Safety switches with solenoid and separate actuator

Selection diagram

ACTUATORS

HEAD TYPE AND WORKING PRINCIPLE

- VF KEYF
- VF KEYF1
- VF KEYF2
- VF KEYF3
- VF KEYF7
- VF KEYF8

VF KEYF
- locked actuator with de-energized solenoid
-VF KEYF1
- locked actuator with energized solenoid
-VF KEYF2
- locked actuator with de-energized solenoid with auxiliary lock release device

CONTACT BLOCKS

- 18
- 20
- 21
- 28
- 29
- 30

18

Solenoid supply voltage

- 24 V AC/DC
- 230 V AC

24 V AC/DC
- 24 VAC/DC (-10% ... +25%)
- 230 VAC (-15% ... +10%)

120 V AC
- 120 VAC (-15% ... +20%)

CONDUIT ENTRIES

- Threaded conduit entries (standard)
- With cable gland assembled
- With M12 metal connector assembled and wired

Product option
Accessory sold separately

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Safety switches with solenoid and separate actuator

**Code structure**

**Attention!** The feasibility of a code number does not mean the effective availability of a product. Please contact our sales office.

**FS 1896D024-F1GM2K40**

<table>
<thead>
<tr>
<th>Contact blocks</th>
<th>Solenoid operated</th>
<th>Actuator operated</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>1NO+1NC</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1NO+2NC</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>3NC</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>1NO+1NC</td>
<td>1NC</td>
</tr>
<tr>
<td>29</td>
<td>2NC</td>
<td>1NC</td>
</tr>
<tr>
<td>30</td>
<td>1NC</td>
<td>2NC</td>
</tr>
</tbody>
</table>

**Working principle**

- 96D: locked actuator with de-energized solenoid
- 96E: locked actuator with energized solenoid
- 98D: locked actuator with energized solenoid with auxiliary lock release device

**Solenoid supply voltage**

- 024: 24 VAC/DC (-10% ... +25%).
- 120: 120 VAC (-15% ... +20%)
- 230: 230 VAC (-15% ... +10%)

**Preinstalled cable gland or connectors**

- no cable gland or connector (standard)
- K21: with assembled cable gland suitable for Ø 6 to Ø 12 mm cables range
- K40: with M12 metal connector assembled and wired, 8 poles

**Threaded conduit entry**

- PG 13.5 (standard)
- M2: M20x1.5

**Contacts type**

- silver contacts (standard)
- G: silver contacts gold plated 1 µm

**Actuators**

- without actuator (standard)
- F: with straight actuator
- F1: with right-angled actuator
- F2: with jointed actuator
- F3: with jointed actuator adjustable in two directions
- F7: with jointed actuator adjustable in one direction
- F8: with universal actuator

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- F7: with jointed actuator adjustable in one direction
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Notes: Calculate the power supply using the average solenoid power. Please consider the inrush solenoid power in order to avoid intervention of overload-protection in case of electronic power supply.

Main data
- Polymer housing, three conduit entries
- Protection degree IP66
- 6 contact blocks available
- 6 stainless steel actuators available
- Three supply voltages available
- Versions with auxiliary release device or auxiliary lock release device
- Versions with energized or de-energized solenoid

Markings and quality marks:

Approval IMQ: CA02.00792
Approval UL: E131787
Approval EZU: 1010151

In conformity with standards:
IEC 947-5-1, IEC 337-1, EN 60947-5-1, CEI 17-45, IEC 204-1, EN 60204-1, CEI 17-45, EN 1088, EN ISO 12101-1, EN ISO 12102-2, IEC 529, EN 60529, CEI 70-1, EN 61000-6-2, EN 61000-6-3, EN 50081-1, EN 50082-2, CENELEC EN 50013, BG-GS-ET-15.

In conformity with requirements requested by:

Positive contact opening in conformity with standards:
IEC 947-5-1, EN 60947-5-1, CEI EN 60947-5-1, VDE 0660-206.

Electrical data

| Thermal current (Ith): 10 A | Rated insulation voltage (Ui): 500 VAC 600 VDC | Protection against short circuits: fuse 10 A 500 V type aM |
| Direct current: 2 A | Rated insulation voltage (Ui): 30 VAC 36 VDC | Protection against short circuits: fuse 2 A 500 V type gG |
| Pollution degree: 3 |

Utilization categories

- Alternate current: AC15 (50...60 Hz)
  - Ue (V): 250 400 500
  - le (A): 4 1
  - Direct current: DC13
  - Ue (V): 24 125 250
  - le (A): 1,1 0,4

- Alternate current: AC15 (50...60 Hz)
  - Ue (V): 24
  - le (A): 2
  - Direct current: DC13
  - Ue (V): 24
  - le (A): 2
Description
These switches are used on machines where the hazardous conditions remain for a while, even after the machine has been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. They can also be used when it is necessary to control machine guards, allowing the opening of protections only under specific conditions.

Rotating head and release device
The head can be quickly rotated on each of the 4 sides of the switch by unfastening the two fixing screws. The mechanical lock release device can be rotated in 90° steps as well. This enables the switch to assume 32 different configurations.

Actuator regulation zone
This switch has a wide backlash of the actuator into the head (4,5 mm) to avoid that door gaskets keep in traction the actuator on the solenoid. With closed door, check that the actuator doesn’t knock straight against the head of the switch; it must be in the adjustment zone (0,5…5 mm)

Actuator holding force
The strong interlocking system guarantees a maximum actuator holding force of 1000 N.

Installation of two or more switches connected to the same power supply
24 VAC/DC version only
- This operation is intended to reduce the results of the solenoid inrush current on the power supply and has to be executed only if necessary and with special care.
- Switch off the power supply.
- Open the switch cover.
- Remove the black plastic protection that covers the solenoid by unscrewing the two screws which fix the protection to the body of the switch.
- Move the dip-switch with a tool so that each switch has a different combination (see figure beside). If more than four switches are installed, repeat the combinations for any next set of four switches.
- Reposition the black plastic protection and tighten the two screws with a torque of 0,8 Nm.

Data type approved by IMQ and EZU
Rated insulation voltage (Ui): 500 VAC
400 VAC for contact blocks 20, 21, 28, 29, 30
Thermal current (Itt): 10 A
Protection against short circuits: fuse 10 A 500 V type aM
Protection degree: IP66
MV terminals (screw clamps)
Pollution degree 3
Utilization category: AC15
Operation voltage (Ue): 400 VAC (50 Hz)
Operation current (Ie): 3 A
Forms of the contact element: Zb, Y+Y+X, Y+Y+Y, Y+X+X
Positive opening of contacts on contact block 18, 20, 21, 28, 29, 30
In conformity with standards: EN60947-1, EN 60947-5-1 and subsequent modifications and completions, fundamental requirements of the Low Voltage Directive 73/23 EEC and subsequent modifications and completions.

Data type approved by UL
Utilization categories Q300 (69 VA, 125-250 VDC)
A600 (720 VA, 120-600 VAC)
Data of the housing type 1, 4X (indoor use only), 12, 13
In conformity with standard: UL 508
For all contact blocks use 60 or 75 °C copper (Cu) conductor and wire size No. 12-14 AWG. Terminal tightening torque of 7,1 Lb-In.

Please contact our technical service for the list of type approved products.
Description

The working principle of these safety switches allows three different working states:

- **state A**: with the actuator inserted and blocked by the solenoid
- **state B**: with the actuator inserted but not blocked
- **state C**: with the actuator extracted

All or some of these states may be controlled through the positive opening contacts of the internal contact block. In detail, contact blocks that have electric contacts marked with the symbol of the solenoid (\(\bigcirc\)) are switched in the transition between the state A and state B, while the electric contacts marked with the symbol of the actuator (\(\rightarrow\)) are switched between state B and state C:

- **Working principle D**: Actuator blocked with de-energized solenoid. Actuator release is obtained by power supply to the solenoid (see example of working cycle steps).
- **Working principle E**: Actuator blocked with energized solenoid. The unlock of the actuator is obtained by power-off to the solenoid.

It is advisable to use this version under special conditions because a blackout will allow the immediate opening of the protection.

This series of products includes many technical solutions that result flexible on installation and easy working:

- Six different types of stainless steel actuator, suitable to be fixed in several positions and with insertion radius arc equal to or over 80 mm.
- Swinging head, in 90° steps, with two actuator entries for easy installation of the switch.
- To extract the inserted but not blocked actuator, a 30 N force is necessary, that avoids the guard opening because of vibrations or impacts.
- When actuator is locked, it can still move a little (4.5 mm), to avoid that door gaskets keep in traction the actuator on the solenoid.
- Housing with three conduit entries for easier installation or connection in series.
- Electronic control of the power supply, which allow a wide tolerance on supply voltage. This technical solution resolves the problems that may derive from not stable power supply (machine distance from main transformers, tension variation between night/day hours), allowing also a low solenoid power consumption and consequently enlarging the working temperatures range of the switch.
- No-loosing screws contact blocks, fingers protection, twin bridge contacts and double interruption for a higher contact reliability.

Versions with D working principle are supplied with a sealable auxiliary release device used by technicians during the installation or to access to inside the machine in case of black-out. The release device may be of sealable type (head 96, see figure A) or lock type (head 98, see figure B). In this last case the release device may also be used to allow authorized operators in possession of key to open small protections.

**Attention!** These switches alone are not suitable for applications where operators with key may physically enter the dangerous area, because an eventual closing of the door behind them could restart the machine working. In this case must be used the entry locking device VF KB1 that is visible on page 4/29.
Example of working cycle steps with FS 2896D024-F1 (switch with working principle D)

Contacts position in switch states

<table>
<thead>
<tr>
<th>Operation state</th>
<th>Working principle D</th>
<th>Working principle E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Locked actuator with de-energized solenoid</td>
<td>Locked actuator with energized solenoid</td>
</tr>
<tr>
<td>Actuator</td>
<td>Inserted and locked</td>
<td>Extracted</td>
</tr>
<tr>
<td>Solenoid</td>
<td>De-energized</td>
<td>Energized</td>
</tr>
</tbody>
</table>

The GUARD CLOSING with de-energized solenoid brings the switch back in B state and then in A state in quick sequence.

Safety switches with solenoid and separate actuator
Switch with D working principle, supplied with sealable auxiliary release device and without actuator

Switch with E working principle and without actuator

Switch with D working principle, supplied with lock auxiliary release device and without actuator

Contact blocks

Contacts type:

L → slow action

CONTACTS:

- 1NO+1NC
- 1NO+2NC
- 3NC

All measures in the diagrams are in mm

How to read travel diagrams

All measures in the diagrams are in mm

CONTACTS:

- NC opening
- NO closing

Max travel

Positive opening travel

Example diagram

Contacts controlled by the solenoid

Contacts controlled by the actuator

IMPORTANT:

NC contact has to be considered with inserted actuator and lock by the lock. In safety applications it is necessary to activate the switch at least up to the positive opening point indicated in the diagrams with the symbol 🦂. Operate the switch at least with the positive opening force, indicated below each article, next the value of minimum force.

Accessories

<table>
<thead>
<tr>
<th>Article</th>
<th>Description</th>
<th>Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>VF KB1</td>
<td>Actuator entry locking device</td>
<td>1 pc</td>
</tr>
</tbody>
</table>

Padlockable device to lock the actuator entry in order to prevent from the accidental closing of the door behind operators while they are inside the machine. To be used only with FD, FL, FC and FS series with metal heads.

VF KLA371 | Set of 2 locking keys | 1 pc

Extra copy of the locking keys, only to be purchased if further keys are needed (standard supply 2 units). All switches keys have the same code. Other codes on request.
### Accessories for sealing

Pliers, steel wire and lead seals used to seal the auxiliary release device (head 96D).

<table>
<thead>
<tr>
<th>Article</th>
<th>Description</th>
<th>Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>VF FSPB-200</td>
<td>Set of 200 lead seals</td>
<td>1 pc</td>
</tr>
<tr>
<td>VF FSPB-10</td>
<td>Set of 10 lead seals</td>
<td>1 pc</td>
</tr>
<tr>
<td>VF FSPF-400</td>
<td>400 m steel wire roll</td>
<td>1 pc</td>
</tr>
<tr>
<td>VF FSPF-10</td>
<td>10 m steel wire roll</td>
<td>1 pc</td>
</tr>
</tbody>
</table>

Items with code on the green background are available in stock.

**Accessories**

See page 5/1