



EN	Operating instructions.	pages 1 to 8
	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 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 Warning about misuse



In case of improper use or manipulation of the safety switch-gear, personal hazards or damages to machinery or plant components cannot be excluded. The relevant requirements of the standard ISO 14119 must be observed.

1.7 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

This operating instructions manual applies to the following types:

AZM201D-①-②-T-1P2P2P-③

No.	Option	Description
①		Standard coding
	I1	Individual Coding*
	I2	Individual coding*, re-teaching enabled
②	ST2	Connector plug M12, 8-pole
	ST	Connector plug M23, 12-pole (AZM201D...2965-1)
③		Power to unlock
	A	Power to lock



* Note about the individual coding

The individual, high coding refers to the detection of the correctly extended target in the bolt (interlock monitoring Y3/Y4). The door detection (safety guard monitoring Y1/Y2) corresponds to the low coding level for all versions.

Actuator	suitable for
AZ/AZM201-B1-...	Sliding safety guards
AZ/AZM201-B30-...	Hinged safety guards
AZ/AZM201-B40-...	Hinged-doors with overlapping folds



Only if the information described in this operating instructions manual are realised correctly, the safety function and therefore the compliance with the Machinery Directive is maintained.

2.2 Special versions

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



Additional information regarding the special versions can be found on the enclosed form.

2.3 Purpose

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 ISO 14119 as type 4 interlocking devices. Designs with individual coding are classified as highly coded.



The AZM 201D is a safety switch with additional interlocking function.

The safety function consists of safely switching off the safety outputs when the safety guard is unlocked (PL d / control category 3) or opened (PL e / control category 4) and maintaining the safe switched off condition of the safety outputs for as long as the safety guard is open or unlocked.



Safety switches 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.



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 Technical Data

Standards:	EN 60947-5-3, ISO 14119, 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 ISO 14119:	
- I1-version:	high (* see 2.1)
- I2-version:	high (* see 2.1)
- Standard coding version:	low
Response time:	
- Actuator:	≤ 100 ms
Duration of risk:	< 200 ms
Time to readiness:	< 4 s
Cable length:	max. 200 m (cable length and cable section alter the voltage drop depending on the output current)

Mechanical data

Termination:	Connector plug M12, 8-pole, Connector plug M23, 12-pole
Tightening torque for the cover screws:	0.7 ... 1 Nm (Torx T10)
Latching force:	30 N
Holding force F_{max} :	2,600 N (1,300 N when used with the AZ/AZM201-B30 actuator, for indoor use)
Holding force F_{Zh} :	2,000 N (1,000 N when used with the AZ/AZM201-B30 actuator, for indoor use)
Actuating speed:	≤ 0.2 m/s
Mechanical life:	≥ 1,000,000 operations

Switching distances to EN 60947-5-3

Assured switching distance s_{ao} :	4 mm
Assured switch-off distance s_{ar} :	30 mm

Environmental conditions

Ambient temperature:	-25 °C ... +60 °C
Storage and transport temperature:	-25 °C ... +85 °C
Relative humidity:	max. 93 %, non condensing, non icing
Degree of protection:	IP66, IP67 to EN 60529
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:	≤ 1 Hz

Electrical data

Operating voltage U_B :	24 VDC –15% / +10% (stabilised PELV power supply)
Rated operating current I_B :	1.2 A
Power consumption device:	< 0.05 A
Operating current device with magnet switched on:	
- Averaged:	< 0.2 A
- Peak current:	< 0.7 A / 100 ms
Required rated short-circuit current:	100 A
External cable and device fuse rating:	
- Connector M12:	2 A gG
- Connector M23:	4 A gG

Electrical data – Safety outputs

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

Source:	C2		Sink:	C1	C2	
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Safety outputs:	Y3, Y4
Switching elements:	OSSD, p-type, short-circuit proof
Utilisation category:	DC-13
- Rated operating voltage U_B :	24 VDC
- Rated operating current I_B :	each max. 0.1 A
Voltage drop U_d :	≤ 4 V
Leakage current I_r :	≤ 0.5 mA
Cross-wire monitoring by device:	No

Electrical data – Diagnostic output

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

* Residual current through outputs Y3, Y4, OUT: $I_{Y3} + I_{Y4} + I_{OUT} \leq 0.1$ A

Electrical data – Magnet control

Solenoid input:	IN
Switching thresholds:	– 3 V ... 5 V (Low), 15 V ... 30 V (High)
Power consumption:	typical 10 mA / 24 V, dynamic 20 mA
Duty ratio solenoid:	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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Use isolated power supply only.
For use in NFPA 79 Applications only.
Adapters providing field wiring means are available from the manufacturer. Refer to manufacturers information.



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

2.5 Safety classification

- of the interlocking function (safety guard monitoring, Y1 and Y2)

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to e
Control Category:	4
PFH:	5.7×10^{-10} / h
PFD:	5.0×10^{-5}
SIL:	suitable for SIL 3 applications
Mission time:	20 years

- of the interlocking function (interlock monitoring Y3 and Y4)

Standards:	EN ISO 13849-1, IEC 61508
PL:	up to d
Control Category:	3
PFH:	2.4×10^{-9} / h
PFD:	1.9×10^{-4}
SIL:	suitable for SIL 2 applications
Mission time:	20 years

3. Assembly

3.1 General mounting instructions



Please observe the relevant requirements of the standards ISO 12100, ISO 14119 and ISO 14120.

Two mounting holes for M6 screws with washers (washers included in delivery) are provided for mounting the safety switch. The safety switch must not be used as end stop. Any mounting position. The mounting position however must be chosen so that the ingress of dirt and soiling in the used opening is avoided. The unused actuator opening must be sealed by means of the dust-proof flap (included in delivery).

Minimum distance between two safety switches

as well as to other systems with same frequency (125 kHz): 100 mm.

Mounting of the safety switch and the actuator

Refer to the mounting instructions manual for the corresponding actuator.

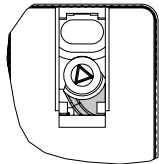


The actuator must be permanently fitted to the safety guards and protected against displacement by suitable measures (tamperproof screws, gluing, drilling of the screw heads).

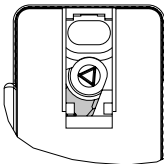
3.2 Manual release

For the machine set-up, the safety switch can be unlocked in de-energised condition. After opening of the plastic flap "A" (refer to image "Dimensions"), the triangular key must be turned clockwise to bring the blocking bolt in unlocking condition.

Component ready for operation

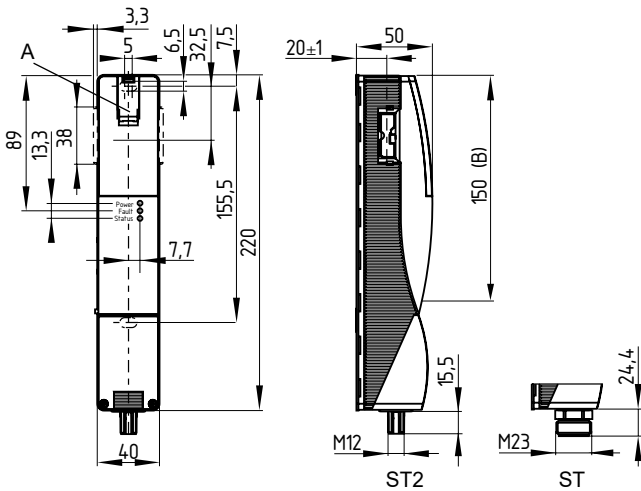


Component not ready for operation



3.3 Dimensions

All measurements in mm.



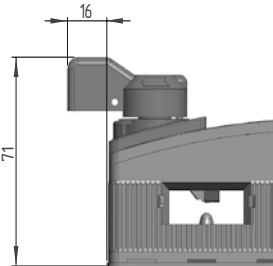
- Key
A: Manual release
B: Active RFID area

Metal parts and magnetic fields in the lateral RFID area of the solenoid interlock and the actuator can influence the switching distance or lead to malfunctions.

3.4 Retrofit kit for Manual release/Emergency exit

The retrofit kit is used for subsequent functional expansion of the safety switch.

Table with 3 columns: Designation, Ordering code. Rows: Emergency release (RF-AZM200-N, 103003543), Emergency Exit (RF-AZM200-T, 103004966).



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 power supply of the safety switch must provide protection against permanent overvoltage. To that effect, stabilised PELV supply units must be used. The safety outputs can be directly integrated in the safety circuit of the control system.

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

For applications up to PL e / control category 4 to EN ISO 13849-1, the safety outputs Y1 and Y2 of the safety switch or safety switches must be connected to a safety-monitoring module of the same control category. The antivalent switching safety outputs Y3 and Y4 are suitable for requirements up to PL d / control category 3. For this, the outputs must be tested for non-equivalence by a control that satisfies PL d/Category 3 in accordance with EN ISO 13849-1 at a minimum.

The outputs cannot be wired in series.

Inductive loads (e.g. contactors, relays, etc.) are to be provided with suitable interference suppression circuitry.

- Requirements for the connected safety-monitoring module:
• Dual-channel safety input, suitable for 2 or 4 p-type semi-conductor outputs

Safety outputs Y1 and Y2

The safety-monitoring module must tolerate internal function with cyclic switch-off of the safety outputs Y1 and Y2 for max. 2 ms (typically < 1 ms). The switch-off stage of the test cycle is temporarily reduced by an active ohmic discharge of the cable. 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.

Safety outputs Y3 and Y4

The safety outputs Y3 and Y4 are antivalent switching outputs. A short concordance (<50 ms) must be accepted as small switching delays are possible.

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.

If the safety component is wired to relays or to non-safety relevant control components, a new risk analysis must be carried out.

Cable

The maximum connectable cable length is approx. 20 m, depending on the cable cross-section used with an operating current of 0.5 A.

5. Operating principle and actuator coding

5.1 Magnet control

In the power to unlock version of the AZM 201D, the safety switch is unlocked when the IN signal (= 24V) is set. In the power to lock version of the AZM 201D, the safety switch is locked when the IN signal (= 24 V) is set.

5.2 Mode of operation of the safety outputs

Release of the safety switch leads to switch-off of the safety output Y3 and switch-on of the safety output Y4. The unlocked protective device can be locked again, provided that the actuator unit remains inserted in the safety switch, in which case the safety outputs Y3/Y4 change state again.

The safety guard must not be opened.



Enabling path 1 is depicted by the safety outputs Y1/Y2 of the AZM 201D. This path switches when the actuator is detected for applications up to PL e / control category 4. Enabling path 2 (Y3/Y4) enables (unlocks) both outputs, when the actuator is detected AND the target is detected AND the locked condition is detected.

5.3 Actuator coding

Safety switches with standard coding are ready to use upon delivery.

Individually coded safety switches and actuators will require the following "teach-in" procedure:

1. Switch the safety switch's voltage supply off and back on.
2. Introduce the actuator in the detection range. Teach-in is signalled on the safety switch, the green LED is switched off, the red LED illuminates and the yellow LED flashes (1 Hz).
3. After 10 seconds, brief cyclic yellow flashes (5 Hz) request the switch-off of the operating voltage of the safety switch. (If the voltage is not switched off within 5 minutes, the safety switch 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 executed allocation of safety switch 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.

6. Diagnostic functions

6.1 Diagnostic-LEDs

The safety switchgear signals the operational state as well as errors through three coloured LEDs installed on the front side of the device.

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

6.2 Operating principle of the electronic diagnostic output

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

The diagnostic output is not a safety-related output.

Error

Errors, which no longer guarantee the function of the safety switch (internal errors) cause the safety outputs to be switched off within the risk time. An error that does not immediately affect the safe functionality of the safety switch (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 sensor can be reset by opening and relocking the relevant guard door. The safety outputs enable and allow a restart. An interlocking chain must be permanently "locked" to enable the reactivation.



Automatic, electronic locking takes place if more than one fault is detected at the safety outputs or a cross circuit is detected between Y1 and Y2. This means that normal fault acknowledgement is no longer possible. To reset this type of interlocking, the safety switch must be isolated from the power supply after elimination of the error causes.



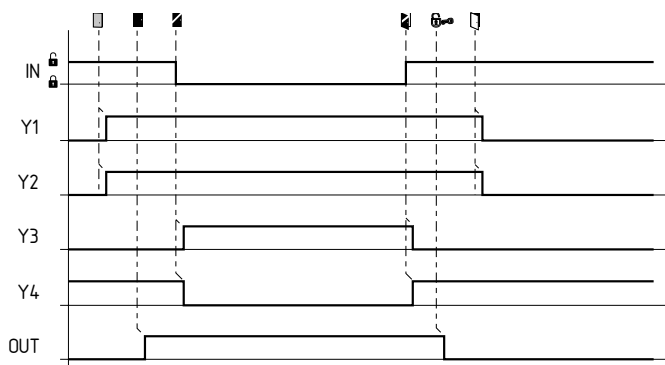
The safety outputs Y3 and Y4 are not monitored. This task is assumed by the downstream safety-monitoring module. To test the outputs, the AZM 201D must be operated at least once a year (energisation of the IN input). The equivalence of outputs Y3 and Y4 must be verified.

Error warning

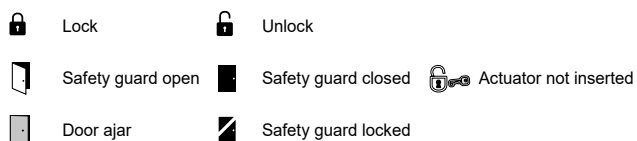
A fault has occurred, which causes the safety outputs to be disabled after 30 minutes. The safety outputs initially remain enabled. An error warning is deleted when the cause of error is eliminated.

Behaviour of the diagnostic output (Version ...-1P2P2P)

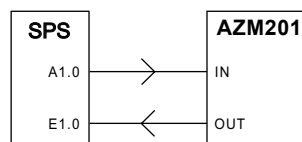
(Example: power to unlock version)



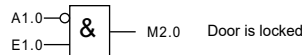
Key



Evaluation of the diagnostic output (Version ...-1P2P2P)



Power to unlock: IN = 0 = locking



Power to lock: IN = 1 = locking

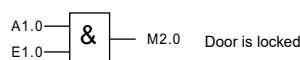
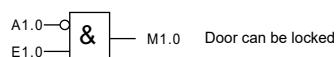


Table 1: Diagnostic information of the safety switchgear

System condition	Solenoid control IN		LED			Safety outputs				Diagnostic output OUT
	Power to unlock	Power to lock	green	red	yellow	Y1	Y2	Y3	Y4	
Safety guard open	24 V (0 V)	0 V (24 V)	On	Off	Off	0 V	0 V	0 V	24 V	0 V
Door closed, actuator not inserted	24 V	0 V	On	Off	Flashes 3 Hz	24 V	24 V	0 V	24 V	0 V
Door closed, actuator inserted, not locked	24 V	0 V	On	Off	Flashes	24 V	24 V	0 V	24 V	24 V
Door closed, actuator inserted, interlocking blocked	0 V	24 V	On	Off	Flashes	24 V	24 V	0 V	24 V	24 V
Guard closed, actuator inserted and locked	0 V	24 V	On	Off	On	24 V	24 V	24 V	0 V	24 V
Error warning¹⁾ "solenoid interlock locked"	0 V	24 V	On	Flashes ²⁾	On	24 V ¹⁾	24 V ¹⁾	24 V	0 V	24 V
Error	0 V (24 V)	24 V (0 V)	On	Flashes ²⁾	Off	0 V	0 V	0 V	24 V	24 V
Additionally for variant I1/I2:										
Teach-in procedure actuator started			Off	On	Flashes	24 V	24 V	0 V	24 V	0 V
Only I2: teach-in procedure actuator (release block)			Flashes	Off	Off	24 V	24 V	0 V	24 V	0 V

¹⁾ after 30 min: disabling due to fault

²⁾ refer to flash code

Table 2: Error messages / flash codes red 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
6 flash pulses	Error actuator combination	0 min	An invalid combination of actuators was detected (blocking bolt detection or tamper attempt).
Continuous red signal	Internal fault / overvoltage or undervoltage fault	0 min	Device defective / supply voltage not within specifications

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. Fitting of the safety switch and the actuator
2. Check the integrity of the cable entry and connections
3. Check the switch enclosure for damage

7.2 Maintenance

We recommend a regular visual inspection and functional test, including the following steps:

1. Check the fixing of the safety switch and the actuator
2. Remove particles of dust and soiling
3. Check cable entry and connections



To test the outputs, the AZM 201D must be operated at least once a year (energisation of the IN input). The ambivalence of the outputs Y3 and Y4 must be tested.



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 configuration and connector accessories

Function safety switchgear		Pin configuration of the connector	Colour code or conductor numbering of the below-mentioned Schmersal connectors		Possible colour code of other commercially available connectors according to EN 60947-5-2
24 V	U _e	1	WH	1	BN
OUT	Diagnostic output	2	BN	2	WH
GND	GND	3	GN	3	BU
Y1	Safety output 1	4	YE	4	BK
Y3	Safety output 3	5	GY	5	GY
Y4	Safety output 4	6	PK	6	PK
Y2	Safety output 2	7	BU	7	VT
IN	Solenoid control	8	RD	8	OR
LED	LED+	9		9	
Key button	Input/output	10		10	
Key button	Input/output	11		11	
NC	-	12		12	

Connector plug ST2 M12, 8-pole



Connector plug ST M23, 12-pole



Connecting cables with female connector
IP67, M12, 8-polig – 8 x 0.25 mm²


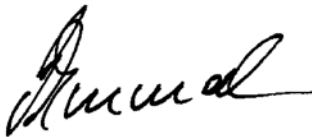
Cable length	Ordering code
2.5 m	103011415
5.0 m	103007358
10.0 m	103007359

Connecting cables with female connector
IP67, M23, 12-polig – 12 x 0.75 mm²

Cable length	Ordering code
5.0 m	101208520
10.0 m	103007354
20.0 m	101214418

Further versions in other lengths and with angled cable exit are available upon request.

10. EU Declaration of conformity

EU Declaration of conformity		 SCHMERSAL
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:	AZM201	
Type:	See ordering code	
Description of the component:	Interlocking device with electromagnetic interlock for safety functions	
Relevant Directives:	Machinery Directive RED-Directive RoHS-Directive	2006/42/EC 2014/53/EU 2011/65/EU
Applied standards:	EN 60947-5-3:2013 ISO 14119:2013 EN 300 330 V2.1.1:2017 EN ISO 13849-1:2015 EN 61508 parts 1-7:2010	
Notified body for the prototype test:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln ID n°: 0035	
EC-prototype test certificate:	01/205/5608.00/17	
Person authorised for the compilation of the technical documentation:	Oliver Wacker Möddinghofe 30 42279 Wuppertal	
Place and date of issue:	Wuppertal, 18. February, 2021	
AZM201-H-EN		
	Authorised signature Philip Schmersal Managing Director	



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