



EN Operating instructions.pages 1 to 8
Original

Content

1 About this document

1.1 Function 1

1.2 Target group: authorised qualified personnel. 1

1.3 Explanation of the symbols used 1

1.4 Appropriate use 1

1.5 General safety instructions 1

1.6 Warning about misuse 2

1.7 Exclusion of liability 2

2 Product description

2.1 Ordering code 2

2.2 Special versions. 2

2.3 Purpose 2

2.4 Technical data 2

2.5 Safety classification 3

3 Mounting

3.1 General mounting instructions 3

3.2 Dimensions 3

3.3 Retrofit kit for Emergency release/Emergency exit 4

4 Electrical connection

4.1 General information for electrical connection. 4

5 Operating principle and diagnostic functions

5.1 Magnet control 5

5.2 Mode of operation of the safety outputs. 5

5.3 Diagnostic-LEDs 5

5.4 Operating principle of the electronic diagnostic output 5

6 Set-up and maintenance

6.1 Functional testing. 6

6.2 Maintenance 6

7 Disassembly and disposal

7.1 Disassembly. 6

7.2 Disposal 6

8 Appendix

8.1 Wiring example 6

8.2 Wiring configuration and connector accessories 7

9 EU Declaration of conformity

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 is used for identifying 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 switchgear, 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:

AZM 200 D-①-T-1P2P2②

No.	Option	Description
①	SK	Screw terminals
	CC	Cage clamps
	ST1	Connector plug M23, (8+1)-pole
	ST2	Connector plug M12, 8-pole
	ST3	Connector plug M23, 12-pole (AZM 200 D...2568)
②		Power to unlock
	A	Power to lock

Actuator	suitable for
AZ/AZM200-B1-...	Sliding safety guards
AZ/AZM200-B30-...	Hinged safety guards
AZ/AZM200-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 AZM 200 D 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.



The safety switchgears are classified according to ISO 14119 as type 4 interlocking devices.



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:	IEC 60947-5-3, ISO 14119, ISO 13849-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations
Coding level according to ISO 14119:	low
Holding force F_{max} :	2,600 N (1,300 N when used with the AZ/AZM 200-B30 actuator, for indoor use)
Holding force F_{Zh} :	2,000 N (1,000 N when used with the AZ/AZM200-B30 actuator, for indoor use)
Latching force:	30 N
Protection class:	IP66, IP67 to IEC 60529
Insulation protection class:	II, III
Overvoltage category:	III
Degree of pollution:	3
Execution of the electrical connection:	screw terminals or cage clamp connection, M12 or M23 connector
Cable section:	min. 0.25 mm ² , max. 1.5 mm ² (including conductor ferrules)
Tightening torque for the cover screws:	0.7 ... 1 Nm (Torx T10)
Cable entry:	M20
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)

Switching distances to IEC 60947-5-3:

Assured switching distance s_{so} :	14 mm
Assured switch-off distance s_{ar} :	22 mm

Ambient conditions

Ambient temperature:	-25 °C ... +60 °C
Storage and transport temperature:	-25 °C ... +85 °C
Resistance to vibration:	10 ... 55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Switching frequency:	≤ 1 Hz
Response time:	< 60 ms
Duration of risk:	< 120 ms
Time to readiness:	< 4,000 ms
Max. actuating speed:	≤ 0,2 m/s

Electrical Data

Rated operating voltage U_e :	24 VDC -15% / +10% (stabilised PELV)
Rated operating current I_e :	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
No-load current I_0 :	max. 0.5 A
Rated impulse withstand voltage U_{imp} :	0.8 kV
Rated insulation voltage U_i :	32 VDC
Device fuse rating:	
- Screw terminals or cage clamps:	≤ 4 A when used to UL 508
- Connector M12:	≤ 2 A
- Connector M23:	≤ 4 A

Electrical data – Safety outputs

Safety outputs:	Y1 and Y2
Switching elements:	OSSD, p-type, short-circuit proof
Utilisation category:	DC-13: U_e/I_e : 24 VDC / 0.25 A
Rated operating current I_e :	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:	≤ 1.0 ms
Test pulse interval:	1,000 ms
Classification:	ZVEI CB24I

Source:	C1	Sink:	C1
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Safety outputs:	Y3 and Y4
Switching elements:	OSSD, p-type, short-circuit proof
Utilisation category:	DC-13: U_e/I_e : 24 VDC / 0.1 A
Rated operating current I_e :	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
Rated operating current I_e :	0.05 A*
Utilisation category:	DC-13: U_e/I_e : 24 VDC / 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
Rated operating voltage $U_{e/Low}$:	-3 V ... 5 V
Rated operating voltage $U_{e/High}$:	15 V ... 30 V
Rated operating current I_e :	typically 10 mA at 24 V, dynamically 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.

2.5 Safety classification

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

Standards:	ISO 13849-1, IEC 61508
PL:	e
Control Category:	4
PFH:	4×10^{-9} / h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

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

Standards:	ISO 13849-1, IEC 61508, IEC 60947-5-3
PL:	d
Control Category:	3
PFH:	1×10^{-7} / h
SIL:	suitable for SIL 2 applications
Mission time:	20 years

3. Mounting

3.1 General mounting instructions



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

For fitting the safety switch and the actuator, two mounting holes for M6 screws with washers (washers included in delivery) are provided. 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: 100 mm

Mounting of the actuators and the safety switches

Refer to the mounting instructions manual for the corresponding actuator.

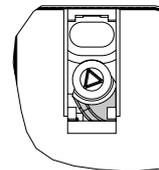


The actuator must be permanently fitted to the safety guards and protected against displacement by suitable measures (tamperproof screws, gluing, drilling of the screw heads).

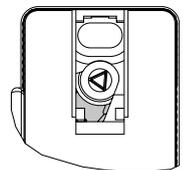
Manual release

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. The normal locking function is only restored after the triangular key has been returned to its original position. Caution: do not turn beyond the latching point! After being put into operation, the manual release must be secured by closing the plastic flap "A" and affixing the seal, which is included in delivery.

Component ready for operation

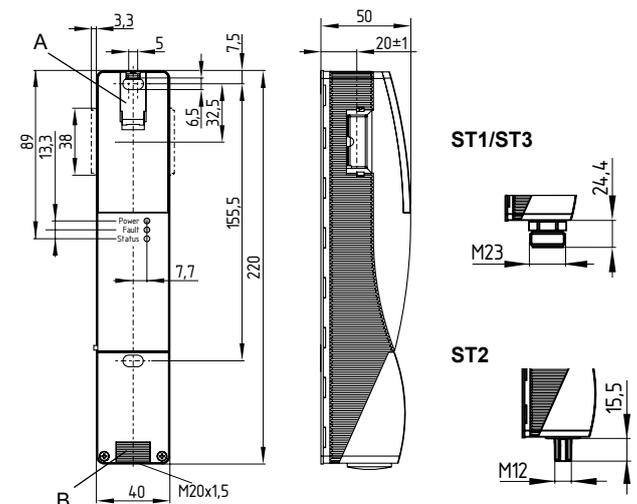


Component not ready for operation



3.2 Dimensions

All measurements in mm.



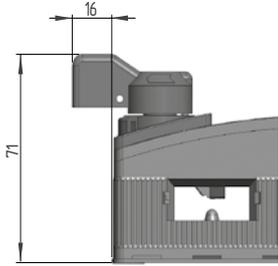
Key

- A: Manual release
- B: Cable entry

3.3 Retrofit kit for Emergency release/Emergency exit

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

	Designation	Ordering code
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. For applications up to PL e / control category 4 to 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 (refer to wiring example). The antivalent switching safety outputs Y3 and Y4 are suitable for requirements up to PL d / control category 3. To that effect, the outputs must be connected to a safety-monitoring module meeting at least the requirements of PL d / control category 3 to ISO 13849-1. 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, Y2

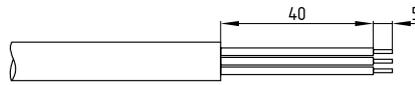
The safety-monitoring module must tolerate internal functional with cyclic switch-off of the safety outputs Y1 and Y2 for max. 2 ms (typically < 1 ms). The switch-off stage of the test cycle is temporarily reduced by an active ohmic discharge of the cable. The safety-monitoring module does not need to 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 the AZM 200 D might present small switching delays.

Cable

If the cable input is realised through a metric M20 cable gland, this gland must be dimensioned by the user so as to fit the cable used. A cable gland with strain relief and suitable IP protection class must be used.



The maximum cable length is 200 m (for ST2 M12 connectors approx. 20 m depending on the cable section used for an operating current of 0.5 A). The maximum cable section is 1.5 mm², incl. conductor ferrules. Prior to the connection, the cable must be stripped by 40+5 mm and insulated by 5 mm.

5. Operating principle and diagnostic functions

5.1 Magnet control

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

5.2 Mode of operation of the safety outputs

The unlocking of the safety switch causes the safety outputs Y3 and Y4 to be disabled. As long as the actuator is inserted in the safety switch, the unlocked safety guard can be relocked, in which case the safety outputs will be re-enabled.

The safety guard must not be opened.



Enabling path 1 is depicted by the safety outputs Y1/Y2. 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 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

5.4 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 disabled. Any error that does not immediately affect the safe functionality of the safety switch will lead to a delayed shut-down (refer to table 2).

After fault rectification (fault at output Y1 or Y2, temperature fault), the fault is acknowledged 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.



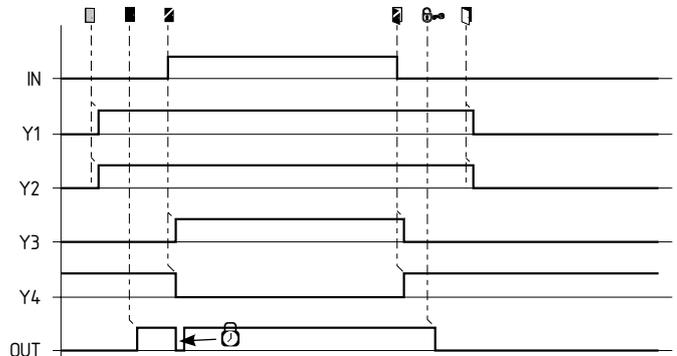
The safety outputs Y3 and Y4 are not monitored. This task is assumed by the downstream safety-monitoring module. To test the outputs, the AZM 200 D must be operated at least once a year (energisation of the IN input). The ambivalence of the outputs Y3 and Y4 must be tested.

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 in the slave when the error cause is eliminated.

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

(Example: power to unlock version)



Key

	Safety guard open		Safety guard closed
	Safety guard unlocked		Safety guard locked
	Door ajar		Actuator not inserted
	Locking time: 150 ... 250 ms, typically 200 ms		

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

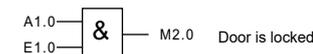
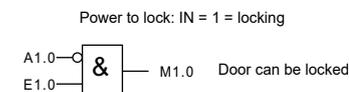
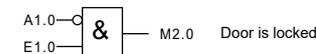
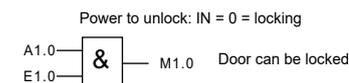
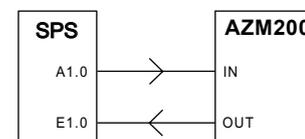


Table 1: the diagnostic function of the AZM 200 D safety switch

System condition	Solenoid control IN		LED green	LED red	LED yellow	Safety outputs				Diagnostic output OUT
	Power to unlock	Power to lock				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	0 V
Error	0 V (24 V)	24 V (0 V)	On	Flashes ²⁾	Off	0 V	0 V	24 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 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	Error target	0 min	Incorrect or defective actuator
6 flash pulses	Error target combination	0 min	An invalid combination of targets was detected (blocking bolt detection or tamper attempt)
Continuous red signal	Internal error	0 min	

6. Set-up and maintenance

6.1 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

6.2 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 200 D 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.

7. Disassembly and disposal

7.1 Disassembly

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

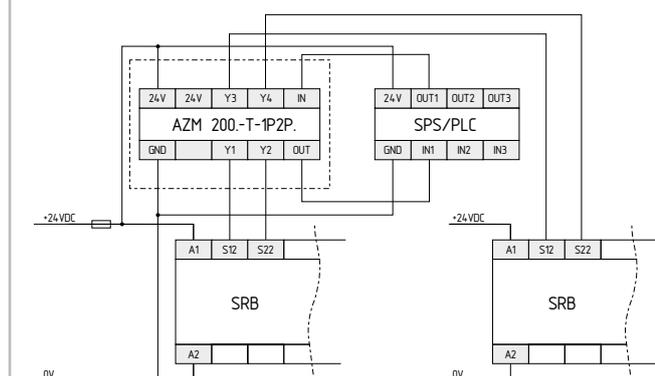
7.2 Disposal

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

8. Appendix

8.1 Wiring example

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.



8.2 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	
					to IEC 60947-5-2	DIN 47100
A1	U _e	1	BN	1	BN	WH
OUT	Diagnostic output	2	WH	2	WH	BN
A2	GND	3	BU	3	BU	GN
Y1	Safety output 1	4	BK	4	BK	YE
Y3	Safety output 3	5	GY	5	GY	GY
Y4	Safety output 4	6	VT	6	PK	PK
Y2	Safety output 2	7	RD	7	VT	BU
IN	Solenoid control	8	PK	8	OR / shielded	RD
LED	LED+	9		9		
Key button	Input/output	10		10		
Key button	Input/output	11		11		
NC	-	12		12		

Connector plug ST1 M23, (8+1)-pole



Connector plug ST2 M12, 8-pole



Connector plug ST M23, 12-pole



Connecting cables with female connector
IP67, M23, (8+1)-pole - 8 x 0.75 mm²

Cable length	Part number
5.0 m	101209959
10.0 m	101209958

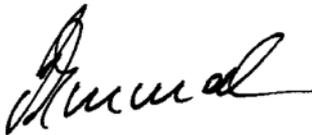
Connecting cables with female connector
IP67, M12, 8-pole - 8 x 0.25 mm²

Cable length	Part number
2.5 m	103011415
5.0 m	103007358
10.0 m	103007359

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

Cable length	Part number
5.0 m	101208520

9. 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:	AZM 200	
Type:	See ordering code	
Description of the component:	Interlocking device with electromagnetic interlock for safety functions	
Relevant Directives:	Machinery Directive	2006/42/EC
	EMC-Directive	2014/30/EU
	RoHS-Directive	2011/65/EU
Applied standards:	EN 60947-5-3:2013 ISO 14119: 2013 EN ISO 13849-1:2015 EN 61508 parts 1-7: 2010 EN 62061:2005 + AC:2010 + A1:2013 + A2:2015	
Notified body for the prototype test:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln ID n°: 0035	
EC-prototype test certificate:	01/205/5122.02/20	
Person authorised for the compilation of the technical documentation:	Oliver Wacker Möddinghofe 30 42279 Wuppertal	
Place and date of issue:	Wuppertal, February 26, 2020	
		
	Authorised signature Philip Schmersal Managing Director	

AZM200-F-EN



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

