SCHMERSAL

EN Operating instructions. . . . . .pages 1 to 6
Original

Content

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.

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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 EN 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 170 ① ②-AS③④⑤⑥

No.	Option	Description
①	B	Actuator monitored
	BZ	Combined actuator/solenoid interlock monitoring
②	ST	M12 x 1 connector
③		Latching force 5 N
	R	Latching force 30 N
④		Power to unlock
	A	Power to lock
⑤	P	Magnet supply 24 VDC (AUX)
⑥	2197	Manual release for Power to unlock

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 170 AS is designed for use with AS-Interface Safety at Work.

The safety switchgears are classified according to EN ISO 14119 as type 2 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.

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.

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 of the safety switchgear consists of 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 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.

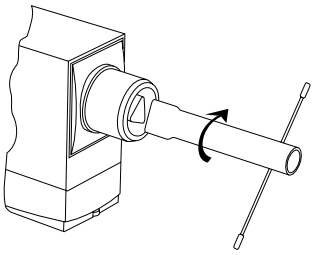
LED display

The LEDs have the following meaning (to EN 62026-2):

Green LED	AS-Interface supply voltage
Red LED	AS-Interface communication error or slave address = 0
Yellow LED	Status enable

Manual release (ordering suffix -2197 for power to unlock)

A manual release is available as a mounting tool and in the event of a power failure in case the power to unlock principle is used.
If the triangular key is turned 180°, the locking bolt is pulled into the unlocking position. Please ensure that jamming by external influence on the actuator is avoided. The normal locking function is only restored after the triangular key has been returned to its original position. After being put into operation, the manual release must be secured by installing the sealing plug, which is included in delivery.



Triangular key TK-M5 (101100887) available as accessory.

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:	EN 60947-5-1, EN ISO 14119, EN 62026-2, EN ISO 13849-1
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Actuator and locking bolt:	stainless steel 1.4301
Coding level according to ISO EN 14119:	low
Maximum switching frequency:	1 Hz
Mechanical data:	
Connection:	M12 connector, 4 pole
Mechanical life:	> 1,000,000 million operations
Actuating speed:	≤ 2 m/s
Holding force F_{max}:	1,300 N
Holding force F_{Zh}:	1,000 N
Latching force:	30 N for ordering suffix R
Ambient conditions:	
Ambient temperature:	−25 °C ... +55 °C
Storage and transport temperature:	−25 °C ... +85 °C
Relative humidity:	30 ... 95 %, no condensation
Resistance to vibration:	10 ... 150 Hz, amplitude 0.35 mm

Resistance to shock:	30 g / 11 m/s
Degree of protection:	IP67 to EN 60529
Switch-off delay:	< 100 m/s
Rated insulation voltage U_{i1}:	32 VDC
Rated impulse withstand voltage U_{imp1}:	800 V
Insulation protection class:	II
Overvoltage category:	III
Degree of pollution:	3
Electrical data – AS-Interface:	
Operating voltage range:	26.5 ... 31.6 VDC, through AS-Interface, reverse polarity-proof
AS-interface power consumption:	max. 0.1 A
Device insulation:	internal short-circuit proof
AS-i specification:	
- Version:	V 2.1
- Profile:	S-7.B.F.E
	IO code: 0x7
	ID code: 0xB
	ID code 1: 0xF
	ID code 2: 0xE
	AS-i inputs:
- Channel 1:	Data bits DI 0/DI 1
- Channel 2:	Data bits DI 2/DI 3
	Databits condition static 0 or dynamic code transmission SaW
AS-i outputs:	
- DO 0:	Magnetically controlled locking
- DO 1 … DO 3:	No function
AS-i parameter bits	
- P0:	Actuator detected
- P1:	Interlock locked
- P2:	no function
- P3:	no function
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):
Operating voltage range:	24 VDC −15% / +10% (stabilised PELV units)
Power consumption AUX:	max. 0.5 A
Magnet switch-on time:	100 %
Rated insulation voltage U_{i2}:	32 VDC
Rated impulse withstand voltage U_{imp2}:	800 V
Device fuse rating:	≤ 4 A when used to UL 508
Diagnostic information:	LED green: AS-Interface supply voltage
	LED red: AS-Interface communication error or slave address = 0
	LED yellow: enabling status

2.5 Safety classification of the interlocking function

Standards:	EN ISO 13849-1, EN 61508
Intended structure:	
- If a fault exclusion of a hazardous damage to the 1-channel mechanics is authorised and sufficient protection against tampering is ensured:	applicable up to cat. 3 / PL d / SIL 2
- PFH:	1.01 x 10-7 / h for ≤ 100,000 operations / year
- Basically:	applicable up to cat. 1 / PL c / SIL 1
- PFH:	1.14 x 10-6 / h for ≤ 100,000 operations / year
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.

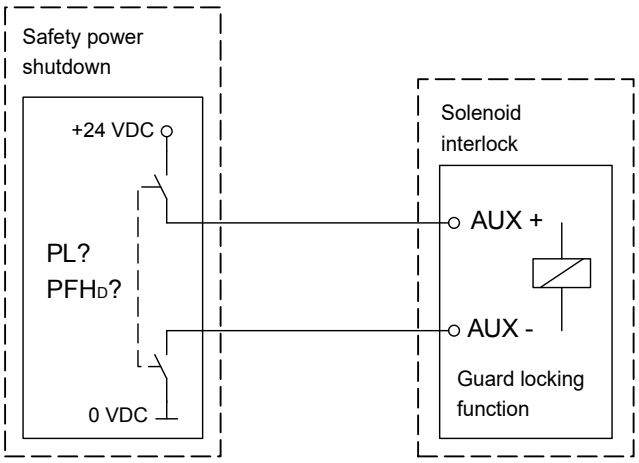
The following safety classification of the unlocking function is based on the application of the principle of safety energy disconnection for the solenoid supply

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).

A fault exclusion for the guard locking function can be assumed by an external safety energy disconnection.

In this case, the guard locking function 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

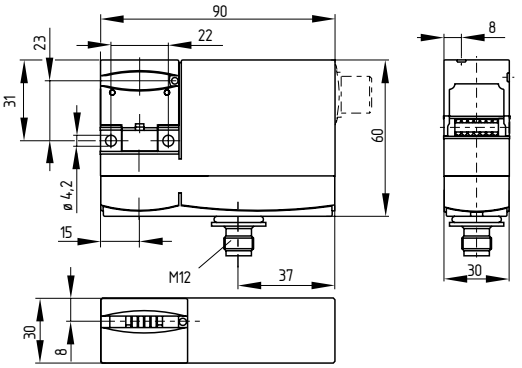
Two mounting holes are provided for fixing the enclosure. The solenoid interlock is double insulated. The use of an earth wire is not authorised. The solenoid interlock must not be used as an end stop. Any mounting position. The mounting position must be chosen so as to avoid the penetration of dirt in the used holes. The unused opening must be sealed by means of slot sealing plugs. Tightening force for the Torx T10 cover screws 0.7 ... 1 Nm.

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 remarks of the standards EN ISO 12100, EN ISO 14119 and EN ISO 14120.

3.2 Dimensions

All measurements in mm.



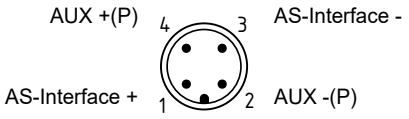
4. Electrical connection

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 170 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 connector is A-coded. 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 170 B ST-AS

The safety outputs of the AS-i safety monitor are enabled, when the following condition is met:
• the actuator is inserted

AZM 170 BZ ST-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:
• the solenoid interlock is locked

The solenoid interlock now can be locked.
Half-code 2 (AS-i SaW bit 2,3) is enabled, when:
• the actuator is inserted

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 170 AS. In the power to lock variant of the AZM 170 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 170 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

Depending on the component used, the AZM 170 AS can be configured in the ASIMON configuration software with the following monitoring devices (also refer to the ASIMON manual).

Double channel dependent with filtering

Suitable for: AZM 170 B ST-AS
The use of this monitoring device is especially advantageous on safety guards where bounce or vibration against the mechanical stop upon closing is a problem.
• Optionally with startup test
• Stabilisation time typically 0.5 up to 1.0 s
• Synchronisation time typically 5.0 up to 10 s
The safety-monitoring module is only released after expiration of the stabilising time; the synchronization time always must exceed the stabilising time.

Double channel conditionally dependent

Suitable for: AZM 170 BZ ST-AS
• Independent: In - 2
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 redundancy and the "Safety guard closed" signal are not tested in this configuration. To test these conditions, additional measures must be taken beyond the safety monitor.

Double channel dependent

Suitable for: AZM 170 B ST-AS
• Synchronisation time typically: 1.0 s, for AZM 170 BZ ST-AS infinite (∞)
• Optionally with startup test
• Optional with local acknowledge
When the AZM 170 BZ ST-AS is used together with this monitoring device for conducting the start-up test prior to every restart, the safety guard must 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.

5.6 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.

Parameter bit	Condition = 1	Condition = 0
0	Actuator inserted. The actuator can now be locked.	No actuator detected
1	Actuator inserted and locked	Actuator not locked
2	---	---
3	---	---

AZM 170 B ST-AS .A.
B-variant, power to lock (magnet-operated locking)

System condition	Magnet input AS-i D Out: 0	AS-i power green LED	Authorised operation Yellow LED	SaW code Authorised operation				Parameter port P0 - P1 - P2 - P3			
Safety guard open	0	ON	-	0	0	0	0	0	0	1	1
Safety guard closed	0	ON	ON	SaW code				1	0	1	1
Safety guard locked	1	ON	ON	SaW code				1	1	1	1

AZM 170 BZ ST-AS .A.
BZ-variant, power to lock (magnet-operated locking)

System condition	Magnet input AS-i D Out: 0	AS-i power green LED	Authorised operation Yellow LED	SaW code Authorised operation				Parameter port P0 - P1 - P2 - P3			
Safety guard open	0	ON	-	0	0	0	0	0	0	1	1
Safety guard closed	0	ON	-	0	0	HC 2*		1	0	1	1
Safety guard locked	1	ON	ON	SaW code				1	1	1	1

HC 2*. Half-code 2 (AS-i SaW bit 2,3)

AZM 170 B ST-AS ..
B-variant, power to unlock (spring-operated locking

System condition	Magnet input AS-i D Out: 0	AS-i power LED green	Authorized operation LED yellow	SaW code Authorised operation				Parameter port P0 - P1 - P2 - P3			
Safety guard open	1	ON	-	0	0	0	0	0	0	1	1
Safety guard closed	1	ON	ON	SaW code				1	0	1	1
Safety guard locked	0	ON	ON	SaW code				1	1	1	1

AZM 170 BZ ST-AS ..
BZ-variant, power to unlock (spring-operated locking)

System condition	Magnet input AS-i D Out: 0	AS-i power LED green	Authorized operation LED yellow	SaW code Authorised operation				Parameter port P0 - P1 - P2 - P3			
Safety guard open	1	ON	-	0	0	0	0	0	0	1	1
Safety guard closed	1	ON	-	0	0	HC 2*		1	0	1	1
Safety guard locked	0	ON	ON	SaW code				1	1	1	1

HC 2*. Half-code 2 (AS-i SaW bit 2,3)

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. Check the switch enclosure for damage
2. Check for free movement of the actuating element
3. Check the integrity of the cable entry and connections

6.2 Maintenance

A regular visual inspection and functional test, including the following steps, is recommended:
1. Check the free movement of the actuating element
2. Remove particles of dust and soiling
3. Check cable entry and connections

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. 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: AZM 170 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/EG
EMC-Directive	2014/30/EU
RoHS-Directive	2011/65/EU

Applied standards:
EN 60947-5-1:2017
EN ISO 14119:2013
EN ISO 13849-1:2015
EN 61508 parts 1-7:2010

Person authorised for the compilation of the technical documentation:
Oliver Wacker
Möddinghofe 30
42279 Wuppertal

Place and date of issue: Wuppertal, 13. February, 2020

Authorised signature
Philip Schmersal
Managing Director

AZM170AS-C-EN

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

K.A. Schmersal GmbH & Co. KG
Möddinghofe 30, 42279 Wuppertal
Germany
Phone: +49 202 6474-0
Telefax: +49 202 6474-100
E-Mail: info@schmersal.com
Internet: www.schmersal.com