



EN Operating instructions.pages 1 to 6
Original

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1. About this document

1.1 Function

This operating instructions manual provides all the information you need for the mounting, set-up and commissioning to ensure the safe operation and disassembly of the safety switchgear. The operating instructions must be available in a legible condition and a complete version in the vicinity of the device.

1.2 Target group: authorised qualified personnel

All operations described in this operating instructions manual must be carried out by trained specialist personnel, authorised by the plant operator only.

Please make sure that you have read and understood these operating instructions and that you know all applicable legislations regarding occupational safety and accident prevention prior to installation and putting the component into operation.

The machine builder must carefully select the harmonised standards to be complied with as well as other technical specifications for the selection, mounting and integration of the components.

1.3 Explanation of the symbols used



Information, hint, note:

This symbol indicates useful additional information.



Caution: Failure to comply with this warning notice could lead to failures or malfunctions.

Warning: Failure to comply with this warning notice could lead to physical injury and/or damage to the machine.

1.4 Appropriate use

The products described in these operating instructions are developed to execute safety-related functions as part of an entire plant or machine. It is the responsibility of the manufacturer of a machine or plant to ensure the correct functionality of the entire machine or plant.

The safety switchgear must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of applications can be found in the chapter "Product description".

1.5 General safety instructions

The user must observe the safety instructions in this operating instructions manual, the country specific installation standards as well as all prevailing safety regulations and accident prevention rules.



Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: products.schmersal.com.

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications.

There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

1.6 Warning about misuse



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

1.7 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting or failure to comply with this operating instructions manual. The manufacturer shall accept no liability for damages resulting from the use of unauthorised spare parts or accessories.

For safety reasons, invasive work on the device as well as arbitrary repairs, conversions and modifications to the device are strictly forbidden, the manufacturer shall accept no liability for damages resulting from such invasive work, arbitrary repairs, conversions and/or modifications to the device.

2. Product description

2.1 Ordering code

This operating instructions manual applies to the following types:

AZ201-①-ST-T-AS

No.	Option	Description
①		Standard coding
	I1	Individual coding
	I2	Individual coding, re-teaching enabled

Actuator	suitable for
AZ/AZM201-B1-...	Sliding safety guards
AZ/AZM201-B30-...	Hinged safety guards



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 Comprehensive quality insurance to 2006/42/EC

Schmersal is a certified company to appendix X of the Machinery Directive. As a result, Schmersal is entitled to autonomously conduct the conformity assessment procedure for the products listed in Appendix IV of the MD without involving a notified body. The prototype test certificates are available upon request or can be downloaded from the Internet at products.schmersal.com.

2.4 Purpose

The non-contact, electronic safety switchgear is designed for application in AS interface Safety at Work and is used for monitoring the position of movable guard systems.



The safety switchgears are classified according to ISO 14119 as type 4 interlocking devices. Designs with individual coding are classified as highly coded.

The safety function 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 a 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.

2.5 Technical Data

Standards: EN 60947-5-3, EN 62026-2, EN ISO 13849-1, EN 61508

Working principle: RFID
 Frequency band: 125 kHz
 Transmitter output: max. -6 dBm

Coding level according to ISO 14119:

- I1-version: high
 - I2-version: high
 - Standard coding version: low

Material of the enclosure: glass-fibre reinforced thermoplastic, self-extinguishing

Maximum switching frequency: 1 Hz

Response time: ≤ 100 ms

Duration of risk: ≤ 200 ms

Time to readiness: ≤ 4 s

Mechanical data

Connection: Connector plug M12, 4-pole, A-coded

Mechanical life: ≥ 1,000,000 operations

Actuating speed: ≤ 0.2 m/s

Tightening torque for device fixation: max. 8 Nm

Tightening torque for the cover screws: 0.7 ... 1 Nm (Torx T10)

Latching force: 30 N

Switching distances to EN 60947-5-3

Assured switch-on distance s_{ao} : 4 mm

Assured switch-off distance s_{gr} : 30 mm

Hysteresis: max. 1.5 mm

Repeat accuracy R: < 0.5 mm

Environmental conditions

Ambient temperature: -25 °C ... +65 °C

Storage and transport temperature: -25 °C ... +85 °C

Relative humidity: max. 93 %, non condensing, non icing

Resistance to shock: 30 g / 11 ms

Resistance to vibration: 10 ... 150 Hz, Amplitude 0.35 mm

Degree of protection: IP66, IP67 to EN 60529

Installation altitude above sea level: max. 2,000 m

Protection class: III

Insulation values to EN 60664-1:

- Rated insulation voltage U_i : 32 VDC

- Rated impulse withstand voltage U_{imp} : 0.8 kV

- Over-voltage category: III

- Degree of pollution: 3

Electrical data – AS-Interface

AS-i operating voltage:	26.5 - 31.6 V DC, protection against polarity reversal
AS-i power consumption:	≤ 0.1 A
AS-i device insulation:	internal short-circuit proof
AS-i specification:	
- Version:	V 3.0
- Profile:	S-0.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 Data bits condition static 0 or dynamic code transmission
AS-i Outputs:	
- DO 0 ... DO 3:	no function
AS-i parameter bits:	
- P0:	Door and actuator detected
- P1:	--- (static 0)
- P2:	Tamper protection time active (FID)
- P3:	Device error (FID)
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

LED status display

Green/Red LED (AS-i Duo LED):	Supply voltage / Communication error / Slave address = 0 / Peripheral error set / Device error detected / Manipulation protection active
Red LED:	Internal device error
Yellow LED:	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.



This device complies with part 15 of the FCC Rules and contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s): Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, AND
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This device complies with the Nerve Stimulation Exposure Limits (ISED SPR-002) for direct touch operations. Changes or modifications not expressly approved by K.A. Schmersal GmbH & Co. KG could void the user's authority to operate the equipment.

2.6 Safety classification

Standards:	EN ISO 13849-1, EN 61508
PL:	up to e
Control Category:	4
PFH:	≤ 1.81 x 10 ⁻⁹ / h
PFD _{avg} :	≤ 1.59 x 10 ⁻⁴
SIL:	suitable for SIL 3 applications
Mission time:	20 years

3. Assembly

3.1 General mounting instructions

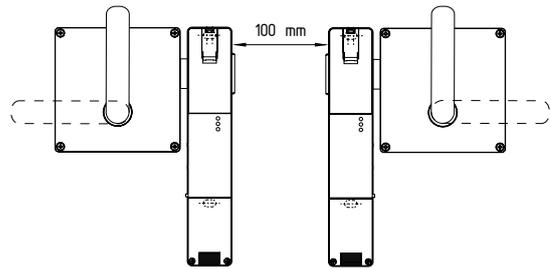


Please observe the relevant requirements of the standards ISO 12100, ISO 14119 and ISO 14120.

To mount the safety switch, two mounting holes for M6 screws with washers (washers included in delivery) are provided in the device. 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 switchgear

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



Mounting of the actuators

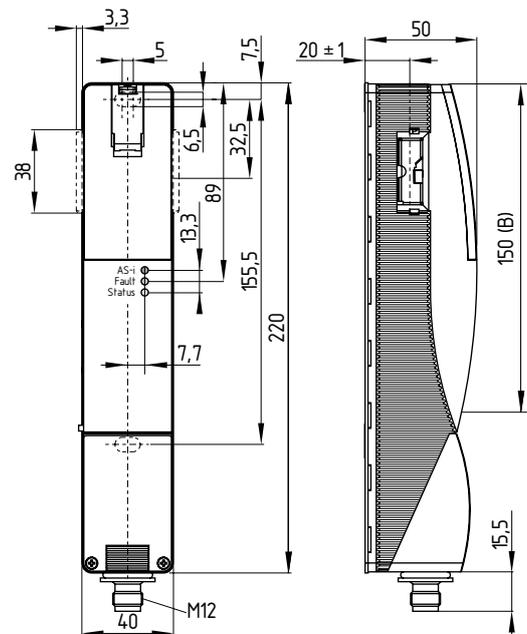
Refer to the mounting instructions manual for the corresponding actuator AZ/AZM201-B30... or AZ/AZM201-B1...



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

3.2 Dimensions

All measurements in mm.



Key

B: Active RFID area



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

4. Electrical connection

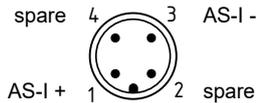
4.1 General information for electrical connection



The electrical connection may only be carried out by authorised personnel in a de-energised condition.

The 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):

Pin assignment M12 connector



5. Functions and configuration

5.1 Mode of operation of the safety outputs

The safety outputs of the AS-i safety monitor are enabled, when the following conditions are met:

- guard door detected
- the actuator is inserted

5.2 Configuration of the safety monitor

The AZ201-AS can be configured in the ASIMON configuration software with the following monitoring module (also refer to the ASIMON manual).

Double channel dependent

- Synchronisation time: 0.1 s
- Optionally with startup test
- Optional with local acknowledge



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

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 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.

5.5 Actuator teaching / actuator detection

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

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

1. Switch the safety switch's voltage supply off and back on.
2. Introduce the actuator in the detection range. Teach-in is signalled on the safety switch, the red LED illuminates and the yellow LED flashes (1 Hz).
3. After 10 seconds, brief cyclic yellow flashes (5 Hz) request the switch-off of the operating voltage of the safety switch. (If the voltage is not switched off within 5 minutes, the safety switch cancels the "teach-in" procedure and signals a false actuator by 5 red flashes).
4. After the operating voltage is switched back on, the actuator must be detected once more in order to activate the taught actuator code. In this way, the activated code is definitively saved!

For ordering suffix -I1, the executed allocation of safety switch and actuator is irreversible.

For ordering suffix -I2, the "teach-in" procedure for a new actuator can be repeated an unlimited number of times. When a new actuator is taught, the code, which was applicable until the moment, becomes invalid. Subsequent to that, an enabling inhibit will be active for ten minutes, thus providing for an increased protection against tampering. The AS-i Duo LED will flash red/green until the expiration of the time of the enabling inhibit and the detection of the new actuator. In case of power failure during the lapse of time, the 10-minutes tampering protection time will restart.

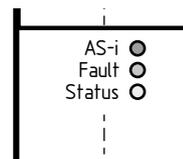
6. Diagnostic

6.1 LED indications

The safety switchgear signals the operational state as well as errors through three coloured LEDs 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): LED Red/Green (AS-i Duo LED):	AS-Interface supply voltage / AS-Interface communication error / Slave address = 0 / Internal device error detected / Tampering protection time active
LED red (Fault):	Device error (see table 2)
LED yellow (status):	Device status/release status (door and actuator detected)



6.2 Error / Error warning

Errors, which no longer guarantee the safe functionality of the AZ201-AS safety switchgear, cause the safety enabling to be switched off and are signalled through a flashing pattern of the red LED (see 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.

With an excess temperature in the device, the system is safely switched off only after 30 mins as the safe functioning of the AZ201-AS is guaranteed.

The fault warning is via the permanent port P3 and the FID-Bit.

These advanced fault warnings can be used to control the process switch off.

6.3 Diagnostic information

Table 1: Diagnostic information of the safety switchgear AZ201-AS

System condition	LED indications			Fault diagnostic					Authorised operation AS-i SaW-Code (DI 0 ... DI 3)
	red/green AS-i duo-LED	red Error	yellow Status	FID-Bit	P3	P2	P1	P0	
Safety guard open	green	Off	Off	0	0	0	0	0	static 0
Door closed, and actuator not inserted	green	Off	Off	0	0	0	0	0	static 0
Door closed and actuator inserted.	green	Off	on	0	0	0	0	1	dynamically
Actuator teach-in process (I variants only)	red-green flashing	on	Flashes	1	1	0	0	0	static 0
Manipulation protection active (I2 variant only)	red-green flashing	Off	Off	1	0	1	0	0	static 0
Device fault detected	red-green flashing	Flashes ¹⁾	Off	1	1	0	0	X	static 0
AS-i error: Slave address = 0 or communication error	red	depending on the condition		-	-	-	-	-	static 0

¹⁾ refer to flash code

Table 2: Error messages / flash codes red LED

Flash codes (red)	Designation	Autonomous switch-off after	Error cause
4 flashes	Excess device temperature	30 min	Internal excess temperature T > 90 C (FID)
5 flashes	Actuator fault	0 min	Wrong or defective actuator (FID)
6 flashes	Error actuator combination	0 min	Latch breakage or attempt at manipulation (FID)
Continuous red signal	Internal error	0 min	Device defective (FID)

Diagnostic signal periphery error (FID)

All error messages of the safety switchgear are also transmitted as a "periphery error" to the control system through the AS-i master. A "periphery error" (FID input of the AS-i chip) is signaled by the alternating red and green flashing of the AS-i duo LED on the AS-i device.

The periphery error is also set when the manipulation protection time with the teach-in process of a new actuator elapses.

6.4 Read-out of the parameter ports

The parameter port P0 to P3 of an AS-i slave 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.

Diagnostic information (P0 ... P3)

Parameter bit	Condition = 1
0	Door closed AND actuator inserted.
1	--- (static 0)
2	Enabling inhibit (tamper protection time) active (FID)
3	Internal device error detected (FID)

7. Set-up and maintenance

7.1 Functional testing

The safety function of the safety components must be tested. The following conditions must be previously checked and met:

1. Fitting of the safety switch and the actuator.
2. Check max. axial offset of actuator unit and safety switch.
3. Fitting and integrity of the cable connections.
4. Check the switch enclosure for damage.

7.2 Maintenance

In the case of correct installation and adequate use, the safety switchgear features maintenance-free functionality.

A regular visual inspection and functional test, including the following steps, is recommended:

- Check the fixing of the safety switch and the actuator
- Check max. axial misalignment of actuator and safety switch
- Fitting and integrity of the cable connections.
- Check the switch enclosure for damages
- Remove particles of dust and soiling.



Adequate measures must be taken to ensure protection against tampering either to prevent tampering of the safety guard, for instance by means of replacement actuators.

Damaged or defective components must be replaced.

8. Disassembly and disposal

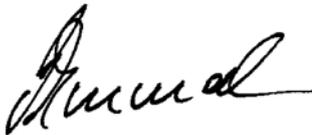
8.1 Disassembly

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

8.2 Disposal

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

9. 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:	AZ201-AS	
Type:	See ordering code	
Description of the component:	Safety Switch for safety functions with integrated AS-i Safety at Work	
Relevant Directives:	Machinery Directive	2006/42/EC
	RED-Directive	2014/53/EU
	RoHS-Directive	2011/65/EU
Applied standards:	EN 60947-5-3:2013 ISO 14119:2013 EN 300 330 V2.1.1:2017 EN ISO 13849-1:2015 EN 61508 parts 1-7:2010	
Notified body for the prototype test:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln ID n°: 0035	
EC-prototype test certificate:	01/205/5608.00/17	
Person authorised for the compilation of the technical documentation:	Oliver Wacker Möddinghofe 30 42279 Wuppertal	
Place and date of issue:	Wuppertal, 21. May 2021	
AZ201-AS-B-EN		
	Authorised signature Philip Schmersal Managing Director	



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



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