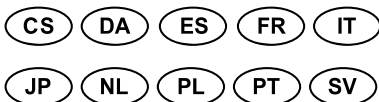




EN Operating instructions pages 7 to 12
Original



Detailed user information at products.schmersal.com.

1. About this document

This document provides all the information you need for the mounting, set-up and commissioning to ensure the safe operation and disassembly of the switchgear. The operating instructions enclosed with the device must always be kept in a legible condition and accessible.

All operations described in the 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 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.

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications.

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

2. Product description

2.1 Purpose

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

2.2 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. There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

2.3 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting or failure to comply with the 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.

2.4 Technical Data

General data

Standards	EN ISO 13849-1, EN ISO 14119, EN IEC 60947-5-3, EN IEC 61508
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Coding level according to EN ISO 14119	I1 variant: High I2 variant: High Standard coded variant: Low
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Working principle	RFID
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Frequency band RFID	125 kHz
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Transmitter output RFID, maximum	-6 dB/m
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Time to readiness, maximum	5,000 ms
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Duration of risk, maximum	200 ms
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Reaction time, switching off safety outputs via actuator, maximum	100 ms
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Reaction time, switching off safety outputs via safety inputs, maximum	1.5 ms
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Degree of protection	IP66, IP67, IP69
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Safety classification

Standards	EN ISO 13849-1, EN IEC 61508
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Safety classification - Interlocking function

Performance Level, up to	e
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Category	4
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PFH value	5.20×10^{-10} /h
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PFD value	4.50×10^{-5}
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Safety Integrity Level (SIL), suitable for applications in	3
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Mission time	20 Year(s)
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Safety classification - Guard locking function

Performance Level, up to	d
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Category	2
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PFH value	2.00×10^{-9} /h
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PFD value	1.80×10^{-4}
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Safety Integrity Level (SIL), suitable for applications in	2
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Mission time	20 Year(s)
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Mechanical data

Mechanical life, minimum	1,000,000 Operations
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Note (Mechanical life)	When using as door stop: ≥ 50.000 operations (door mass ≤ 5 kg and actuating speed ≤ 0.5 m/s)
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Angular misalignment between solenoid interlock and actuator, maximum	2°
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Holding force F_{\max} , maximum	1,500 N
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Holding force F_{zh} in accordance with EN ISO 14119	1,150 N
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Latching force (position 1 / position 2)	25 N / 50 N
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Type of the fixing screws	2x M6
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Tightening torque of the fixing screws	6 ... 7 Nm
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Mechanical data - Switching distances according EN IEC 60947-5-3

Switch distance, typical	2 mm
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Assured switching distance "ON" S_{ao}	1 mm
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Assured switching distance "OFF" S_{ar}	20 mm
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Mechanical data - Connection technique

Connection type	Connector M12, 8-pole, A-coded
Length of sensor chain, maximum	200 m
Note (length of the sensor chain)	Cable length and cross-section change the voltage drop depending on the output current

Note (series-wiring)	Unlimited number of devices, observe external line fusing, max. 31 devices in case of serial diagnostic SD
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Electrical data

Operating voltage	24 VDC -15 % / +10 % (stabilised PELV power supply)
No-load supply current I_0 , maximum	100 mA
Current consumption with magnet ON, average	200 mA
Current consumption with magnet ON, peak	350 mA / 200 ms
Required rated short-circuit current	100 A
External wire and device fuse rating	2 A gG
Switching frequency, maximum	0.5 Hz

Electrical data - Magnet control

Designation, Magnet control	IN
Switching thresholds	-3 V ... 5 V (Low) 15 V ... 30 V (High)
Current consumption at 24 V	10 mA
Test pulse duration, maximum	5 ms
Test pulse interval, minimum	40 ms

Electrical data - Safety digital inputs

Designation, Safety inputs	X1 and X2
Switching thresholds	-3 V ... 5 V (Low) 15 V ... 30 V (High)
Current consumption at 24 V	5 mA
Test pulse duration, maximum	1 ms
Test pulse interval, minimum	100 ms

Electrical data - Safety digital outputs

Designation, Safety outputs	Y1 and Y2
Design of control elements	short-circuit proof, p-type
Voltage drop U_d , maximum	2 V
Leakage current I_r , maximum	0.5 mA
Utilisation category DC-12	24 VDC / 0.25 A
Utilisation category DC-13	24 VDC / 0.25 A
Test pulse duration, maximum	0.5 ms
Test pulse interval, typical	1000 ms

Electrical data - Diagnostic outputs

Designation, Diagnostic outputs	OUT
Design of control elements	short-circuit proof, p-type
Voltage drop U_d , maximum	2 V
Utilisation category DC-13	24 VDC / 0.05 A
Utilisation category DC-12	24 VDC / 0.05 A

Electrical data - Serial diagnostic SD

Designation, Serial diagnostic SD	OUT
Design of control elements	short-circuit proof, p-type
Operating current	150 mA
Wiring capacitance	50 nF

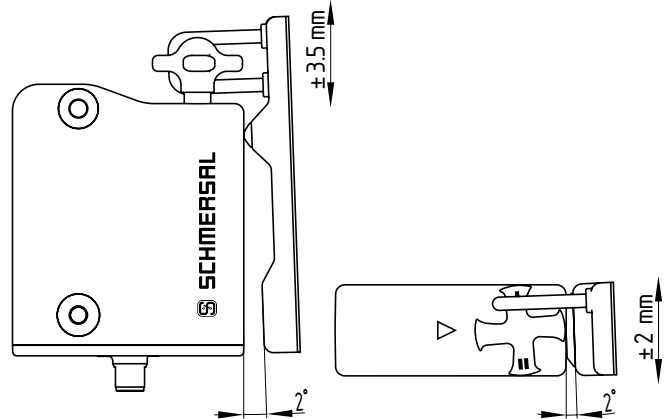
3. Mounting

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



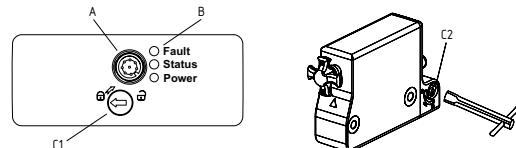
To avoid any interference inherent to this kind of system and any reduction of the switching distances, please observe the following guidelines:

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

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!



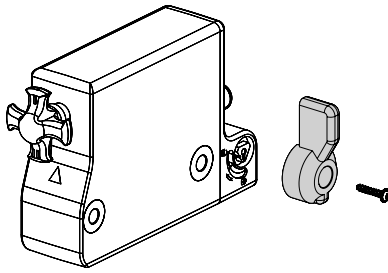
Key

- A: connector plug M12, 8-pole
- B: LED display
- C1: Manual release by means of slotted screwdriver
- C2: Manual release by means of triangular key TK-M5

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

3.3 Emergency exit -T/-T8 or emergency release -N

With variants that have both emergency exit and emergency release, the red lever is loosely supplied. Before first use, mount the lever on the triangular part of the release using the screw supplied so that the arrow in the triangle and pin on the red lever are congruent. The installation of the lever is possible on both sides. The opposite side can be used as a manual release by means of a triangular key TK-M5.



Reset of the manual release by actuating the red emergency exit lever must be prevented by the user.



Emergency exit (-T/-T8)

Fitting and actuation only from within the hazardous area

To activate the emergency exit, turn the red lever in the direction of the arrow to the end stop. The safety outputs switch off and the guard system can be opened. The blocked position is cancelled by turning the lever in the opposite direction. In the unlocked position, the guard system is secured against unintentional locking.



Emergency release (-N)

Fitting and actuation only from outside the hazardous area. The emergency release should only be used in an emergency. The solenoid interlock should be installed and/or protected so that an inadvertent opening of the interlock by an emergency release can be prevented. The emergency release must be clearly labelled that it should only be used in an emergency. The label can be used that was included in the delivery.

To activate the emergency release turn the red lever in the direction of the arrow to the end stop. The safety outputs switch off and the guard system can be opened. The lever is latched and cannot be returned to its original position. To cancel the blocking condition, the central mounting screw must be loosened to such extent that the lever can be turned back into its original position. The screw must then be re-tightened.



To ensure correct operation of emergency exit -T/-T8 and emergency release -N, the safety door/guard must not be in a mechanically tensioned state.



It is possible to combine an emergency exit with an emergency release. Please note that when the red lever is actuated, the opposite lever also rotates. As such, the procedure outlined above must be followed to release the emergency release lever.

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

Protection is not required when pilot wires are laid. The cables however must be separated from the supply and energy cables. The max. fuse rate for a sensor chain depends on the section of the connecting cable of the sensor.

Requirements for the connected safety-monitoring module:

Dual-channel safety input, suitable for 2 p-type semi-conductor outputs

4.2 Wiring configuration

Function safety switchgear

	with conventional diagnostic output	with serial diagnostic function	Pin configuration of the connector
A1	U _e		1
X1	Safety input 1		2
A2	GND		3
Y1	Safety output 1		4
OUT	Diagnostic output	SD output	5
X2	Safety input 2		6
Y2	Safety output 2		7
IN	Solenoid control	SD input	8



5. Actuator coding and latching force adjustment

5.1 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:

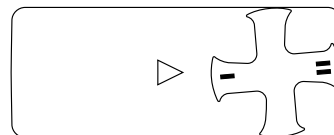
1. Switch the solenoid interlock's voltage supply off and back on.
2. Introduce the actuator in the detection range. The teach-in procedure is signalled at the solenoid interlock, green LED off, red LED on, yellow LED flashes (1 Hz).
3. After 10 seconds, brief yellow cyclic flashes (3 Hz) request the 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. Once the operating voltage is switched back on, the actuator must be detected once more in order to activate the actuator code that has been taught in. In this way, the activated code is definitively saved!

For ordering suffix -I1, the 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.

5.2 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. Active principle and diagnostic functions

6.1 Mode of operation of the safety outputs

In the standard 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 AZM300Z solenoid interlock; in that case, the safety outputs are re-enabled.

It is not necessary to open the safety guard.

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

6.2 Diagnostic-LEDs

green (Power) Supply voltage on
yellow (Status) Operating condition
red (Fault) Error (see table 2: Error messages / flash codes red diagnostic LED)

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

The diagnostic output is not a safety-related output.

Error

Errors which no longer guarantee the function of the safety switchgear (internal errors) cause the safety outputs to be disabled within the duration of risk. After fault rectification, the error message is reset by opening and re-closing the corresponding safety guard.

Fault warning

A fault that does not immediately endanger the safety function of the safety switchgear (e.g. too high ambient temperature, safety output at external potential, cross-circuit) leads to delayed shutdown (see Table 2). 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. If the fault warning remains on for 30 minutes, the safety outputs are also switched off (red LED flashes, see Table 2).

6.3 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.

Table 1: Diagnostic information of the safety switchgear

System condition	Magnet control IN		LED			Safety outputs Y1, Y2		Diagnostic output OUT
	Power to unlock	Power to lock	green	red	yellow	AZM300Z	AZM300B	
Safety guard open	24 V (0 V)	0 V (24 V)	On	Off	Off	0 V	0 V	0 V
Safety guard closed, not locked	24 V	0 V	On	Off	Flashes	0 V	24 V	24 V
Safety guard closed, locking impossible	0 V	24 V	On	Off	Flashes	0 V	24 V	0 V
Safety guard 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 pulses (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

6.4 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 SD-gateway and the solenoid interlock, the switching condition of the solenoid interlock is maintained.

Table 3: I/O data and diagnostic data

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

Bit n°	Call 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 -> fault

7. Set-up and maintenance

The safety function of the safety components must be tested. 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:

1. Check for a secure installation of the actuator and the solenoid interlock.
2. Check max. axial misalignment of actuator and solenoid interlock.
3. Check max. angular misalignment (see "Mounting" part).
4. Fitting and integrity of the cable connections.
5. Check the switch enclosure for damages.
6. Remove particles of dust and soiling.
7. For versions with emergency exit and emergency release the following should also be considered:
 - For versions with emergency exit it must be possible to open the guard system from within the hazardous area; it must not be possible that the guard system is blocked from the inside.
 - By operating the emergency release lever outside of the hazardous zone it must be possible to open the guard system.



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. Declaration of conformity

We declare under our sole responsibility that the products mentioned comply with all relevant provisions of the directives and regulations listed below and conform to the following standards.

Relevant Directives:

2006/42/EC	SI 2008/1597
2014/53/EU	SI 2017/1206
2011/65/EU	SI 2012/3032

Applied standards:

IEC 60947-5-3:2013
EN ISO 14119:2013
EN 300 330 V2.1.1:2017
EN ISO 13849-1:2015
IEC 61508 Parts 1-7:2010

Notified body for the prototype test:



TÜV Rheinland
Industrie Service GmbH
Am Grauen Stein
51105 Köln
ID n°: 0035

Test certificate:

01/205/5281.03/20



TÜV Rheinland UK
1011 Stratford Road
Solihull, B90 4BN
ID n°: 2571

01/205U/5281.00/21



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

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