



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 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 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:

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
P		Magnet supply 24 VDC (AUX)



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 Purpose

The AZM 200 AS with non-contact electronic safety sensors is designed for application in the AS interface Safety at Work and is used for monitoring the position and blocking movable protective equipment.



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

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.



If the risk analysis indicates the use of a monitored interlock then a variant with the monitored interlock is to be used, labelled with the symbol.
The actuator monitoring variant (B) is a safety switch with an interlock function for process protection.

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



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

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 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.



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



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, EN 62026-2, ISO 13849-1, IEC 61508
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Working principle:	inductive
Coding level according to ISO 14119:	low
Response time:	< 60 ms
Duration of risk:	< 120 ms
Time to readiness:	< 4,000 ms
Recommended actuator:	AZ/AZM 200-B1, AZ/AZM 200-B30, AZ/AZM 200-B40

Mechanical data

Connection:	Connector plug M12, 4-pole,
Mechanical life:	> 1,000,000 operations (for safety guards ≤ 5 kg; actuating speed: ≤ 0.5 m/s)
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/AZM 200-B30 actuator, for indoor use)
Latching force:	30 N
Actuating speed:	≤ 2 m/s
Tightening torque:	
- Device fixing:	max. 8 Nm
- Cover screws:	0.7 ... 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
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 Hz ... 150 Hz, amplitude 0.35 mm
Protection class:	IP67 to IEC 60529
Protection rating:	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 mains unit
Power consumption:	≤ 500 mA
Magnet switch-on time:	100 %
Device fuse rating:	≤ 4 A (when used to UL 508)

LED switching conditions display

	Supply voltage / Communication error / Slave address = 0
(1) LED green-red (AS-i Duo LED):	Internal device error
(2) LED red:	Device condition (Enabling status)
(3) LED yellow:	

 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

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

PL:	e
Control Category:	4
PFH:	≤ $1.00 \times 10^{-9} / h$
SIL:	suitable for SIL 3 applications
Mission time:	20 years

2.6 Safety classification of the guard locking function

If the device is used as an interlock for personal safety, a safety classification of the guard locking function is required.

When classifying the interlock function, a distinction must be made between monitoring of the interlock function (locking function) and controlling the unlocking function.

The following safety classification of the unlocking function is based on the application of the principle of safety energy disconnection for the solenoid supply

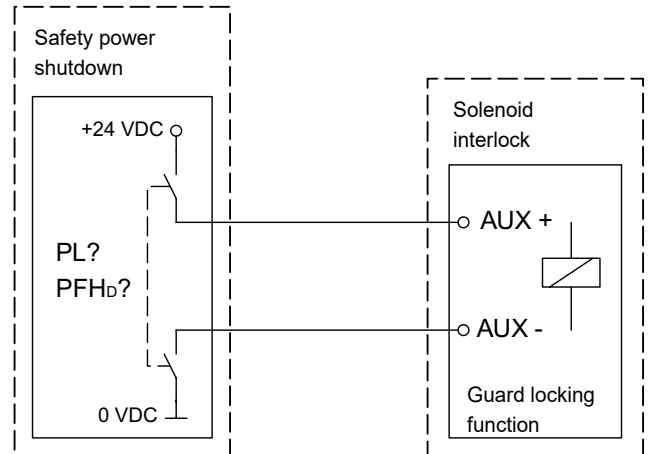


The safety classification for the release function only applies to devices with monitored interlock function, in power to unlock version and with solenoid supply from 24 VDC (AUX) (see ordering code).

By reliably isolating the power externally, it can be assumed that no errors can occur with regard to the locking device of the interlock.

In this case, the locking device of the solenoid interlock does not have an effect on the failure probability of the unlock function.

The safety level of the unlock function is determined exclusively by the external safety power shutdown.



Fault exclusion with regard to wiring routing must be observed.



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

3. Mounting

3.1 General mounting instructions



The installation 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).

Minimum distance between two devices: 100 mm

Fitting of 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).



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

3.2 Manual release

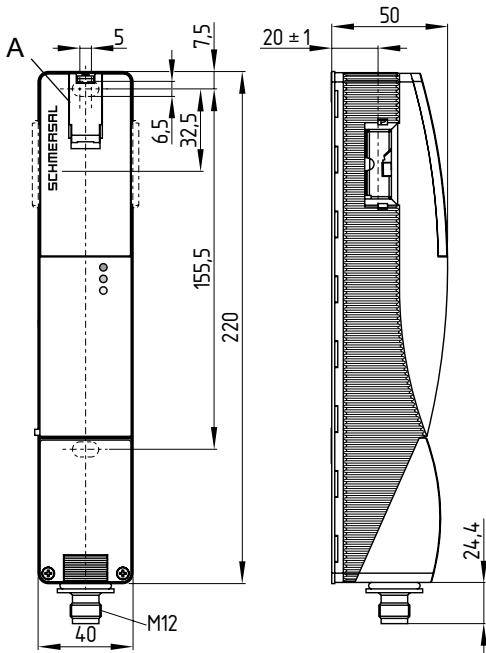
For the machine set-up, the solenoid interlock can be unlocked in a de-energised condition. After opening of the plastic flap "A" (refer to image "Dimensions"), the triangular key must be turned clockwise to bring the blocking bolt in unlocking condition. The normal locking function is only restored 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.



Key

A: Manual release under plastic cover

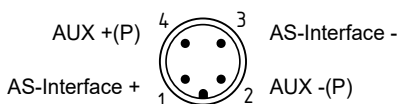
4. Electrical connection

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 62026-2):



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.

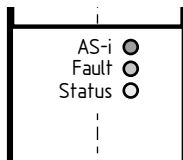
6. Diagnostic

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 LEDs have the following meaning (in accordance with EN 62026-2):

LED red/green (AS-i duo LED):	AS-Interface supply voltage / AS-Interface communication error or slave address = 0
Red LED:	Internal device error
Yellow LED:	Device Status



6.2 Diagnostic information

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

System condition	Solenoid control (DO 0)		LED			Condition AS-i SaW-Code (DI 0 ... DI 3)
	Power to unlock	Power to lock	green-red ³⁾	red	yellow	
Guard open	1 (0)	0 (1)	green	off	off	static 0
Door closed, actuator not inserted	1 (0)	0 (1)	green	off	off	static 0
Guard closed, actuator inserted (not locked)	1	0	green	off	flashes	AZM 200 ST-T-AS static 0 AZM 200 B ST-T-AS dynamically AZM 200 BZ ST-T-AS DI 0, DI 1: dynamic DI 2, DI 3: static 0
Guard closed, actuator inserted and locked	0	1	green	off	on	dynamically
Error warning ¹⁾ , actuator inserted and locked. Shutdown approaching	0	1	green	flashes ²⁾ / on	on	dynamically
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	depending on the condition	static 0

1) after 30 min -> fault

2) refer to flash code

3) 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	Excess device temperature	max. 30 min	Internal excess temperature
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 error	0 min	Device defective

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 safety monitor can be switched back on, thus enabling the machine.

Error warning

If a fault has occurred, 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.

6.3 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 hexadecimal 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	Guard closed, actuator inserted and locked	Actuator not locked
2	Magnet voltage in tolerance range ($18\text{ V} \leq U_m \leq 28\text{ V}$)	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



Measures must be taken to protect against manipulation or against the bypassing of safety device, for example, using an extra actuator.

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. EU Declaration of conformity

EU Declaration of conformity



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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 AS

Type: See ordering code

Description of the component: Interlocking device with electromagnetic interlock for safety functions with integrated AS-i Safety at Work

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

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Place and date of issue: Wuppertal, 26. February, 2020

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AZM200AS-D-EN



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



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