



EN BetriebsanleitungSeiten 1 bis 12
Original

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1. About this document

1.1 Function

This operating instructions manual provides all the information you need for the mounting, set-up and commissioning to ensure the safe operation and disassembly of the safety switchgear. The operating instructions must be available in a legible condition and a complete version in the vicinity of the device.

1.2 Target group: authorised qualified personnel

All operations described in this operating instructions manual must be carried out by trained specialist personnel, authorised by the plant operator only.

Please make sure that you have read and understood these operating instructions and that you know all applicable legislations regarding occupational safety and accident prevention prior to installation and putting the component into operation.

The machine builder must carefully select the harmonised standards to be complied with as well as other technical specifications for the selection, mounting and integration of the components.

1.3 Explanation of the symbols used



Information, hint, note:

This symbol indicates useful additional information.



Caution: Failure to comply with this warning notice could lead to failures or malfunctions.

Warning: Failure to comply with this warning notice could lead to physical injury and/or damage to the machine.

1.4 Appropriate use

The Schmersal range of products is not intended for private consumers.

The products described in these operating instructions are developed to execute safety-related functions as part of an entire plant or machine. It is the responsibility of the manufacturer of a machine or plant to ensure the correct functionality of the entire machine or plant.

The safety switchgear must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of applications can be found in the chapter "Product description".

1.5 General safety instructions

The user must observe the safety instructions in this operating instructions manual, the country specific installation standards as well as all prevailing safety regulations and accident prevention rules.



Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: products.schmersal.com.

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications. There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

1.6 Safety instructions for explosion protection

The manufacturer's declaration on explosion protection can be found at products.schmersal.com.

1.7 Warning about misuse



In case of improper use or manipulation of the safety switchgear, personal hazards or damages to machinery or plant components cannot be excluded.

1.8 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting or failure to comply with this operating instructions manual. The manufacturer shall accept no liability for damages resulting from the use of unauthorised spare parts or accessories.

For safety reasons, invasive work on the device as well as arbitrary repairs, conversions and modifications to the device are strictly forbidden, the manufacturer shall accept no liability for damages resulting from such invasive work, arbitrary repairs, conversions and/or modifications to the device.

2. Product description

2.1 Ordering code

EX-AZM300^①-^②ST-^③-^④-^⑤-3GD

No.	Option	Description
①	Z	Solenoid interlock monitored
	B	Actuator monitoring
②		Standard coding
	I1	Individual coding
③	I2	Individual coding, re-teaching enabled
	1P2P	1 p-type diagnostic output and 2 p-type safety outputs
	SD2P	Serial diagnostic output and 2 p-type safety outputs
④		Power to unlock
	A	Power to lock
⑤	CL	With protective enclosure, door hinge left
	CR	With protective enclosure, door hinge right

Actuator **EX-AZ/AZM300-B1**

2.2 Special versions

For special versions, which are not listed in the ordering code below 2.1, these specifications apply accordingly, provided that they correspond to the standard version.

2.3 Determination and use for functional safety in accordance with the Machinery Directive.

The non-contact, electronic safety switchgear is designed for application in safety circuits and is used for monitoring the position and locking of movable safety guards.



The safety switchgears are classified according to EN ISO 14119 as type 4 interlocking devices. Designs with individual coding are classified as highly coded.

The different variants can be used as safety switch with interlocking function either as solenoid interlock.



If the risk analysis indicates the use of a monitored interlock then a variant with the monitored interlock is to be used, marked with the symbol in the ordering code.

The actuator monitoring variant (B) is a safety switch with an interlock function for process protection.

Safety function

The safety function consists of safely switching off the safety outputs when the safety guard is opened and maintaining the safe switched off condition of the safety outputs for as long as the safety guard is open.



Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the safety guard can be opened immediately on failure of the power supply or upon activation of the main switch.

Series-wiring

Series-wiring can be set up. The reaction and risk times increase by up to 1.5 ms per additional device when connected in series. The quantity of devices is only limited by the cable drops and the external cable fuse protection, according to the technical data. Series-wiring of up to 31 EX-AZM300 ... SD components with serial diagnostics is possible. In devices with the serial diagnostics function (ordering suffix -SD), the serial diagnostics connections are wired in series and connected to a SD-Gateway for evaluation purposes. Wiring examples for series-wiring, refer to appendix.



The user must evaluate and design the safety chain in accordance with the relevant standards and the required safety level. If multiple safety switchgears are involved in the same safety function, the PFH values of the individual components must be added.



The entire concept of the control system, in which the safety component is integrated, must be validated to the relevant standards.

2.4 Determination and use for explosion protection

The components can be used in potentially explosive atmospheres of Zone 2 and 22 equipment category 3 GD. Installation and maintenance requirements in accordance with the standard series 60079 must be met. Explosion protection is achieved with ignition protection types Ex tc (protection through enclosure) and Ex tc (increased safety).



The component must be mechanically protected. In order to provide for an increased mechanical protection, the solenoid interlock must be fitted with an additional protective enclosure (included in delivery).

Conditions for safe operation

The specific ambient temperature range must be observed. External influences, e.g. B. sources of heat and cold must be observed and protective measures taken if necessary. Protection against permanent UV radiation must be guaranteed.

2.5 Technical Data

Marking in accordance with the ATEX Directive: II 3GD

Marking in accordance with standards: Ex ec IIB T5 Gc
Ex tc IIIB T95°C Dc X

Applied standards: IEC 60947-5-3, EN ISO 14119,
EN IEC 60079-0, EN 60079-7, EN 60079-31
EN ISO 13849-1, IEC 61508

Enclosure: glass-fibre reinforced thermoplastic, self-extinguishing
Active principle: RFID
Frequency band: 125 kHz
Transmitter output: max. -6 dBm

Coding level according to EN ISO 14119:
- I1-version: high
- I2-version: high
- Standard coding version: low

Reaction time, switching off outputs Y1, Y2 via:
- Actuator: ≤ 100 ms
- Inputs X1,X2: ≤ 1.5 ms
Duration of risk: ≤ 200 ms
Time to readiness: ≤ 5 s

Series-wiring: Unlimited number of components,
please observe external cable protection,
max. 31 components in case of serial diagnostics
Length of the sensor chain: max. 200 m
(Cable length and cable section alter the
voltage drop depending on the output current)

Mechanical data

Holding force F_{max} : 1.500 N
Holding force F_{zh} : 1.150 N
Latching force: 25 N / 50 N
Mechanical life: $\geq 1,000,000$ operations
- when used as door stop: $\geq 50,000$ operations
for safety guards ≤ 5 kg
and actuating speed ≤ 0.5 m/s

Angular misalignment between
solenoid interlock and actuator: $\leq 2^\circ$

Connection: Connector plug M12, 8-pole, A-coded
Fixing screws: V4A, 2 x M6, strength class 8.8
Tightening torque of the fixing screws: 8 Nm
Max. impact energy: 7 J with CL/CR protective enclosure

Switching distances to IEC 60947-5-3:

Typical switching distance s_n : 2 mm
Assured switching distance s_{ao} : 1 mm
Assured switch-off distance s_{ar} : 20 mm

Ambient conditions

Ambient temperature: 0 °C ... +50 °C
Storage and transport temperature: -10 °C ... +90 °C
Relative humidity: max. 93 %, non condensing, non icing
Degree of protection: IP64 according to EN 60079-7
IP6X according to EN 60079-31

Installation altitude above sea level: max. 2,000 m
Protection class: III
Resistance to shock: 30 g / 11 ms
Resistance to vibration: 10 ... 150 Hz, Amplitude 0.35 mm

Insulation values to EN 60664-1:
- Rated insulation voltage U_i : 32 VDC
- Rated impulse withstand voltage U_{imp} : 0.8 kV
- Over-voltage category: III
- Degree of pollution: 3
Switching frequency: ≤ 0.5 Hz

Electrical data

Operating voltage U_B : 24 VDC -15 % / +10 %
(stabilised PELV - power supply)

No-load supply current I_0 : < 0.1 A
Operating current device with magnet switched on:
- Averaged: < 0.2 A
- Peak current: < 0.35 A / 200 ms
Required rated short-circuit current: 100 A
External cable and device fuse rating: 2 A gG

Electrical data – Safety inputs

Safety inputs: X1 and X2
Switching thresholds: - 3 V ... 5 V (Low),
15 V ... 30 V (High)

Current consumption per input: ≤ 5 mA / 24 V

Accepted test pulse duration on input signal: ≤ 1.0 ms

- With test pulse interval of: ≥ 100 ms

Classification: ZVEI CB24I

Sink:	C1	Source:	C1	C2	C3
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Electrical data – Safety outputs

Safety outputs: Y1 and Y2
Switching elements: p-type, short-circuit proof
Utilisation category: DC-12, DC-13
- Rated operating voltage U_o : 24 VDC
- Rated operating current I_o : each max. 0.25 A
Leakage current I_l : ≤ 0.5 mA
Voltage drop U_d : ≤ 4 V
Cross-wire monitoring by device: Yes
Test pulse duration: ≤ 0.3 ms
Test pulse interval: 1,000 ms
Classification: ZVEI CB24I

Source:	C2	Sink:	C1	C2	
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Electrical data – Diagnostic output

Diagnostic output: OUT
Switching element: p-type, short-circuit proof
Utilisation category: DC-12, DC-13
- Rated operating voltage U_o : 24 VDC
- Rated operating current I_o : max. 0.05 A
Voltage drop U_d : ≤ 4 V

Electrical data – Magnet control

Solenoid input: IN
Switching thresholds: - -3 V ... 5 V (Low),
5 V ... 30 V (High)

Power consumption: 10 mA / 24 V

Magnet switch-on time: 100 %

Accepted test pulse duration on input signal: ≤ 5.0 ms

- With test pulse interval of: ≥ 40 ms

Classification: ZVEI CB24I

Sink:	C0	Source:	C1	C2	C3
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Serial diagnostic SD

Operating current: 0.15 A

Wiring capacitance: max. 50 nF

LED switching conditions display

green LED: Supply voltage

yellow LED: Device condition

red LED: Fault



This device complies with part 15 of the FCC Rules and contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s):

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This device complies with the Nerve Stimulation Exposure Limits (ISED SPR-002) for operations with a minimum distance of 100 mm. Changes or modifications not expressly approved by K.A. Schmersal GmbH & Co. KG could void the user's authority to operate the equipment.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) L'appareil ne doit pas produire de brouillage.
 - (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.
- Cet appareil est conforme aux limites d'exposition relatives à la stimulation des nerfs (ISED CNR-102) pour les opérations avec une distance minimale de 100 mm.

Changements ou modifications non expressément approuvés par K.A.Schmersal GmbH & Co. KG pourrait annuler le droit de l'utilisateur à utiliser l'équipement.

2.6 Safety classification

- of the interlocking function:

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to e
Control Category:	4
PFH:	$5.2 \times 10^{-10} / h$
PFD:	4.5×10^{-6}
SIL:	suitable for SIL 3 applications
Mission time:	20 years

- of the guard locking function:

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to d
Control Category:	2
PFH:	$2.0 \times 10^{-9} / h$
PFD:	1.8×10^{-4}
SIL:	suitable for SIL 2 applications
Mission time:	20 years



The safety consideration of the guard locking function only applies for standard devices with monitored solenoid interlock EX-AZM300Z-...-1P2P-... (see Ordering code). A safety assessment of the guard locking function for devices with serial diagnostics "SD2P" is not allowed due to the non-safe locking/unlocking signal from the SD Gateway



If for a certain application the power to unlock version of a solenoid interlock cannot be used, then for this exception an interlock with power to lock can be used if additional safety measure need to be realised that have an equivalent safety level.



The safety analysis of the guard locking function refers to the component solenoid interlock EX-AZM as part of the complete system. On the customer side further measures such as safe actuation and safe cable installation to prevent faults are to be implemented. In the event of a fault resulting in the unlocking of the guard locking, this is detected by the solenoid interlock and the safety gates Y1/Y2 switch off. When such a fault occurs the protection equipment may open immediately, just once, before the safe condition of the machine is reached. The system reaction of category 2 allows that a fault can occur between tests causing the loss of the safety function which is detected by the test.



The actuation of the interlock must be compared externally with the OSSD release. If a shut-down now occurs due to an unintentional unlocking this is detected by an external diagnostic.

3. Mounting

3.1 General mounting instructions



Please observe the remarks of the standards EN ISO 12100, EN ISO 14119 and EN ISO 14120.

Any mounting position.

For attachment of the solenoid interlock and the actuator, two mounting holes for M6 screws are provided.

A washer (2 mm) for symmetrical mounting of the solenoid interlock to the protective enclosure is included in the delivery. We recommend the use of washers for mounting of the actuator.

To avoid any interference inherent to this kind of system and any reduction of the switching distances, please observe the following guidelines:

- The presence of metal chips in the vicinity of the solenoid interlock is liable to modify the switching distance.
- Keep away from metal chips.

Tightening torque of the fixing screws:

- Solenoid interlock: 8 Nm
- Actuator: 5 ... 6 Nm

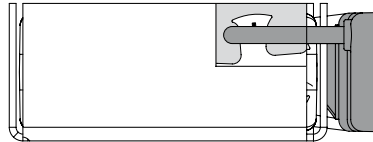


The actuator must be permanently fitted to the safety guards and protected against displacement by suitable measures (tamperproof screws, gluing, drilling of the screw heads).



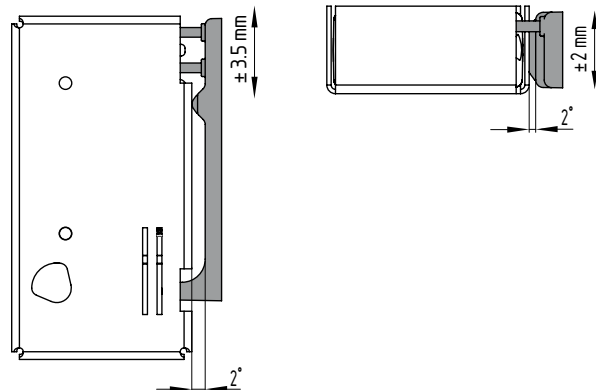
The solenoid interlock can be used as an end stop. Dependant upon the door weight and the actuating speed, the mechanical life could be reduced.

Actuation direction



Provide for a sufficient insertion of the actuator into the rotary handle.

The system must only be operated with an angle of $\leq 2^\circ$ between the solenoid interlock and the actuator.



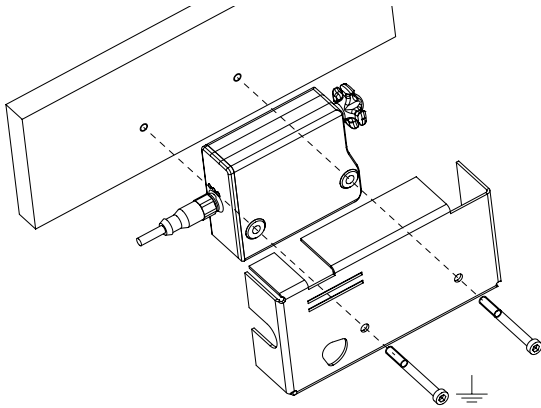
Mounting of the solenoid interlock with protective enclosure



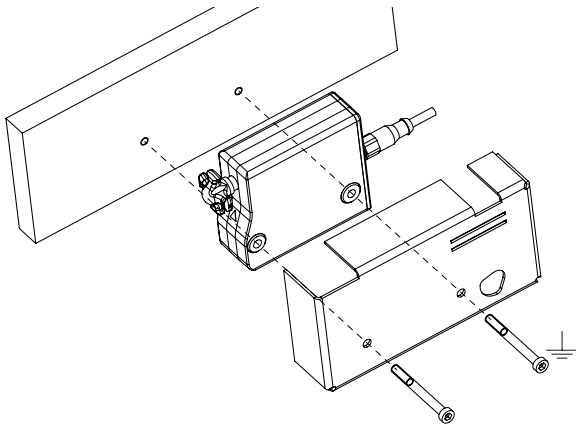
In order to provide for an increased mechanical protection, the solenoid interlock must be fitted with the additional -CL/-CR protective enclosure (included in delivery). Screws and mounting plate are not included in delivery.

There is no external potential equalization. The device must be attached to an electrically conductive metal base, which in turn must be included in the potential equalisation. Use marked fastening screw for external potential equalisation.

EX-AZM300...-CL



EX-AZM300...-CR

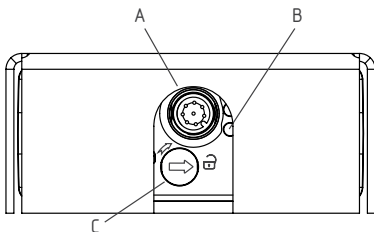


3.2 Manual release

For the machine set-up, the solenoid interlock can be unlocked in a de-energised condition. The solenoid interlock is unlocked by turning the manual release in the position

The normal locking function is only restored after the manual release has been returned to its original position

Caution: do not turn beyond the end stop!



Key

A: Connector plug M12, 8-pole

B: LED indications

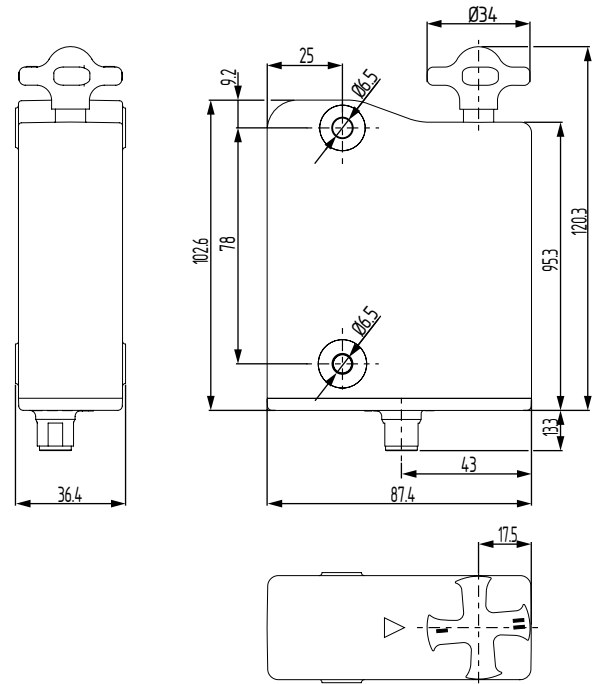
C: Manual release by means of slotted screwdriver

The manual release must be protected against accidental actuation, e.g. by using the enclosed seal after completing commissioning.

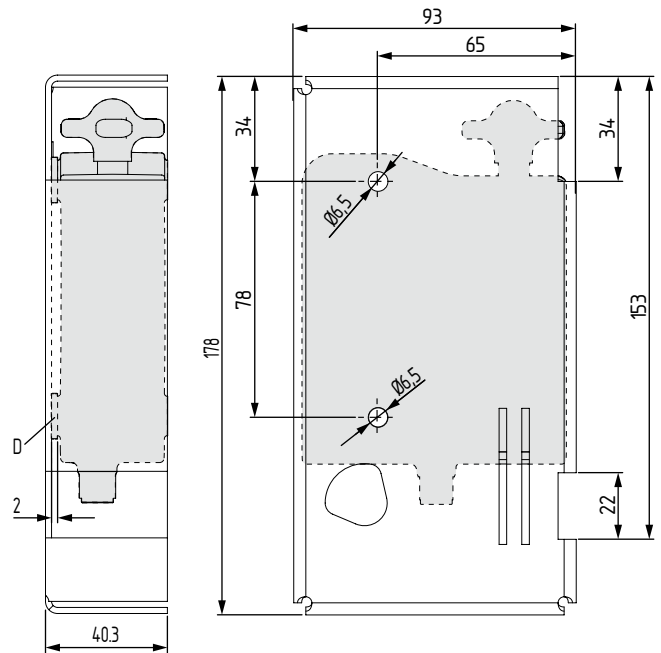
3.3 Dimensions

All measurements in mm.

Solenoid interlock without protective enclosure



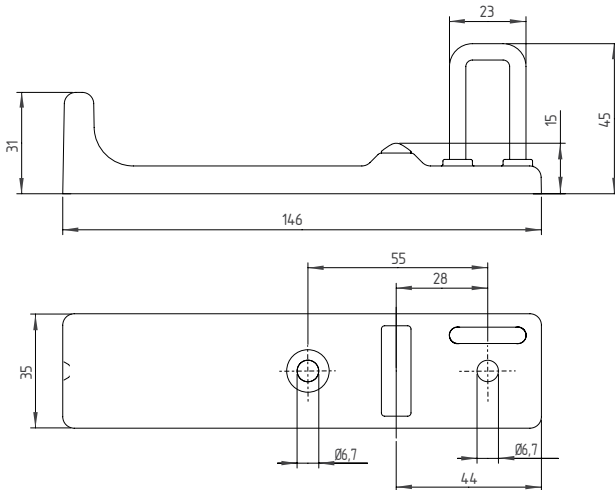
Solenoid interlock with protective enclosure



Key

D: Spacer washer between solenoid interlock and protective enclosure

Actuator EX-AZ/AZM300-B1 (not included in delivery)



4. Electrical connection

4.1 General information for electrical connection



The electrical connection may only be carried out by authorised personnel in a de-energised condition.

The voltage inputs A1, X1, X2 and IN must have a protection against permanent overvoltage. Supply units according to EN 60204-1 is recommended.

The required electrical cable fuse protection must be integrated in the installation.

The safety outputs can be integrated in the safety circuit of the control system.

When delivered, the unit's built-in plug is protected against the ingress of dust and water by means of a protective cap.

The socket of the connecting cable to be used must also be sealed with a protective cap.

Cable design



The unit must be connected with a suitable plug connector in accordance with EN 60079-14.

The plug connection must comply with the requirements of EN IEC 60079-0; section 20: Supplementary requirements for plug connections (protection against unintentional disconnection).

In addition, the plug connection must be marked in accordance with EN IEC 60079-0; section 29.13; table 18 point e: "WARNING - DO NOT DISCONNECT UNDER VOLTAGE".

Cable design in case of serial diagnostics



When wiring SD devices, please observe the voltage drop on the cables and the current carrying capacity of the individual components.

The wiring capacity of the connecting cable of the solenoid interlock must not exceed 50 nF. Depending on the strand structure, normal unshielded 30 m long control cables LIYY 0.25 mm² to 1.5 mm² have a wiring capacitance of approx. 3 ... 7 nF.

Requirements for the connected safety-monitoring module:

- Dual-channel safety input, suitable for p-type semi-conductor outputs



Configuration of the safety-monitoring module

If the safety sensor is connected to electronic safety-monitoring modules, we recommend that you set a discrepancy time of min. 100 ms. The safety inputs of the safety-monitoring module must be able to blank a test impulse of approx. 1 ms. The safety-monitoring module does not need to have a cross-wire short monitoring function, if necessary, the cross-wire short monitoring function must be disabled.



Information for the selection of suitable safety-monitoring modules can be found in the Schmersal catalogues or in the online catalogue on the Internet: products.schmersal.com.

5. Operating principle, actuator coding and latching force adjustment

5.1 Magnet control

In the power to unlock version of the EX-AZM300, the solenoid interlock is unlocked when the IN signal (= 24V) is set. In the power to lock version of the EX-AZM300, the solenoid interlock is locked when the IN signal (= 24 V) is set.

5.2 Mode of operation of the safety outputs

In the standard EX-AZM300Z variant, the unlocking of the solenoid interlock causes the safety outputs to be disabled. The unlocked safety guard can be relocked as long as the actuator is inserted in the EX-AZM300Z solenoid interlock; in that case, the safety outputs are re-enabled. **It is not necessary to open the safety guard.**

In the EX-AZM300B version, only the opening of the safety guard causes the safety outputs to be disabled.

If the safety outputs are already enabled, any error that does not immediately affect the functionality of the solenoid interlock (e.g. too high an ambient temperature, interference potential at the safety outputs, cross-wire short) will lead to a warning message, the disabling of the diagnostic output and the delayed shutdown of the safety outputs. Safety outputs are disabled if the error warning is active for 30 minutes. The signal combination, diagnostic output disabled and safety channels still enabled, can be used to stop the production process in a controlled manner. After the rectification of the error, the error message is reset by opening the corresponding safety guard. For devices with serial diagnostic, a bit can be set/deleted in the call telegram to reset the fault.

5.3 Actuator coding

Solenoid interlocks with standard coding are ready to use upon delivery.

Individually coded solenoid interlocks and actuators will require the following "teach-in" procedure:

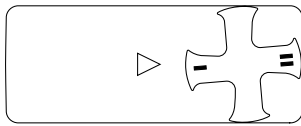
1. Switch the solenoid interlock's voltage supply off and back on.
2. Introduce the actuator in the detection range. The teach-in procedure is signalled at the solenoid interlock, green LED off, red LED on, yellow LED flashes (1 Hz).
3. After 10 seconds, brief yellow cyclic flashes (3 Hz) request the switch-off of the operating voltage of the solenoid interlock. (If the voltage is not switched off within 5 minutes, the solenoid interlock cancels the "teach-in" procedure and signals a false actuator by 5 red flashes).
4. After the operating voltage is switched back on, the actuator must be detected once more in order to activate the taught actuator code. In this way, the activated code is definitively saved!

For ordering suffix -I1, the thus executed allocation of safety switchgear and actuator is irreversible.

For ordering suffix -I2, the "teach-in" procedure for a new actuator can be repeated an unlimited number of times. When a new actuator is taught, the code, which was applicable until that moment, becomes invalid. Subsequent to that, an enabling inhibit will be active for ten minutes, thus providing for an increased protection against tampering. The green LED will flash until the expiration of the time of the enabling inhibit and the detection of the new actuator. In case of power failure during the lapse of time, the 10-minutes tampering protection time will restart.

5.4 Adjustment of the latching force

In order to enable trouble-free functionality of the device, the rotary handle must be in position I or II when the safety guard is open. In the intermediate positions, locking is impossible. The latching force is changed by turning the rotary handle by 180°. In position I, the latching force is approx. 25 N. In position II, the latching force is approx. 50 N.



6. Diagnostic function

6.1 Diagnostic-LEDs

The solenoid interlock signals the operating condition, as well as errors through 3-colour LEDs.

- green** (Power) supply voltage on
- yellow** (Status) operating condition
- red** (Fault) Error (see table 2: Error messages / flash codes red diagnostic LED)

The green LED indicates that the safety sensor is ready for operation. The supply voltage is on and all safety inputs are present. Flashing (1Hz) of the green LED signals that a voltage is missing on one or both of the safety inputs (X1 and/or X2).

System condition	LED		
	green	red	yellow
No input signal at X1 and/or X2	Flashes (1Hz)	Off	Off
Safety guard open and a safety guard in the series circuit in front of it is also open	Flashes (1Hz)	Off	Off
Safety guard closed and a safety guard in the series circuit in front of it is open	Flashes (1Hz)	Off	Flashes
Safety guard locked and a safety guard in the series circuit in front of it is open	Flashes (1Hz)	Off	On

6.2 Solenoid interlock with conventional diagnostic output

The short-circuit proof diagnostic output OUT can be used for central visualisation or control tasks, e.g. in a PLC.

The diagnostic output is not a safety-relevant output!

Error

Errors, which no longer guarantee the function of the solenoid interlock (internal errors) cause the safety outputs to be disabled immediately. Any error that does not immediately affect the safe functionality of the solenoid interlock (e.g. excess ambient temperature, safety output to external potential, short circuit) will lead to a delayed shut-down (refer to table 2).

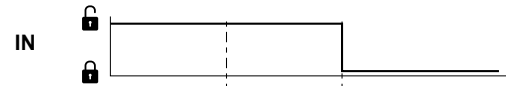
After fault rectification, the error message is reset by opening and re-closing the corresponding safety guard.

Error warning

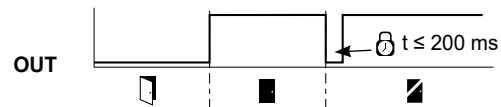
A fault has occurred, which causes the safety outputs to be disabled after 30 minutes (LED "fault" flashes, see Table 2). The safety outputs initially remain enabled. This signal combination, diagnostic output disabled and safety channels still enabled, can be used to stop the production process in a controlled manner. An error warning is deleted when the cause of error is eliminated.

Behaviour of diagnosis output based on interlock with power to unlock as an example

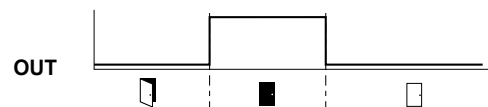
Input signal magnet control



Normal sequence, door was locked



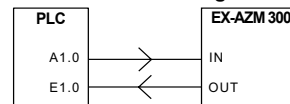
Door could not be locked or fault



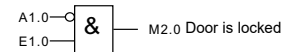
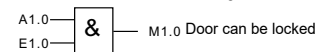
Key

- Lock
- Unlock
- Safety guard open
- Safety guard closed
- Locking time
- Safety guard not locked or fault
- Safety guard locked

Evaluation of the diagnostic outputs



Power to unlock: IN = 0 = locking



Power to lock: IN = 1 = locking

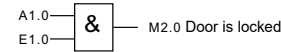
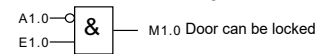


Table 1: Diagnostic information of the safety switchgear

System condition	Solenoid control IN		LED			Safety outputs Y1, Y2		Diagnostic output OUT
	Power to unlock	Power to lock	green	red	yellow	EX-AZM300Z	EX-AZM300B	
Safety guard open	24 V (0 V)	0 V (24 V)	On	Off	Off	0 V	0 V	0 V
Door closed, not locked	24 V	0 V	On	Off	Flashes	0 V	24 V	24 V
Door closed, locking impossible	0 V	24 V	On	Off	Flashes	0 V	24 V	0 V
Door closed and locked	0 V	24 V	On	Off	On	24 V	24 V	24 V
Error warning ¹⁾	0 V	24 V	On	Flashes ²⁾	On	24 V ¹⁾	24 V ¹⁾	0 V
Error	0 V (24 V)	24 V (0 V)	On	Flashes ²⁾	Off	0 V	0 V	0 V
No input signal at X1 and/or X2	0 V (24 V)	24 V (0 V)	Flashes	Off	Off	0 V	0 V	0 V
No input signal at X1 and/or X2	0 V (24 V)	24 V (0 V)	Flashes	Off	On/flashes	0 V	0 V	24 V
Additionally for variant I1/I2:								
Teach-in procedure actuator started			Off	On	Flashes	0 V	0 V	0 V
Only I2: teach-in procedure actuator (release block)			Flashes	Off	Off	0 V	0 V	0 V

¹⁾ after 30 min: disabling due to fault

²⁾ refer to flash code

Table 2: Error messages / flash codes red diagnostic LED

Flash codes (red)	Designation	Autonomous switch-off after	Error cause
1 flash pulse	Error (warning) at output Y1	30 min	Fault in output test or voltage at output Y1, although the output is disabled.
2 flash pulses	Error (warning) at output Y2	30 min	Fault in output test or voltage at output Y2, although the output is disabled.
3 flash pulses	Error (warning) cross-wire short	30 min	Cross-wire short between the output cables or fault at both outputs
4 flash pulses	Error (warning) temperature too high	30 min	The temperature measurement reveals an internal temperature that is too high
5 flash pulses	Actuator fault	0 min	Incorrect or defective actuator, bracket broken
6 flash pulses	Fault rotary handle	0 min	Rotary handle not in authorised intermediate position
Continuous red signal	Internal error	0 min	Device defective

6.3 Solenoid interlock with serial diagnostic function SD

Solenoid interlocks with serial diagnostic cable have a serial input and output cable instead of the conventional diagnostic output. If solenoid interlocks are wired in series, the diagnostic data are transmitted through the series-wiring of the inputs and outputs.

Max. 31 solenoid interlocks can be wired in series. For the evaluation of the serial diagnostics line either the PROFIBUS-Gateway SD-I-DP-V0-2 or the Universal-Gateway SD-I-U-... are used. This serial diagnostic interface is integrated as slave in an existing field bus system. In this way, the diagnostic signals can be evaluated by means of a PLC.

The necessary software for the integration of the SD-Gateway is available for download at products.schmersal.com.

The response data and the diagnostic data are 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 is transmitted to the component through an output byte of the PLC. In case of a communication error between the field bus gateway and the solenoid interlock, the switching condition of the solenoid interlock is maintained.

Error warning

A fault has occurred, which causes the safety outputs to be disabled after 30 minutes. The safety outputs initially remain enabled. This enables the shutdown of the process in a controlled manner. An error warning is deleted when the cause of error is eliminated.

Error

A fault has occurred, which causes the safety outputs to be disabled. The fault is reset, when the cause is eliminated and bit 7 of the request byte changes from 1 to 0 or the safety guard is opened. Faults at the safety outputs are only deleted upon the next release, as the fault rectification cannot be detected sooner.

Diagnostic error (warning)

If an error (warning) is signalled in the response byte, detailed fault information can be read out.



Accessories for the series-wiring

For convenient wiring and series-wiring of SD components, the SD junction boxes PFB-SD-4M12-SD (variant for the field) and PDM-SD-4CC-SD (variant for control cabinet on carrier rail) are available along with additional comprehensive accessories. Detailed information is available on the Internet, products.schmersal.com.



On wiring SD devices, please pay attention to the voltage drop on the cables and the current carrying capacity of the individual components.

Table 3: I/O data and diagnostic data

(The described condition is reached, when Bit = 1)

Bit n°	Request byte	Response byte	Diagnostic error warning	Diagnostic error
Bit 0:	Magnet on, irrespective of power to lock or power to unlock principle	Safety output activated	Error output Y1	Error output Y1
Bit 1:	---	Safety guard closed AND locking/unlocking possible ¹⁾	Error output Y2	Error output Y2
Bit 2:	---	Actuator detected and locked	Cross-wire short	Cross-wire short
Bit 3:	---	---	Temperature too high	Temperature too high
Bit 4:	---	Input condition X1 and X2	---	Incorrect or defective actuator, bracket broken
Bit 5:	---	Valid actuator detected	Internal device error	Internal device error
Bit 6:	---	Error warning ²⁾	Communication error between the field bus Gateway and the safety switchgear	---
Bit 7:	Error reset	Error (enabling path switched off)	Rotary handle not in authorised intermediate position	Rotary handle not in authorised intermediate position

¹⁾ The leading diagnosis message through bit 1 indicates whether locking or unlocking of the guard system is possible. The solenoid interlock **cannot be unlocked** if e.g. the door pulls the turret out of its rest position beyond the set latching force. This can occur if doors are heavily distorted or when pulling the door. The solenoid interlock can only be **locked** if the turret is in the rest position, i.e. the latching force is sufficient to pull the guard system into the correct position.

²⁾ after 30 min: disabling due to fault

7. Set-up and maintenance

7.1 Functional testing

The safety function of the safety components must be tested. The following conditions must be previously checked and met:

1. Check max. axial misalignment of actuator and solenoid interlock.
2. Check max. angular misalignment (see "Mounting" part)
3. Fitting and integrity of the cable connections.
4. Check the switch enclosure for damage.
5. Remove particles of dust and soiling.

7.2 Maintenance

In the case of correct installation and adequate use, the safety switchgear features maintenance-free functionality. A regular visual inspection and functional test, including the following steps, is recommended:

- Check for a secure installation of the actuator and the solenoid interlock
- Check max. axial misalignment of actuator and solenoid interlock.
- Check max. angular misalignment (see "Mounting" part)
- Fitting and integrity of the cable connections.
- Check the switch enclosure for damages
- Remove soiling



Avoid electrostatic charging. Clean the actuator with a damp cloth only.



Adequate measures must be taken to ensure protection against tampering either to prevent tampering of the safety guard, for instance by means of replacement actuators.

Damaged or defective components must be replaced.

8. Disassembly and disposal

8.1 Disassembly

The safety switchgear must be disassembled in a de-energised condition only.

8.2 Disposal

The safety switchgear must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.

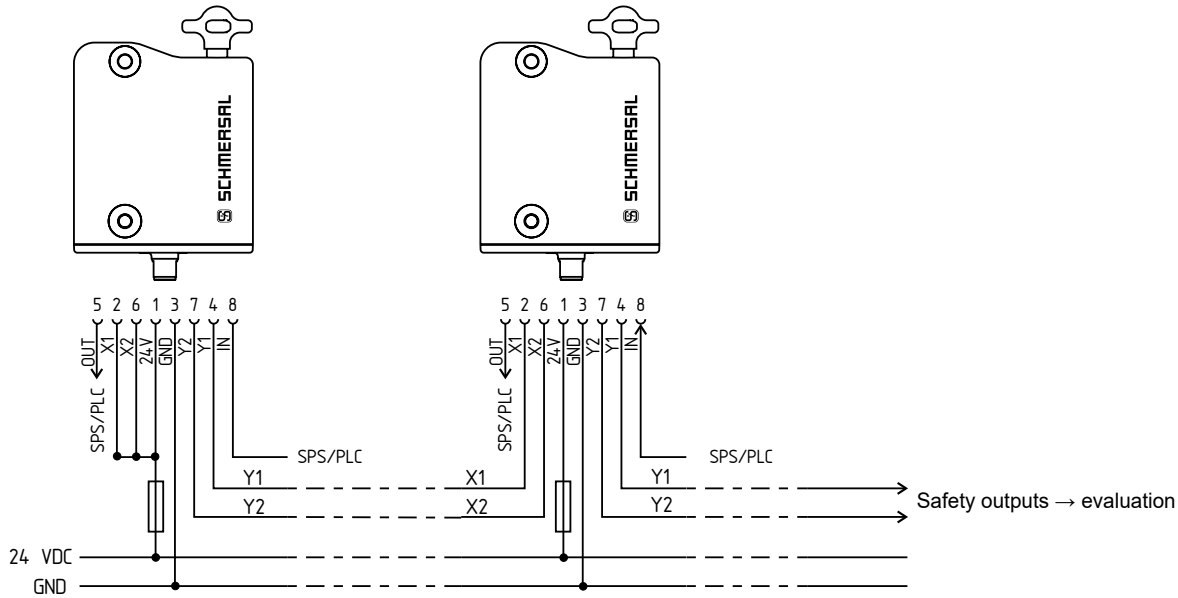
9. Appendix

9.1 Wiring examples

The application examples shown are suggestions. They however do not release the user from carefully checking whether the switchgear and its set-up are suitable for the individual application.

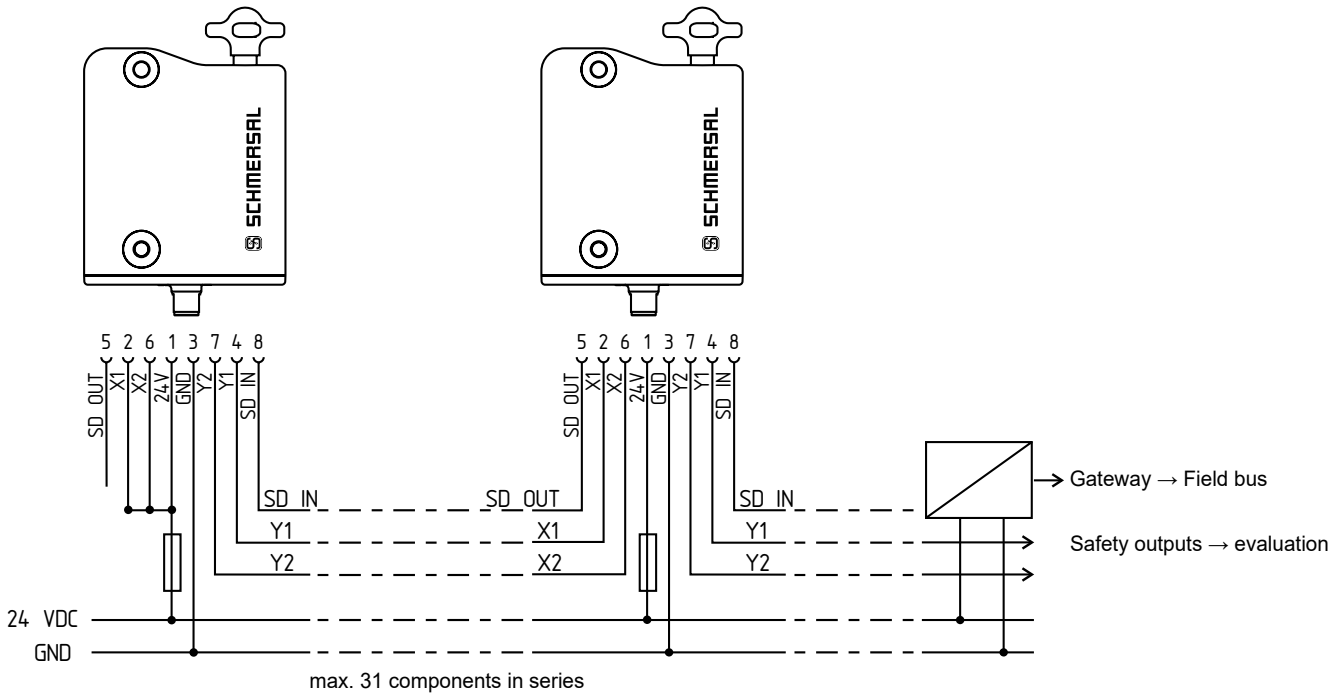
Wiring example 1: Series-wiring of the EX-AZM300 with conventional diagnostic output

The voltage is supplied at both safety inputs of the terminal safety component of the chain (considered from the safety-monitoring module). The safety outputs of the first safety component are wired to the safety-monitoring module.


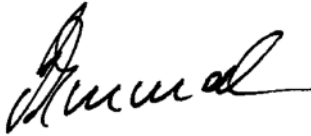


Wiring example 2: Series-wiring of the EX-AZM300 with serial diagnostic function

The safety outputs of the first safety component are wired to the safety-monitoring module. The serial Diagnostic Gateway is connected to the serial diagnostic input of the first safety component.



10. EU Declaration of conformity

EU Declaration of conformity		
Original	K.A. Schmersal GmbH & Co. KG Möddinghofe 30 42279 Wuppertal Germany Internet: www.schmersal.com	
We hereby certify that the hereafter described components both in their basic design and construction conform to the applicable European Directives.		
Name of the component:	EX-AZM300 ...-3GD	
Type:	see ordering code	
Marking	Ⓢ II 3G Ex ec IIB T5 Gc Ⓢ II 3D Ex tc IIIB T95°C Dc X	
Description of the component:	Interlocking device with electromagnetic interlock for safety functions	
Relevant Directives:	Machinery Directive	2006/42/EC
	RED-Directive	2014/53/EU
	Explosion Protection Directive (ATEX)	2014/34/EU
	RoHS-Directive	2011/65/EU
Applied standards:	IEC 60947-5-3:2013, EN ISO 14119:2013, EN 300 330 V2.1.1:2017, EN IEC 60079-0:2018, EN 60079-7:2015, EN 60079-31:2014, EN ISO 13849-1:2015, IEC 61508 parts 1-7:2010	
Notified body for the prototype test in accordance with the Machinery Directive 2006/42/EC:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln ID n°: 0035	
EC test certificate in accordance with the Machinery Directive 2006/42/EC:	01/205/5281.03/20	
Person authorised for the compilation of the technical documentation:	Oliver Wacker Möddinghofe 30 42279 Wuppertal	
Conformity with the explosion protection directive 2014/34/EU (ATEX) is declared by the manufacturer without involving a test center.		
Place and date of issue:	Wuppertal, August 9, 2022	
		
	Authorised signature Philip Schmersal Managing Director	

EX-AZM300-3DG-D-EN



The currently valid declaration of conformity can be downloaded from the internet at products.schmersal.com.



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