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.
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>CC</td>
<td>Cage clamps</td>
</tr>
<tr>
<td></td>
<td>SK</td>
<td>Screw terminals</td>
</tr>
<tr>
<td></td>
<td>ST</td>
<td>Connector plug M 12</td>
</tr>
<tr>
<td>①</td>
<td>11/03</td>
<td>1 NO contacts / 4 NC contacts with connector plug</td>
</tr>
<tr>
<td></td>
<td>11/12</td>
<td>2 NO contacts / 3 NC contacts with connector plug</td>
</tr>
<tr>
<td></td>
<td>12/03</td>
<td>1 NO / 5 NC</td>
</tr>
<tr>
<td></td>
<td>12/11</td>
<td>2 NO contacts / 3 NC contacts with connector plug</td>
</tr>
<tr>
<td></td>
<td>12/12</td>
<td>1 NO / 4 NC</td>
</tr>
<tr>
<td>②</td>
<td></td>
<td>Latching force 5 N</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>Latching force 30 N</td>
</tr>
<tr>
<td>③</td>
<td></td>
<td>Power to unlock</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>Power to lock</td>
</tr>
<tr>
<td>④</td>
<td></td>
<td>Lateral emergency exit</td>
</tr>
<tr>
<td></td>
<td>ED</td>
<td>Manual release on the cover side</td>
</tr>
<tr>
<td></td>
<td>EU</td>
<td>Manual release on the rear side</td>
</tr>
<tr>
<td>⑤</td>
<td></td>
<td>Emergency exit</td>
</tr>
<tr>
<td></td>
<td>TD</td>
<td>Emergency exit on the cover side</td>
</tr>
<tr>
<td></td>
<td>TU</td>
<td>Emergency exit on the rear side</td>
</tr>
<tr>
<td>⑥</td>
<td></td>
<td>Emergency release</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Emergency release</td>
</tr>
<tr>
<td>➀</td>
<td>024</td>
<td>U, 24 VAC/DC</td>
</tr>
<tr>
<td></td>
<td>110/230</td>
<td>U, 110/230 VAC</td>
</tr>
<tr>
<td>⑦</td>
<td></td>
<td>Without LED</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>With LED</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 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.

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.)
Manual release is realised by turning the triangular key by 180° (M5 triangular key available as accessory), so that 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 plastic cover, which is included in delivery.

Lateral manual release
Manual release on the cover side or on the rear side
(ordering suffix -ED/-EU)

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

Emergency release (ordering suffix -N)
(Mounting and actuation only outside of the safety guard)

The emergency release should only be used in an emergency. The solenoid interlock should be installed and/or protected so that an inadvertent opening of the interlock by an emergency release can be prevented. The emergency release must be clearly labelled that it should only be used in an emergency. The label can be used that was included in the delivery.

To activate the emergency release in case of an emergency, the orange lever must be turned to the stop in the direction marked by the arrow. In this position, the safety guard can be opened. The lever is latched and cannot be returned to its original position. To cancel the blocking condition, the central mounting screw must be loosened to such extent that the lever can be turned back into its original position. The screw must then be re-tightened.

Emergency exit
(Fitting and actuation only from within the hazardous area)
To activate the emergency exit of the T version in case of an emergency, the orange lever must be turned to the stop in direction marked by the arrow. The emergency exit function of the TD and TU versions is activated by pressing the red pushbutton. In this position, the safety guard can be opened. The blocking condition is cancelled by turning the lever in opposite direction or by pulling back the pushbutton. In unlocked position, the safety guard is protected against unintentional closing.

Lateral emergency exit
(ordering suffix -T)
Emergency exit on the cover side or on the rear side
(ordering suffix -TD/-TU)
The entire concept of the control system, in which the safety component is integrated, must be validated to the relevant standards.

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:** IEC 60947-5-1, ISO 14119, BG-GS-ET-19
- **Enclosure:** glass-fibre reinforced thermoplastic, self-extinguishing
- **Actuator and locking bolt:** stainless steel 1.4301
- **Holding force F:** 2,000 N
- **Latching force:** 30 N for ordering suffix R
- **Coding level according to ISO 14119:** low
- **Protection class:** IP67
- **Contact material:** Silver
- **Contact type:** Change-over contact with double break type Zb, with galvanically separated contact bridges
- **Switching system:** ☀ acc. IEC 60947-5-1 slow action, NC contact with positive break
- **Connection:** screw terminals or cage clamps or connector plug
- **Cable section:** min. 0.25 mm², max. 1.5 mm² (including conductor ferrules)
- **Cable entry:** 4 x M16
- **Positive break travel (unlocked):** 10 mm
- **Positive break force (unlocked):** 10 N for each NC contact fitted
- **Actuating speed:** max. 2 m/s
- **Actuating frequency:** max. 1,000 operations/h
- **Mechanical life:** > 1 million operations
- **Ambient temperature:** −25 °C ... +60 °C

### Electrical data:

#### Utilisation category
- AC-15, DC-13
- ST 4-pole: 4 A / 230 VAC, 2.5 A / 24 VDC
- ST 8-pole: 4 A / 230 VAC, 4 A / 24 VDC
- ST 8-pole: 2 A / 24 VDC

#### Rated operating current / voltage I \(_{\text{op}}\)/U \(_{\text{op}}\):
- Connector ST 4-pole: 2.5 A / 230 VAC
- Connector ST 8-pole: 0.8 A / 24 VDC

#### Rated insulation voltage U \(\text{i} \): 250 V
- Connector ST 4-pole: 250 V
- Connector ST 8-pole: 60 V

#### Thermal test current I \(\text{imp} \): 6 A
- Connector 4-pole: 4 A
- Connector 8-pole: 2 A

#### Max. fuse rating:
- Connector 4-pole: 6 A gG D-fuse
- Connector 8-pole: 4 A gG D-fuse

#### Required rated short-circuit current:
- Connector ST 4-pole: 2 A gG D-fuse

#### Rated control voltage U \(_{\text{c}}\):
- 24 VDC
- 24 VAC / 50/60 Hz
- 110 VAC / 50/60 Hz
- 230 VAC / 50/60 Hz

### Electrical data – Magnet control:

- **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

Use Type 4X (Indoor Use) and 12 connector fittings. Tightening torque rating: 4.4 lb in.

### 2.5 Safety classification of the interlocking function

**Standards:** ISO 13849-1

- **Envisaged structure:** 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 \(\text{nc} \) NC contact: 2,000,000
- B \(\text{no} \) 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.

\[
MTTFD = \frac{B_{\text{nc}}}{0,1 \times n_{\text{op}}} \quad n_{\text{op}} = d_{\text{op}} \times h_{\text{op}} \times 3600 \text{ s/h} \quad t_{\text{cycle}}
\]

(Determined values can vary depending on the application-specific parameters \(d_{\text{op}}\), \(h_{\text{op}}\), 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 guard locking function, a distinction must be made between monitoring of the interlocking function and control of the release function.

The following classification of the release function is based on the principle of isolating the supply of power to the solenoid.

\[
\text{PL} = \frac{B_{\text{nc}}}{0,1 \times n_{\text{op}}} \quad n_{\text{op}} = d_{\text{op}} \times h_{\text{op}} \times 3600 \text{ s/h} \quad t_{\text{cycle}}
\]

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 that case, the locking device of the interlock does not contribute towards the failure probability of the release function.

The level of safety of the release function relies, therefore, exclusively on reliable external deactivation of the power.

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).

The 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.

**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

Three 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 however must be chosen so that the ingress of dirt and soiling in the used opening is avoided. Unused actuator openings must be sealed with slot sealing plugs.

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 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.

⚠️ 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 🔒.

Appropriate cable glands with a suitable degree of protection are to be used. Remove the thin walls of the mounting holes by inserting the cable entry.

Puncturing the wall of the holes with auxiliary tools (e.g. screwdriver) can cause damage.

4.2 Contact variants

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

Power to unlock

Power to lock

AZM 161SK-12/12...
AZM 161CC-12/12...

AZM 161SK-12/03...
AZM 161CC-12/03...

Key

Positive break NC contact

Monitoring the interlock according to ISO 14119

Actuated

Not actuated
Operating instructions
Solenoid interlock

AZM 161ST-../.. with connector

AZM 161ST-12/11...

AZM 161ST-11/12...

AZM 161ST-11/03...

AZM 161 12/11

AZM 161...-G with LED

The contacts are shown in closed and locked condition.

AZM 161SK-12/12...G

AZM 161CC-12/12...G

A1 A2 41 51 52 63 64 14 21 22 71 72 12 3 4

AZM 161 11/12

AZM 161ST-11/03...

AZM 161ST-11/12...

AZM 161ST-12/11...

AZM 161ST-../..

AZM 161SK-12/03...G

AZM 161CC-12/03...G

A1 A2 41 51 52 63 64 12 21 22 71 72 11 12

System condition

<table>
<thead>
<tr>
<th>System condition</th>
<th>Solenoid control</th>
<th>LED</th>
<th>Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>guard open</td>
<td>24V ● 0V ●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guard closed,</td>
<td>24V ● 0V ●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>actuator inserted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guard closed,</td>
<td>0V ● 24V ●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>actuator inserted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and locked</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key

12: guard closed  + : +24 VDC
64: unlocked  ⊥ : 0 VDC

5. Set-up and maintenance

5.1 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 solenoid interlock and the actuator
2. Check the integrity of the cable entry and connections
3. Check the switch enclosure for damage

5.2 Maintenance
A regular visual inspection and functional test, including the following steps, is recommended:
1. Check for tight installation of the actuator and the switch
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.

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.
7. 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: AZM 161

Type: See ordering code

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

Relevant Directives:
- Machinery Directive 2006/42/EG
- EMC-Directive 2014/30/EU
- RoHS-Directive 2011/65/EU

Applied standards:
- DIN EN 60947-5-1:2010
- DIN EN ISO 14119:2014

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

Place and date of issue: Wuppertal, March 12, 2017

Authorised signature
Philipp Schmersal
Managing Director

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