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: 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.

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.
Operating instructions
Solenoid interlock
EX-AZM 161

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:

<table>
<thead>
<tr>
<th>No.</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>➀</td>
<td>SK</td>
<td>Screw terminals</td>
</tr>
<tr>
<td>➁</td>
<td>CC</td>
<td>Cage clamps</td>
</tr>
<tr>
<td>❼</td>
<td>R</td>
<td>Latching force 5 N</td>
</tr>
<tr>
<td>❼</td>
<td>A</td>
<td>Power to unlock</td>
</tr>
</tbody>
</table>

Only if the information described in this operating instructions manual are realised correctly, the safety function and therefore the compliance with the Machinery Directive and the Explosion Protection 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 solenoid interlock has been designed to prevent in conjunction with the control part of a machine, movable safety guards from being opened before hazardous conditions have been eliminated. The components can be used in potentially explosive atmospheres of Zone 22 equipment category 3D. The installation and maintenance requirements to the standard series EN 60079 must be met.

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 safety switchgears are classified according to ISO 14119 as type 2 interlocking devices.

Manual release (for set-up, maintenance, etc.)
The manual release is realised by turning the triangular key (M5 triangular key available as accessory), so that the locking bolt is pulled into the unlocking position. 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 plastic cover, which is included in delivery.

Conditions for safe operation
Due to the specific impact energy, the components must be fitted with a protection against mechanical stresses. The specific ambient temperature range must be observed. The user must provide for a protection against the permanent influence of UV rays.

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

Designation in accordance with the ATEX Directive: Ex tc II 3GD
Designation in accordance with standards: IEC 60947-5-1, slow action, NC contact with positive break

Holding force: - Fmax: 2,000 N - Fmax: 2,600 N
Latching force: 5 N
Actuating speed: max. 1 m/s
Actuating frequency: max. 1,000 operations/h
Mechanical life: max. 1,000,000 million operations
Max. impact energy: without mechanical protective enclosure: 1 J with mechanical enclosure: 7 J

Actuator and locking bolt: stainless steel 1.4301
Contact material: Silver
Cable entry: screw terminals or cage clamps
Cable section: min. Ø 5 mm, max. Ø 10 mm
Connection: screw terminals or cage clamps
Cable cross-section: 1.5 mm² (including conductor ferrules)

Magnet switch-on time: 100 %
Power consumption: max. 10 W
Accepted test pulse duration on input signal: ± 5.0 ms
- With test pulse interval of: ≥ 50 ms

Technical data

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilisation category</td>
<td>AC-15, DC-13</td>
</tr>
<tr>
<td>Rated operating current/voltage Ie/Ue</td>
<td>4 A / 230 VAC, 2.5 A / 24 VDC</td>
</tr>
<tr>
<td>Rated impulse withstand voltage Uimp</td>
<td>4 kV</td>
</tr>
<tr>
<td>Rated insulation voltage Ui</td>
<td>250 V</td>
</tr>
<tr>
<td>Thermal test current Ith</td>
<td>6 A</td>
</tr>
<tr>
<td>Max. fuse rating</td>
<td>6 A, gG D-fuse</td>
</tr>
<tr>
<td>Required rated short-circuit current</td>
<td>1,000 A</td>
</tr>
<tr>
<td>Rated control voltage Uc</td>
<td>24 VDC</td>
</tr>
<tr>
<td>24 VAC / 50/60 Hz, 110 VAC / 50/60 Hz</td>
<td></td>
</tr>
</tbody>
</table>

Electrical data – Magnet control:

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet switch-on time</td>
<td>100 %</td>
</tr>
<tr>
<td>Power consumption</td>
<td>max. 10 W</td>
</tr>
<tr>
<td>Accepted test pulse duration on input signal</td>
<td>± 5.0 ms</td>
</tr>
<tr>
<td>- With test pulse interval of</td>
<td>≥ 50 ms</td>
</tr>
</tbody>
</table>
2.5 Safety classification of the interlocking function

Standards: ISO 13849-1

Envisaged structure:
- Basically: applicable up to Cat. 1 / PL c
- With 2-channel usage and fault exclusion mechanism*: applicable up to Cat. 3 / PL d with suitable logic unit

B_{10D} NC contact: 2,000,000
B_{10D} NO contact at 10% ohmic contact load: 1,000,000
Mission time: 20 years

* If a fault exclusion to the 1-channel mechanics is authorised.

\[
\text{MTTF}_D = \frac{B_{10D}}{0,1 \times \eta_{\text{op}}} \times \frac{d_{\text{op}} \times h_{\text{op}} \times 3600 \, \text{s/h}}{t_{\text{cycle}}}
\]

(Determined values can vary depending on the application-specific parameters \(h_{\text{op}}\), \(d_{\text{op}}\) and \(t_{\text{cycle}}\) as well as the load.)

If multiple safety components are wired in series, the Performance Level to ISO 13849-1 will be reduced due to the restricted error detection under certain circumstances.

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 classification of the release function is only valid for devices with monitored guard locking function and in the power to unlock version (see ordering code).

A fault exclusion for the locking device of the solenoid interlock can be assumed by a safety external energy disconnection.

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.

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

Fitting is only authorised in a de-energised condition.

The enclosure can be fixed by means of 3 mounting holes. The solenoid interlock is double insulated. The use of an earth wire is not authorised. The enclosure 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 holes must be sealed by means of the slot sealing plugs after assembly.

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

Mounting of the actuators: See mounting instructions actuators.

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.

- Safety power shutdown
- Solenoid interlock
- Guard locking function

Fault exclusion with regard to wiring routing must be observed.
Solenoid interlock with protective enclosure

The component must be mechanically protected. In order to provide for increased mechanical protection (7Y impact resistance), the solenoid interlock can be fitted with an additional protective enclosure (available as accessory).

Fitting of the additional mechanical protective enclosure
(Ordering code 101213413 incl. mounting plate)
• Fit the base plate
• Fix the solenoid interlock
• Fix the protective cover by means of 2 screws

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.

If the risk analysis indicates the use of a monitored interlock they are to be connected in the safety circuit with the contacts indicated with the symbol .

The contact labelling can be found in the wiring compartment of the switch.

Cable glands (included in delivery) are only authorised for permanent cables. The constructor must provide for the necessary strain relief. Unused cable entries must be sealed by means of locking screws (included in delivery). After wiring, the cover screws must be tightened uniformly in accordance with the technical data.

Settle length of the conductor
0.5 ... 2.5 mm²

| SK: 7 mm | CC: 5 ... 6 mm |

4.2 Contact variants

Contacts shown in a de-energised condition and with the actuator inserted.

Power to unlock
EX-AZM 161SK-12/12RK-3D
EX-AZM 161CC-12/12RK-3D

Power to lock
EX-AZM 161SK-12/12RKA-3D
EX-AZM 161CC-12/12RKA-3D

Legend:
- Positive break
- Monitoring the interlock according to ISO 14119
- Actuated
- Not actuated

Information for the selection of suitable safety-monitoring modules can be found in the Schmersal catalogues or in the online catalogue on the Internet: www.schmersal.net.
5. Set-up and maintenance

The installation, operation and maintenance must be executed by qualified professionals. The requirements to be met for the installation and the maintenance can be found in this operating instructions manual. Do not expose the device to mechanical and/or thermal loads or stresses, which exceed the limits specified in the operating instructions manual.

For the set-up and the operation of the safety switchgear, the applicable (also national) safety and accident prevention regulations as well as the generally acknowledged codes of practice of technology must be observed.

5.1 Functional testing
The safety function of the safety components must be tested. The following conditions must be previously checked and met:
• The installation is executed according to the instructions
• The connection is executed correctly
• The cable is correctly executed and connected
• The safety component is not damaged
• Remove particles of dust and soiling.
• Check cable entry and connections.

5.2 Maintenance
In case of correct installation in accordance with the instructions described above, the component requires little maintenance. For use in extreme conditions, we recommend routine maintenance including the following steps:
1. Check the correct fixing of the actuator and the safety switchgear
2. Remove particles of dust and soiling
3. Check cable entry and connections in a de-energised condition

Caution: avoid electrostatic charging. Clean with damp cloth.
Do not open the device when live.

Damaged or defective components must be replaced.

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.

For explosion protection reasons, the component must be exchanged after max. 1 million operations.

6. Disassembly and disposal

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

6.2 Disposal
The safety switchgear must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.
EU Declaration of conformity

Original
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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: EX-AZM 161

Type: see ordering code

Marking: ☰ II 3D Ex tc IIIC T80°C Dc X

Description of the component: Interlocking device with electromagnetic interlock for safety functions

Relevant Directives:
- Machinery Directive 2006/42/EC
- EMC-Directive 2014/30/EU
- Explosion Protection Directive (ATEX) 2014/34/EU
- RoHS-Directive 2011/65/EU

Applied standards:
- DIN EN 60947-5-1:2018,
- DIN EN ISO 14119:2014,
- EN 60079-0:2012 + A11:2013,
- EN 60079-31:2014

Person authorised for the compilation of the technical documentation: Oliver Wacker
Möddinghofe 30
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Place and date of issue: Wuppertal, December 6, 2019

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