SCHMERSAL

EN Operating instructions. . . . . .pages 1 to 8
Translation of the original operating instructions

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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 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 machinery 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: www.schmersal.net.

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.

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1.6 Warning about misuse

In case of inadequate or improper use or manipulations of the safety switchgear, personal hazards or damage to machinery or plant components cannot be excluded. The relevant requirements of the standard EN 1088 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 ① ST-T-AS-②P

No.	Option	Description
①		Solenoid interlock monitored
	B	Actuator monitored
	BZ	Combined actuator/solenoid interlock monitoring
②		Power to unlock
	A	Power to lock

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.

2.3 Destination and use

The AZM 200 AS with integrated actuator and safety guard detection operates with non-contact safety sensors and is designed for use in AS-Interface Safety at Work systems. The different variants can be used as safety switch with interlocking function either as solenoid interlock for the position monitoring and locking of movable safety guards.

The safety function of the AZM 200 AS consists in safely switching off the code transmission when the safety guard is opened and maintaining the safe switched off condition for as long as the safety guard is open.

An AS-Interface Safety at Work component functions on the basis of an individual code generator (8 x 4 bit). This safety code is cyclically transmitted over the AS-i network and monitored by the ASM safety monitor.

The component status can be evaluated through a PLC with AS-Interface master. The safety-related functions are enabled by means of the AS-i safety monitor.

For an application requiring a safe linterlocking, the AZM 200 ST-T-AS or the AZM 200 BZ ST-T-AS variant must be selected. The AZM 200 B ST-T-AS is a safety switch with additional interlocking function.

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.

The user must evaluate and design the safety chain in accordance with the relevant standards and the required safety level.

2.4 Technical data

Standards:	EN 50295, EN 60947-5-1, IEC 61508, EN ISO 13849-1, IEC 60947-5-3
Working principle:	inductive
Magnet switch-on time ED:	100 %
Material of the housings:	Plastic, glass-fibre reinforced thermoplastic, self-extinguishing
Response time:	< 60 ms
Duration of risk:	< 120 ms
Time to readiness:	< 4000 ms
Recommended actuators:	AZ/AZM 200-B1, AZ/AZM 200-B30, AZ/AZM 200-B40
Mechanical data	
Execution of the electrical connection:	M12 connector plug, 4 poles
Mechanical life:	> 1,000,000 operations for safety guards ≤ 5 kg; actuating speed: ≤ 0.5 m/s
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 Hz ... 150 Hz, amplitude 0.35 mm
Holding force F_{max}:	2000 N
Latching force:	30 N
Actuating speed:	≤ 2 m/s
Tightening torque for device fixation:	max. 8 Nm
Tightening torque for the cover screws:	0.7 Nm ... 1 Nm (Torx T10)
Manual release (Y/N):	Yes
Ambient conditions	
Ambient temperature:	−25 °C ... +60 °C
Storage and transport temperature:	−25 °C ... +85 °C
Relative humidity:	30 … 95%, no condensation, no icing
Protection class:	IP67 to IEC/EN 60529
Protection class:	II, ⧈
Insulation values to IEC/EN 60664-1:	
- Rated impulse withstand voltage U_{imp}:	0.8 kV
- Rated insulation voltage U_i:	32 VDC
- Overvoltage category:	III
- Degree of pollution:	3

Electrical data - AS-Interface:	
AS-i supply voltage:	26.5 ... 31.6 VDC, protection against polarity reversal
AS-i power consumption:	≤ 100 mA
AS-i device insulation:	internal short-circuit proof
AS-i specification:	
- Version:	V 2.1
- Profile:	S-7.B.F.E
AS-i inputs:	
- Channel 1:	Data bits DI 0/DI 1 = dynamic code transmission
- Channel 2:	Data bits DI 2/DI 3 = dynamic code transmission
AS-i outputs:	
- DO 0:	magnet control
- DO 1 ... DO 3:	no function
AS-i Parameter bits:	
- P0:	Safety guard and actuator detected
- P1:	Solenoid interlock locked
- P2:	Magnet voltage in tolerance range
- P3:	Internal device error
Parameter request:	default value parameter request "1111" (0xF)
AS-i Input module address:	0 - preset to address 0, can be changed through AS-interface bus master or hand-held programming device
Electrical data - Auxiliary voltage (Aux):	
Supply voltage U_B:	24 VDC (−15 % / +10 %) stabilised PELV units
Power consumption:	≤ 500 mA
Device fuse rating:	≤ 4 A (when used to UL 508)
LED switching conditions display:	
(1) LED green-red (AS-i Duo LED):	Supply voltage / Communication error / Slave adress = 0
(2) LED red:	Internal device error
(3) LED yellow:	Device condition (Enabling status)

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

Standards:	EN ISO 13849-1, IEC 61508, IEC 60947-5-3
PL:	up to e
Control category:	up to 4
PFH value:	4 x 10^{-9} / h
SIL:	up to 3
Service life:	20 years
Classification:	PDF-M

3. Mounting

3.1 General mounting instructions

The fitting may only be carried out by authorised personnel.

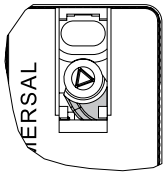
For fitting the AZM 200 AS solenoid interlock, two mounting holes for M6 screws with washers (washers included in delivery) are provided. The solenoid interlock must not be used as an end stop. Any mounting position. The mounting position however must be chosen so that the ingress of dirt and soiling in the used opening is avoided. The unused actuator opening must be sealed by means of the dust-proof flap (included in delivery).

Fitting of the actuator
Refer to the mounting instructions manual for the corresponding actuator.

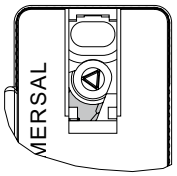
Please observe the remarks of the standards EN ISO 12100, EN 953 and EN 1088.

3.2 Manual release

For the machine set-up, the solenoid interlock 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

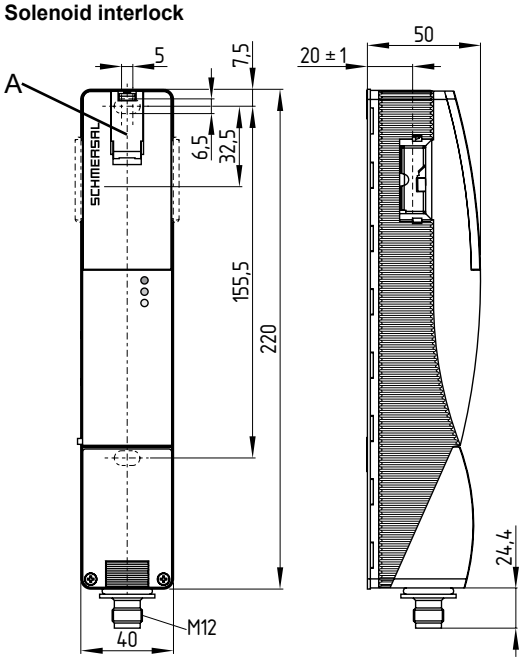


Component not ready for operation

3.3 Dimensions

All measurements in mm.

Solenoid interlock



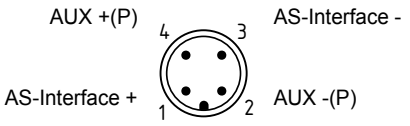
Legend
A = Manual release under plastic cover

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 AZM 200 AS solenoid interlock is supplied through the AS-Interface system. The energy for the locking magnet is individually supplied (AUX). Both voltage supplies of the solenoid interlock must be equipped with a protection against permanent overvoltage. To that effect, stabilised PELV supply units must be used. The connection to the AS-Interface system is realised through an M12 connector. The M12 x 1 connector has an A-coding. The wiring configuration of the M12 connector is defined as follows (to EN 50295):



5. Functions and configuration

5.1 Mode of operation of the safety outputs

AZM 200 ST-T-AS
The safety outputs of the AS-i safety monitor are enabled, when the following conditions are met:
• guard door detected
• the actuator is inserted
• the solenoid interlock is locked

AZM 200 B ST-T-AS
The safety outputs of the AS-i safety monitor are enabled, when the following conditions are met:
• guard door detected
• the actuator is inserted

AZM 200 BZ ST-T-AS
The safety outputs of the AS-i safety monitor are only activated, when both AS-i half-codes are enabled.

Half-code 1 (AS-i SaW bit 0,1) is enabled, when:
• guard door detected
• the actuator is inserted
The solenoid interlock now can be locked!

Half-code 2 (AS-i SaW bit 2,3) is enabled, when:
• the solenoid interlock is additionally locked.

5.2 Magnet control

The control system with the AS-Interface Master can lock and unlock the solenoid interlock through the output bit 0 of the addressed AS-i slave AZM 200 AS. In the power to lock variant of the AZM 200 AS, the functional set of output bit 0 will cause the solenoid interlock to be locked. In the power to unlock variant of the AZM 200 AS, the functional set of output bit 0 will cause the solenoid interlock to be unlocked.

5.3 Programming the slave address

The slave address is programmed through the M12 connector. Any address from 1 to 31 can be set by means of the AS-i bus master or a hand-held programming device.

5.4 Configuration of the safety monitor

The AZM 200 AS can be configured in the ASIMON configuration software with the following monitoring devices (also refer to the ASIMON manual).

Double channel dependent
Suitable for: AZM 200 ST-T-AS, AZM 200 B ST-T-AS, AZM 200 BZ ST-T-AS
• Synchronisation time typically: 0.1 s; for AZM 200 BZ ST-T-AS infinite (∞)
• Optionally with startup test
• Optional with local acknowledge
When the AZM 200 BZ ST-T-AS is used together with this monitoring device for conducting the start-up test prior to every restart, the safety guard must be opened.

Double channel conditionally dependent
Suitable for: AZM 200 BZ ST-T-AS
• Independent: In-1
As long as the actuator remains inserted, the safety guard can be relocked at any time, in which case the safety outputs are reactivated. The safety guard must not be opened.

The configuration of the safety monitor must be tested and confirmed by a qualified and authorised safety expert/safety engineer.

5.5 Status signal "safety release"

The "safety release" status signal from a Safety at Work slave can be cyclically queried by the control system through the AS-i master. To that effect, the 4 input bits with the varying SaW code of a Safety at Work slave are evaluated through an OR operation with 4 inputs in the control system.

6. Diagnostic

6.1 LED display

The solenoid interlock signals the operational state as well as errors through three coloured LED's installed on the front side of the device.

The LED's have the following meaning (to EN 50295):

LED green-red:	AS-Interface supply voltage / AS-Interface communication error or slave address = 0
Red LED:	Internal device error
Yellow LED:	Device status

Error
Errors, which no longer guarantee the function of the AZM 200 AS solenoid interlock (internal error)s cause the safety outputs to be disabled within the risk time. Any error that does not immediately affect the safe functionality of the AZM 200 AS (e.g. the ambient temperature too high) will lead to a delayed shut-down (refer to table 2). After fault rectification, the error message can be reset by opening and closing the relevant guard door. The safety outputs of the ASM can be switched back on, thus enabling the machine.

Error warning
If a fault has occured, which still guarantees the function of the AZM 200 AS solenoid interlock, the system is safely switched off after 30 minutes. The safety outputs of the ASM initially remain enabled. The error message can be read out through the parameter port (refer to Table 1). Depending on the type of fault, the machine is not immediately shut down. The control system obtains a preliminary message, which can be used to shutdown the process in a controlled manner. An error warning is deleted/reset as soon as the error cause is eliminated.

6.2 Diagnostic information

Table 1: the diagnostic function of the AZM 200 AS solenoid interlock

System condition	Solenoid control A0		LED			Condition AS-i SaW	
	Power to unlock	Power to lock	green/ red[3)]	red	yellow	(D0 ... D3)	
Guard open	1 (0)	0 (1)	green	Off	Off	static 0	
Guard closed, actuator not inserted	1 (0)	0 (1)	green	Off	Off	static 0	
Guard closed, actuator inserted (not locked)	1	0	green	Off	Flashes	static 0 dynamic D0, D1: dynamic D2, D3: static 0	(AZM 200 ST-T-AS) (AZM 200 B ST-T-AS) (AZM 200 BZ ST-T-AS)
Guard closed, actuator inserted and locked	0	1	green	Off	On	dynamic	
Error warning[1)], actuator inserted and locked, shutdown approaching	0	1	green	Flashes[2)] / On	On	dynamic	
Error	0 (1)	1 (0)	green	Flashes[2)]	Off	static 0	
internal error	0 (1)	1 (0)	green	On	Off	static 0	
AS-i error: slave address = 0 or communication error	1 (0)	0 (1)	red	depending on the condition		static 0	

1) after 30 min -> fault
2) refer to flash code
2) AS-i Duo-LED green/red

Table 2: Error messages / flash codes red LED

Flash codes (red)	Designation	Autonomous switch-off after	Error cause
4 flash pulses	Error (warning) temperature too high	max. 30 min	The temperature measurement reveals an internal temperature that is too high
5 flash pulses	Error target	0 min	The coding (frequency) of the detected targets diverges too much from the desired value, wrong target
6 flash pulses	Error target combination	0 min	An invalid combination of targets was detected at the 4 coils of the AZM 200 AS. (Currently set: blocking bolt detected & door target not detected => blocking bolt breakage detection or tamper attempt)
Continuous red	Internal error	0 min	Device defective

6.3 Read-out of the parameter port

The parameter port P0 to P3 of a solenoid interlock can be read out through the control interface of the AS-i master (see component description) by means of the "Write parameter" instruction (with hexa-decimal value F). This (non-safe) diagnostic information from the reflected parameters or the answer to a "Write parameter instruction" can be used by the user for diagnostic purposes or for the control programme.

Table 3: diagnostic information (P0...P3)

Parameter bit	Condition = 1	Condition = 0
0	Door closed and actuator inserted. The actuator can now be locked.	Safety guard and actuator not detected
1	Door closed, actuator inserted and locked	Actuator not locked
2	Magnet voltage in tolerance range (18 V ≤ U_m ≤ 28 V)	Magnet voltage not in tolerance range
3	Error* detected	No error detected

*To be observed: refer to error warning (switch-off after 30 min.)

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 safety switchgear
2. Check the switch enclosure for damage
3. Remove particles of dust and soiling

7.2 Maintenance

We recommend a regular maintenance, including the following steps:

- Check the fixing of the safety switch and the actuator
- Check max. axial misalignment of actuator and safety switch
- Check the switch enclosure for damages
- Remove soiling

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 EC Declaration of conformity

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EC Declaration of conformity

Translation of the original declaration of conformity
valid as of December 29, 2009

K.A. Schmersal GmbH
Industrielle Sicherheitsschaltsysteme
Möddinghofe 30, 42279 Wuppertal
Germany
Internet: www.schmersal.com

We hereby certify that the hereafter described safety components both in its basic design and construction conform to the applicable European Directives.

Name of the safety component / type:	AZM 200 AS
Description of the safety component:	Interlocking device with electro-magnetic interlock for safety functions with integrated AS-i Safety at Work
Harmonised EC-Directives:	2006/42/EC-EC-Machinery Directive 2004/108/EC EMC-Directive
Person authorized for the compilation of the technical documentation:	Ulrich Loss Möddinghofe 30 42279 Wuppertal
Notified body, which approved the full quality assurance system, referred to in Appendix X, 2006/42/EC:	TÜV Rheinland Industrie Service GmbH Alboinstr. 56 12103 Berlin ID n°: 0035
Place and date of issue:	Wuppertal, December 7, 2009



Authorised signature
Heinz Schmersal
Managing Director

Note
The currently valid declaration of conformity can be downloaded from the internet at www.schmersal.net.

CE

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