	III
Degree of pollution:	3
Connection:	Connector M23
Series-wiring:	**max. 31 components**
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)
Ambient conditions:	
Ambient temperature:	– 25 °C … + 55 °C
Storage and transport temperature:	– 25 °C … + 85 °C
Relative humidity:	30% … 95%, non-condensing, no icing
Resistance to vibration:	10…55 Hz, amplitude 1mm
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 100 ms
Duration of risk:	< 100 ms
Time to readiness:	< 4 s
Electrical data:	
Rated operating voltage U_e:	24 VDC -15% / +10% (stabilised PELV)
Rated operating current I_e:	1 A
No-load current I_0:	max. 0.5 A
Rated impulse withstand voltage U_{imp}:	800 V
Rated insulation voltage U_i:	32 VDC
Fuse rating:	internally short-circuit proof
Device insulation:	to UL 508 ≤ 4 A; depending on the number of components and loads (Y1, Y2 and OUT)

Note

The magnetic interlocks and the actuator unit must be ordered separately!

Accessories for series-wiring with serial diagnostic see page 31 ff.

Suitable connecting cables with mould connector can be found on page 30.

LED functions

Green	Supply voltage on
Red	Failure
Yellow	Operating status

The diagnostic tables for the MZM 100 can be found on page 44.

Technical data

Safety inputs X1 and X2:
Voltage range – 3V … 5V: low
Voltage range 15V … 30V: high, typically 4 mA at 24 V
Safety outputs Y1 and Y2:
p-type, short-circuit proof
Rated operating voltage U_{e1}: 0 V to 4 V under U_e
Rated operating current I_{e1}: max. 0.25 A
Utilisation category: DC-13
Leakage current I_r: ≤ 0.5 mA
Diagnostic output OUT:
p-type, short-circuit proof
Rated operating voltage U_{e2}: 0 V to 4 V under U_e
Rated operating current I_{e2}: max. 0.05A
Utilisation category: DC-13
Wiring capacitance for -SD2P: max. 50 nF
Solenoid control IN:
Voltage range – 3V … 5V: low
Voltage range 15V … 30V: high, typically 10 mA at 24 V, dynamically 20 mA
Magnet: 100% ED
Classification: (approval under preparation)
To EN ISO 13849-1: up to PL e
To EN 954-1: up to control category 4 (with appropriate circuit)
To IEC/EN 61508: up to SIL 3
PFH value: 4.3 x 10^{-9} / h
Service life: 20 years

Connection

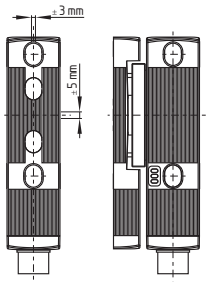
Wiring diagram for the device with integrated connector

Pin configuration	Wiring of the magnetic interlock with diagnostic output	Wiring of the magnetic interlock with serial diagnostic
Pin 1	A1 Ue	A1 Ue
Pin 2	X1 Safety input 1	X1 Safety input 1
Pin 3	A2 GND	A2 GND
Pin 4	Y1 Safety output 1	Y1 Safety output 1
Pin 5	OUT Diagnostic output	SD output
Pin 6	X2 Safety input 2	X2 Safety input 2
Pin 7	Y2 Safety output 2	Y2 Safety output 2
Pin 8	IN Solenoid control	SD input
Pin 9	spare	spare

Integrated connector M23, (8+1)-pole

Note

Misalignment



Safety controller

The programme of suitable safety controllers can be found on page 49 ff.

The control category 4 to EN 954-1 and PL e to EN ISO 13849-1 achieved with these safety controllers depend on the safety controller as well as on the structure of the entire safety circuit.

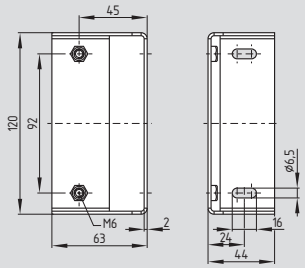
Note

Detailed information about the use of serial diagnostic can be found in the mounting and wiring instructions of the PROFIBUS-Gateway SD-I-DP-V0-2 and in the instructions for integration of the PROFIBUS-Gateway.

A detailed description of the PROFIBUS-Gateway SD-I-DP-V0-2 can be found on page 31 of this catalogue.

Accessories MZM 100

System components



Mounting kit MS MZM 100-W

System components

Connecting cable with connector

Ordering details

Mounting kit (screws included in delivery)	**MS MZM 100-W**

Ordering details

Connecting cable with mould connector (female), M23, (8+1)-pole,	
with soldering terminals	art. n° 1187590
with crimp connection	art. n° 1190956
with 5 m LIYY 8x0.75 mm^2	art. n° 1189931
with 10 m LIYY 8x0.75 mm^2	art. n° 1189978
M12x1, 8-pole,	
2.5 m long, 8x0.23 mm^2	art. n° 1193608
5.0 m long, 8x0.23 mm^2	art. n° 1193609
10 m long, 8x0.23 mm^2	art. n° 1193610

SD-Gateway for PROFIBUS SD-I-DP-V0-2

For the conversion of serial diagnostic signals to the PROFIBUS DP Protocol

Overview of the features

Advantages of the serial diagnostic
- Diagnostic cables of max. 31 safety components can be wired in series
- Series-wiring of different components possible (CSS 34, AZ 200, AZM 200 and MZM 100)
- The diagnostic cable is suitable for series-wiring or daisy-chaining, thus reducing the cabling costs
- Bidirectional communication, i.e. reading of the operational data and unlocking of a solenoid interlock in the chain

Advantages of the integration into the PROFIBUS system
- Default PROFIBUS configuration
- PROFIBUS DP slave
- GSD file for system configuration

Advantages for the communication set-up
- Automatic addressing of the safety components through the serial input
- Automatic and continuous transmission of the operating data of each participating in the diagnostic chain

Advantages of the diagnostic in the PLC
- Mapping of the operating 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 failure/malfunction
- Increased availability: pre-signalling of failures during machine operation, e.g. sagging of the safety guard

SD-Gateway for PROFIBUS SD-I-DP-V0-2

SD-I-DP-V0-2

- PROFIBUS-Gateway SD-I-DP-V0-2 for converting serial diagnostic signals to the PROFIBUS DP protocol
- PROFIBUS-Gateway SD-I-DP-V0-2 is a slave in the PROFIBUS system
- Protection class IP 10 device for control cabinet mounting, for standard DIN rails

Technical data

PROFIBUS interface:		9-pole D-SUB connector Default PROFIBUS connection (DP-A, DP-B, 5V, GND)
Protocol:		PROFIBUS-DP –V0 upwards compatible
Transmission rate:		9.6 kilo baud … 12 mega baud
GSD file:		KAS_0b13.GSD
Short-circuiting device:		internal fuse to EN 60127 PolySwitch 0.5 A / 60 V
LED indications:		refer to table below
DIP-switch 8-pole:		S1 … S7: addressing as PROFIBUS slave S8: automatic addressing of the serial participants
Rated operating voltage U_e:		24 VDC, –15 % / +20 %
Rated operating current I_e:		typically 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
Relative 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:		to EN 61000-6-2 (2002)
to EN 61000-4-2 (ESD):		4 kV / 8 kV
to EN 61000-4-3:		10 V/m / 80% AM
to EN 61000-4-4 (burst):		2 kV DC supply / 1 kV PROFIBUS & SD-Interface
to EN 61000-4-5 (surge):		500 V DC supply / 1 kV PROFIBUS & SD-Interface
to EN 61000-4-6:		10 V / 80 % AM
EMC interfering radiation:		to EN 61000-6-4 (2002)
Industrial interfering radiation:		37 dBÌV/m
Electrical connection:	SD	connection for max. 31 devices in the serial diagnostic
	24 V	+ 24 VDC voltage supply
	0 V	GND of the voltage supplyand GND of the diagnostic cable
		24 VDC supply, approx. 300 mA, PELV power supply

Approvals

CE

Ordering details

SD-I-DP-V0-2	SD Gateway for PROFIBUS

LED signals

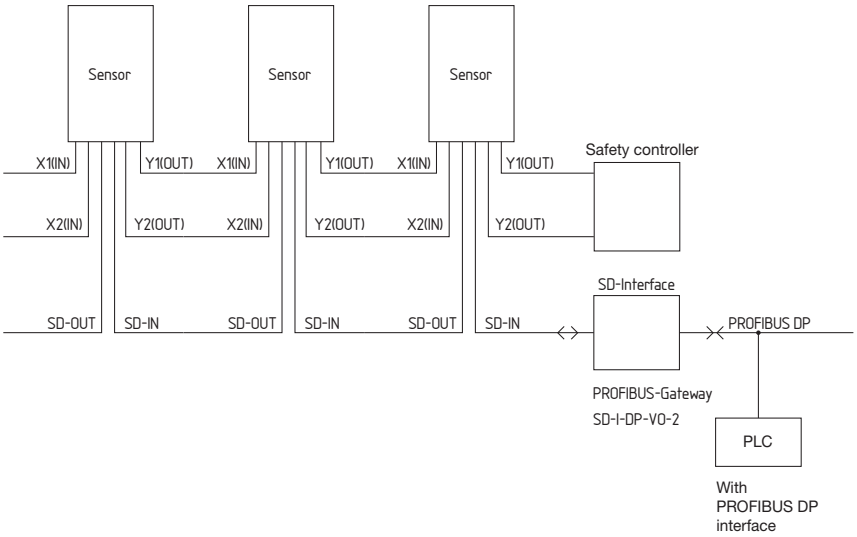
“PB“	Continuous red	Profibus error
	Flashing signal	Profibus initialisation
“SD“	Continuous red	SD Gateway error
	Flashing signal	SD Gateway initialisation
“T”	Continuous yellow	SD initialisation error or ‘teach’ switch active
	Flashing signal	Initialisation error SD participant addresses, teaching required
“ON“	Continuous green	Supply voltage on

SD-Gateway for PROFIBUS SD-I-DP-V0-2

Note

- Serial diagnostic of series-wired safety sensors/solenoid interlocks
- Components with serial diagnostic option:
  AZ 200
  AZM 200
  CSS 34
  MZM 100

Wiring example



Note

Accessories for series-wiring with serial diagnostic see page 35 ff.

Note

Detailed functions, refer to the programming and configuration manual of the SD Gateway

Up to Date

Up-to-date product information and innovations at:
www.schmersal.com

Accessories for series-wiring with serial diagnostic

Overview of the features

Wiring tools enabling a fast and smooth series-wiring of electronic sensors and solenoid interlocks of the CSS, AZ/AZM 200 and MZM family

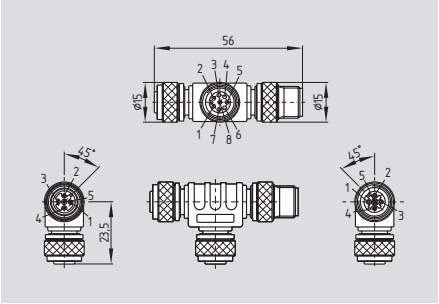
- T-adapter CSS-T
  CSS 34 sensors with serial diagnostic can be daisy-chained by means of T-adapters and conventional cables with 5/8-pole connectors and sockets.
  The number of participants is limited by the 2 A-fuse.

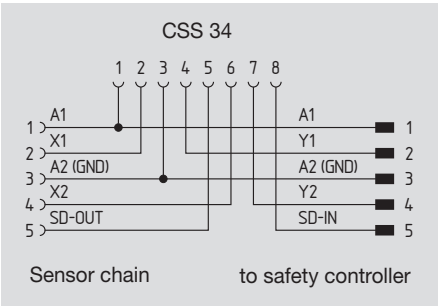
- SD junction box
  To be used preferably for the series-wiring of MZM and AZM components with high power demand
  IP 65 enclosure or open IP 00 design for control cabinet mounting

The SD junction box and the T-adapter are suitable for the series-wiring of components with serial diagnostic. When components with conventional diagnostic output are daisy-chained, only the safety channels are wired in series.

Accessories for series-wiring with serial diagnostic

T-adapter CSS-T





- Enables the series-wiring of CSS 34 sensors. To this end, both the safety channels and the serial diagnostic cable are wired in series.

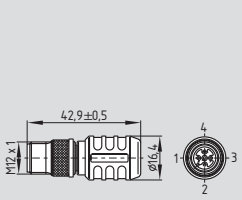
Approvals

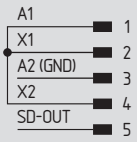
CE

Ordering details

CSS-T	T-adapter

Terminal connector CSS-T-A





- Supplies the safety channels with operating voltage

Approvals

CE

Ordering details

CSS-T-A	Terminal connector

Technical data

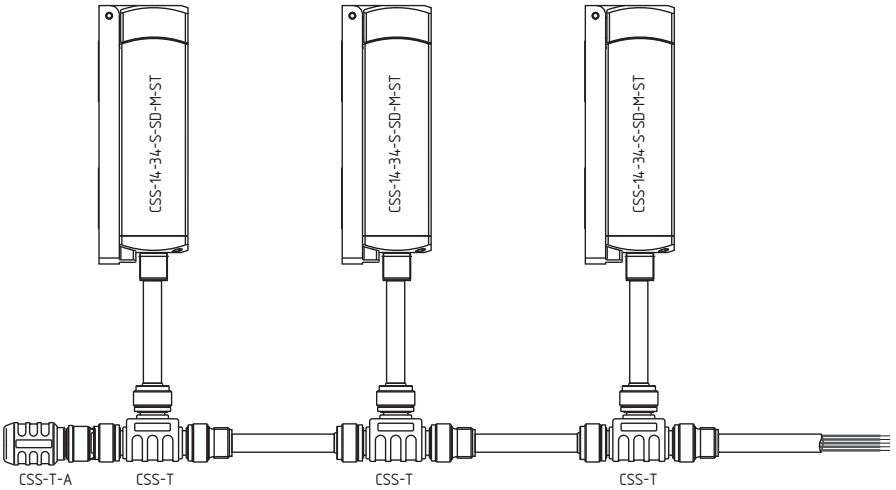
Rated operating voltage of the CSS 34 sensors to be connected:	24 V (–15%/+10%)
Rated operating current of the CSS 34 sensors to be connected:	0.6 A
Fuse of the connecting cables (circuit breaker):	2 A
Ambient temperature T_u:	– 25 °C … + 70 °C

CSS-T and CSS-T-A

With the **CSS-T T-adapter**, CSS 34 sensors can be daisy-chained. To this end, both the safety channels and the serial diagnostic cables are wired in series.
Sensors with conventional diagnostic output can also be wired in series, though in this configuration, the diagnostic outputs are not evaluated.

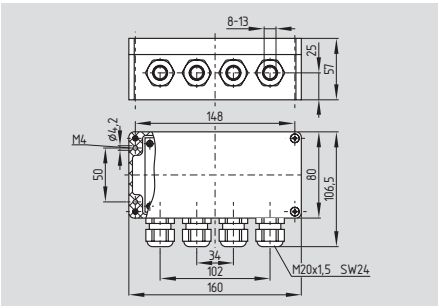
The **CSS-T-A connector** supplies the safety channels with operating voltage.
For the wiring, M12x1 cable extensions can be used. The voltage drop (due to the cable length, cable section, voltage drop per sensor) should be taken into account, as it reduces the maximum number of CSS 34 sensors that can be wired in series.

Wiring example



Accessories for series-wiring with serial diagnostic

SD-2V-F-SK



- For field applications, junction box for 2 components, with screw terminals
- The terminals of the junction box are located in a closed enclosure

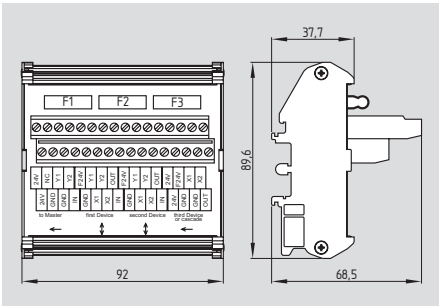
Approvals

CE

Ordering details

SD-2V-F-SK	SD junction box for field applications

SD-2V-S-SK



- For control cabinet mounting, junction box for 2 components, with screw terminals
- Enables wiring in the control cabinet onto standard DIN rails

Approvals

CE

Ordering details

SD-2V-S-SK	SD junction box for control cabinet mounting

Technical data

Standards:	VDE 0100
Enclosure:	thermoplastic, self-extinguishing
Protection class:	SD-2V-F-SK: IP 65 SD-2V-S-SK: IP 00 to IEC/EN 60529
Insulation protection class:	SD-2V-F-SK: II, ⧈ SD-2V-S-SK: II
Overvoltage category:	III
Degree of pollution:	SD-2V-F-SK: 3 SD-2V-S-SK: 2
Connection:	screw terminals
Cable section:	min. 0.25 mm^2 max. 2.50 mm^2 (incl. conductor ferrules)
Cable entry:	SD-2V-F-SK: 4 x M20x1.5, for cladding diameter 8… 13 mm
Number of connections:	to each SD junction box, 2 (optionally 3) components can be connected
Fuse rating:	3 internal fine fuses, 2 A slow blow, 5 x 20

Ambient conditions:

Ambient temperature:	– 25 °C … + 70 °C
Storage and transport temperature:	– 25 °C … + 85 °C
Relative air humidity:	30% … 95%, non-condensing

Electrical data:

Rated operating voltage U_e:	24 VDC -15% / +10% (stabilised PELV)
Rated operating current I_e:	16 A
Rated impulse withstand voltage U_{imp}:	800 V
Rated insulation voltage U_i:	32 VDC
Fuse rating:	16 A

Diagnostic tables of the electronic safety switches, solenoid interlocks and safety sensors

Diagnostic of AZ 200 safety switch with diagnostic output

Diagnostic outputs
The **AZ 200 .-.1P2P** safety switch has one diagnostic output: OUT
OUT Safety guard closed, actuator inserted and no failure detected

The **AZ 200 .-.3P2P** safety switch has three diagnostic outputs: OUT, OUT2, OUT3
OUT Safety guard closed, actuator inserted
OUT2 Failure warning
OUT3 Safety guard detected

The diagnostic outputs are protected against short-circuits by means of a common current-limiting circuit.
Therefore: $I_{OUT} + I_{OUT2} + I_{OUT3} \leq I_{e2}$

Failure
Failures, which no longer guarantee the proper functioning of the AZ 200 safety switch (internal failures), will result in an immediate deactivation of the safety outputs.
Failures, which do not immediately affect the safety function of the AZ 200 safety switch (cross-wire, temperature error, short-circuit + 24 VDC at safety output), will result in a delayed switch-off (see table).

After elimination of the failure, the failure message is reset by opening and closing the relevant safety guard.
The safety outputs are enabled and allow a restart of the machine.

Failure warning
A failure has occurred, which will disable the safety outputs after 30 minutes. The safety outputs initially remain enabled in order to enable a controlled shutdown of the process and set the machine safely to a hold position.
A failure warning is reset when the failure cause is eliminated.

Flash codes (red)	Meaning	Autonomous switch-off after	Cause
1 flash pulse	Failure (warning) output Y1	30 min	Error in output test or voltage at output Y1 although the output is switched off
2 flash pulses	Failure (warning) output Y2	30 min	Error in output test or voltage at output Y2 although the output is switched off
3 flash pulses	Failure (warning) cross-wire	30 min	Cross-wire between the output cables or error at both outputs
4 flash pulses	Failure (warning) ambient temperature too high	30 min	Temperature measurement indicates too high an inner temperature
5 flash pulses	Error target	0 min	The coding (frequency) of the detected actuator does not match the required value, incorrect or defective actuator
6 flash pulses	Error target combination	0 min	An invalid combination of targets was detected at the 4 coils of the AZ 200 safety switch. (Current setting: latching bolt detected & door target not detected =>latch breakage or tampering attempt)
Continuous red	Internal failure	0 min	–

The diagnostic function of the AZ 200 safety switch
The operating condition of the safety switch as well as possible failures and faults are signalled by means of three-colour LED's, installed to the front of the device.

System condition	LED			Safety outputs	Diagnostic outputs			
	Green	Red	Yellow	Y1, Y2	-1P2P OUT	-3P2P OUT	OUT2	OUT3
Safety guard open	On	Off	Off	0 V	0 V	0 V	0 V	0 V
Safety guard closed, actuator not inserted	On	Off	Off	0 V	0 V	0 V	0 V	0 V
Safety guard closed, actuator inserted	On	Off	On	24 V (when X1 = X2 = 24 V)	24 V	24 V	0 V	0 V
Failure warning[1], actuator inserted, switch-off approaching	On	Flashes[2]	On	24 V (when X1 = X2 = 24 V)	0 V	24 V	24 V	0 V
Failure	On	Flashes	Off	0 V	0 V	24V/0V	24 V	0 V

[1] after 30 min -> 0 V
[2] refer to flash codes

Diagnostic of the AZ 200 safety switch with serial diagnostic cable

Safety switch with serial diagnostic cable
Safety switches with serial diagnostic cable have a serial input and output cable instead of the conventional diagnostic output. If safety switches are daisy-chained (i.e. wired in series), the diagnostic input an output data are transmitted through this series-wiring.

Up to 31 safety switches can be wired in series. For the evaluation of the serial diagnostic cable, the PROFIBUS-Gateway SD-I-DP-V0-2 is used. This serial diagnostic interface is integrated as slave in an available PROFIBUS DP network, thus allowing for an evaluation of the diagnostic signals by means of a PLC.

The operational information of the response data and the diagnostic data is automatically and permanently written in an input byte of the PLC for each safety switch in the series-wired chain. The request data for each safety switch are transmitted to the component through an output byte of the PLC.

In case of a communication error between the PROFIBUS-Gateway and the safety switch, the switching condition of the safety outputs of the safety switch is maintained.

Failure
A failure has occurred, which resulted in the immediate deactivation of the safety outputs. The failure is reset when the failure cause is eliminated and bit 7 of the request byte changes from 1 to 0 or when the safety guard is opened.
Failures at the safety outputs will only be deleted upon the next release, as the neutralisation of the failure cannot be detected earlier.

Failure warning
A failure has occurred, which will disable the safety outputs after 30 minutes. The safety outputs initially remain enabled in order to enable a controlled shutdown of the process and set the machine safely to a hold position. A failure warning is reset when the failure cause is eliminated.

Bit n°	Request byte	Response byte	Diagnostic failure warning	Diagnostic failure
Bit 0:	---	Safety output enabled	Error output Y1	Error output Y1
Bit 1:	---	Actuator detected	Error output Y2	Error output Y2
Bit 2:	---	---	Cross-wire	Cross-wire
Bit 3:	---	---	Ambient temperature too high	Ambient temperature too high
Bit 4:	---	Input condition X1 and X2	---	Target error, coding error or false target combination
Bit 5:	---	Safety guard detected	Internal failure	Internal failure
Bit 6:	---	Failure warning[1)]	Communication error between PROFIBUS-Gateway and safety switch	---
Bit 7:	Failure reset	Failure (enabling path switched off)	Operating voltage too low	---

The described condition is obtained, when bit = 1

[1)] after 30 min -> failure

Diagnostic of the AZM 200 solenoid interlock with diagnostic output

Operating principle of the diagnostic output
The short-circuit proof diagnostic output OUT can be used for central indicating or control functions, for instance in a PLC.
The diagnostic output is not a safety-relevant output!

Depending on the component variant, the following diagnostic signals are transmitted:
1P2P-Variant:
OUT Safety guard closed
1P2PW-Variant:
OUT Combined diagnostic signal:
safety guard closed **and** solenoid interlock locked

Failure
Failures, which no longer guarantee the proper functioning of the AZM 200 solenoid interlock (internal failures), will result in a deactivation of the safety outputs.
Failures, which do not immediately affect the safety function of the AZM 200 solenoid interlock (cross-wire, temperature error, short-circuit + 24 VDC at safety output), will result in a delayed switch-off (see table). After elimination of the failure, the failure message is reset by opening and closing the relevant safety guard. The safety outputs are enabled and allow a restart of the machine. A locking chain must be permanently locked to enable the restart.

Failure warning
A failure has occurred, which will disable the safety outputs after 30 minutes. The safety outputs initially remain enabled in order to enable a controlled shutdown of the process and set the machine safely to a hold position. A failure warning is reset in the slave when the failure cause is eliminated.

Flash codes (red)	Meaning	Autonomous switch-off after	Cause
1 flash pulse	Failure (warning) output Y1	30 min	Error in output test or voltage at output Y1 although the output is switched off
2 flash pulses	Failure (warning) output Y2	30 min	Error in output test or voltage at output Y2 although the output is switched off
3 flash pulses	Failure (warning) cross-wire	30 min	Cross-wire between the output cables or error at both outputs
4 flash pulses	Failure (warning) ambient temperature too high	30 min	Temperature measurement indicates too high an inner temperature
5 flash pulses	Error target	0 min	The coding (frequency) of the detected actuator does not match the required value, incorrect or defective actuator
6 flash pulses	Error target combination	0 min	An invalid combination of targets was detected at the 4 coils of the AZM 200 solenoid interlock. (Current setting: latching bolt detected & door target not detected =>latch breakage or tampering attempt)
Continuous red	Internal failure	0 min	–

The diagnostic function of the AZM 200 solenoid interlock
The operating condition of the solenoid interlock as well as possible failures and faults are signalled by means of three-colour LED's, installed to the front of the device.

System condition	Solenoid control IN		LED			Safety outputs Y1, Y2		Diagnostic outputs OUT	
	Power-to-unlock	Power-to-lock	Green	Red	Yellow	AZM 200...	AZM 200 B...	-1P2P	-1P2PW
Safety guard open	24 V (0 V)	0 V (24 V)	On	Off	Off	0 V	0 V	0 V	0 V
Safety guard closed, **actuator not inserted**	24 V	0 V	On	Off	Off	0 V	0 V	0 V	0 V
Safety guard closed, actuator inserted, **not locked**	24 V	0 V	On	Off	Flashes	0 V	24 V	24 V	24 V
Safety guard closed, actuator inserted, **locking impossible**	0 V	24 V	On	Off	Flashes	0 V	24 V	24 V	0 V
Safety guard closed, actuator inserted and locked	0 V	24 V	On	Off	On	24 V	24 V	24 V	24 V
Failure warning[1], Solenoid interlock locked	0 V	24 V	On	Flashes[2]	On	24 V [1]	24 V [1]	0 V	0 V
Failure	0 V (24 V)	24 V (0 V)	On	Flashes[2]	Off	0 V	0 V	0 V	0 V

[1] after 30 min -> failure
[2] refer to flash codes

Diagnostic of the AZM 200 solenoid interlock with serial diagnostic cable

Solenoid interlock with serial diagnostic cable
Solenoid interlocks with serial diagnostic cable have a serial input and output cable instead of the conventional diagnostic output. If solenoid interlocks are daisy-chained, the diagnostic input an output data are transmitted through this series-wiring.

Up to 31 solenoid interlocks can be wired in series. For the evaluation of the serial diagnostic cable, the PROFIBUS-Gateway SD-I-DP-V0-2 is used. This serial diagnostic interface is integrated as slave in an available PROFIBUS DP network, thus allowing for an evaluation of the diagnostic signals by means of a PLC.

The operational information of the response and diagnostic data is automatically and permanently written in an input byte of the PLC for each solenoid interlock in the series-wired chain. The request data for each solenoid interlock are transmitted to the component through an output byte of the PLC.

In case of a communication error between the PROFIBUS-Gateway and the solenoid interlock, the switching condition of the solenoid interlock is maintained.

Failure
A failure has occurred, which resulted in the immediate deactivation of the safety outputs. The failure is reset when the failure cause is eliminated and bit 7 of the request byte changes from 1 to 0 or when the safety guard is opened.
Failures at the safety outputs will only be deleted upon the next release, as the neutralisation of the failure cannot be detected earlier.

Failure warning
A failure has occurred, which will disable the safety outputs after 30 minutes. The safety outputs initially remain enabled in order to enable a controlled shutdown of the process and set the machine safely to a hold position. A failure warning is reset when the failure cause is eliminated.

Bit n°	Request byte	Response byte	Diagnostic failure warning	Diagnostic failure
Bit 0:	Magnet in, independent of power-to-lock or power-to-unlock principle	Safety output enabled	Error output Y1	Error output Y1
Bit 1:	---	Actuator detected	Error output Y2	Error output Y2
Bit 2:	---	Actuator detected and locked	Cross-wire	Cross-wire
Bit 3:	---	---	Ambient temperature too high	Ambient temperature too high
Bit 4:	---	Input condition X1 and X2	---	Target error, coding error or false target combination
Bit 5:	---	Safety guard detected	Internal failure	Internal failure
Bit 6:	---	Failure warning[1)]	Communication error between PROFIBUS-Gateway and solenoid interlock	---
Bit 7:	Failure reset	Failure (enabling path switched off)	Operating voltage too low	---

The described condition is obtained, when bit = 1

[1)] after 30 min -> failure

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

System condition	LED's			Safety outputs	Response byte Bit n°							
	Green	Red	yellow	Y1, Y2	7	6	5	4	3	2	1	0
Supply voltage on, safety guard open	On	Off	Off	0 V	0	0	0	X	0	0	0	0
Safety guard closed, actuator present	On	Off	Flashes	0 V	0	0	0	X	0	0	1	0
Safety guard closed and locked	On	Off	On	24 V	0	0	0	1	0	1	1	1
Failure warning[1)], safety guard locked	On	Flashes	On	24 V	0	1	0	1	0	1	1	1
Failure	On	Flashes	Off	0V	1	0	0	X	0	X	X	0

[1)] after 30 min -> failure

Diagnostic of the MZM 100 magnetic interlock with diagnostic output

Operating principle of the diagnostic output
The short-circuit proof diagnostic output OUT can be used for central indicating or control functions, for instance in a PLC.
The diagnostic output is not a safety-relevant output!

Depending on the component variant, the following diagnostic signals are transmitted:
1P2P-Variant:
OUT Safety guard closed
1P2PW-Variant:
OUT Combined diagnostic signal:
safety guard closed **and**
magnetic interlock locked

Failure
Failures, which no longer guarantee the proper functioning of the MZM 100 magnetic interlock (internal failures), will result in the deactivation of the safety outputs for as long as the risk persists.
Failures, which do not immediately affect the safety function of the MZM 100 magnetic interlock (cross-wire, temperature error, short-circuit + 24 VDC at safety output), will result in a delayed switch-off (see table).

After elimination of the failure, the failure message is reset by opening and closing the relevant safety guard.
When the safety guard is relocked, the safety outputs are enabled.

Flash codes (red)	Meaning	Autonomous switch-off after	Cause
1 flash pulse	Failure (warning) output Y1	30 min	Error in output test or voltage at output Y1 although the output is switched off
2 flash pulses	Failure (warning) output Y2	30 min	Error in output test or voltage at output Y2 although the output is switched off
3 flash pulses	Failure (warning) cross-wire	30 min	Cross-wire between the output cables or error at both outputs. After 30 min., voltage must be switched on/off
5 flash pulses	Actuator (target) error	0 min	The coding of the detected target does not match the required value
6 flash pulses	Holding force error	0 min	The required holding force is not obtained (misalignment/ soiling). The holding force is < 500 N
10 flash pulses	Magnet temperature too high	0 min	The magnet is too hot: T > 70°C
Continuous red	Internal failure	0 min	–

The diagnostic function of the MZM 100 magnetic interlock
The operating condition of the magnetic interlock as well as possible failures and faults are signalled by means of three-colour LED's, installed to the front of the device.

System condition	Magnet control IN	LED's			Safety outputs Y1, Y2	Diagnostic output OUT	
		green	red	yellow		-1P2P	-1P2PW
Guard open	0 V	on	off	off	0 V	0 V	0 V
Guard closed, actuator in	0 V	on	off	flashes	0 V	24 V [3]	24 V
Guard closed, holding force too low	24 V	on	off	flashes	0 V	24 V [3]	0 V
Guard closed and locked	24 V	on	off	on	24 V	24 V	24 V
Error warning, door locked	24 V	on	flashes [2]	on	24 V [1]	0 V	0 V
Error	0V/24V	on	flashes [2]	off	0V	0V	0 V
Unauthorized violent separation of magnetic interlock and actuator	0V/24V	on	flashes	flashes	0V	0V	0 V

[1] after 30 min -> error
[2] refer to flash codes
[3] version -1P2PV: 0 V

Diagnostic of the MZM 100 magnetic interlock with serial diagnostic cable

Magnetic interlock with serial diagnostic cable
Magnetic interlocks with serial diagnostic cable have a serial input and output cable instead of the conventional diagnostic output. If magnetic interlocks are daisy-chained, the diagnostic input an output data are transmitted through this series-wiring.

Up to 31 magnetic interlocks can be wired in series. For the evaluation of the serial diagnostic cable, the PROFIBUS-Gateway SD-I-DP-V0-2 is used. This serial diagnostic interface is integrated as slave in an available PROFIBUS DP network, thus allowing for an evaluation of the diagnostic signals by means of a PLC.

The operational information of the request and response bytes is automatically and permanently written in an input byte of the PLC for each magnetic interlock in the series-wired chain. The request data for each magnetic interlock are transmitted to the component through an output byte of the PLC.

In case of a communication error between the PROFIBUS-Gateway and the magnetic interlock, the switching condition of the magnetic interlock is maintained.

Failure
A failure has occurred, which resulted in the immediate deactivation of the safety outputs. The failure is reset when the failure cause is eliminated and bit 7 of the request byte changes from 1 to 0 or when the safety guard is opened.
Failures at the safety outputs will only be deleted upon the next release, as the neutralisation of the failure cannot be detected earlier.

Failure warning
A failure has occurred, which will disable the safety outputs after 30 minutes. The safety outputs initially remain enabled in order to enable a controlled shutdown of the process and set the machine safely to a hold position. A failure warning is reset when the failure cause is eliminated.

Bit n°	Request byte	Response byte	Diagnostic failure warning	Diagnostic failure
Bit 0:	Magnet in, failure reset	Safety output enabled	Error output Y1	Error output Y1
Bit 1:	---	Actuator detected	Error output Y2	Error output Y2
Bit 2:	---	Magnet activated	Cross-wire	Cross-wire
Bit 3:	---	---	Magnet temperature too high	Magnet temperature too high
Bit 4:	---	Input condition X1 and X2	---	Actuator error, coding error
Bit 5:	---	---	Internal failure	Internal failure
Bit 6:	---	Failure warning[1)]	Communication error between PROFIBUS-Gateway and magnetic interlock	Unauthorised violent separation of magnetic interlock and actuator
Bit 7:	Failure reset	Failure (enabling path switched off)	Operating voltage too low	---

The described condition is obtained, when bit = 1

[1)] after 30 min -> failure

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

System condition	LED's			Safety outputs	Response byte Bit n°							
	Green	Red	yellow	Y1, Y2	7	6	5	4	3	2	1	0
Supply voltage on, safety guard open	On	Off	Off	0 V	0	0	0	X	0	0	0	0
Safety guard closed, actuator present	On	Off	Flashes	0 V	0	0	0	X	0	0	1	0
Safety guard closed and locked	On	Off	On	24 V	0	0	0	1	0	1	1	1
Failure warning[1)], safety guard locked	On	Flashes	On	24 V	0	1	0	1	0	1	1	1
Failure	On	Flashes	Off	0V	1	0	0	X	0	X	X	0

[1)] after 30 min -> failure

Diagnostic of the CSS 34 safety sensor with conventional diagnostic output

The opening of a safety guard will immediately disable the safety outputs of the CSS 34 sensor.

A cross-wire or any failure that does not immediately affect the safety function of the safety sensor, will lead to a delayed shutdown. In this case, the safety outputs are disabled after 30 minutes if the fault is not eliminated. The diagnostic output however is immediately disabled.

The signal combination, diagnostic output disabled and safety outputs still enabled, can be used in the downstream control to stop the production process in a controlled manner and set the machine safely to a hold position.

LED (red)	Flash codes	Cause
1 flash pulse		Error output Y1
2 flash pulses		Error output Y2
3 flash pulses		Cross-wire Y1/Y2
4 flash pulses		Ambient temperature too high
5 flash pulses		Incorrect or defective actuator
Continuous red		Internal failure

Example of the diagnostic function of the CSS 34 or CSS 34F. safety sensor with conventional diagnostic output

Sensor condition	LED's Green	Red	Yellow	Diagnostic output	Safety outputs	Note
I. Supply voltage	On	Off	Off	0V	0 V	Supply voltage on, no evaluation of the voltage quality
II. Actuated	On	Off	On	24 V	24 V	The yellow LED always signals the presence of an actuator within range.
III. Actuated in limit area	On	off	Flashes (1Hz)	24 V pulsed	24 V	The sensor must be readjusted before the actuator gets outside of the maximum switching range and the safety outputs are disabled, thus stopping the machine.
IV. Actuated and feedback circuit open *	On	Off	Flashes (5Hz)	24 V	0 V	The sensor waits for a signal from the feedback circuit: F0 – Close feedback circuit F1 – Trailing edge on feedback circuit
V. Actuated in limit area and feedback circuit open *	On	Off	Flashes alternatively (1Hz/5Hz)	24 V pulsed	0 V	The LED indication combines the sensor functions III and IV
VI. Failure warning, sensor actuated	On	Flashes	On	0 V	24V	After 30 min. if the fault is not eliminated
VII. Failure	On	Flashes	On	0 V	0 V	–

* only for CSS 34F0/F1 with feedback circuit

Diagnostic of the CSS 34 safety sensor with serial diagnostic cable

Sensors with serial diagnostic cable have a serial input and output cable instead of the conventional diagnostic output.
If CSS sensors are daisy-chained, the safety outputs as well as the inputs and outputs of the diagnostic channels are wired in series.

Max. 31 CSS 34 sensors can be wired in series. For the evaluation of the serial diagnostic cable, the serial Diagnostic Gateway for PROFIBUS DP SD-I-DP-V0-2 is used. This serial diagnostic interface is integrated as slave in an available PROFIBUS DP network, thus allowing for an evaluation of the diagnostic signals by means of a PLC.

The operational information of the response and diagnostic data is automatically and permanently written in an input byte of the PLC for each safety sensor in the series-wired chain. The request data for each safety sensor are transmitted to the component through an output byte of the PLC.

In case of a communication error between the PROFIBUS-Gateway and the safety sensor, the switching condition of the safety outputs of the safety sensor is maintained.

Failure
A failure has occurred, which resulted in the immediate deactivation of the safety outputs. The failure is reset when the failure cause is eliminated and bit 7 of the request byte changes from 1 to 0 or when the safety guard is opened.
Failures at the safety outputs will only be deleted upon the next release, as the neutralisation of the failure cannot be detected earlier.

Failure warning
A failure has occurred, which will disable the safety outputs after 30 minutes. The safety outputs initially remain enabled in order to enable a controlled shutdown of the process and set the machine safely to a hold position. A failure warning is reset when the failure cause is eliminated.

Functional example of the status signals, warnings or failure messages
Communication directions: Request byte: from the PLC to the local CSS
Response byte: from the local CSS to the PLC
Warning/failure byte: from the local CSS to the PLC

Bit n°	Request byte	Response byte	Warning or failure byte Failure warnings	Failure messages
Bit 0:	Failure reset	Safety output enabled	Error output Y1	Error output Y1
Bit 1:	---	Actuator detected	Error output Y2	Error output Y2
Bit 2:	---	---	Cross-wire	Cross-wire
Bit 3:	---	---	Ambient temperature too high	Ambient temperature too high
Bit 4:	---	Input condition X1 and X2	---	Actuator fault, coding fault
Bit 5:	---	Actuated in limit area	Internal failure	Internal failure
Bit 6:	---	Failure warning[1)]	Communication error between PROFIBUS-Gateway and the safety sensor	---
Bit 7:	Failure reset	Failure (enabling path switched off)	Operating voltage too low	---

The described condition is obtained, when bit = 1

[1)] after 30 min -> failure

Function of the diagnostic LED's, the serial status signals and the safety outputs
Flash code as in previous version

System condition	LED's			Safety outputs	Status signals serial diagnostic byte Bit n°							
	Green	Red	Yellow	Y1, Y2	7	6	5	4	3	2	1	0
Supply voltage on, not actuated	On	Off	Off	0 V	0	0	0	0	0	0	0	0
Actuated, safety outputs released	On	Off	On	24 V	0	0	0	1	0	0	1	1
Actuated in limit area	On	Off	Flashes 1 Hz	24 V	0	0	1	1	0	0	1	1
Actuated, warning	On	On/ flashes	On	24 V	0	1	0	1	0	0	1	1
Actuated, fault	On	On/ flashes	On	0 V	1	1	0	1	0	1	1	0

The shown bit sequence of the diagnostic byte is an example. A different combination of the operating conditions will lead to a change of the bit sequence.

Diagnostic of the CSS 180 safety sensor

The diagnostic function of the CSS 180 safety sensor
The operating condition of the sensor as well as possible faults are signalled by means of three-color LED's in the transparent end cap of the sensor.

The diagnostic output signals failures or faults before the safety outputs are disabled and enables a controlled shutdown in case of emergency.

The opening of a safety guard will immediately disable the safety outputs of the CSS 180 sensor.

A cross-wire or a failure that does not immediately affect the safety function of the safety sensor, will lead to a delayed shutdown. In this case, the safety outputs are disabled after 1 minute if the failure is not eliminated.
The diagnostic output however is immediately disabled.

This signal combination, diagnostic output disabled and safety outputs still enabled, can be used in a downstream control to stop the production process in a controlled manner and set the machine safely to a hold position.

LED (red)	Flash codes	Cause
1 flash pulse		Error output Y1
2 flash pulses		Error output Y2
3 flash pulses		Cross-wire, error safety outputs 1 and 2
4 flash pulses		Ambient temperature too high
5 flash pulses		Incorrect or defective actuator

Examples of the diagnostic function of the CSS 180 sensor

Sensor condition	LED's	Diagnostic output	Safety outputs	Note
I. Supply voltage on	Green	0V	0 V	Supply voltage on, no evaluation of the voltage quality
II. Actuated	Yellow	24 V	24 V	The yellow LED always signals the presence of an actuator within range
III. Actuated in limit range	Flashes yellow	24 V	24 V	The sensor must be readjusted before the actuator gets outside of the maximum switching range and the safety outputs are disabled, thus stopping the machine.
IV. Failure warning, sensor actuated	Flashes red	0 V	24V	After 1 min. if the fault is not eliminated
V. Failure	Red	0 V	0 V	–

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.

Selection table

Type	Operating voltage	Category EN 954-1	Sensor inputs	Stop category	Signal contacts	Diagnostic 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	**51**
AES 1235	24 VDC	3	2P	2 x Stop 0	–	2 x 100 mA	• Manual without edge detection • Automatic	**52**
SRB 031MC	24VAC/DC	4	2P	3 x Stop 1	1x 2A	–	• Manual without edge detection • Automatic	**53**
SRB 301LC/B	24VAC/DC	4	2P	3 x Stop 0	1x 2A	–	• Manual without edge detection • Automatic	**54**
SRB 301MC	24VAC/DC	4	2P	3 x Stop 0	1x 2A	–	• Manual without edge detection • Automatic	**55**
SRB 304ST	24VAC/DC	4	2P	3 x Stop 0	1x 2A	3 x 100 mA	• Manual **with** edge detection • Automatic	**56**
SRB 324ST	24VAC/DC	4	2P	3 x Stop 0 2 x Stop 1 1…30 s drop-out delay	1x 2A	3 x 100 mA	• Manual **with** edge detection • Automatic	**57**

The table above lists the programme of safety controllers, which are recommended for use with electronic safety sensors and solenoid interlocks.

Further details about suitable safety controllers, such as SRB 220XV2, SRB 301X4, SRB 302X3, SRB 320XV3 and SRB 504ST can be found at: www.elan.de.

AES 1135

- Classification PDF-M to EN 60947-5-3 in combination with BNS safety sensors
- Control category 3 to EN 954-1
- 1 enabling path
- Enable delay time can be modified
- Also suitable for monitoring magnetic safety sensors of the BNS series
- Can be changed from NO/NC to NC/NC contact combination
- Cross-wire monitoring with NO/NC combination
- ISD integral system diagnostic
- Operating voltage 24 VDC
- Short-circuit proof additional outputs
- Connection of input expander possible

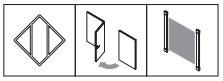
Technical data

Standards:	IEC/EN 60204-1, EN 60947-5-3, EN 954-1, BG-GS-ET-14, BG-GS-ET-20
Stop category:	0
Category to EN 954-1:	3
Start conditions:	automatic
Start-up test:	no
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Mounting:	snaps onto standard DIN rail to DIN 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
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 with 0.75 mm^2 cable
Enabling contacts:	1 enabling path
Utilisation category:	AC-15, DC-13
I_e/U_e:	3 A / 250 VAC 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 6 A (cos φ = 1)
Fuse rating:	6 A gG D fuse
Diagnostic output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
Function display:	LED (ISD)
EMC rating:	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 1135



Function table

Additional transistor output:	**Function / switching condition:**
Y1	Release, enabling paths closed
Y2	No release, enabling paths open

The following faults are recognised by the safety controller 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 controller

AES 1235

- Classification PDF-M to EN 60947-5-3 in combination with BNS safety sensors
- Control category 3 to EN 954-1
- 2 enabling paths
- Enable delay time can be modified
- Also suitable for monitoring magnetic safety sensors of the BNS series
- Cross-wire monitoring with NO/NC combination
- ISD integral system diagnostic
- Short-circuit proof additional outputs
- 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

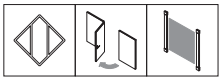
Technical data

Standards:	IEC/EN 60204-1, EN 60947-5-3, EN 954-1, BG-GS-ET-14, BG-GS-ET-20
Stop category:	0
Category to EN 954-1:	3
Start conditions:	automatic or start button
Start-up test:	no
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Mounting:	snaps onto standard DIN rail to DIN 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
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 with 0.75 mm^2 cable
Enabling contacts:	2 enabling paths
Utilisation category:	AC-15, DC-13
I_e/U_e:	3 A / 250 VAC 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 6 A (cos φ = 1)
Fuse rating:	6 A gG D fuse
Diagnostic output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
Function display:	LED (ISD)
EMC rating:	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	Release, enabling paths closed
Y2	No release, enabling paths open

The following faults are recognised by the safety controller 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 controller

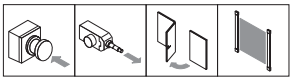
SRB 031MC

- Processing of signals from potential-free outputs, e.g. emergency stop command devices, interlocking equipment, etc.
- Processing of signals from outputs of magnetic safety switches and outputs connected to potentials (AOPD's) depending on the execution
- 1 or 2-channel control
- Optionally cross-wire detection (through switch)
- 3 enabling paths, stop 1
- 1 diagnostic contact (NC)
- Switching capacity of the enabling contacts 8 A
- Automatic reset, manual reset without edge detection
- Green LED indications for relay K1, K2, supply voltage U_B and internal fuse U_i
- Control category 4 to EN 954-1 depending on the execution

Approvals

Technical data

Standards:	IEC/EN 60204-1, EN 60947-5-3, EN 954-1, BG-GS-ET-14, BG-GS-ET-20
Stop category:	1
Category to EN 954-1:	4
Start conditions:	automatic or start button
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Connection and cable section:	
Solid strand lead:	rigid or flexible (with or without conductor ferrules) 0.25 … 2.5 mm^2
Multi-strand lead with the same section:	flexible (with or without TWIN conductor ferrules) 0.5 … 1.5 mm^2 rigid or flexible (with plastic-free conductor ferrules) 0.25 … 2.5 mm^2
U_e:	24 VDC -15%/+20%, residual ripple max. 10% 24 VAC -15% /+10%
Frequency range:	50/60 Hz
Protection class:	terminals: IP20, enclosure: IP40, mounting compartment: IP54 to EN 60529
Power consumption:	2.0 W; 4.9 VA
Fuse rating:	internal electronic fuse, tripping current > 0.5 A Reset after approx. 1 s
Feedback circuit:	yes
Enabling contacts:	3 x stop 1
Utilisation category:	AC-15, DC-13: EN 60 947-5-1
Max. switching capacity:	250 V, 8 A ohmic (inductive with appropriate protective wiring), AC-15: 230 VAC/6 A, DC-13: 24 VDC/1.2 A Residual current at ambient temperature: up to: – 45°C = 24 A; – 55°C = 18 A; – 60°C = 12 A
Min. switching capacity:	min. 10 V / 10 mA
Fuse rating:	8 A gG D fuse
Auxiliary contacts:	45-46
Switching capacity:	24 VDC, 2 A
Fuse rating:	2 A gG D fuse
Switching capacity:	min. 10V / 10mA
Contact material:	AgSnO, AgNi, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	≤ 400 ms
Drop-out delay:	in case of emergency stop: ≤ 1.0s ± 30% at 24 VDC and duty cycle > 3.5s in case power failure: ≤ 1.0s ± 30% at 24 VDC and duty cycle > 3.5s
Air clearances and creepage distances:	IEC/EN 60 664-1 (DIN VDE 0110-1), 4 kV/ 2
Overvoltage category:	II to DIN VDE 0110
Degree of pollution:	3 to DIN VDE 0110
Ambient temperature:	– 25 °C...+ 60 °C
Mechanical life:	10 million operations
Function display:	4 LED
Weight:	250 g
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.



Ordering details

SRB 031MC-24V/①

No.	Replace	Description
①		Time delay:
	0.4sec	0.4 seconds
	0.7sec	0.7 seconds
	1.1sec	1.1 seconds
	1.5sec	1.5 seconds

Function table

The integrated LED's indicate the following operating conditions:

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

SRB 301LC/B

- Processing of signals from potential-free outputs, e.g. emergency stop command devices, interlocking equipment, etc.
- Processing of signals from the outputs of magnetic safety switches (to this end, equipped with built-in current and voltage limitation)
- 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 diagnostic contact (NC)
- Manual reset without edge detection
- Automatic reset function
- Green LED indications for relay K1, K2, supply voltage UB and internal fuse Ui
- Control category 4 to EN 954-1

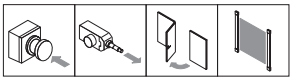
Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Stop category:	3x stop 0
Category to EN 954-1:	4
Start conditions:	reset button without edge detection, auto start
Enclosure:	glass-fibre reinforced thermoplastic
Connection and cable section:	
Solid strand lead:	rigid or flexible (with or without conductor ferrules) 0.25 … 2.5 mm^2
Multi-strand lead with the same section:	flexible (without or with TWIN conductor ferrules) 0.5 … 1.5 mm^2 rigid or flexible (with plastic-free conductor ferrules) 0.25 … 2.5 mm^2
U_e:	24 VDC –15%/+20%, residual ripple max. 10% 24 VAC –15%/+10%
Frequency range:	50/60 Hz
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
Fuse rating:	glass fuse F1, tripping current 0.5 A
Monitored inputs:	1- or 2-channel
Feedback circuit:	yes
Control circuits:	S11/S12, S21/S22: max. 28 VDC
Enabling contacts:	3 enabling paths
Utilisation category:	AC-15, DC-13
Max. 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
Diagnostic contacts:	1 NC contact
Switching capacity:	2 A/24 VDC
Fuse rating:	2 A gG D fuse
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
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Approvals

Ordering details

SRB 301LC/B



Function table

The integrated LED's indicate the following operating conditions:

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

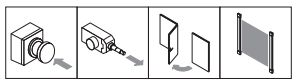
SRB 301MC

- Processing of signals from potential-free outputs, e.g. emergency stop command devices, interlocking equipment, etc.
- Processing of signals from the outputs of magnetic safety switches and outputs connected to potentials (AOPD's) depending on the execution
- 1 or 2 channel control
- Optionally cross-wire detection (through switch)
- 3 enabling paths, stop 0
- 1 diagnostic contact (NC)
- Switching capacity of the enabling contacts 8 A
- Automatic reset, manual reset without edge detection
- Green LED indications for relay K1, K2, supply voltage U_B and internal fuse U_i
- Control category 4 to EN 954-1 depending on the execution

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
Category to EN 954-1:	4
Start conditions:	automatic or start button
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Connection and cable section:	
Solid strand lead:	rigid or flexible (with or without conductor ferrules) 0.25 … 2.5 mm^2
Multi-strand lead with the same section:	flexible (without or with TWIN conductor ferrules) 0.5 … 1.5 mm^2 rigid or flexible (with plastic-free conductor ferrules) 0.25 … 2.5 mm^2
U_e:	24 VDC -15%/+20%, residual ripple max. 10% 24 VAC -15% /+10%
Frequency range:	50/60 Hz (for AC operating voltage)
Protection class:	terminals: IP20, enclosure: IP40, mounting compartment: IP54 to EN 60529
Power consumption:	max. 2.0 W; 4.9 VA
Fuse rating:	internal electronic fuse, tripping current > 0.5 A Reset after approx. 1 s
Feedback circuit:	yes
Enabling contacts:	3 x stop 0
Utilisation category:	AC-15, DC-13: EN 60 947-5-1
Max. switching capacity:	250 V, 8 A ohmic (inductive with appropriate protective wiring), AC-15: 230 VAC/6 A, DC-13: 24 VDC/1.2 A Residual current at ambient temperature Up to: – 45°C = 24 A; – 55°C = 18 A; – 60°C = 12 A
Min. switching capacity:	min. 10 V / 10 mA
Fuse rating:	8 A gG D fuse
Auxiliary contacts:	41-42
Switching capacity:	24 VDC, 2 A
Fuse rating:	2 A gG D fuse
Switching capacity:	min. 10V / 10mA
Contact material:	AgSnO, AgNi, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	with automatic start ≤ 400 ms
Drop-out delay:	≤ 25 ms in case of emergency stop ≤ 80 ms in case of power failure
Air clearances and creepage distances:	IEC/EN 60 664-1 (DIN VDE 0110-1), 4 kV/ 2
Overvoltage category:	II to DIN VDE 0110
Degree of pollution:	3 to DIN VDE 0110
Ambient temperature:	– 25 °C...+ 60 °C
Mechanical life:	10 million operations
Function display:	LED
Weight:	230 g
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

SRB 301MC

Function table

The integrated LED's indicate the following operating conditions:

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

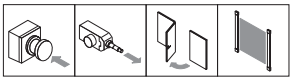
SRB 304ST

- 3 enabling paths
- 1 additional acknowledgment contact (auxiliary contacts must not be used in safety circuits!)
- 3 diagnostic contacts
- Optionally:
  – Trailing edge
  – Automatic reset function
- Optionally cross-wire detection
- Hybrid fuse
- Green LED indications for relay K1, K2, supply voltage UB and internal fuse Ui
- Control category 4 to EN 954-1
- Plug-in terminals

Approvals

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
Category to EN 954-1:	4
Start conditions:	automatic or start button (optionally monitored)
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Connection and cable section:	
Solid strand lead:	rigid or flexible (with or without conductor ferrules) 0.25 … 2.5 mm^2
Multi-strand lead with the same section:	
Plug-in or print terminals:	rigid or flexible (with plastic-free conductor ferrules) 0.25 … 1.5 mm^2
	flexible (without or with TWIN conductor ferrules) 0.5 … 1.5 mm^2
Cage clamps:	flexible with TWIN conductor ferrules 0.5 … 1.0 mm^2
U_e:	24 VDC -15%/+20%, residual ripple max. 10%
	24 VAC -15% /+10%
Frequency range:	50/60 Hz (for AC operating voltage)
Protection class:	terminals: IP20, Enclosure: IP40,
	mounting compartment: IP54 to EN 60529
Power consumption:	4.8 W, 7.8 VA, plus signal output
Fuse rating:	internal electronic fuse, tripping current F1: > 2.5 A
	Tripping current F1: > 1.0 A, reset after
	interruption of the supply voltage
Feedback circuit:	yes
Enabling contacts:	3 x stop 0
Utilisation category:	AC-15, DC-13: EN 60 947-5-1
Max. switching capacity:	250 V, 8 A ohmic (inductive with appropriate protective wiring),
	13-14, 23-24, 33-34: AC-15: 230 VAC/6 A, DC-13: 24 VDC/6 A
	47-48, 57-58: AC-15: 230 VAC/3 A, DC-13: 24 VDC/2 A
Fuse rating:	13-14, 23-24, 33-34: 8 A gG D fuse;
	47-48, 57-58: 6 A gG D fuse
Auxiliary contacts:	41-42
Switching capacity:	24 VDC, 2 A
Fuse rating:	2 A gG D fuse
Diagnostic contacts:	signal outputs Y1-Y3
Switching capacity:	24 VDC, 100 mA / residual current 200 mA
Fuse rating:	100 mA gG D fuse
Contact material:	AgSnO, AgNi, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	≤ 30 ms; ≤ 200 ms (with automatic start)
Drop-out delay:	in case of emergency stop: ≤ 30 ms; in case of power failure: ≤ 80 ms
Air clearances and creepage distances:	IEC/EN 60 664-1 (DIN VDE 0110-1), 4 kV/ 2
Ambient temperature:	– 25 °C...+ 60 °C
Mechanical life:	10 million operations
Function display:	LED
Weight:	420 g
Dimensions:	45 x 100 x 121 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are
	to be suppressed by means of a suitable circuit.



Ordering details

SRB 304ST

Function table

The integrated LED's indicate the following operating conditions:

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

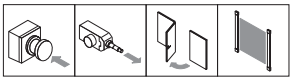
SRB 324ST

- Processing of signals from potential-free outputs, e.g. emergency stop command devices, interlocking equipment, etc.
- Processing of signals 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 diagnostic outputs (semi-conductor outputs)
- With hybrid fuse
- Optionally:
  – Cross-wire detection
  – Automatic reset function
  – Manual reset with edge detection in fail-safe circuit
- Green LED indications for relay K1, K2, K3, K4, supply voltage U_B and internal fuse U_i
- Control category 4 to EN 954-1

Approvals

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)
Category to EN 954-1:	4
Start conditions:	start, reset button (trailing edge) auto start
Enclosure:	glass-fibre reinforced thermoplastic
Connection and cable section:	
Solid strand lead:	rigid or flexible (with or without conductor ferrules) 0.25 … 2.5 mm^2
Multi-strand lead with the same section:	
Plug-in or print terminals:	rigid or flexible (with plastic-free conductor ferrules) 0.25 … 1.5 mm^2
	flexible (without or with TWIN conductor ferrules) 0.5 … 1.5 mm^2
Cage clamps:	flexible with TWIN conductor ferrules 0.5 … 1.0 mm^2
U_e:	24 VDC –15%/+20%, residual ripple max. 10%
	24 VAC –15%/+10%
Frequency range:	50/60 Hz (for AC operating 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
Fuse rating:	F1: internal electronic fuse, tripping current > 2.5 A,
	F2: internal electronic fuse, tripping current > 1.0 A,
	reset after interruption of the supply voltage
Monitored inputs:	1- or 2-channel
Feedback circuit:	yes
Control circuits:	S11/S12, S21/S22: max. 28 VDC
Enabling contacts:	5 enabling paths
Utilisation category:	AC-15, DC-13
Max. 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
Auxiliary contacts:	61/62:
Switching capacity:	2 A/24 VDC
Fuse rating:	2 A gG D fuse
Max. switching frequency:	5 Hz
Diagnostic output:	Y1 - Y3: 100 mA in total
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
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.



Ordering details

SRB 324 ST

Function table

The integrated LED's indicate the following operating conditions:

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

Download now

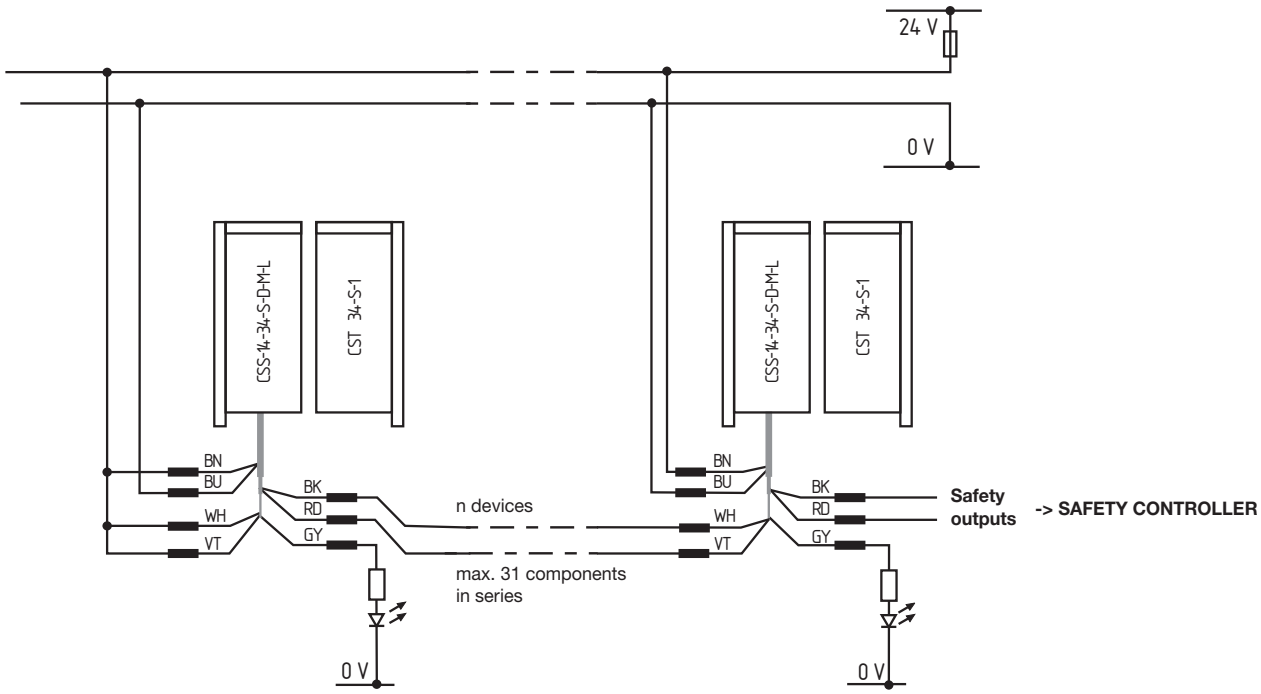
Data sheets, mounting and wiring instructions, declarations of conformity and much more at:
www.products.schmersal.com

Wiring examples for application and use

Series-wiring

Wiring examples for different sensor types

Series-wiring of the CSS 34 with diagnostic 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 examples applies to all CSS 34 sensor types with conventional diagnostic output

Safety sensor	Position of the 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

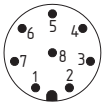
Safety sensor	Position of the active face	Integrated connector
CSS – 14 – 34 – S – D – M - ST	on the side	8 pole
CSS – 12 – 34 – V – D – M - ST	on top	8 pole

Actuator	Position of the active face
CST – 34 – S – 1	on the side
CST – 34 – V – 1	on top

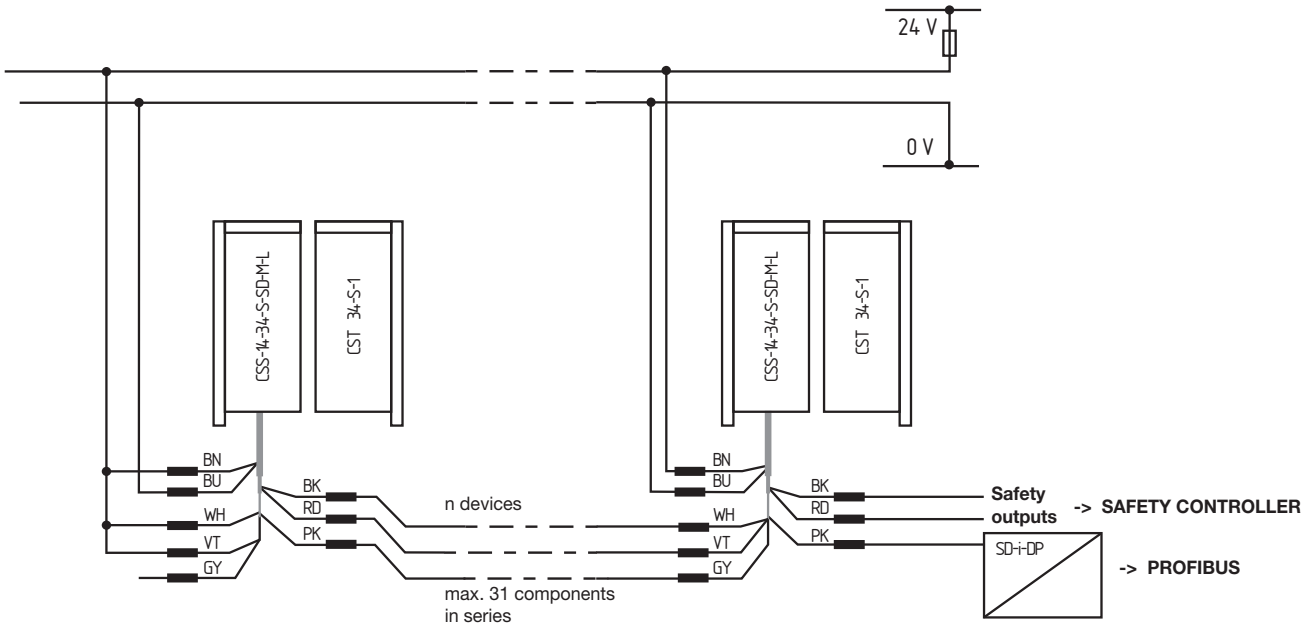
Legend

Wiring diagram for the CSS 34 safety sensors with integrated connector (ordering suffix -ST)

Wiring of the CSS 34 safety sensor with diagnostic output	Pin configuration of the connector	Colour of the cable with connector
A1 Ue	Pin 1	Depending on the selected component, see accessories page 14
A2 GND	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	
Diagnostic output	Pin 5	
Without function	Pin 8	



Series-wiring of the CSS 34 with serial diagnostic cable



The safety outputs 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 examples applies to all CSS 34 safety sensors with serial diagnostic

Safety sensor	Position of the 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

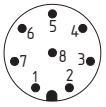
Safety sensor	Position of the active face	Integrated connector
CSS – 14 – 34 – S – SD – M - ST	on the side	8 pole
CSS – 12 – 34 – V – SD – M - ST	on top	8 pole

Actuator	Position of the active face
CST – 34 – S – 1	on the side
CST – 34 – V – 1	on top

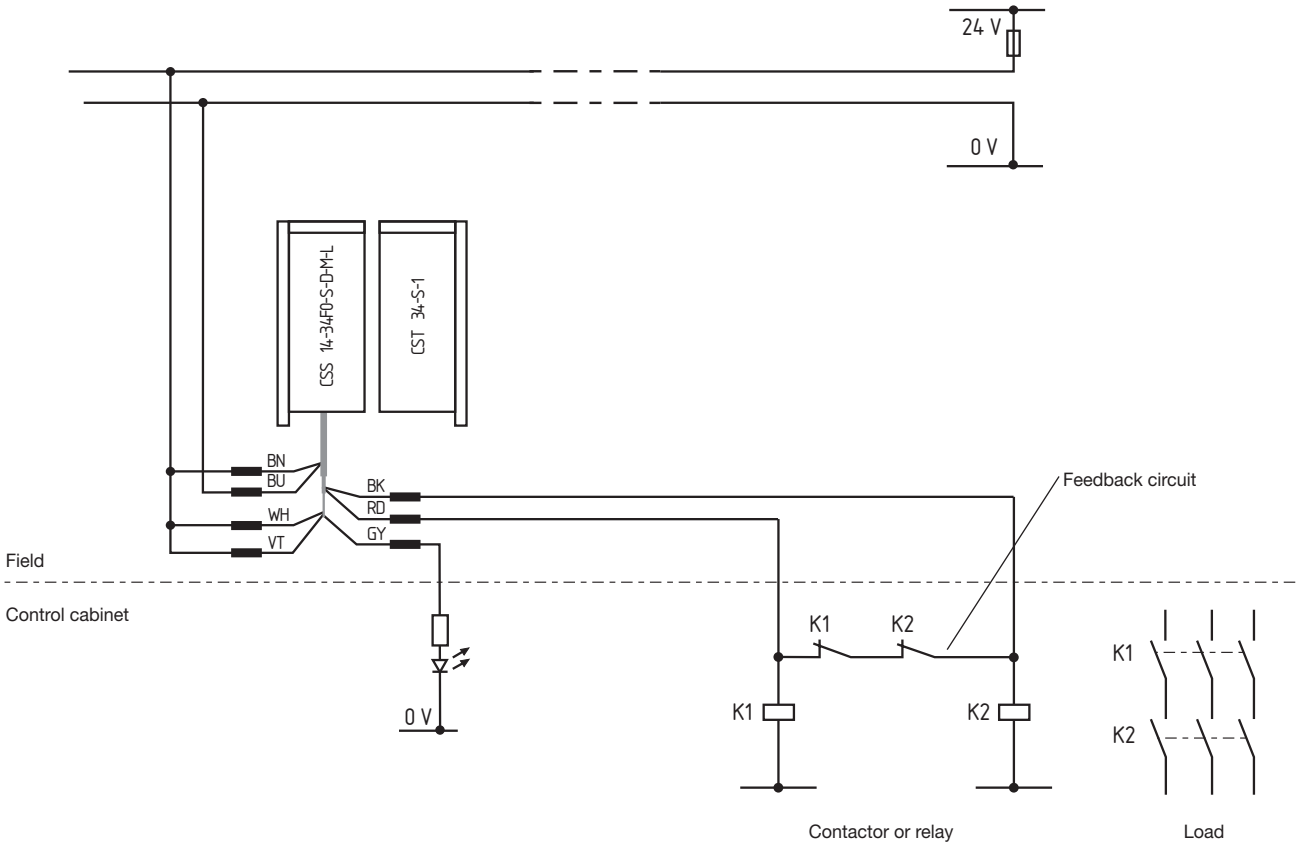
Legend

Wiring diagram for the CSS 34 safety sensors with integrated connector (ordering suffix -ST)

Wiring of the CSS 34 safety sensor with diagnostic output	Pin configuration of the connector	Colour of the cable with connector
A1 Ue	Pin 1	Depending on the selected component, see accessories page 14
A2 GND	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	
Diagnostic output	Pin 5	
Without function	Pin 8	



Single device CSS 34F0 with diagnostic output



Direct control of the positive-action relays
Automatic start through the feedback circuit
Optionally, an enabling switch can be integrated in the feedback circuit. The sensor is switched on when the button is pushed.
Variant F0 has no edge monitoring for the switch.

Product selection

This examples applies to all CSS 34F0 sensor types with conventional diagnostic output

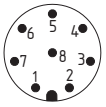
Safety sensor	Description
CSS 12 - 34F0 - S - D CSS 14 - 34F0 - S - D CSS 12 - 34F0 - V - D CSS 14 - 34F0 - V - D	Input for enabling switch Suitable for automatic start

Actuator	Description
CST – 34 – S – 1 CST – 34 – V – 1	active face on the side active face on top

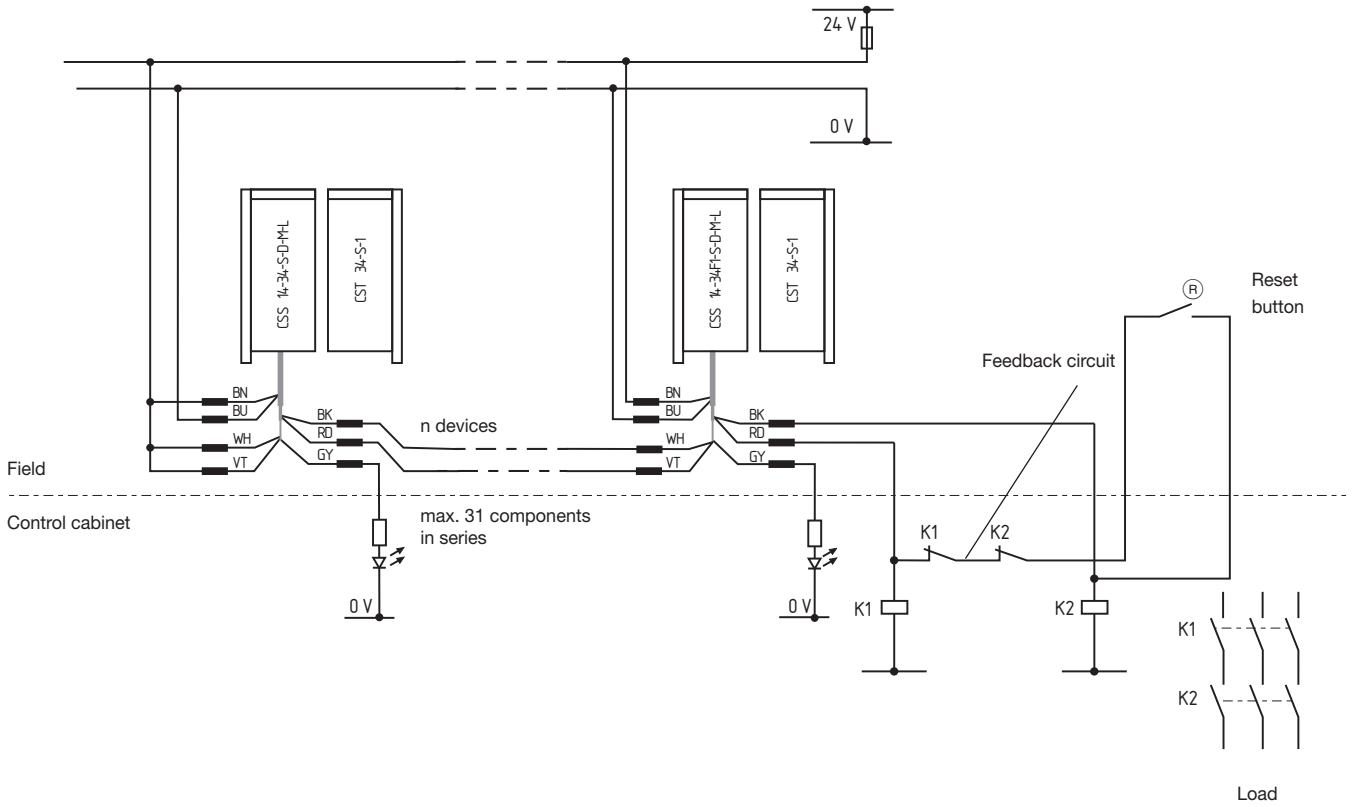
Legend

Wiring diagram for the CSS 34 safety sensors with integrated connector (ordering suffix -ST)

Wiring of the CSS 34 safety sensor with diagnostic output	Pin configuration of the connector	Colour of the cable with connector
A1 Ue	Pin 1	Depending on the selected component, see accessories page 14
A2 GND	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	
Diagnostic output	Pin 5	
Without function	Pin 8	



Series-wiring of the CSS 34 and CSS 34F1 with conventional diagnostic outputs



Direct control of the positive-action relays
The internal safety controlling function of the CSS 34F1-… variant monitors the feedback contacts as well as the trailing edge of the reset button. The sensor switches when the button is released.

Product selection

This examples applies to all CSS 34 and CSS 34F1 sensor types with conventional diagnostic output

Safety sensor	Description
CSS 12 - 34 - S - D CSS 14 - 34 - S - D CSS 12 - 34 - V - D CSS 14 - 34 - V - D	Standard execution
CSS 12 - 34F1 - S - D CSS 14 - 34F1 - S - D CSS 12 - 34F1 - V - D CSS 14 - 34F1 - V - D	Input for reset button, with edge detection

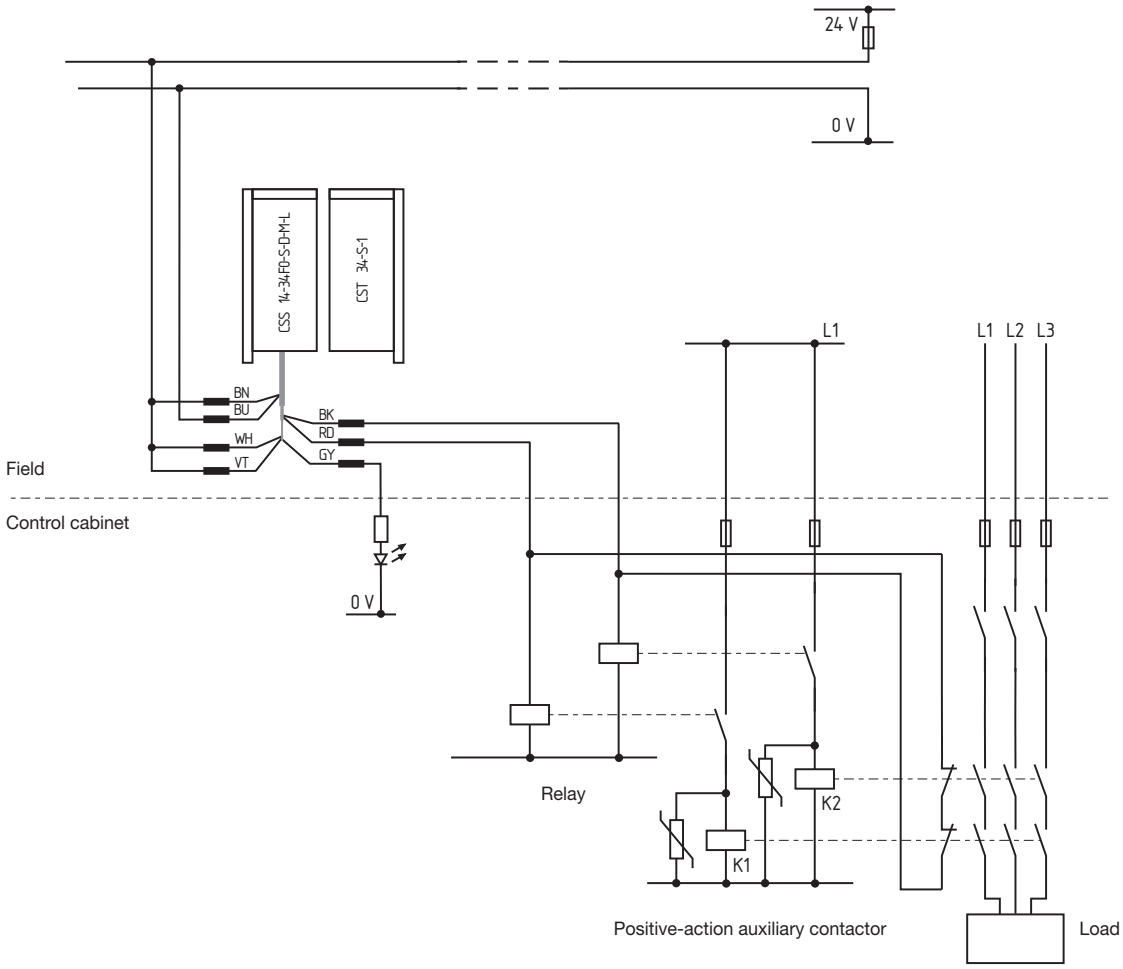
Actuator	Description
CST – 34 – S – 1	active face on the side
CST – 34 – V – 1	active face on top

Legend

Wiring diagram for the CSS 34 safety sensors with integrated connector (ordering suffix -ST)

Wiring of the CSS 34 safety sensor with diagnostic output	Pin configuration of the connector	Colour of the cable with connector
A1 Ue	Pin 1	Depending on the selected component, see accessories page 14
A2 GND	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	
Diagnostic output	Pin 5	
Without function	Pin 8	

Single device CSS 34F0 with conventional diagnostic output



Wiring with auxiliary relay to control high-capacity contactors
The NC contacts of the load-switching contactors are monitored.
Optional executions of the feedback circuit with one button, see wiring examples on previous pages.

Product selection

This examples applies to all CSS 34F0 sensor types with conventional diagnostic output

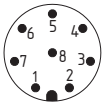
Safety sensor	Description
CSS 12 - 34F0 - S - D CSS 14 - 34F0 - S - D CSS 12 - 34F0 - V - D CSS 14 - 34F0 - V - D	Input for enabling button Suitable for automatic start

Actuator	Description
CST – 34 – S – 1	active face on the side
CST – 34 – V – 1	active face on top

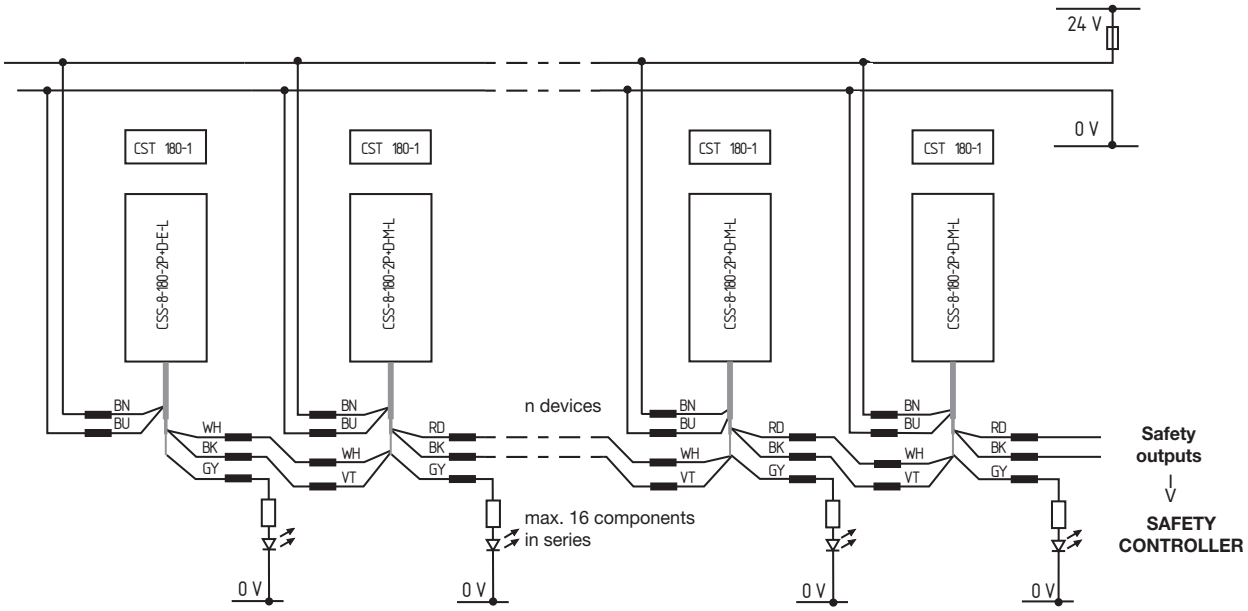
Legend

Wiring diagram for the CSS 34 safety sensors with integrated connector (ordering suffix -ST)

Wiring of the CSS 34 safety sensor with diagnostic output	Pin configuration of the connector	Colour of the cable with connector
A1 Ue	Pin 1	Depending on the selected component, see accessories page 14
A2 GND	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	
Diagnostic output	Pin 5	
Without function	Pin 8	



Series-wiring of the CSS 180 with common cable for safety inputs and outputs



The first end/terminal sensor CSS-8-180-...-E-L has no safety inputs.
The CSS-7-180LC-2P-E-L optionally can be used as end/terminal sensor.
It has no safety inputs or diagnostic outputs.

Product selection

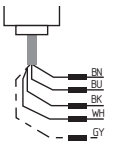
This example requires “E” and “M” type sensors

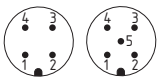
Safety sensor	Connection
CSS - 7 - 180LC - 2P - E - L	Connecting cable, 4-wire
CSS - 8 - 180 - 2P - E - L	Connecting cable, 4-wire
CSS - 8 - 180 - 2P - E - LST	Connecting cable, 4-wire with connector M12 x 1, 4-pole
CSS - 8 - 180 - 2P + D - E - L	With diagnostic output, connecting cable 5-wire
CSS -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

Legend

Wiring of the CSS 180 safety sensors with an “E” in the ordering code (end or single device)

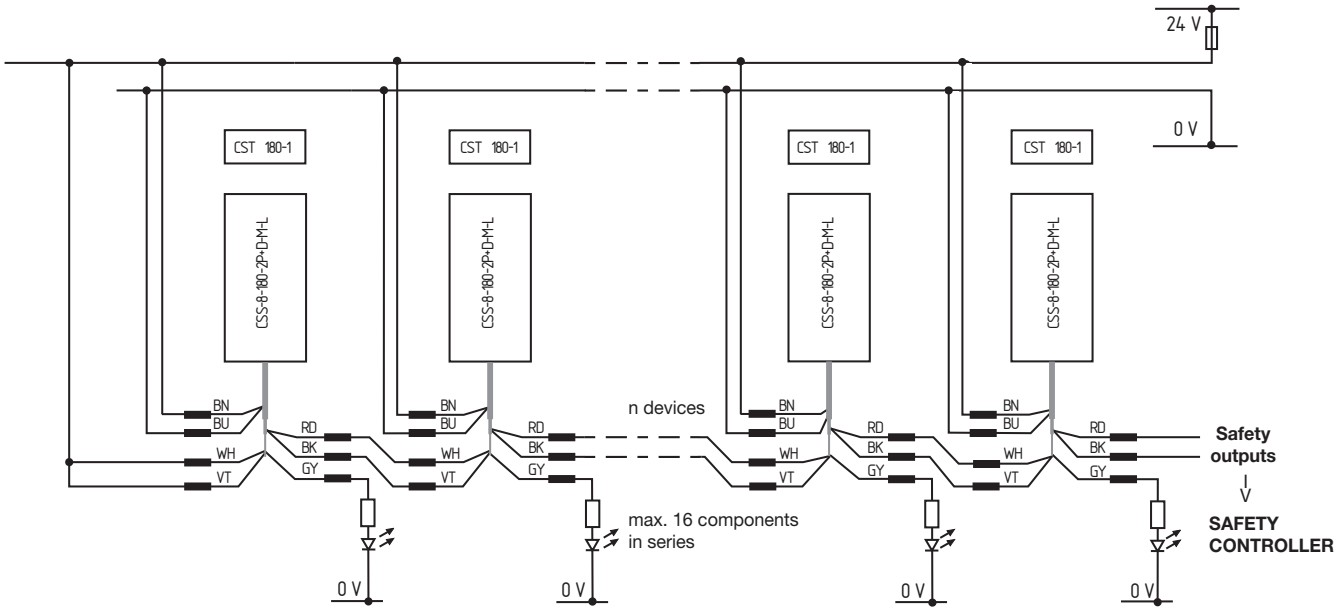
Colour of the connecting cable	Wiring	Pin configuration of the connector
BN (brown)	A1 Ue	Pin 1
BU (blue)	A2 GND	Pin 3
BK (black)	Y1 Safety output 1	Pin 4
WH (white)	Y2 Safety output 2	Pin 2
Only 5-pole version:		
GY (grey)	Diagnostic output (option)	Pin 5





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

Series-wiring of the CSS 180 with common cable for the safety inputs and outputs



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

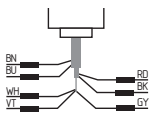
This example exclusively requires M-type sensors
Single device or end/terminal device of a sensor chain

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

Legend

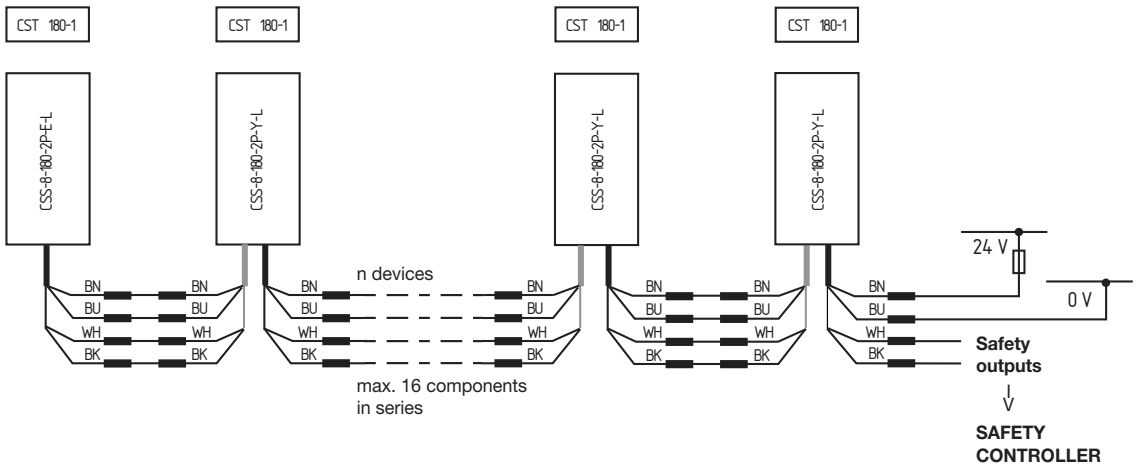
Wiring of the CSS 180 safety sensors with an “M” in the ordering code (device with multifunctional connection)

Colour of the connecting cable	Wiring	Pin configuration of the connector
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)	Diagnostic output	Pin 5
–	spare	Pin 8



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

Without diagnostic output



The first end/terminal sensor CSS-8-180-...-E-L has no safety inputs (wiring, see page 17).

Product selection

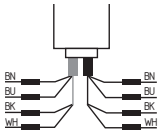
This examples applies to all CSS 180 safety sensors with a “Y” in the ordering code

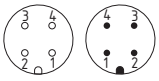
Safety sensor	Connection
CSS - 8 - 180 - 2P - Y - L CSS - 8 - 180 - 2P - Y -LST	2 cables, 4-wire 2 cables, connecting cable with male/female connector, M12 x 1, 4-pole

Legend

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

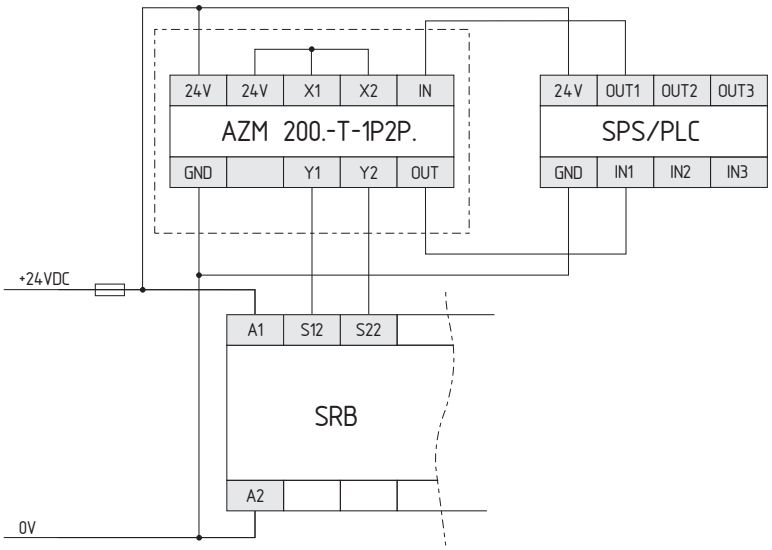
Colour of the connecting cable	Wiring of the grey cable (IN)	black cable (OUT)	Pin configuration of the connector
BN (brown)	A1 Ue	A1 Ue	Pin 1
BU (blue)	A2 GND	A2 GND	Pin 3
BK (black)	X1 Safety input 1	Y1 Safety output 1	Pin 4
WH (white)	X2 Safety input 2	Y2 Safety output 2	Pin 2





Connector
female male

Single device AZM 200.-T-1P2P.



Wiring example: up to control category 4

Product selection

This example applies to the AZM 200 electronic solenoid interlock

Solenoid interlock	Description
AZM 200..-T-1P2P.	1 diagnostic output

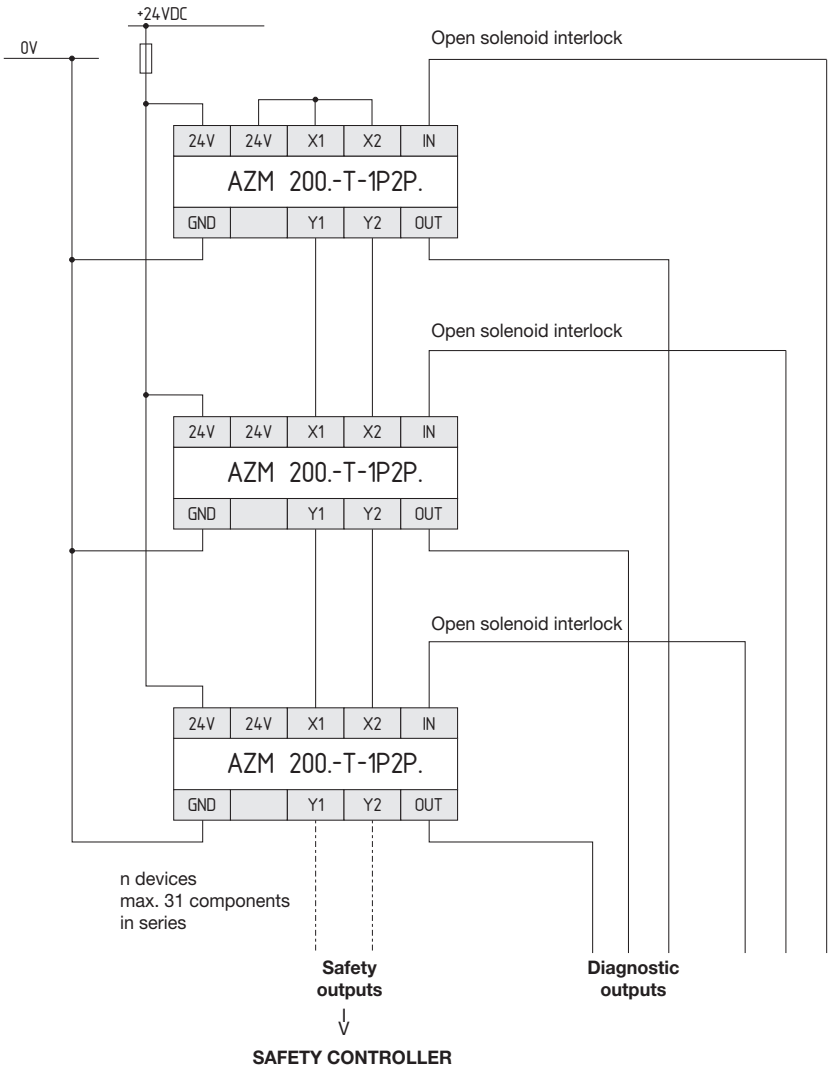
Legend

Wiring of the AZM 200 electronic solenoid interlock

Clamp	Wiring AZM 200 solenoid interlock	Pin configuration of the connector
24 V	Rated operating voltage	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	Diagnostic output	Pin 5
IN	Solenoid control	Pin 8
–	spare	Pin 9

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

Series-wiring of the AZM 200 electronic solenoid interlock



With the represented power-to-unlock principle, the solenoid is energised to enable the opening.
With the alternative power-to-lock principle (not represented), the solenoid must be energised to keep the device in closed condition.

Product selection

This example applies to the AZM 200 electronic solenoid interlock

Solenoid interlock	Description
AZM 200..-T-1P2P.	1 diagnostic output with power-to-unlock principle
AZM 200..-T-1P2P.a	1 diagnostic output with power-to-lock principle

Legend

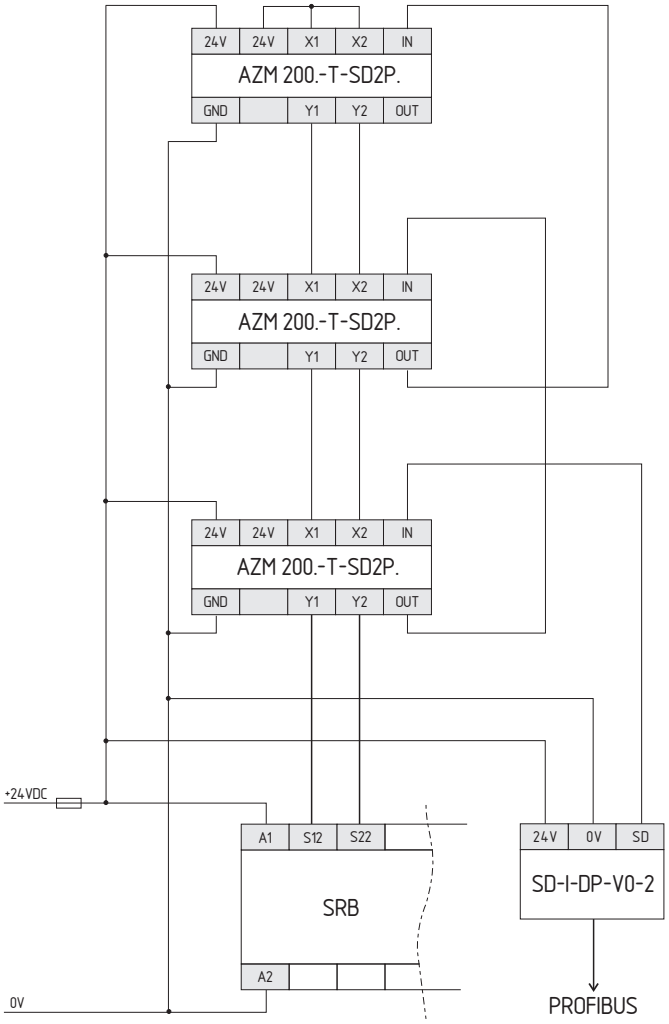
Wiring of the AZM 200 electronic solenoid interlock

Clamp	Wiring AZM 200 solenoid interlock	Pin configuration of the connector
24 V	Rated operating voltage	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	Diagnostic output	Pin 5
IN	Solenoid control	Pin 8
–	spare	Pin 9

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

Series-wiring of the AZM 200 with serial diagnostic outputs

AZM 200.-T-SD2P.



Wiring example: series-wiring up to control category 4

Product selection

This example applies to the AZM 200 electronic solenoid interlock

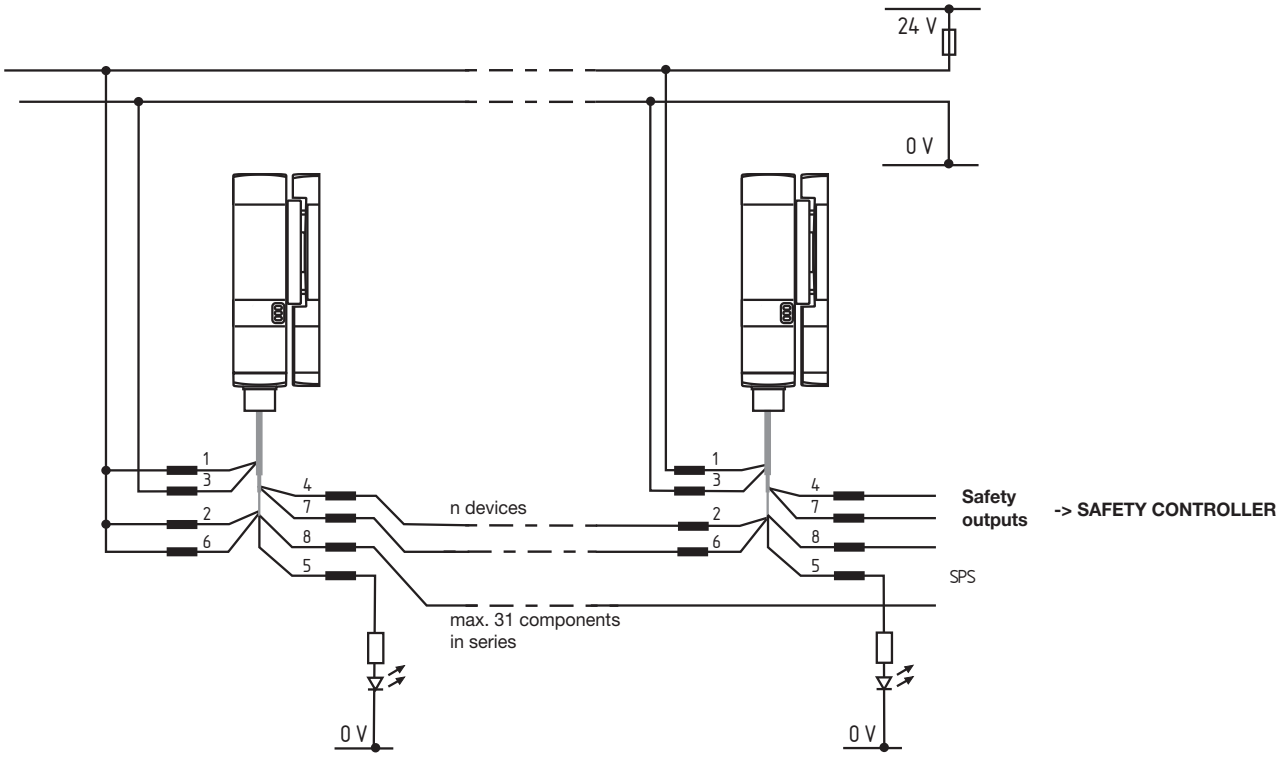
Solenoid interlock	Description
AZM 200..-T-SD2P.	Serial diagnostic output and 2 safety outputs, p-type

Legend

Wiring of the AZM 200 electronic solenoid interlock

Clamp	Wiring AZM 200 solenoid interlock	Pin configuration of the connector
24 V	Rated operating voltage	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	Diagnostic output	Pin 5
IN	Solenoid control	Pin 8
–	spare	Pin 9

Series-wiring of the MZM 100 with diagnostic output



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

Product selection

This examples applies to the MZM 100 electronic magnetic interlock

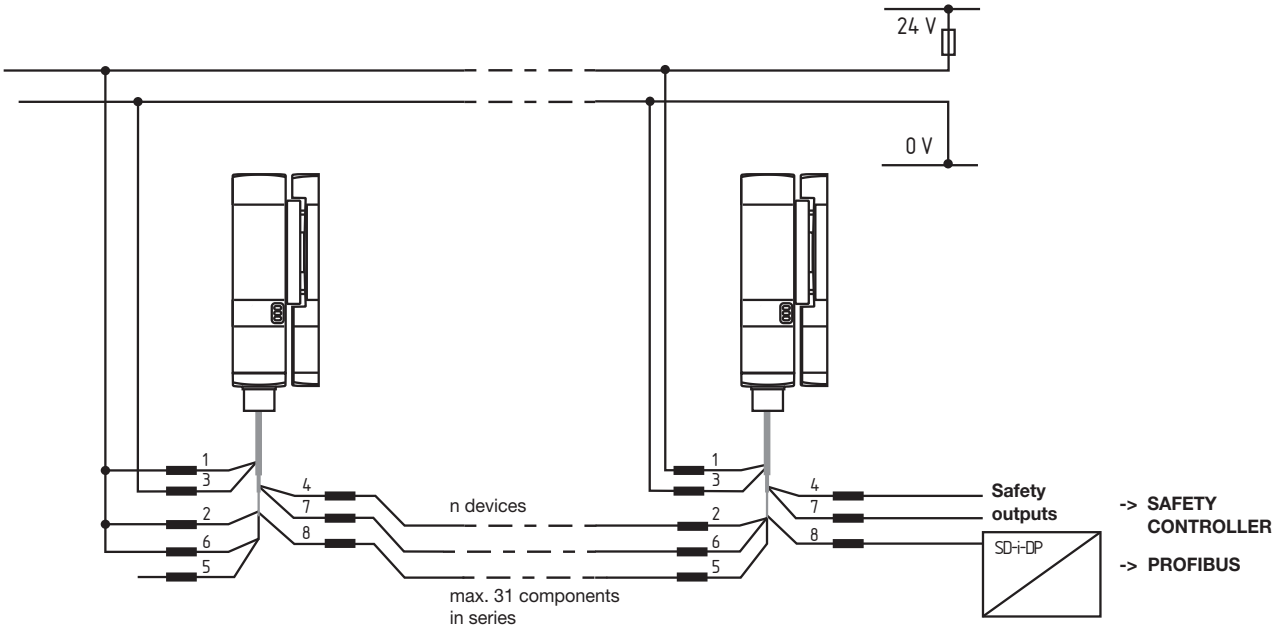
Magnetic interlock	Description
MZM 100ST-1P2P.a...	1 diagnostic output with power-to-lock principle

Legend

Wiring of the MZM 100 electronic magnetic interlock

Pin configuration	Wiring of the magnetic interlock with diagnostic output
Pin 1	A1 Ue
Pin 2	X1 Safety input 1
Pin 3	A2 GND
Pin 4	Y1 Safety output 1
Pin 5	OUT Diagnostic output
Pin 6	X2 Safety input 2
Pin 7	Y2 Safety output 2
Pin 8	IN Solenoid control
Pin 9	spare

Series-wiring of the MZM 100 with serial diagnostic cable



The safety outputs of the first magnetic interlock are wired to the safety controller.
The PROFIBUS-Gateway is connected to the serial diagnostic input of the first magnetic interlock.

Product selection

This examples applies to the MZM 100 electronic magnetic interlock

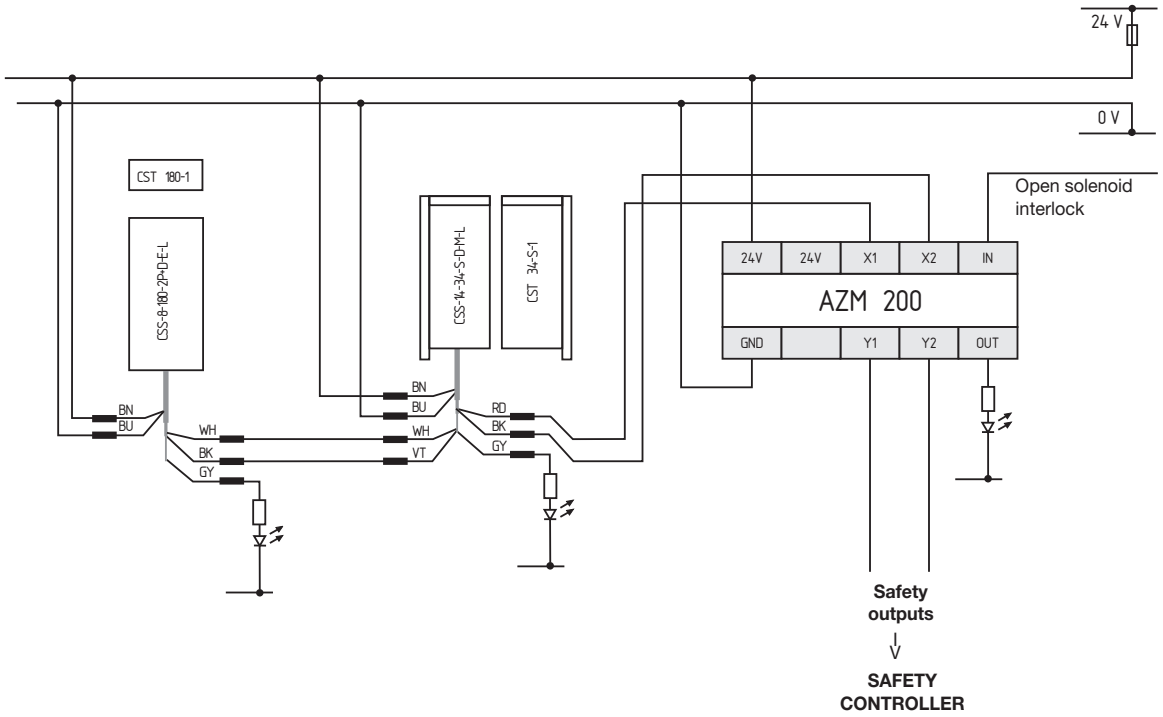
Magnetic interlock	Description
MZM 100ST-SD2P.a...	Serial diagnostic output with power-to-lock principle

Legend

Wiring of the MZM 100 electronic magnetic interlock

Pin configuration	Wiring of the magnetic interlock with serial diagnostic
Pin 1	A1 Ue
Pin 2	X1 Safety input 1
Pin 3	A2 GND
Pin 4	Y1 Safety output 1
Pin 5	SD Output
Pin 6	X2 Safety input 2
Pin 7	Y2 Safety output 2
Pin 8	SD Input
Pin 9	Spare

Series-wiring of various sensors and solenoid interlocks with diagnostic output



The CSS 180, CSS 34, MZM 100, 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 CSS 34 and AZM 200, max. 31 devices. If the CSS 180 is used in a “mixed” series-wiring, the maximum number of series-wired devices is limited to 16.

Product selection

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, connecting cable 5-wire Actuator
CSS – 14 – 34 – S – D – M - L with CST – 34 – S – 1	Position of the active face: on the side, connecting cable, 7-wire Actuator, on the side
AZM 200..-T-1P2P.a	1 Diagnostic output with power-to-lock principle

Legend

Wiring diagram of the represented devices: see previous pages:

Wiring diagram of the CSS 180, page 17.

Wiring diagram of the CSS 34, page 14.

Wiring diagram of the AZM 200, page 23.

Around the clock

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Connection of sensors and interlocks to various safety controllers

Wiring examples

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Safety outputs Y1/Y2

The safety outputs Y1/Y2 must be connected to the safety controller in the following way:

Sensors/ Solenoid interlock	Safety output 1	Safety output 2
CSS 180	Y1	Y2
CSS 34	Y1	Y2
AZ 200	Y1	Y2
AZM 200	Y1	Y2
MZM 100	Y1	Y2
To be connected to	↓	↓

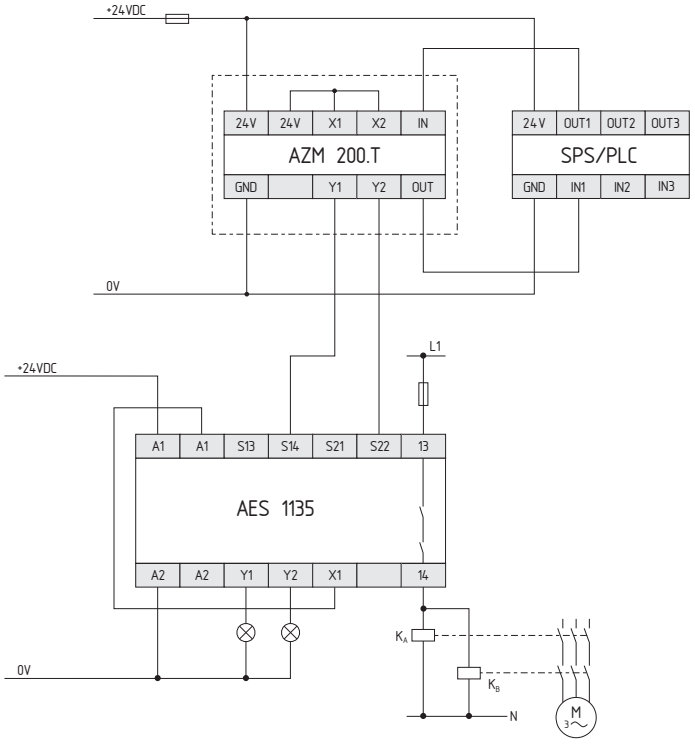
Safety controller	Safety channel 1	Safety channel 2	Feedback/Start contact connection	Start contact	Notes bridge	See page
AES 1135	S 14	S 22	–	–	A1 - X2	77
AES 1235	S 14	S 22	A1 - X1	–	A1 - X2	77
SRB 031MC	S 12	S 22	X1 - X2	X1 - X2	–	78
SRB 301LC/B	S 12	S 22	X1 - X2	X1 - X2	–	78
SRB 301MC	S 12	S 22	X1 - X2	X1 - X2	–	79
SRB 304ST	S 12	S 32	X1 - X2	X3 - X4	S22 - S21	79
SRB 324ST	S 12	S 32	X1 - X2	X3 - X4	S22 - S21	80

Note:
The following drawings apply for the wiring of sensors (CSS 34) and solenoid interlocks (AZM 200 and MZM 100).
Sensor and safety controller require the same mass potential.

The wiring examples are represented with the safety guards closed and in de-energised condition.

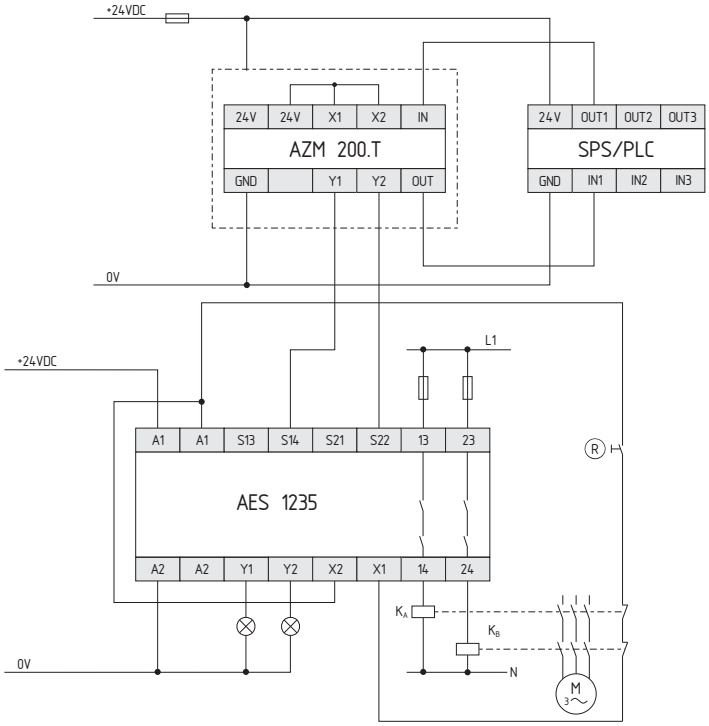
The shown application examples are suggestions. The user however must carefully check if the configuration is suitable for his specific application.

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



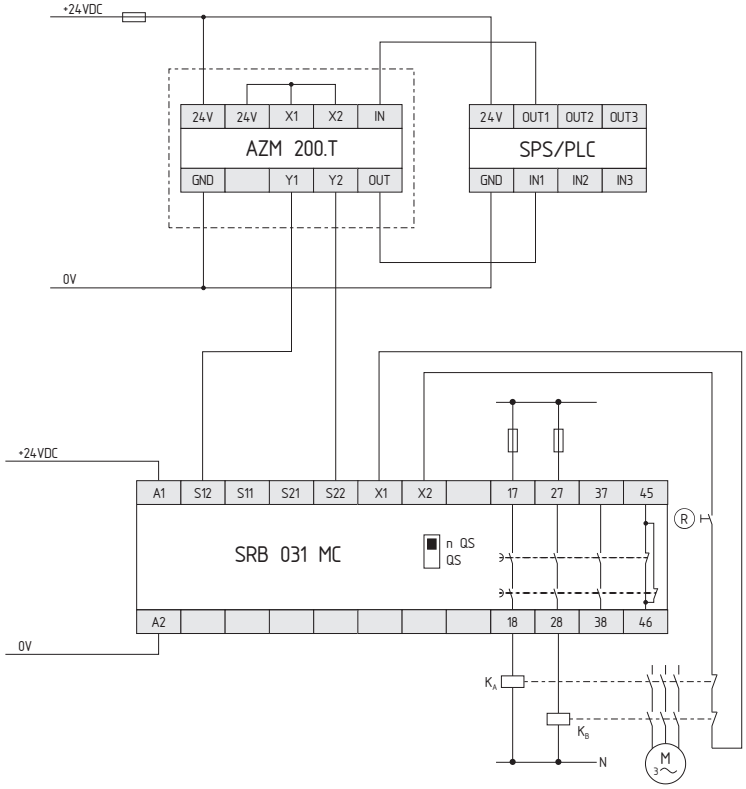
AES 1135 requires a bridge between A1 and X1, to work with two NC contacts (AZM 200).

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

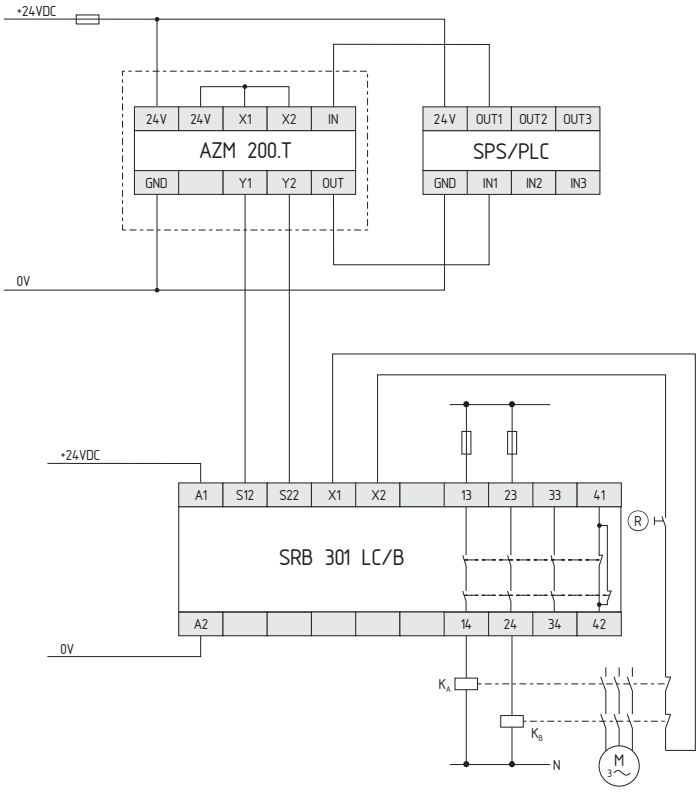


AES 1235 requires a bridge between A1 and X2 to work with two NC contacts (AZM 200).

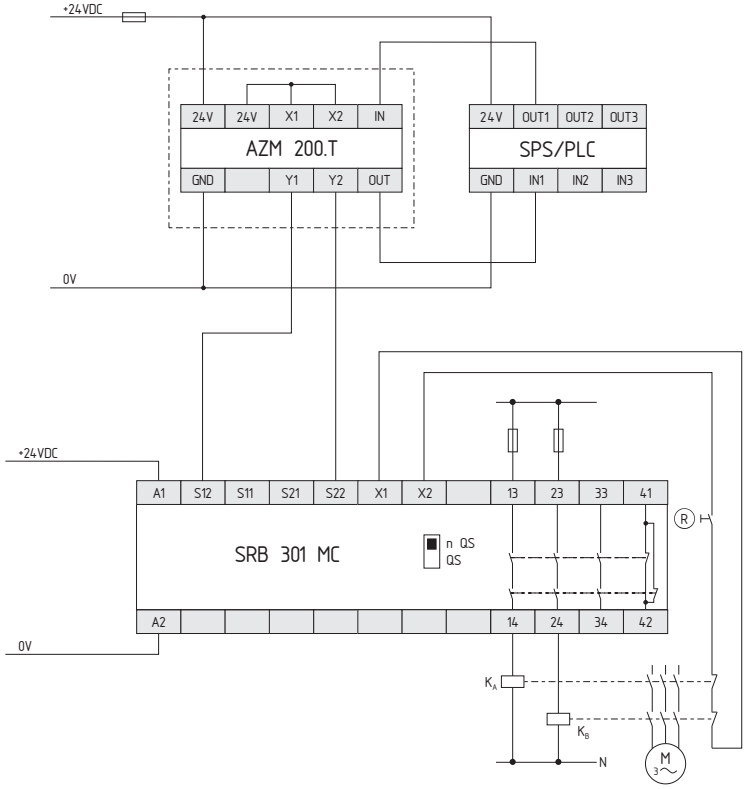
Connection of an AZM 200 solenoid interlock to the SRB 031MC safety controller



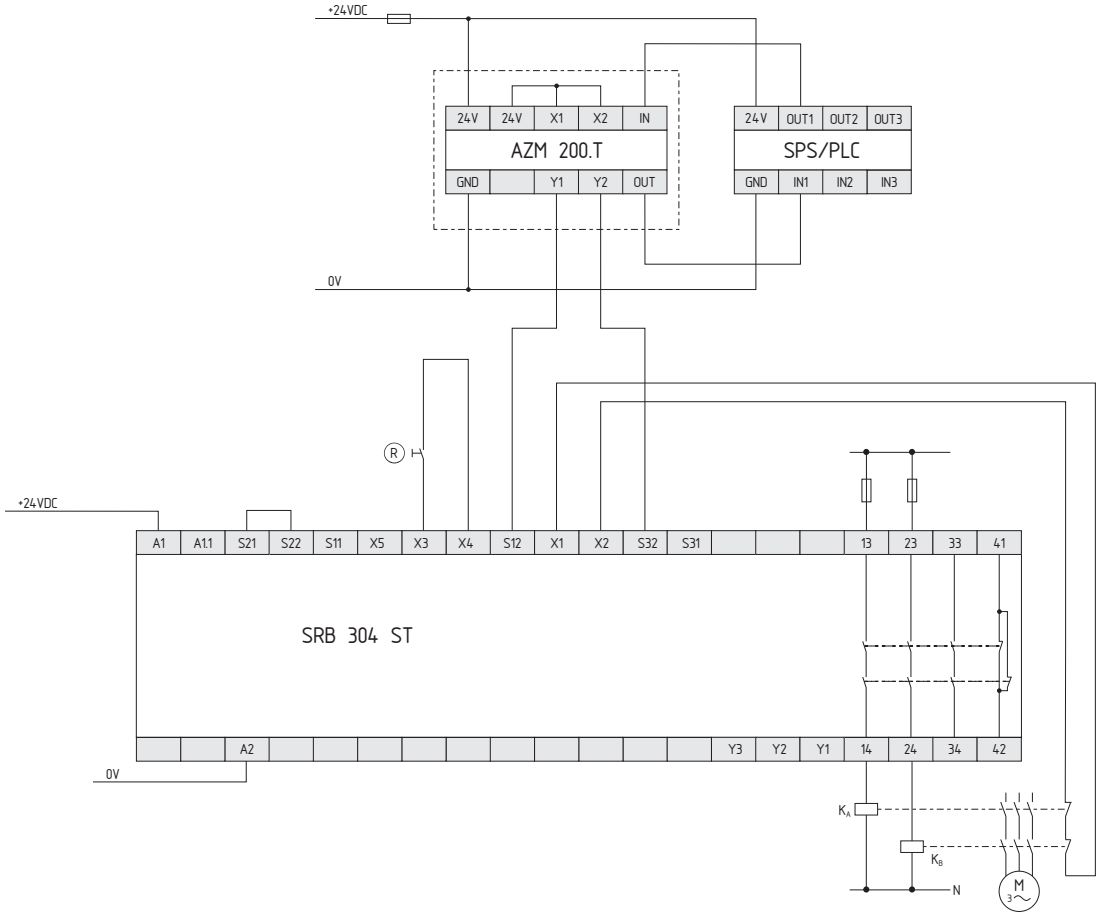
Connection of an AZM 200 solenoid interlock to the SRB 301LC/B safety controller



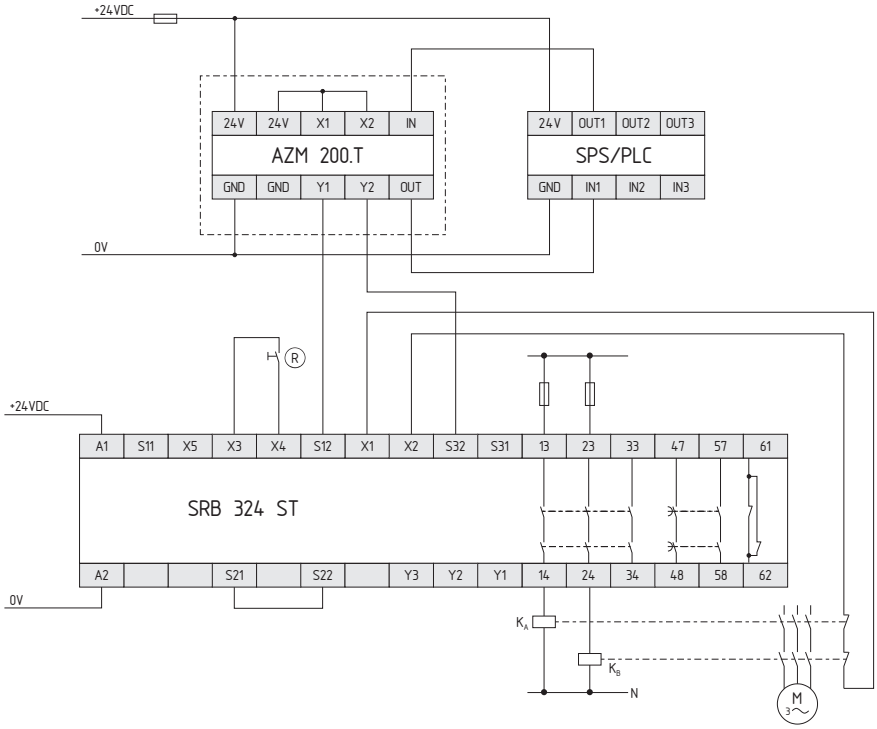
Connection of an AZM 200 solenoid interlock to the SRB 301MC safety controller



Connection of an AZM 200 solenoid interlock to the SRB 304ST safety controller



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



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