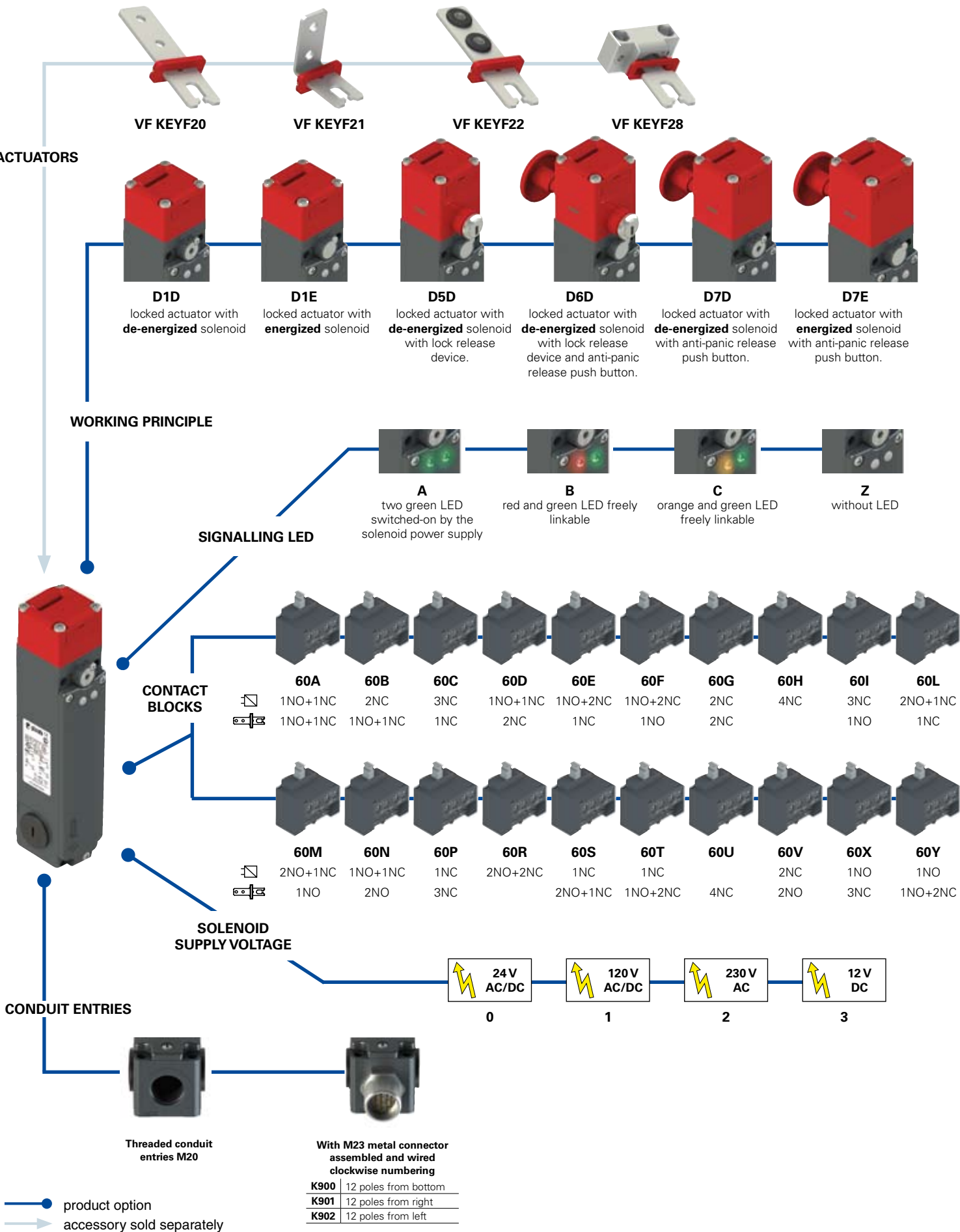


Selection diagram





## Code structure

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

article options  
**FG 60AD1D0A-LP30F20GK900**

## Integrated contact blocks

	Solenoid operated 	Actuator operated 
<b>60A</b>	1NO+1NC	1NO+1NC
<b>60B</b>	2NC	1NO+1NC
<b>60C</b>	3NC	1NC
<b>60D</b>	1NO+1NC	2NC
<b>60E</b>	1NO+2NC	1NC
<b>60F</b>	1NO+2NC	1NO
<b>60G</b>	2NC	2NC
<b>60H</b>	4NC	/
<b>60I</b>	3NC	1NO
<b>60L</b>	2NO+1NC	1NC
<b>60M</b>	2NO+1NC	1NO
<b>60N</b>	1NO+1NC	2NO
<b>60P</b>	1NC	3NC
<b>60R</b>	2NO+2NC	/
<b>60S</b>	1NC	1NC+2NO
<b>60T</b>	1NC	2NC+1NO
<b>60U</b>	/	4NC
<b>60V</b>	2NC	2NO
<b>60X</b>	1NO	3NC
<b>60Y</b>	1NO	1NO+2NC

## Working principle

<b>D1D</b>	locked actuator with de-energized solenoid
<b>D1E</b>	locked actuator with energized solenoid
<b>D5D</b>	locked actuator with de-energized solenoid. With lock release device.
<b>D6D</b>	locked actuator with de-energized solenoid. With lock release device and anti-panic release push button.
<b>D7D</b>	locked actuator with de-energized solenoid. With anti-panic release push button.
<b>D7E</b>	locked actuator with energized solenoid. With anti-panic release push button.

## Solenoid supply voltage

<b>0</b>	24 Vac/dc (-10% ... +10%)
<b>1</b>	120 Vac/dc (-15% ... +10%)
<b>2</b>	230 Vac (-15% ... +10%)
<b>3</b>	12 Vdc (-15% ... +20%)

## Preinstalled connectors

	no connectors (standard)
<b>K900</b>	with M23 metal connector assembled and wired, 12 poles from bottom
<b>K901</b>	with M23 metal connector assembled and wired, 12 poles from right
<b>K902</b>	with M23 metal connector assembled and wired, 12 poles from left

## Contacts type

	silver contacts (standard)
<b>G</b>	silver contacts gold plated 1 µm

## Actuators

	without actuator (standard)
<b>F20</b>	with straight actuator (VF KEYF20)
<b>F21</b>	with right-angled actuator (VF KEYF21)
<b>F22</b>	with actuator with rubber mountings (VF KEYF22)
<b>F28</b>	with universal actuator (VF KEYF28)

## Release button length

	wall thickness length max 15 mm (standard)
<b>LP30</b>	wall thickness length max 30 mm
<b>LP40</b>	wall thickness length max 40 mm
<b>LP60</b>	wall thickness length max 60 mm
<b>LPRG</b>	adjustable for wall thickness length from 60 mm to 500 mm

## Signalling LED

<b>A</b>	two green LED switched-on by the solenoid power supply
<b>B</b>	red and green LED freely linkable
<b>C</b>	orange and green LED freely linkable
<b>Z</b>	without LED



**Main features**

- Actuator holding force 2500 N
- 20 contact blocks with 4 contacts
- Metal housing, three conduit entries M20
- Protection degree IP67
- Version with lock release device and emergency release push button
- 4 stainless steel actuators
- Rotating head and devices and not detachable
- Signalling LED
- Working with energized or de-energized solenoid

**Markings and quality marks:**



Approval IMQ: CA02.03848  
Approval UL: E131787  
Approval CCC: 2013010305602309  
Approval GOST: POCC IT.AB24.B04512

**Technical data**

**Housing**

Metal housing, coated with baked epoxy powder.  
Three conduit entries M20  
Protection degree: IP67 according to EN 60529  
with cable gland having equal or higher protection degree (electrical contacts)

**General data**

For safety applications up to SIL 3 / PL e  
Safety parameters: see page 7/34  
Ambient temperature: from -25°C to +60°C  
Max actuation frequency: 600 operations cycles<sup>1</sup>/hour  
Mechanical endurance: 1 million of operations cycles<sup>1</sup>  
Max actuating speed: 0,5 m/s  
Min. actuating speed: 1 mm/s  
Max holding force: 2500 N  
Maximum force before the breaking in accordance with GS-ET-19: 2800 N  
Maximum holding force in accordance with GS-ET-19: 2150 N  
Max backlash of the actuator: 4,5 mm  
Actuator extraction force: 30 N  
Driving torque for installation: see pages 7/1-7/12  
(1) One operation cycle means two movements, one to close and one to open contacts, as foreseen by EN 60947-5-1 standard..

**Cross section of the conductors (flexible copper wire)**

Contact blocks: min. 1 x 0,34 mm<sup>2</sup> (1 x AWG 22)  
max. 2 x 1,5 mm<sup>2</sup> (2 x AWG 16)

**In conformity with standards:**

IEC 60947-5-1, EN 60947-5-1, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 60529, EN 60529, EN 61000-6-2, EN 61000-6-3, NFC 63-140, VDE 0660-200, VDE 0113, BG-GS-ET-15.

**Approvals:**

IEC 60947-5-1, UL 508.

**In conformity with requirements requested by:**

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.

**Positive contact opening in conformity with standards:**

IEC 60947-5-1, EN 60947-5-1, VDE 0660-206.

**Solenoid**

Solenoid duty cycle: 100% ED  
Solenoid protection 12 V: fuse 1 A type gG  
Solenoid protection 24 V: fuse 0,5 A type gG  
Solenoid protection 120 V: fuse 315 mA, delayed type  
Solenoid protection 230 V: fuse 315 mA, delayed type  
Solenoid power: 9 VA

**⚠ If not expressly indicated in this chapter, for the right installation and the correct utilization of all articles see requirements indicated from page 7/1 to page 7/12.**

Electrical data			Utilization categories			
without connector	Thermal current (Ith):	10 A	Alternate current: AC15 (50...60 Hz)			
	Rated insulation voltage (Ui):	400Vac 300 Vdc	Ue (V)	120	250	400
	Rated impulse withstand voltage (U <sub>imp</sub> ):	6 kV	Ie (A)	6	5	3
	Conditional short circuit current:	1000 A according to EN 60947-5-1	Direct current: DC13			
	Protection against short circuits:	fuse 10 A 500 V type aM	Ue (V)	24	125	250
with 12 poles M23 connector	Pollution degree:	3	Ie (A)	3	0,7	0,4
	Thermal current (Ith):	8 A	Alternate current: AC15 (50...60 Hz)			
	Rated insulation voltage (Ui):	250 Vac 300 Vdc	Ue (V)	120	250	
	Protection against short circuits:	fuse 8 A 500 V type gG	Ie (A)	6	5	
	Pollution degree:	3	Direct current: DC13			
			Ue (V)	24	125	250
			Ie (A)	3	0,7	0,4



### Data type approved by IMQ

Rated insulation voltage (Ui): 400 Vac  
Thermal current (Ith): 10  
Rated impulse withstand voltage ( $U_{imp}$ ): 6 kV  
Protection against short circuits: fuse 10 A 500 V type gG  
Protection degree: IP67  
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: X+X+X+X, Y+Y+Y+Y, X+Y+Y+Y, X+X+Y+Y, X+X+X+Y  
Positive opening of contacts on contact block 60A, 60B, 60C, 60D, 60E, 60F, 60G, 60H, 60I, 60L, 60M, 60N, 60P, 60R, 60S, 60T, 60U, 60V, 60X, 60Y

In conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/CE.

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

### Data type approved by UL

Utilization categories A300 (720 VA, 120-300 Vac)  
Q300 (69 VA, 125-250 Vdc)

Data of the housing type 1, 4X "indoor use only", 12, 13

In conformity with standard: UL 508

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

### Limits of utilization

Do not use where dust and dirt may penetrate in any way into the head and deposit there, in particular where metal dust, concrete or chemicals are spread.

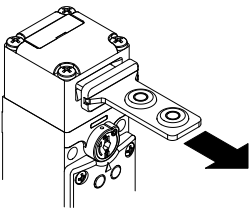
Do not use where explosive or inflammable gas is present.

Use Atex products in environments with explosion hazard (see page 2/137).

**Description**

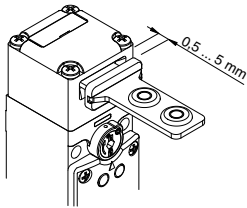
These switches are used on machines where the hazardous conditions remain for a while, even after the machines have been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. They can also be used when it is necessary to control machine guards allowing the opening of protections only under specific conditions.

**Actuator holding force**



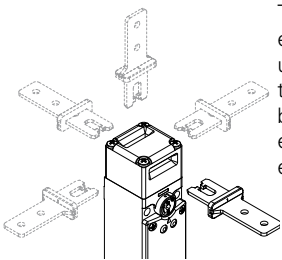
The strong interlocking system guarantees a maximum actuator holding force of 2500 N.

**Actuating regulation zone**



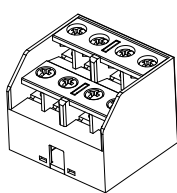
This switch has a wide backlash of the actuator into the head (4,5 mm) to avoid that door gaskets keep in traction the actuator on the solenoid. With closed door, check that the actuator doesn't knock straight against the head of the switch; it must be in the adjustment zone (0,5...5 mm)

**Rotating heads and devices**



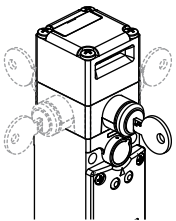
The head can be quickly rotated on each of the 4 sides of the switch by unfastening the four fixing screws. Also the lock release device and the release button can be rotated in 90° steps; this enables the switch to assume 32 different configurations.

**4 poles contact block**



Innovative 4 poles contact block, available in different contacts configurations to monitor the actuator or the solenoid (patented). The contact block is supplied with no-loosening screws and self-lifting plates

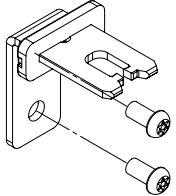
**Release device with rotating lock**



The auxiliary release device with rotating lock is used to allow the maintenance or the entry into the machinery to authorized personnel only. Rotating the key, will make the same action of the solenoid, that is move solenoid contacts and release the actuator. The device can be rotated allowing the installation of the safety switch inside the machinery and

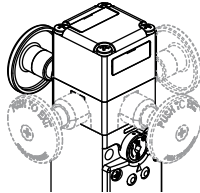
making the release device accessible outside the protection. In this way, the switch is more protected against possible tampering and the external side/surface of the machinery remains pleasant.

**Safety screws for actuators**



These new screws have tamper-resistant Torx buttonheads. Devices fixed with this kind of screws cannot be removed or tampered by common tools. See accessories page 6/5.

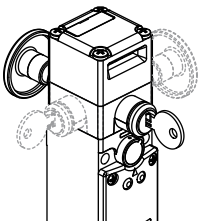
**Emergency release push button**



This device is used when the safety switch controls hazardous areas where operators may physically enter with all their body. The release button, oriented towards inside the machinery, allows the exit of the operator accidentally trapped also in case of possible black-out.

Pushing the button, it will be actuated the same function of the auxiliary release device. To reset the switch, restore the button to the initial position. The emergency button can be rotated, available with different lengths and it is fixed to the switch by a screw, so to allow the installation of the switch inside or outside the guards.

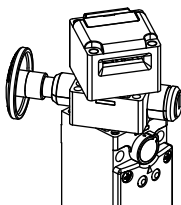
**Lock release device and emergency push button**



This device performs the two above mentioned functions at the same time. Also in this case the device can be rotated and the release button can be ordered with different lengths. The activation of the button has the priority on the lock, that is with the closed lock is possible to activate the button and unlock the switch. To reset the switch is

necessary to restore lock and button to their initial position.

**Not detachable head and devices**

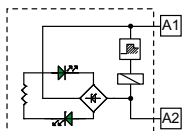


The head and the release devices can be rotated but they are not detachable to each other. In such a way the switch is safer because the installer do not have to worry about the assembly of various components and there is a lower probability of damages (loss of small parts, dirt penetration, etc.)

**Signalling LED type A**



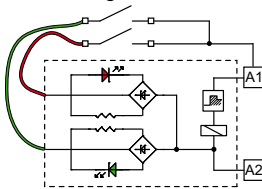
In the version with signalling LED type A, two green LED are switched-on directly by the solenoid power supply. Wiring is not necessary.



**Signalling LED type B**



In the version with signalling LED type B, two LED connection wires are available, one green and one red. Through suitable connections to the contact block, it is possible to control the different states of the switch.



## Description

### Working conditions

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 ( ) are switched in the transition between the state A and state B, while the electric contacts marked with the symbol of the actuator ( ) are switched between state B and state C:

### Working principle

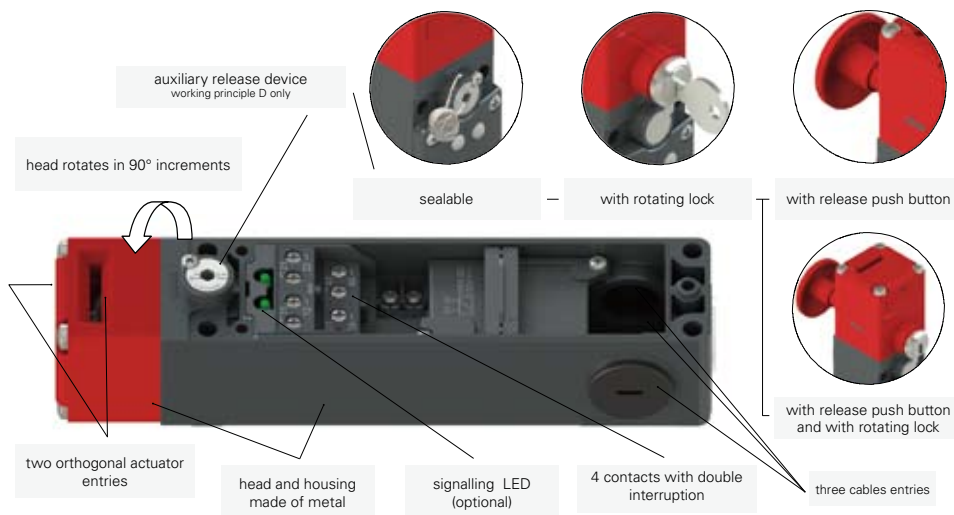
It is also possible to choose between two working principles for the actuator locking:

- **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.

### Product versatility

This series of products includes many technical solutions that results in easier installation and working:

- Four different types of stainless steel actuators, 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. Heads D5, D6 and D7 are provided with release devices that can be rotated independently to the actuator entry side. All parts of heads are rotating but not detachable from the body, in order to avoid any tampering or wrong assembling during the installation.
- To extract the inserted but not blocked actuator, a 30 N force is necessary, that avoids the guard opening because of vibrations or impacts.
- Extremely heavy mechanical system of actuator locking, able to support traction forces up to 2500 N.
- 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 an easier installation or connection in series.
- Electronic control of the power supply. 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, contacts with double interruption, high contact reliability.
- Version with signalling LED connected to the power supply or freely linked by the installer. LED are externally visible through the housing cover.



### Release device

Versions with D working principle are supplied with a sealable auxiliary release device used by technicians during the installation or to access the machine in case of black-out.

Head D1: • The auxiliary release device is actuated by screwing to the end the safety dowel and rotating the device by 180°.

- The arrow on the switch cover indicates the auxiliary release device state. After the actuator release, put in the start position and reposition the safety dowel.
- To avoid improper use of the auxiliary release device during the usual machine working cycle, it has to be sealed with some drops of paint or by lead sealing.

Head D5: The auxiliary release device is composed of a lock with double key supplied on issue.

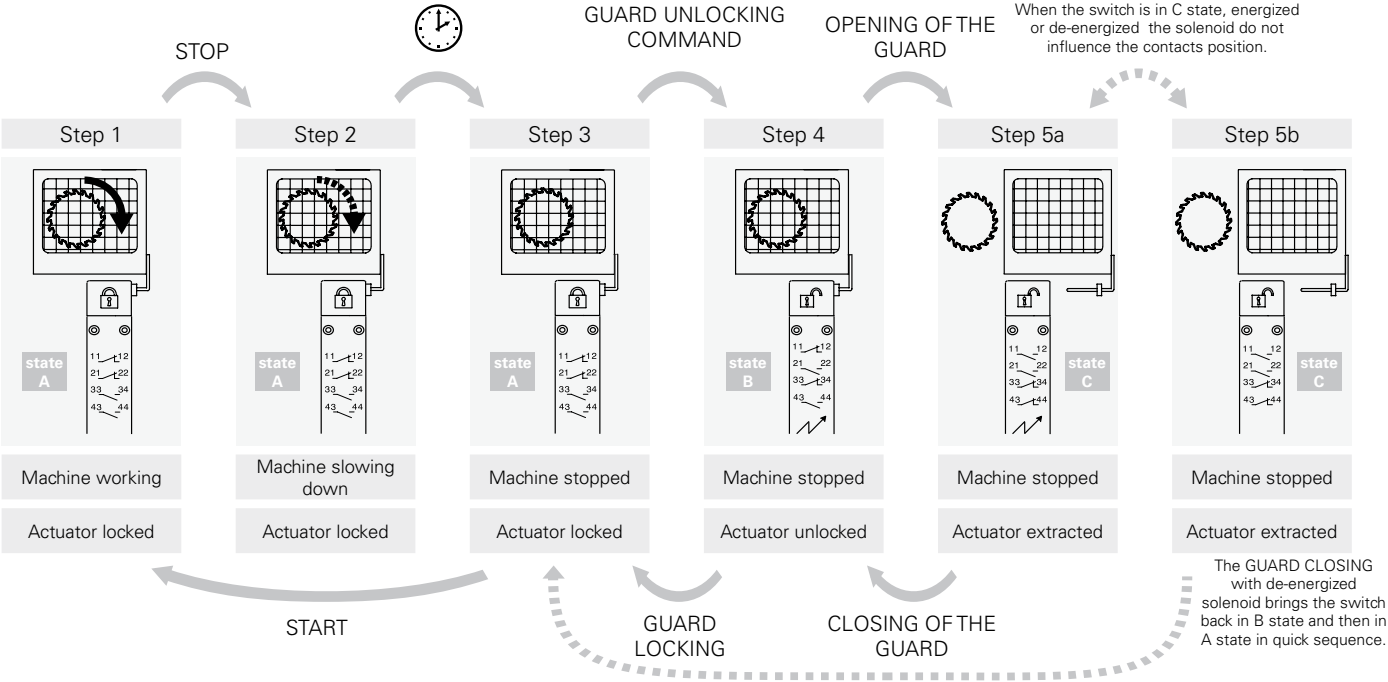
Head D7: The auxiliary release device is composed of a mushroom-head push button with no panic functions. This device must be rotated towards the inner and dangerous side of the machine so that an operator entrapped could activate it, release the switch and go out of the area. To restore the switch, reset the push button. This device cannot be used for functions of emergency stop of the machine.

Head D6: This head has contemporaneously functions of heads D5 and D7. The release occurs always, any of two devices is activated (push button or lock).

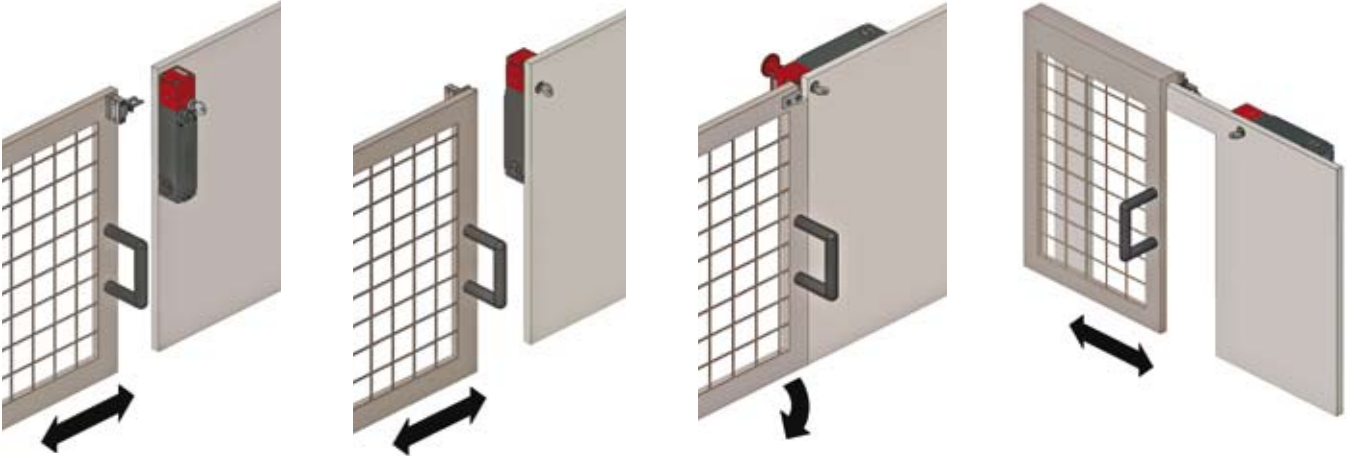
### Gate monitoring

These switches alone cannot protect operators or maintenance men where they may physically enter with all their body in the hazardous area, because an involuntary closing of the protection behind them could allow the restart of the machine. If the authorization to the machine restart is completely granted by these switches, it must be foreseen a system to avoid that risk, as for example the pad lockable device to lock the actuator entry, item VF KB2 at page 4/86 or a safety handle with padlocks as for example VF AP-P11B-200P (page 4/109).

Example of working cycle steps with FG 60AD1D0A-F21 (switch with working principle D)



Application examples on machinery guards





## Contacts position in switch states

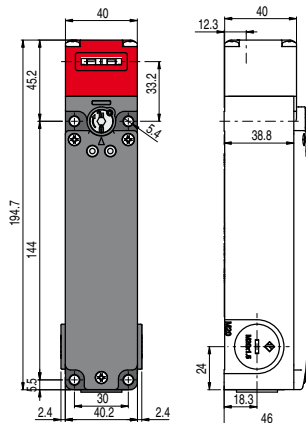
Operation state	Working principle D			Working principle E		
	locked actuator with de-energized solenoid			locked actuator with energized solenoid		
	state A	state B	state C	state A	state B	state C
Actuator	Inserted and locked	Inserted and unlocked	Extracted	Inserted and locked	Inserted and unlocked	Extracted
Solenoid	De-energized	Energized	-	Energized	De-energized	-
FG 60A..... 1NO+1NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
1NO+1NC controlled by the actuator	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44
FG 60B..... 2NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
1NO+1NC controlled by the actuator	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44
FG 60C..... 3NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
1NC controlled by the actuator	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42
FG 60D..... 1NO+1NC controlled by the solenoid	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22
2NC controlled by the actuator	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42
FG 60E..... 1NO+2NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
1NC controlled by the actuator	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44
FG 60F..... 1NO+2NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
1NO controlled by the actuator	33 34 43 44	33 34 43 44	33 34 43 44	31 32 43 44	31 32 43 44	31 32 43 44
FG 60G..... 2NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
2NC controlled by the actuator	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42
FG 60H..... 4NC controlled by the solenoid	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42
FG 60I..... 3NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
1NO controlled by the actuator	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44
FG 60L..... 2NO+1NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
1NC controlled by the actuator	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44
FG 60M..... 2NO+1NC controlled by the solenoid	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22
1NO controlled by the actuator	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44
FG 60N..... 1NO+1NC controlled by the solenoid	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22
2NO controlled by the actuator	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44
FG 60P..... 1NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
3NC controlled by the actuator	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42
FG 60R..... 2NO+2NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44
FG 60S..... 1NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
2NO+1NC controlled by the actuator	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44
FG 60T..... 1NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
1NO+2NC controlled by the actuator	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44	31 32 43 44
FG 60U..... 4NC controlled by the actuator	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42	11 12 21 22 31 32 41 42
FG 60V..... 2NC controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
2NO controlled by the actuator	33 34 43 44	33 34 43 44	33 34 43 44	31 32 43 44	33 34 43 44	33 34 43 44
FG 60X..... 1NO controlled by the solenoid	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22	13 14 21 22
3NC controlled by the actuator	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42	31 32 41 42
FG 60Y..... 1NO controlled by the solenoid	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22	11 12 21 22
1NO+2NC controlled by the actuator	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44	33 34 43 44

## Dimensional drawings

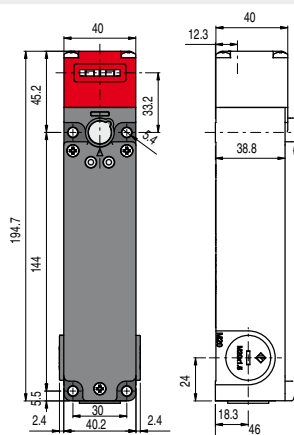
Contacts type:

**L** = slow action

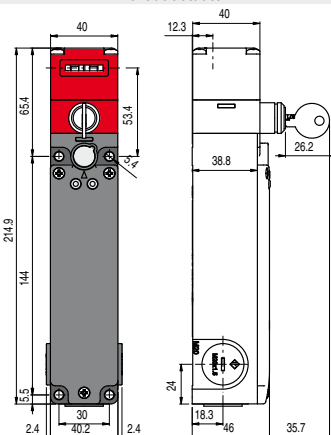
D working principle with sealable auxiliary release device, supplied without actuator



E working principle, supplied without actuator



D working principle with lock release device, supplied without actuator

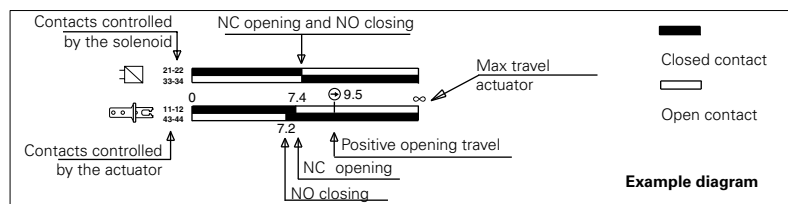


### Contact blocks


60A		FG 60AD1D0A		1NO+1NC	1NO+1NC	FG 60AD1E0A		1NO+1NC	1NO+1NC
60B		FG 60BD1D0A		2NC	1NO+1NC	FG 60BD1E0A		2NC	1NO+1NC
60C		FG 60CD1D0A		3NC	1NC	FG 60CD1E0A		3NC	1NC
60D		FG 60DD1D0A		1NO+1NC	2NC	FG 60DD1E0A		1NO+1NC	2NC
60E		FG 60ED1D0A		1NO+2NC	1NC	FG 60ED1E0A		1NO+2NC	1NC
60F		FG 60FD1D0A		1NO+2NC	1NO	FG 60FD1E0A		1NO+2NC	1NO
60G		FG 60GD1D0A		2NC	2NC	FG 60GD1E0A		2NC	2NC
60H		FG 60HD1D0A		4NC	/	FG 60HD1E0A		4NC	/
60I		FG 60ID1D0A		3NC	1NO	FG 60ID1E0A		3NC	1NO
60L		FG 60LD1D0A		2NO+1NC	1NC	FG 60LD1E0A		2NO+1NC	1NC
60M		FG 60MD1D0A		2NO+1NC	1NO	FG 60MD1E0A		2NO+1NC	1NO
60N		FG 60ND1D0A		1NO+1NC	2NO	FG 60ND1E0A		1NO+1NC	2NO
60P		FG 60PD1D0A		1NC	3NC	FG 60PD1E0A		1NC	3NC
60R		FG 60RD1D0A		2NO+2NC	/	FG 60RD1E0A		2NO+2NC	/
60S		FG 60SD1D0A		1NC	2NO+1NC	FG 60SD1E0A		1NC	2NO+1NC
60T		FG 60TD1D0A		1NC	1NO+2NC	FG 60TD1E0A		1NC	1NO+2NC
60U		FG 60UD1D0A			4NC	FG 60UD1E0A			4NC
60V		FG 60VD1D0A		2NC	2NO	FG 60VD1E0A		2NC	2NO
60X		FG 60XD1D0A		1NO	3NC	FG 60XD1E0A		1NO	3NC
60Y		FG 60YD1D0A		1NO	1NO+2NC	FG 60YD1E0A		1NO	1NO+2NC
Min. force		30 N (60 N				30 N (60 N			
Travel diagrams		page 4/84 - group 1				page 4/84 - group 1			

## How to read travel diagrams

All measures in the diagrams are in mm



**IMPORTANT:**

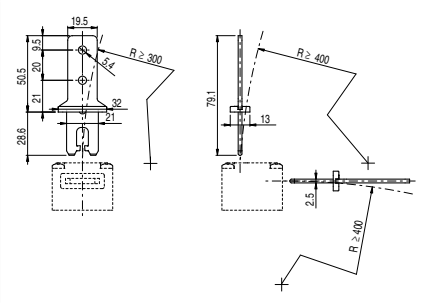

**NC contact** has to be considered with inserted and locked actuator. **In safety applications** it is necessary to activate the switch **at least up to the positive opening point** indicated in the diagrams with the symbol . Operate the switch **at least with the positive opening force**, indicated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



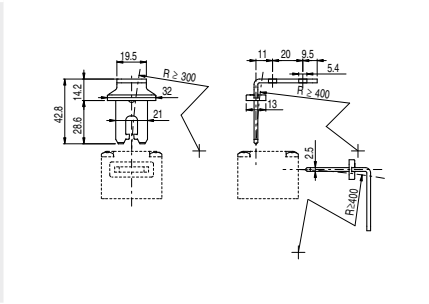

**Stainless steel actuators**

**IMPORTANT:** These actuators must be used with FG series only (e.g. FG 60AD1D0A).

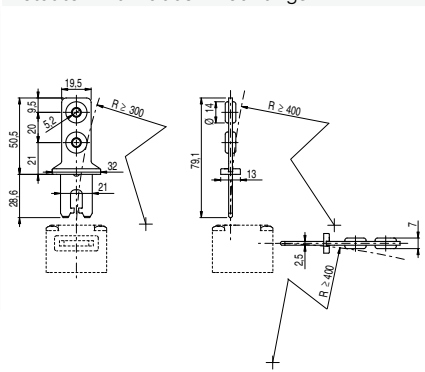

Article	Description
VF KEYF20	Straight actuator



Article	Description
VF KEYF21	Right-angled actuator



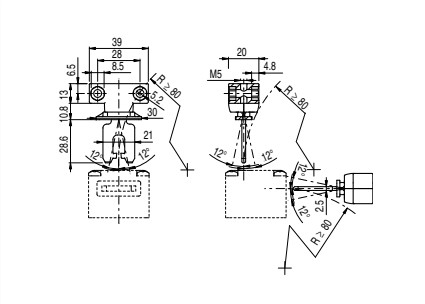
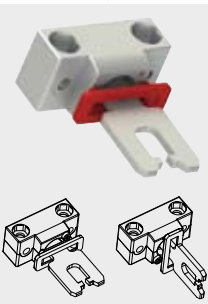
Article	Description
VF KEYF22	Actuator with rubber mountings



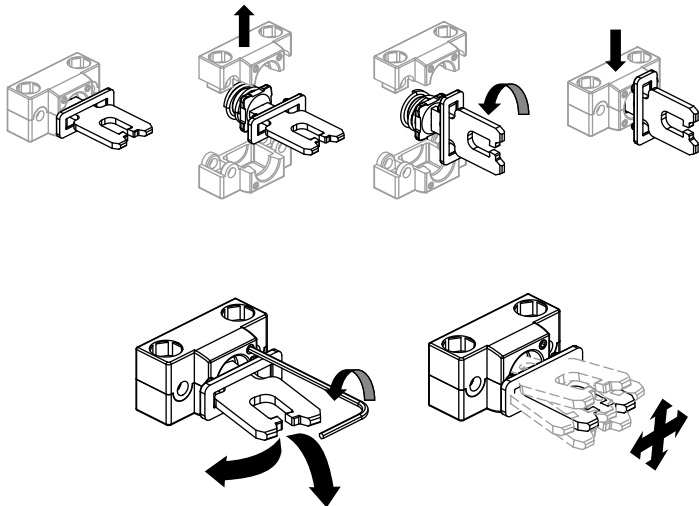
**Universal actuator VF KEYF28**

**IMPORTANT:** These actuators must be used with FG series only (e.g. FG 60AD1D0A).

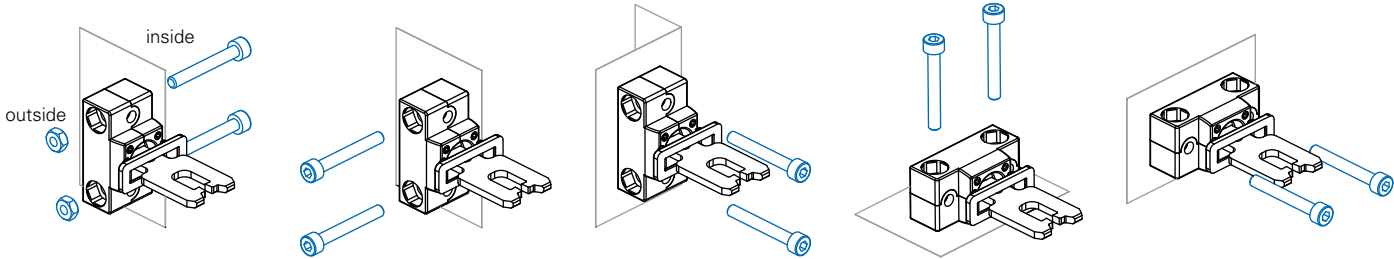
Article	Description
VF KEYF28	Universal actuator



Joined and two directions adjustable actuator for doors with reduced dimensions.  
The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.



for inaccurate doors





## Accessories for sealing

Pliers, steel wire and lead seals used to seal the auxiliary release device.



Article	Description
VF FSPB-200	Set of 200 lead seals
VF FSPB-10	Set of 10 lead seals

Article	Description
VF FSFI-400	400 m steel wire roll
VF FSFI-10	10 m steel wire roll

Article	Description
VF FSPZ	Plier without logo



## Accessories

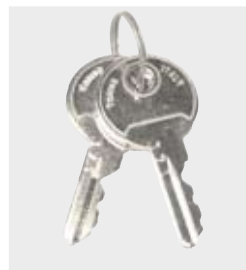
Article	Description
VF KB2	Actuator entry locking device



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 FG series. Padlocks diameter holes 9 mm

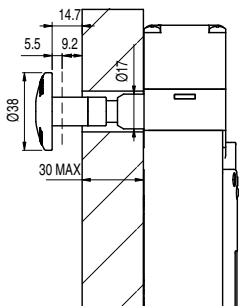


Article	Description
VF KLA371	Set of 2 locking keys



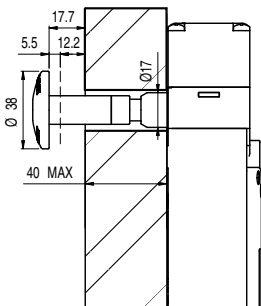
Extra copy of the locking keys to be purchased if further keys are needed (standard supply 2 units). All switches keys have the same code. Other codes on request.

Other release button lengths



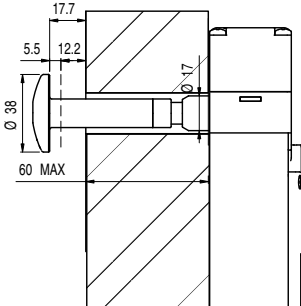
-LP30

Wall thickness length  
from 15 to 30 mm



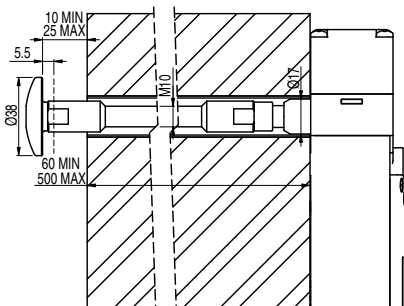
-LP40

Wall thickness length  
from 30 to 40 mm



-LP60

Wall thickness length  
from 40 to 60 mm



-LPRG

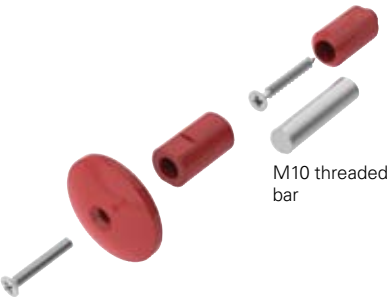
Wall thickness length  
60 ... 500 mm

- Avoid torsion and bending on the release button bar.
  - To guarantee the device correct operation, keep a distance of 10 to 25 mm between the wall and the release button.
  - Keep clean the release push button slipping area. The guide bushing or tube must be cleaned inside, since dirt or chemical products could compromise the device operation.
  - Periodically check for correct device operation.
- Avoid torsion and bending on the release button bar.
  - Use a bushing or a tube with 18±0,5 mm diameter as a guide inside the wall.
  - The M10 threaded bar has to be inserted into the guide in order to avoid its bending. The M10 threaded bar is not supplied with the device.
  - To guarantee the device correct operation, keep a distance of 10 to 25 mm between the wall and the release button.
  - Keep clean the release push button slipping area. The guide bushing or tube must be cleaned inside, since dirt or chemical products could compromise the device operation.
  - Periodically check for correct device operation.

Release pushbutton



Article	Description
VF FG-LP15	Polymer release pushbutton for wall thickness length 15-mm max, supplied with screw
VF FG-LP30	Polymer release pushbutton for wall thickness length 30-mm max, supplied with screw
VF FG-LP40	Polymer release pushbutton for wall thickness length 40-mm max, supplied with screw
VF FG-LP60	Metal release pushbutton for wall thickness length 60-mm max, supplied with screw



M10 threaded bar

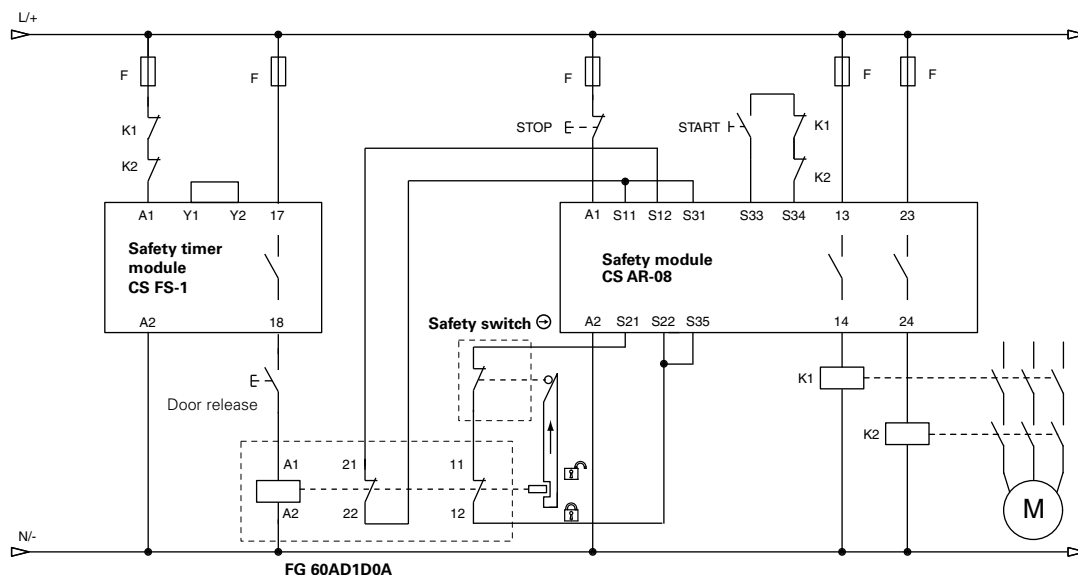
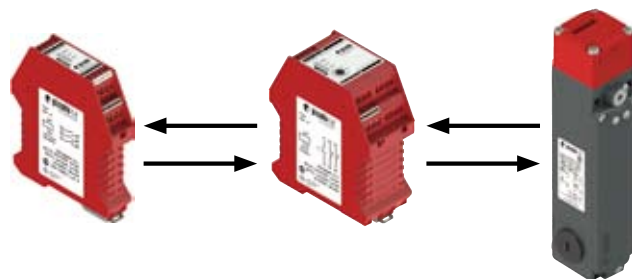
Article	Description
VF FG-LPRG	Metal release pushbutton from 60 to 500 mm, supplied with 2 supports and 2 screws, without M10 threaded bar

The M10 bar can be supplied in zinc-plated steel with 1-m length. Article: AC 8512.

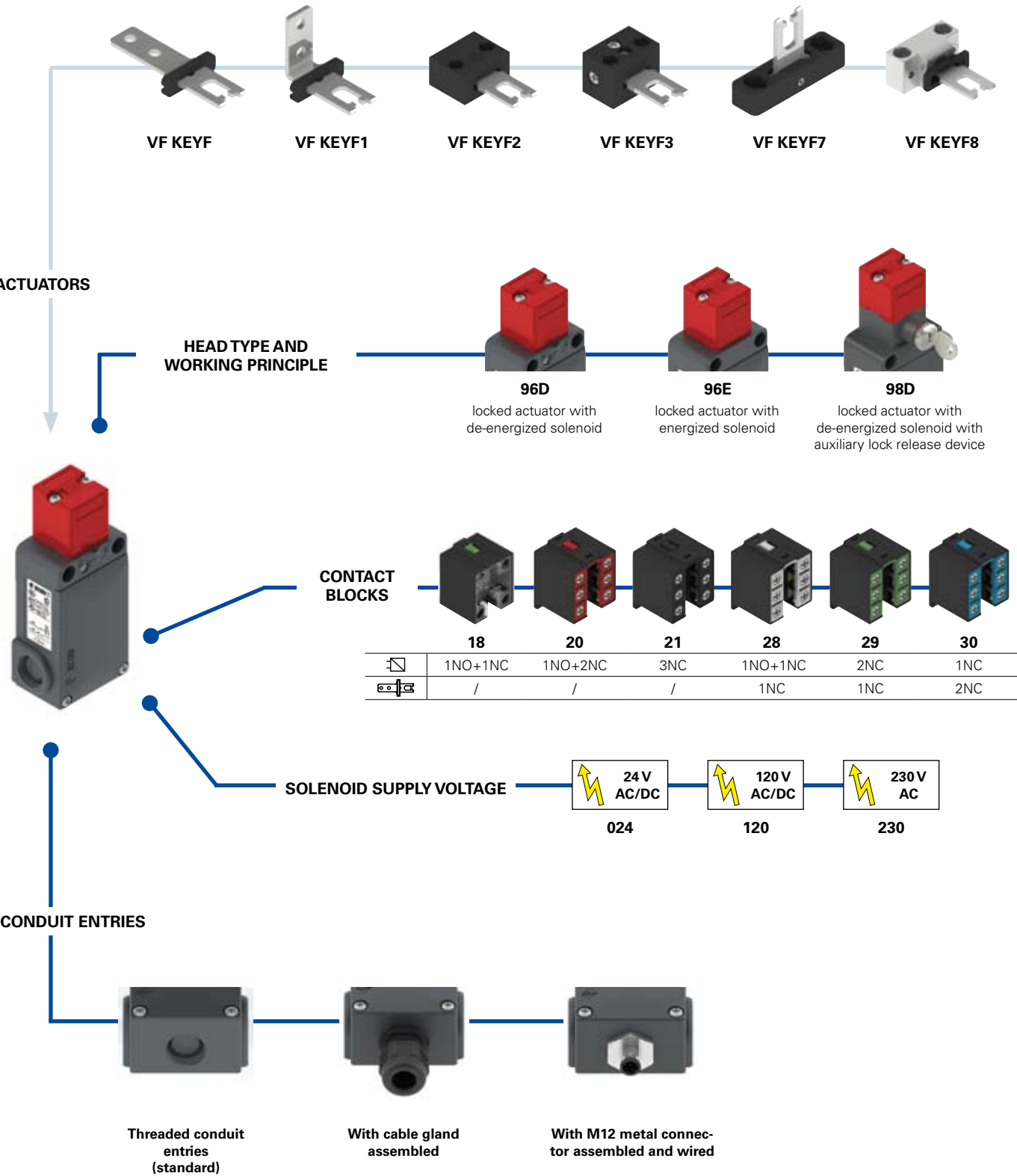
## Safety modules

Pizzato Elettrica s.r.l. offers its customers a wide range of safety modules made considering the typical problems about the control of the safety switches and their real use conditions. There are available safety modules with instantaneous or delayed contacts suitable for type 0 (immediate stop) or type 1 (monitored stop) emergency circuits.

Safety switches with solenoid series FG could be connected to safety modules in order to obtain safety circuits up to PLe in accordance with EN ISO 13849. For any technical information or wiring diagram please contact our technical staff.



Selection diagram



—●— product option  
—▶— accessory sold separately



## Code structure



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

article

options

**FS 1896D024-F1GM2K40**

## Contact blocks

	Solenoid operated 	Actuator operated 
<b>18</b>	1NO+1NC	/
<b>20</b>	1NO+2NC	/
<b>21</b>	3NC	/
<b>28</b>	1NO+1NC	1NC
<b>29</b>	2NC	1NC
<b>30</b>	1NC	2NC

## Working principle

<b>96D</b>	locked actuator with de-energized solenoid
<b>96E</b>	locked actuator with energized solenoid
<b>98D</b>	locked actuator with de-energized solenoid with auxiliary lock release device

## Solenoid supply voltage

<b>024</b>	24 Vac/dc (-10% ... +25%).
<b>120</b>	120 Vac/dc (-15% ... +20%)
<b>230</b>	230 Vac (-15% ... +10%)

## Preinstalled cable gland or connectors

	no cable gland or connector (standard)
<b>K21</b>	with assembled cable gland suitable for Ø 6 to Ø 12 mm cables range
...	.....
<b>K40</b>	with assembled 8 poles M12 metal connector
...	.....

For the complete list of all combinations, please contact our technical office.

## Threaded conduit entry

	PG 13,5 (standard)
<b>M2</b>	M20x1,5

## Contacts type

	silver contacts (standard)
<b>G</b>	silver contacts gold plated 1 µm

## Actuators

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



Main data

- Polymer housing, three conduit entries
- Protection degree IP67
- 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 CCC: 2007010305230011  
Approval ECU: 1010151  
Approval GOST: POCC IT.AB24.B04512

**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.

Technical data

Housing

Housing made of glass-reinforced polymer, self-extinguishing, shock-proof thermoplastic resin and with double insulation   
Three conduit entries  
Protection degree: IP67 according to EN 60529 with cable gland having equal or higher protection degree (electrical contacts)

General data

For safety applications up to SIL 3 / PL e  
Safety parameters: see page 7/34  
Ambient temperature: from -25°C to +60°C  
Max actuation frequency: 600 operations cycles<sup>1</sup>/hour  
Mechanical endurance: 800.000 operations cycles<sup>1</sup>  
Max actuating speed: 0,5 m/s  
Min. actuating speed: 1 mm/s  
Max holding force: 1100 N (head 96), 900 N (head 98)  
Max backlash of the actuator: 4,5 mm  
Actuator extraction force: 30 N  
Driving torque for installation: see pages 7/1-7/12  
(1) One operation cycle means two movements, one to close and one to open contacts, as foreseen by EN 60947-5-1 standard..

Cross section of the conductors (flexible copper wire)

Contact blocks 20, 21, 28, 29, 30:	min.	1 x 0,34 mm <sup>2</sup>	(1 x AWG 22)
	max.	2 x 1,5 mm <sup>2</sup>	(2 x AWG 16)
Contact blocks 18:	min.	1 x 0,5 mm <sup>2</sup>	(1 x AWG 20)
	max.	2 x 2,5 mm <sup>2</sup>	(2 x AWG 14)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 60529, EN 60529, EN 61000-6-2, EN 61000-6-3, NFC 63-140, VDE 0660-200, VDE 0113, BG-GS-ET-15.

Approvals:

IEC 60947-5-1, UL 508, GB14048.5-2001.

In conformity with requirements requested by:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.

Positive contact opening in conformity with standards:

IEC 60947-5-1, EN 60947-5-1, VDE 0660-206.

Solenoid

Solenoid duty cycle:	100% ED
Inrush solenoid power:	20 VA 0,1 s (24 V) 18 VA 0,1 s (120 V) 18 VA 0,1 s (230 V)
Steady-state solenoid power:	4 VA
Average solenoid power:	10 VA
Solenoid protection 24 V:	fuse 500 mA delayed type,
Solenoid protection 120 V:	fuse 315 mA, delayed type
Solenoid protection 230 V:	fuse 160 mA, delayed type

If not expressly indicated in this chapter, for the right installation and the correct utilization of all articles see requirements indicated from page 7/1 to page 7/12.

Electrical data		Utilization categories			
without connector	Thermal current (I <sub>th</sub> ):	10 A	Alternate current: AC15 (50...60 Hz)		
	Rated insulation voltage (U <sub>i</sub> ):	500 Vac 600 Vdc	U <sub>e</sub> (V)	250	400
		400 Vac 500 Vdc (contact blocks 20, 21, 28, 29, 30)	I <sub>e</sub> (A)	6	4
	Rated impulse withstand voltage (U <sub>imp</sub> ):	6 kV			1
		4 kV (contact blocks 20, 21, 28, 29, 30)	Direct current: DC13		
with 8 poles M12 connector	Conditional short circuit current:	1000 A according to EN 60947-5-1	U <sub>e</sub> (V)	24	125
	Protection against short circuits:	fuse 10 A 500 V type aM	I <sub>e</sub> (A)	6	1,1
	Pollution degree:	3			0,4
	Thermal current (I <sub>th</sub> ):	2 A	Alternate current: AC15 (50...60 Hz)		
	Rated insulation voltage (U <sub>i</sub> ):	30 Vac 36 Vdc	U <sub>e</sub> (V)	24	
	Protection against short circuits:	fuse 2 A 500 V type gG	I <sub>e</sub> (A)	2	
	Pollution degree:	3	Direct current: DC13		
			U <sub>e</sub> (V)	24	
			I <sub>e</sub> (A)	2	

## Data type approved by IMQ, CCC and EZU

Rated insulation voltage (Ui): 500 Vac  
400 Vac (for contact blocks 20, 21, 28, 29, 30)

Thermal current (Ith): 10 A

Protection against short circuits: fuse 10 A 500 V type aM

Rated impulse withstand voltage ( $U_{imp}$ ): 6 kV  
4 kV (for contact blocks 20, 21, 28, 29, 30)

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: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/CE.

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

## 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

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 (0,8 Nm).

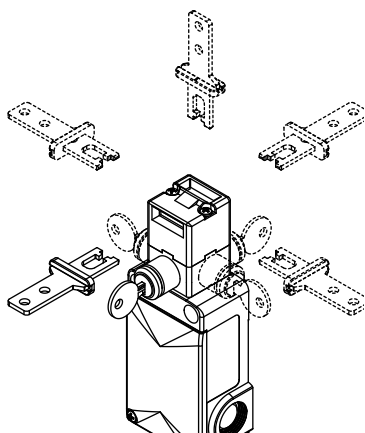
In conformity with standard: UL 508

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

## Description

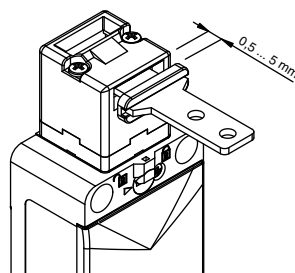
These switches are used on machines where the hazardous conditions remain for a while, even after the machine has been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. They can also be used when it is necessary to control machine guards, allowing the opening of protections only under specific conditions.

### Rotating head and release device



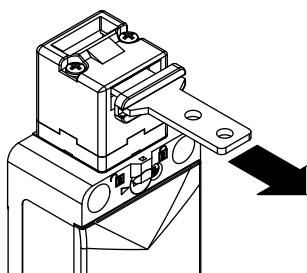
The head can be quickly rotated on each of the 4 sides of the switch by unfastening the two fixing screws. The mechanical lock release device can be rotated in 90° steps as well. This enables the switch to assume 32 different configurations.

### Actuator regulation zone



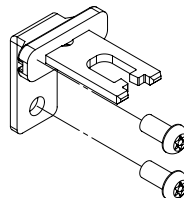
This switch has a wide backlash of the actuator into the head (4,5 mm) to avoid that door gaskets keep in traction the actuator on the solenoid. With closed door, check that the actuator doesn't knock straight against the head of the switch; it must be in the adjustment zone (0,5...5 mm)

### Actuator holding force



Thanks to recent mechanical improvement the strong interlocking system guarantees a maximum actuator holding force of 1100 N (head 96).

### Safety screws for actuators



These new screws have tamper-resistant Torx buttonheads. Devices fixed with this kind of screws cannot be removed or tampered by common tools. See accessories page 6/5.

### Limits of utilization

Do not use where dust and dirt may penetrate in any way into the head and deposit there, in particular where metal dust, concrete or chemicals are spread.

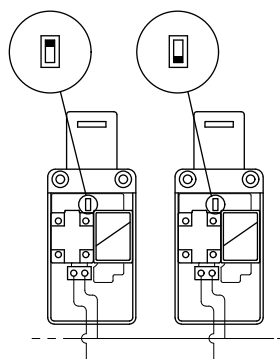
Do not use where explosive or inflammable gas is present.

Use Atex products in environments with explosion hazard (see page 2/137).

## 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 switch body.
- 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.

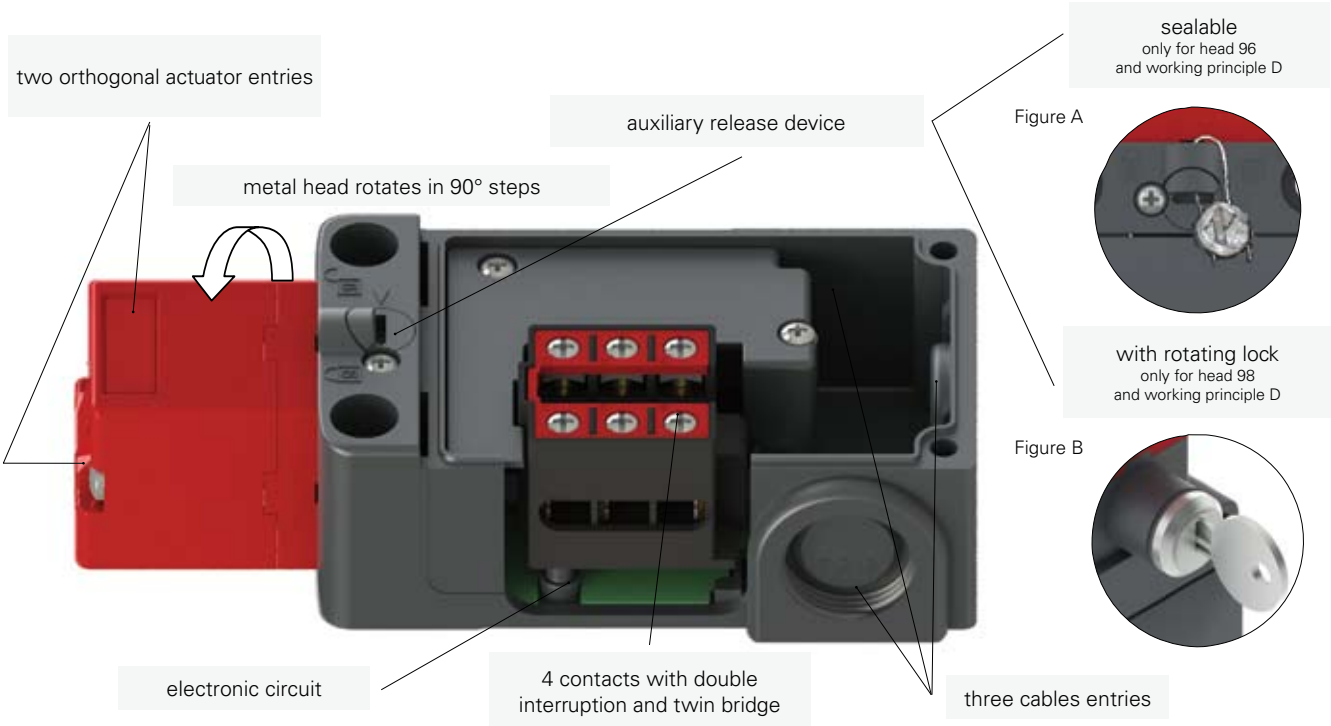


## Description

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 (  ) are switched in the transition between the state A and state B, while the electric contacts marked with the symbol of the actuator (  ) are switched between state B and state C:



It is also possible to choose between two working principles for the actuator locking:

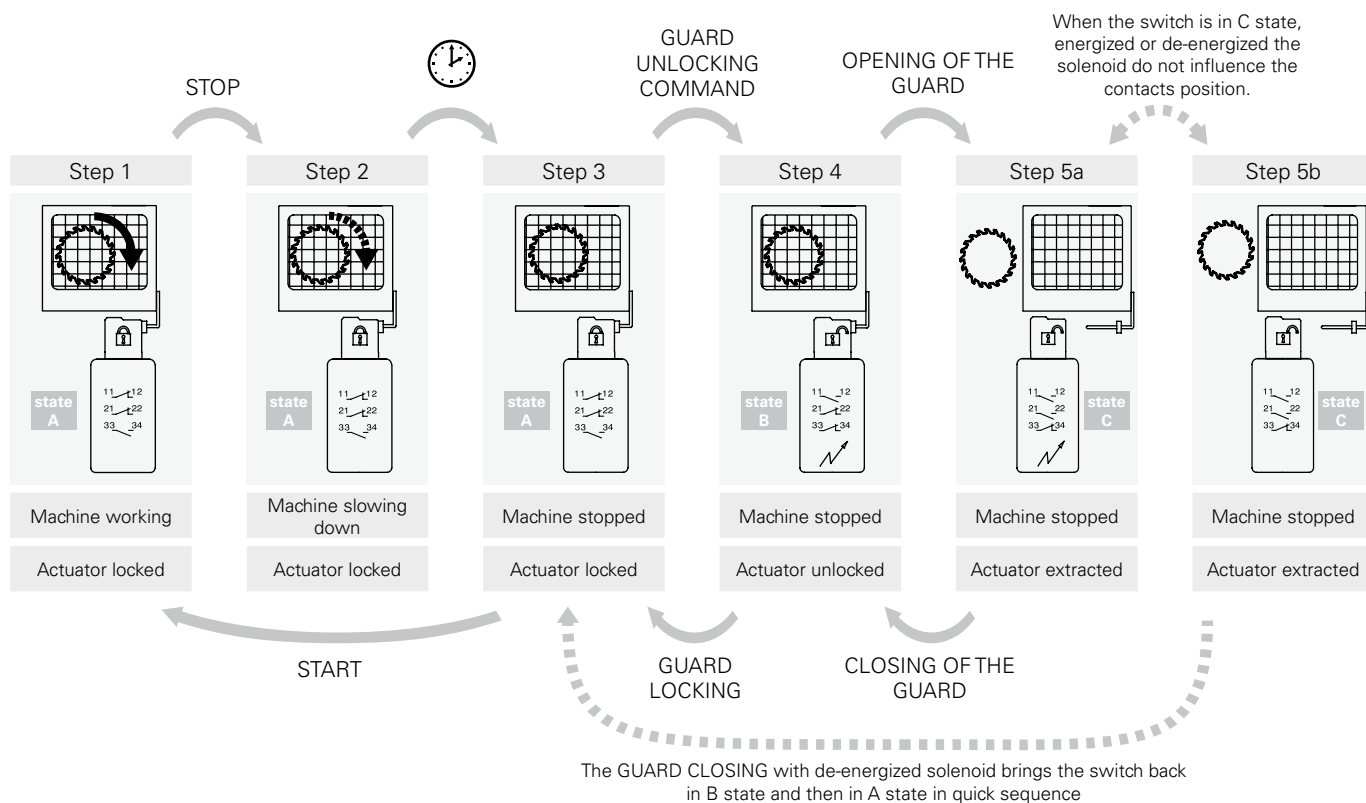
- **Working principle D:** Actuator blocked with de-energized solenoid. Actuator release is obtained by power supply to the solenoid (see example of working cycle steps).
- **Working principle E:** Actuator blocked with energized solenoid. The unlock of the actuator is obtained by power-off to the solenoid. 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 an 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 4/95.

**Example of working cycle steps with FS 2896D024-F1 (switch with working principle D)****Contacts position in switch states**

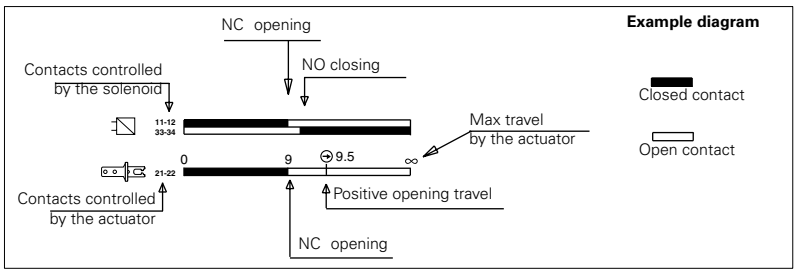
Operation state	Working principle D locked actuator with de-energized solenoid			Working principle E locked actuator with energized solenoid		
	state A	state B	state C	state A	state B	state C
Actuator	Inserted and locked	Inserted and unlocked	Extracted	Inserted and locked	Inserted and unlocked	Extracted
Solenoid	De-energized	Energized	-	Energized	De-energized	-
FS 18..... 1NC+1NO controlled by the solenoid						
FS 20..... 2NC+1NO controlled by the solenoid						
FS 21..... 3NC controlled by the solenoid						
FS 28..... 1NO+1NC controlled by the solenoid 1NC controlled by the actuator						
FS 29..... 2NC controlled by the solenoid 1NC controlled by the actuator						
FS 30..... 1NC controlled by the solenoid 2NC controlled by the actuator						

Dimensional drawings

Contacts type:		D working principle, supplied with sealable auxiliary release device and without actuator	E working principle and without actuator	D working principle, supplied with lock auxiliary release device and without actuator
[L] = slow action				
Contact blocks				
18	[L]	FS 1896D024 → 1NO+1NC 	FS 1896E024 → 1NO+1NC 	FS 1898D024 → 1NO+1NC 
20	[L]	FS 2096D024 → 1NO+2NC 	FS 2096E024 → 1NO+2NC 	FS 2098D024 → 1NO+2NC 
21	[L]	FS 2196D024 → 3NC 	FS 2196E024 → 3NC 	FS 2198D024 → 3NC 
28	[L]	FS 2896D024 → 1NO+2NC 	FS 2896E024 → 1NO+2NC 	FS 2898D024 → 1NO+2NC 
29	[L]	FS 2996D024 → 3NC 	FS 2996E024 → 3NC 	FS 2998D024 → 3NC 
30	[L]	FS 3096D024 → 3NC 	FS 3096E024 → 3NC 	FS 3098D024 → 3NC 
Min. force		30 N (40 N →)	30 N (40 N →)	30 N (40 N →)

How to read travel diagrams

All measures in the diagrams are in mm



**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 between brackets, below each article, next the value of minimum force.

Accessories

Article	Description
VF KB1	Actuator entry locking device

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. It cannot be used for switches with plastic heads. Padlocks diameter holes 9 mm

Article	Description
VF KLA371	Set of 2 locking keys

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

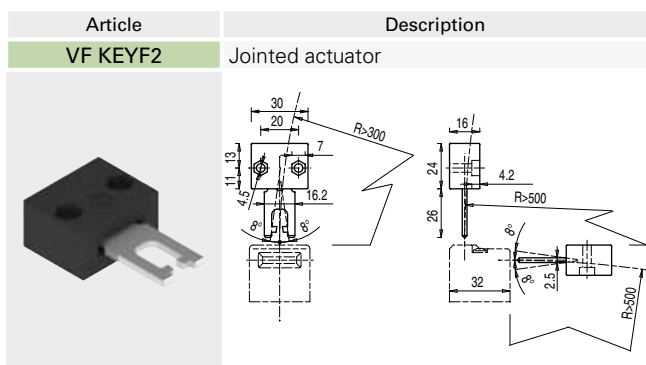
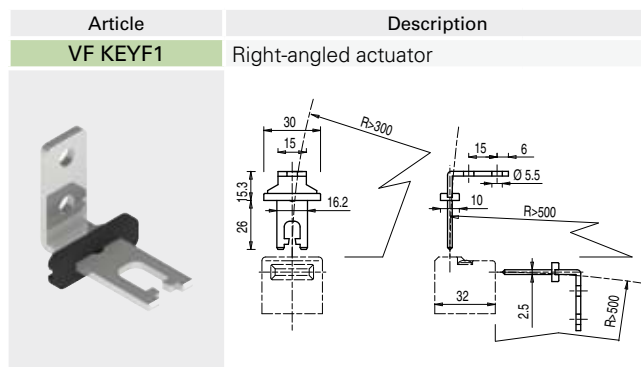
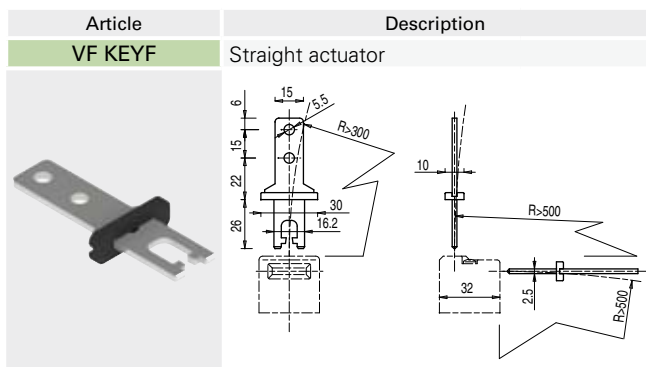
Accessories See page 6/1

All measures in the drawings are in mm

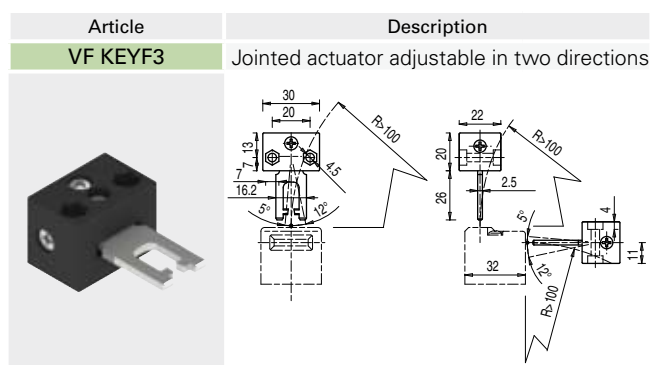


## Stainless steel actuators

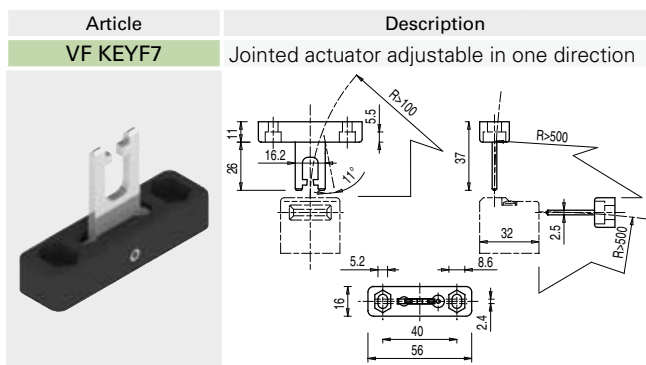
**IMPORTANT:** These actuators must be used with FD, FP, FL, FC or FS series only (e.g. FS 1896D024).



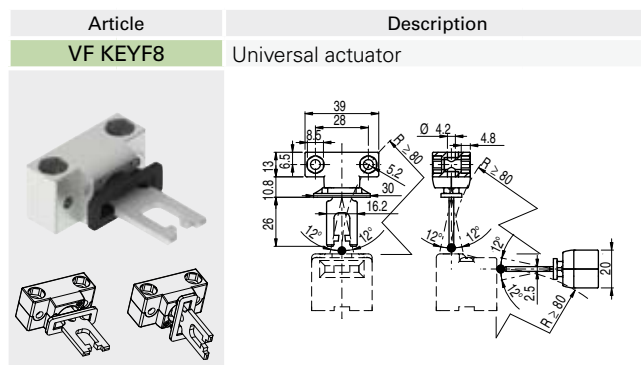
The actuator can flex in four directions for applications where the door alignment is not precise.



Actuator adjustable in two directions for doors with reduced dimensions.



Actuator adjustable in one direction for doors with reduced dimensions.



Jointed and two directions adjustable actuator for doors with reduced dimensions. The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.

## Accessories for sealing

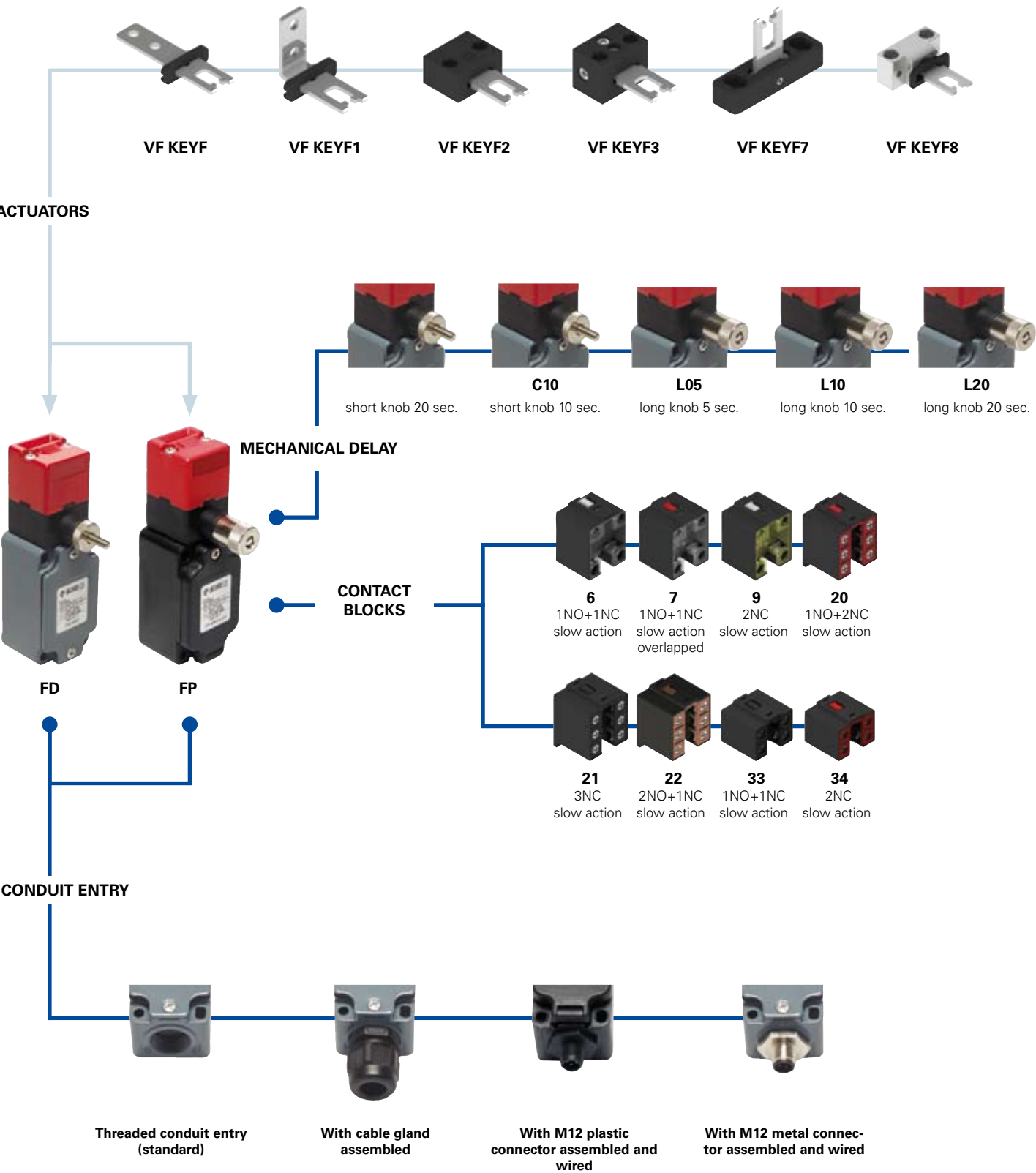


Article	Description
VF FSPB-200	Set of 200 lead seals
VF FSPB-10	Set of 10 lead seals
Article	Description
VF FSFI-400	400 m steel wire roll
VF FSFI-10	10 m steel wire roll
Article	Description
VF FSPZ	Plier without logo

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

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

Selection diagram

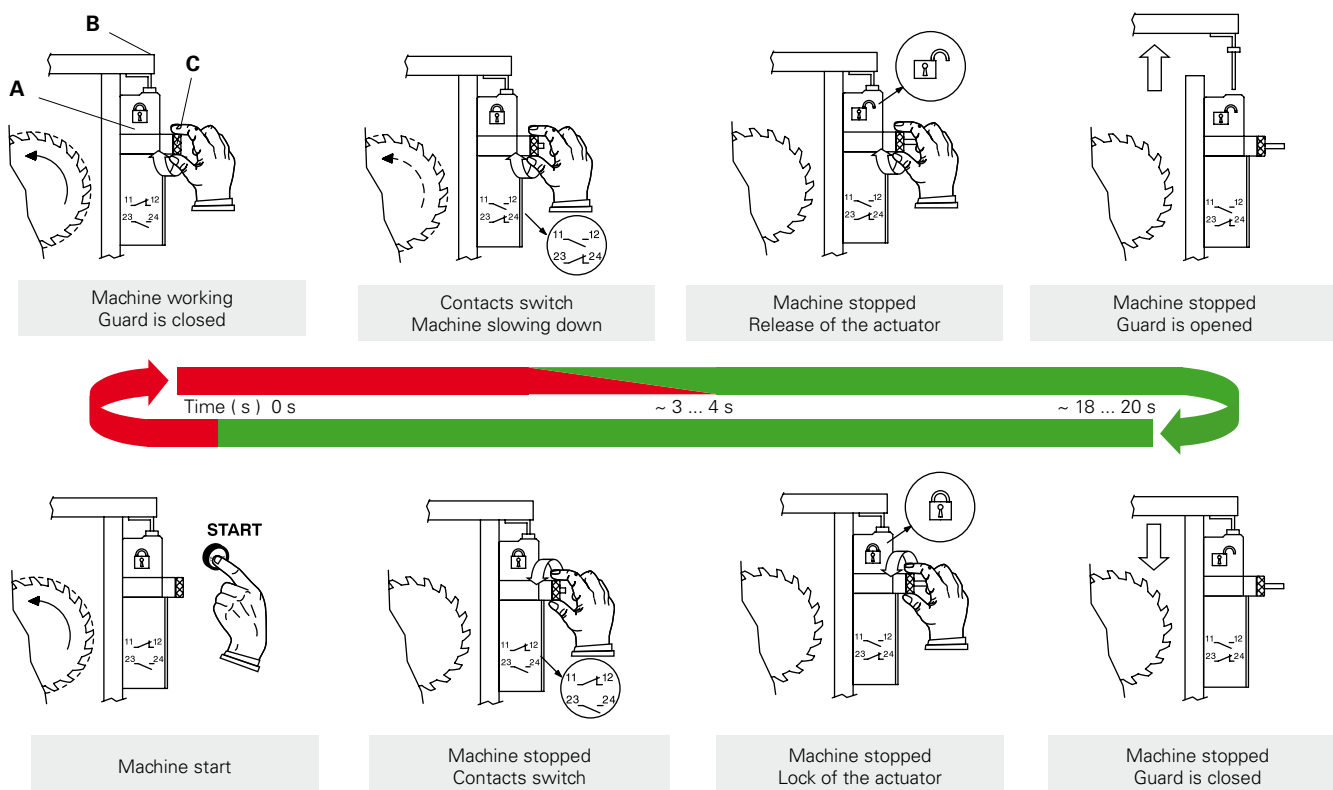


● product option  
➡ accessory sold separately



## Working cycle (FP 6R2-F1)

The switch is fixed to the machine body (A), while the stainless steel actuator is fastened to the guard (B). Once installed, the switch will firmly lock the actuator. In order to remove the actuator, the knob (C) has to be rotated. On the first turns the electrical contacts will positively open, then, after about 20 seconds (or 10 seconds depending on the knob version), the actuator will be released. In order to close the guard, the knob must be rotated in the opposite direction. This switch doesn't need power supply or timer and can be easily installed on old machines without important changes in their electrical circuit. The knob (C) may be supplied in a short (standard) or in a long version.



## Code structure

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

article options  
**FD 6R2-L10F1GM2K50**

### Housing

- FD** metal housing, one conduit entry  
**FP** polymer housing, one conduit entry

### Contact blocks

- 6** 1NO+1NC, slow action  
**7** 1NO+1NC, slow action overlapped  
**9** 2NC, slow action  
**20** 1NO+2NC, slow action  
**21** 3NC, slow action  
**22** 2NO+1NC, slow action  
**33** 1NO+1NC, slow action  
**34** 2NC, slow action

### Mechanical delay

- short knob 20 s (standard)  
**C10** short knob 10 s  
**L05** long knob 5 s  
**L10** long knob 10 s  
**L20** long knob 20 s

### 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

### 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

- K50** with assembled 5 poles M12 metal connector

For the complete list of all combinations, please contact our technical office.

### Threaded conduit entry

- PG 13,5 (standard)  
**M2** M20x1,5

### Contacts type

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



Main data

- Metal housing or polymer housing, one conduit entry
- Protection degree IP67
- 8 contact blocks available
- 6 stainless steel actuators available
- M12 assembled connector versions
- Silver contacts gold plated versions
- Strong actuator locking (1000N)
- Manual actuator unlocking
- Versions with different unlocking delay times


Markings and quality marks:



Approval IMQ:	EG605 (FD series) EG606 (FP series) E131787
Approval UL:	E131787
Approval CCC:	2007010305230000 (FD series) 2007010305230014 (FP series)
Approval EZU:	1010151
Approval GOST:	POCC IT.AB24.B04512

Technical data

Housing

Housing type FP made of glass-reinforced polymer, self-extinguishing, shock-proof thermoplastic resin and with double insulation   
Housing type FD made of metal, coated with baked epoxy powder.  
FD and FP series one conduit entry  
Protection degree:

IP67 according to EN 60529  
with cable gland having equal or higher protection degree (electrical contacts)

General data

For safety applications up to SIL 3 / PL e

Safety parameters: see page 7/34  
Ambient temperature: from -25°C to +80°C

Version for operation in ambient temperature from -40°C to +80° C on request  
Max actuation frequency: 360 operations cycles<sup>1</sup>/hour  
Mechanical endurance: 500.000 operations cycles<sup>1</sup>  
Max actuating speed: 0,5 m/s  
Min. actuating speed: 1 mm/s  
Max holding force: 1000 N  
Max backlash of the actuator: 4,5 mm  
Driving torque for installation: see pages 7/1-7/12

(1) One operation cycle means two movements, one to close and one to open contacts, as foreseen by EN 60947-5-1 standard..

Cross section of the conductors (flexible copper wire)

Contact blocks 20, 21, 22, 33, 34:	min.	1 x 0,34 mm <sup>2</sup>	(1 x AWG 22)
	max.	2 x 1,5 mm <sup>2</sup>	(2 x AWG 16)
Contact blocks 6, 7, 9:	min.	1 x 0,5 mm <sup>2</sup>	(1 x AWG 20)
	max.	2 x 2,5 mm <sup>2</sup>	(2 x AWG 14)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 60529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, BG-GS-ET-15.

Approvals:


IEC 60947-5-1, UL 508, GB14048.5-2001.

In conformity with requirements requested by:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.

Positive contact opening in conformity with standards:

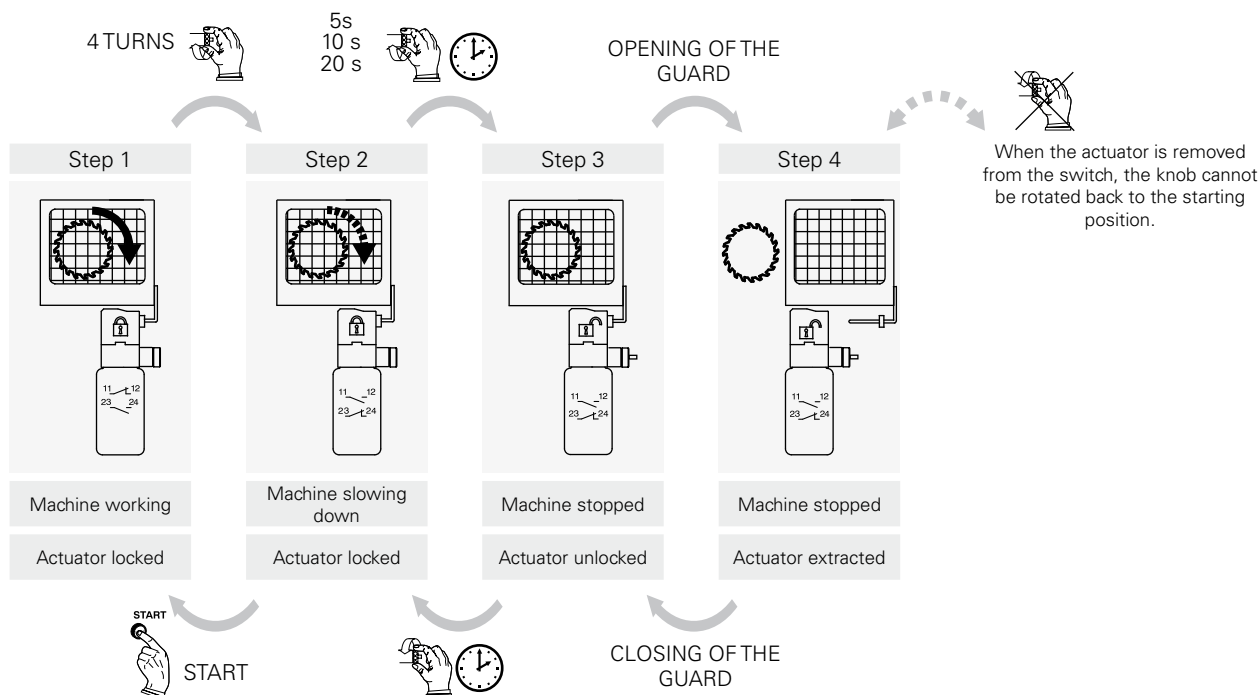
IEC 60947-5-1, EN 60947-5-1, VDE 0660-206.

 If not expressly indicated in this chapter, for the right installation and the correct utilization of all articles see requirements indicated from page 7/1 to page 7/12.

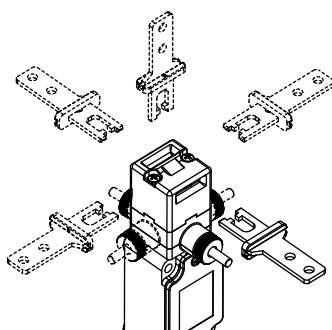
Electrical data			Utilization categories			
without connector	Thermal current (I <sub>th</sub> ):	10 A	Alternate current: AC15 (50...60 Hz)			
	Rated insulation voltage (U <sub>i</sub> ):	500 Vac 600 Vdc	U <sub>e</sub> (V)	250	400	500
		400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	I <sub>e</sub> (A)	6	4	1
	Rated impulse withstand voltage (U <sub>imp</sub> ):	6 kV	Direct current: DC13			
		4 kV (contact blocks 20, 21, 22, 33, 34)	U <sub>e</sub> (V)	24	125	250
with 4 or 5 poles M12 connector	Conditional short circuit current:	1000 A according to EN 60947-5-1	I <sub>e</sub> (A)	6	1,1	0,4
	Protection against short circuits:	fuse 10 A 500 V type aM	Alternate current: AC15 (50...60 Hz)			
	Pollution degree:	3	U <sub>e</sub> (V)	24	120	250
			I <sub>e</sub> (A)	4	4	4
			Direct current: DC13			
with 8 poles M12 connector	Thermal current (I <sub>th</sub> ):	4 A	U <sub>e</sub> (V)	24	125	250
	Rated insulation voltage (U <sub>i</sub> ):	250 Vac 300 Vdc	I <sub>e</sub> (A)	4	1,1	0,4
	Protection against short circuits:	fuse 4 A 500 V type gG	Alternate current: AC15 (50...60 Hz)			
	Pollution degree:	3	U <sub>e</sub> (V)	24		
			I <sub>e</sub> (A)	2		

## Example of working cycle steps with FD 6R2-F1

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 the pulleys, saw disks, mills. This switch has its ideal application where the guard is not open frequently and the installation of a switch with solenoid would be too expensive.

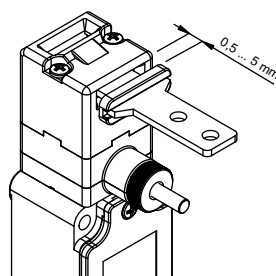


## Rotating heads and knobs



The head can be quickly rotated on each of the 4 sides of the switch by unfastening the two fixing screws. The mechanical delay 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) for an easier installation. 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).

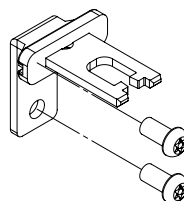
## Limits of utilization

Do not use where dust and dirt may penetrate in any way into the head and deposit there, in particular where metal dust, concrete or chemicals are spread.

Do not use where explosive or inflammable gas is present.

Use Atex products in environments with explosion hazard (see page 2/137).

## Safety screws for actuators



These new screws have tamper-resistant Torx buttonheads.

Devices fixed with this kind of screws cannot be removed or tampered by common tools.

See accessories page 6/5.

## Data type approved by IMQ, CCC and EZU

Rated insulation voltage (Ui): 500 Vac  
400 Vac (for contact blocks 20, 21, 22, 33, 34)

Thermal current (Ith): 10 A

Protection against short circuits: fuse 10 A 500 V type aM

Rated impulse withstand voltage (U<sub>imp</sub>): 6 kV  
4 kV (for contact blocks 20, 21, 22, 33, 34)

Protection degree: IP67

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, Y+Y+X, Y+Y+Y, Y+X+X

Positive opening of contacts on contact block 6, 7, 9, 20, 21, 22, 33, 34

In conformity with standards: EN 60947-1, EN 60947-5-1 + A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/CE.

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

## Data type approved by UL

Utilization categories Q300 (69 VA, 125-250 Vdc)

A600 (720 VA, 120-600 Vdc)

Data of the housing type 1, 4X "indoor use only", 12, 13

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 (0.8 Nm).

In conformity with standard: UL 508

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

Dimensional drawings

Contacts type:  
L = slow action  
LO = slow action overlapped

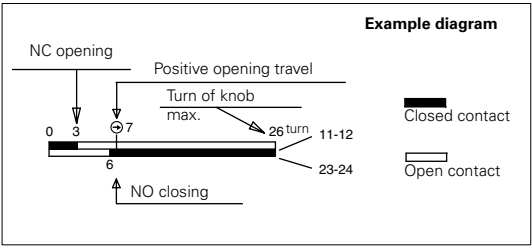
Contact blocks

	Polymer housing Without actuator	Metal housing Without actuator	Metal housing Without actuator
6 L	FP 6R2 1NO+1NC 	FD 6R2 1NO+1NC 	FD 6R2-L10 1NO+1NC 
7 LO	FP 7R2 1NO+1NC 	FD 7R2 1NO+1NC 	FD 7R2-L10 1NO+1NC 
9 L	FP 9R2 2NC 	FD 9R2 2NC 	FD 9R2-L10 2NC 
20 L	FP 20R2 1NO+2NC 	FD 20R2 1NO+2NC 	FD 20R2-L10 1NO+2NC 
21 L	FP 21R2 3NC 	FD 21R2 3NC 	FD 21R2-L10 3NC 
22 L	FP 22R2 2NO+1NC 	FD 22R2 2NO+1NC 	FD 22R2-L10 2NO+1NC 
33 L	FP 33R2 1NO+1NC 	FD 33R2 1NO+1NC 	FD 33R2-L10 1NO+1NC 
34 L	FP 34R2 2NC 	FD 34R2 2NC 	FD 34R2-L10 2NC 
Min. force	10 N (18 N)	10 N (18 N)	10 N (18 N)

All measures are in turns of knob

How to read travel diagrams

All measures are in turns of knob

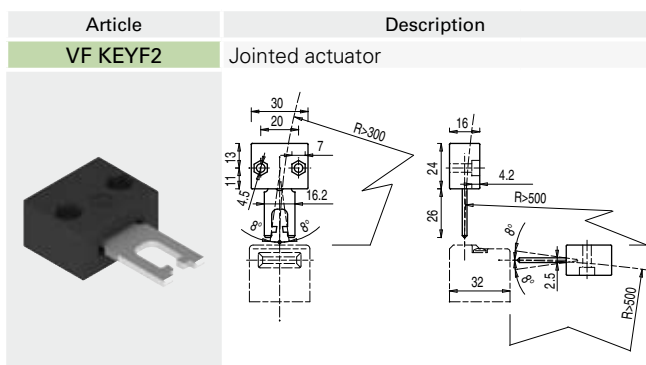
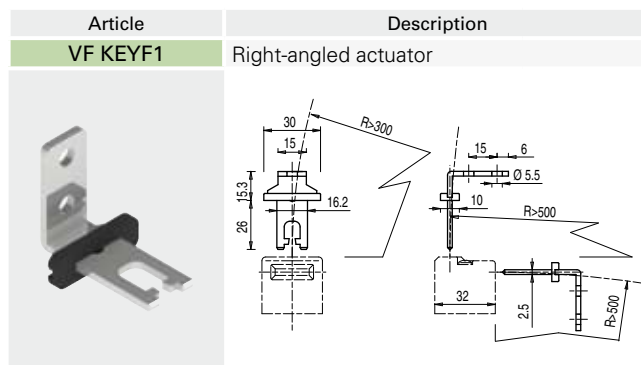
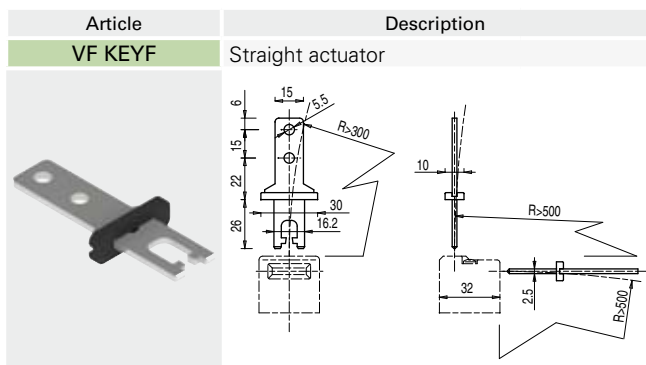


**IMPORTANT:**  
**NC contact** has to be considered with inserted and blocked actuator and with the knob rotated anti-clockwise up to the end of the travel. **In safety applications** it is necessary to activate the switch **at least up to the positive opening point** indicated in the diagrams with the symbol ☺. Operate the switch **at least with the positive opening force**, indicated between brackets, below each article, next the value of minimum force.

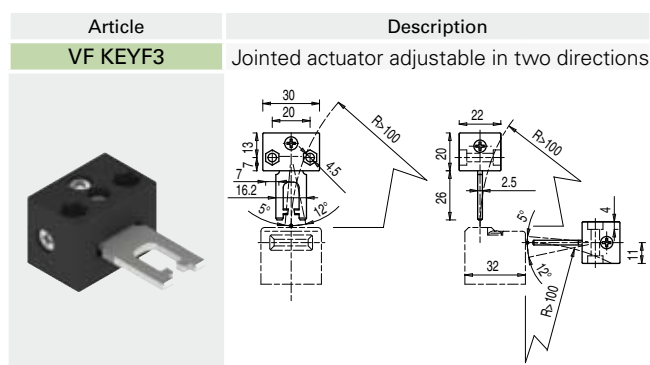


## Stainless steel actuators

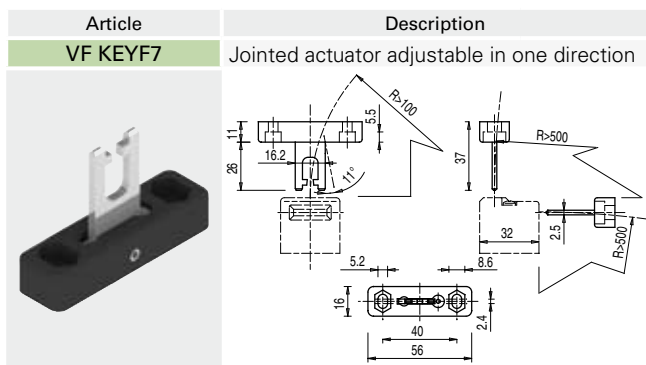
**IMPORTANT:** These actuators must be used with FD, FP, FL, FC or FS series only (e.g. FD 6R2).



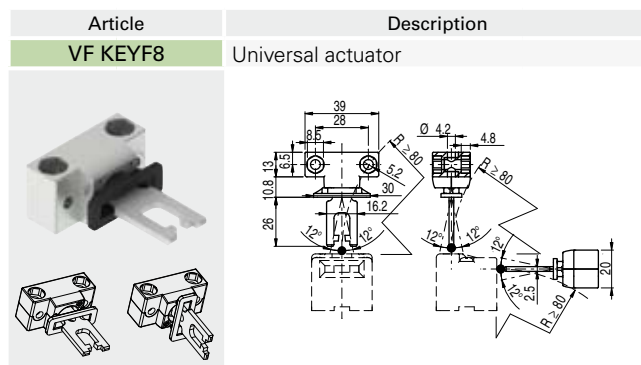
The actuator can flex in four directions for applications where the door alignment is not precise.



Actuator adjustable in two directions for doors with reduced dimensions.

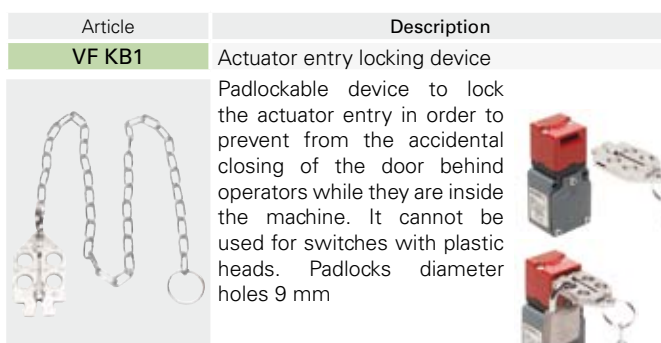


Actuator adjustable in one direction for doors with reduced dimensions.



Joined and two directions adjustable actuator for doors with reduced dimensions.  
The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.

## Accessories

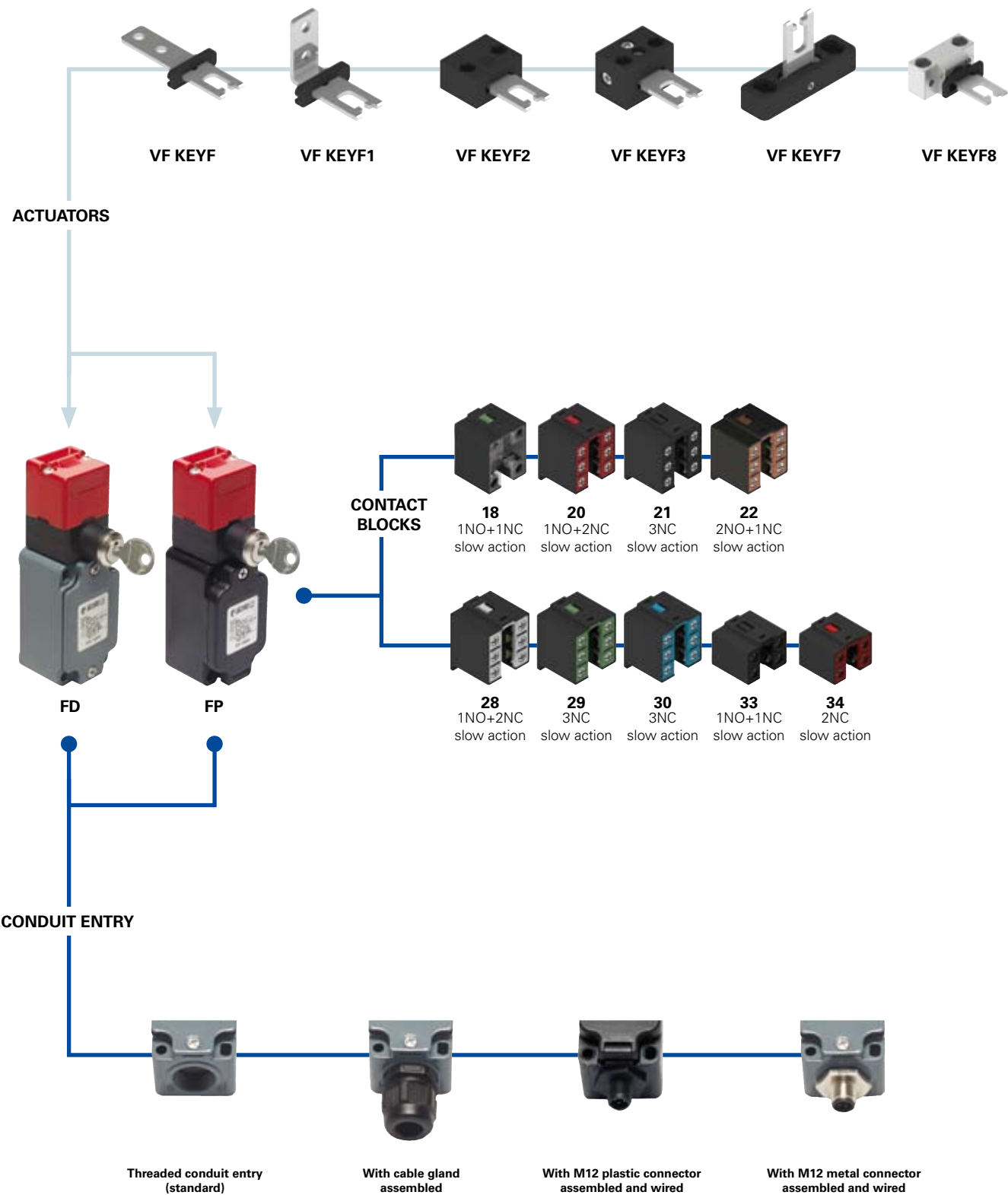


Padlockable device to lock the actuator entry in order to prevent from the accidental closing of the door behind operators while they are inside the machine. It cannot be used for switches with plastic heads. Padlocks diameter holes 9 mm



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

Selection diagram



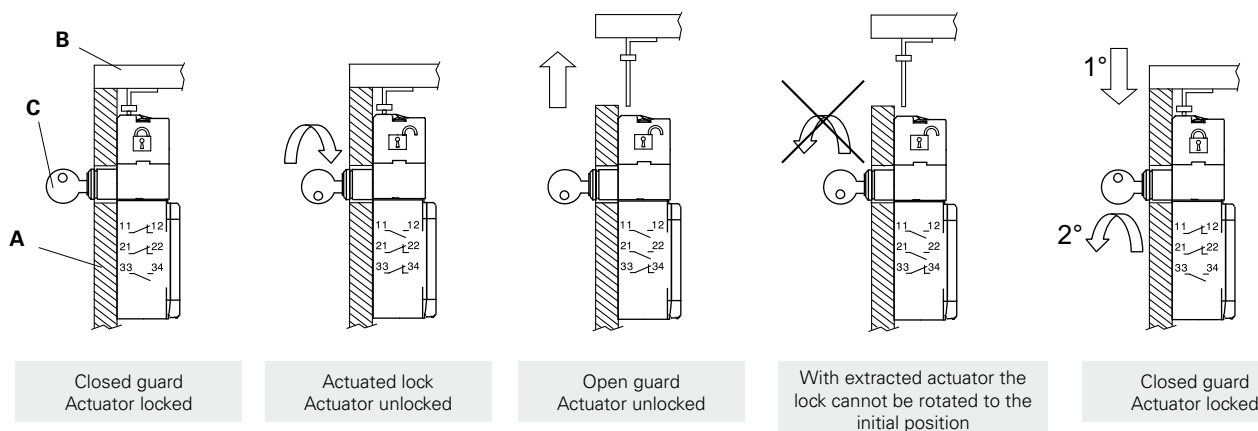
—●— product option  
—▶— accessory sold separately



## Working cycle (FP 2899-F1)

The switch is fixed to the machine body (A), while the stainless steel actuator is fastened to the guard (B). Once installed, the switch will firmly lock the actuator. To remove the actuator, it is necessary to unlock the key locking device rotating the key (C). When the actuator is removed, the key cannot be put in the starting position anymore.

In the example is pointed out how it is possible to have contacts moved by the key lock or by the actuator and how it is possible to install the switch inside the machine, keeping externally visible only the release device.



## Code structure

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

article options  
**FD 1899-F1GM2K50V200**

### Housing

<b>FD</b>	metal housing, one conduit entry
<b>FP</b>	polymer housing, one conduit entry

### Contact blocks

	Contact activated by the lock	Contact activated by the actuator
<b>18</b>	1NO+1NC	
<b>20</b>	1NO+2NC	
<b>21</b>	3NC	
<b>22</b>	2NO+1NC	
<b>28</b>	1NO+1NC	1NC
<b>29</b>	2NC	1NC
<b>30</b>	1NC	2NC
<b>33</b>	1NO+1NC	
<b>34</b>	2NC	

### Actuators

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

### Key lock ciphering

	one key coding (371)(standard)
<b>V200</b>	up to 50 different key coding numbers

### Preinstalled cable gland or connectors

	no cable gland or connector (standard)
<b>K21</b>	with assembled cable gland suitable for Ø 6 to Ø 12 mm cables range
...	.....
<b>K50</b>	with assembled 5 poles M12 metal connector
...	.....

For the complete list of all combinations, please contact our technical office.

### Threaded conduit entry

	PG 13,5 (standard)
<b>M2</b>	M20x1,5

### Contacts type

	silver contacts (standard)
<b>G</b>	silver contacts gold plated 1 µm



Patent pending

Main data

- Metal housing or polymer housing, one conduit entry
- Protection degree IP67
- 9 contact blocks available
- 6 stainless steel actuators available
- M12 assembled connector versions
- Silver contacts gold plated versions
- Strong actuator locking (1000 N)
- Manual actuator unlocking


Markings and quality marks:



Approval IMQ:	EG605 (FD series) EG606 (FP series)
Approval UL:	E131787
Approval CCC:	2007010305230000 (FD series) 2007010305230014 (FP series)
Approval ECU:	1010151
Approval GOST:	POCC IT.AB24.B04512

Technical data

Housing

Housing type FP made of glass-reinforced polymer, self-extinguishing, shock-proof thermoplastic resin and with double insulation   
Housing type FD made of metal, coated with baked epoxy powder.  
FD and FP series one conduit entry  
Protection degree:

IP67 according to EN 60529  
with cable gland having equal or higher protection degree (electrical contacts)

General data

For safety applications up to SIL 3 / PL e

Safety parameters: see page 7/34  
Ambient temperature: from -25°C to +80°C

Version for operation in ambient temperature from -40°C to +80° C on request  
Max actuation frequency: 3600 operations cycles<sup>1</sup>/hour  
Mechanical endurance: 500.000 operations cycles<sup>1</sup>  
Max actuating speed: 0,5 m/s  
Min. actuating speed: 1 mm/s  
Max holding force : 1000 N  
Max backlash of the actuator: 4,5 mm  
Actuator extraction force: 30 N  
Driving torque for installation: see pages 7/1-7/12  
(1) One operation cycle means two movements, one to close and one to open contacts, as foreseen by EN 60947-5-1 standard.

Cross section of the conductors (flexible copper wire)

Contact blocks 20, 21, 22, 28, 29, 30, 33, 34:	min.	1 x 0,34 mm <sup>2</sup>	(1 x AWG 22)
	max.	2 x 1,5 mm <sup>2</sup>	(2 x AWG 16)
Contact blocks 18:	min.	1 x 0,5 mm <sup>2</sup>	(1 x AWG 20)
	max.	2 x 2,5 mm <sup>2</sup>	(2 x AWG 14)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 60529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, BG-GS-ET-15.

Approvals:


IEC 60947-5-1, UL 508, GB14048.5-2001.

In conformity with requirements requested by:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.

Positive contact opening in conformity with standards:

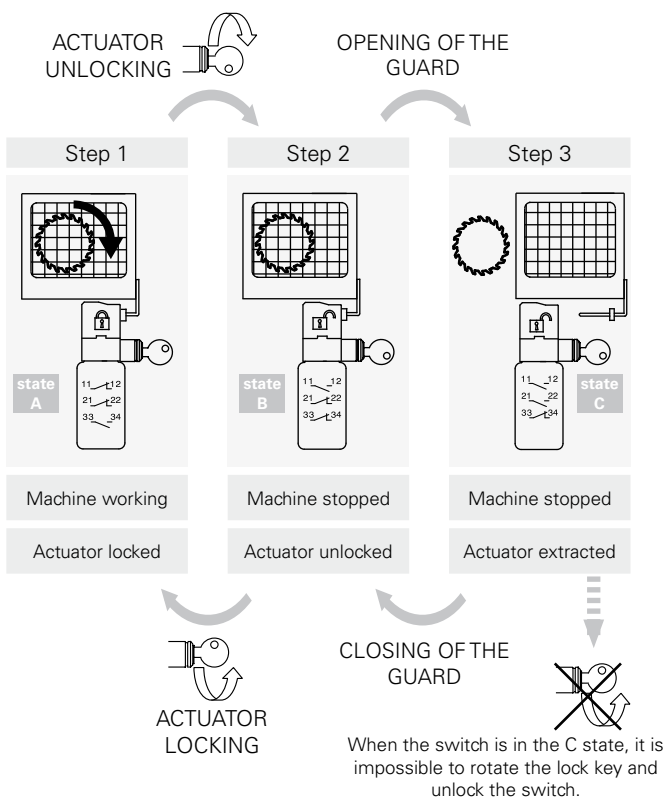
IEC 60947-5-1, EN 60947-5-1, VDE 0660-206.

 If not expressly indicated in this chapter, for the right installation and the correct utilization of all articles see requirements indicated from page 7/1 to page 7/12.

Electrical data			Utilization categories			
without connector	Thermal current (I <sub>th</sub> ):	10 A	Alternate current: AC15 (50...60 Hz)			
	Rated insulation voltage (U <sub>i</sub> ):	500 Vac 600 Vdc	U <sub>e</sub> (V)	250	400	500
		400 Vac 500 Vdc (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)	I <sub>e</sub> (A)	6	4	1
	Rated impulse withstand voltage (U <sub>imp</sub> ):	6 kV	Direct current: DC13			
		4 kV (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)	U <sub>e</sub> (V)	24	125	250
with 4 or 5 poles M12 connector	Conditional short circuit current:	1000 A according to EN 60947-5-1	I <sub>e</sub> (A)	6	1,1	0,4
	Protection against short circuits:	fuse 10 A 500 V type aM	Alternate current: AC15 (50...60 Hz)			
	Pollution degree:	3	U <sub>e</sub> (V)	24	120	250
	Thermal current (I <sub>th</sub> ):	4 A	I <sub>e</sub> (A)	4	4	4
	Rated insulation voltage (U <sub>i</sub> ):	250 Vac 300 Vdc	Direct current: DC13			
with 8 poles M12 connector	Protection against short circuits:	fuse 4 A 500 V type gG	U <sub>e</sub> (V)	24	125	250
	Pollution degree:	3	I <sub>e</sub> (A)	4	1,1	0,4
	Thermal current (I <sub>th</sub> ):	2 A	Alternate current: AC15 (50...60 Hz)			
	Rated insulation voltage (U <sub>i</sub> ):	30 Vac 36 Vdc	U <sub>e</sub> (V)	24		
	Protection against short circuits:	fuse 2 A 500 V type gG	I <sub>e</sub> (A)	2		
	Pollution degree:	3	Direct current: DC13			
			U <sub>e</sub> (V)	24		
			I <sub>e</sub> (A)	2		

## Example of working cycle steps with FD 2899-F1

This type of switches **is applied on fences or protections where entrance is allowed to authorized personnel only. They have been studied to control large protected areas where operators may physically enter.** Supplied with a strong lock (up to 1000 N), the actuator can be removed from the head only after a complete rotation (180°) of the locking key. During the key rotation, electrical contacts are switched, and the actuator will be released only after NC contacts are positively opened. Contacts activated by the key locking device set to the initial position only with inserted actuator and with locking key device rotated in locked position. **It is impossible to rotate the key when the key locking device is unlocked and the actuator is removed (C state).** Contacts actuated by key locking or by actuator are available.



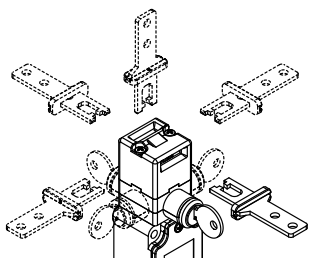
Operation state	state A	state B	state C
Actuator	Inserted and locked	Inserted and unlocked	Extracted
Lock	Closed	Opened	Opened

<b>Contact blocks</b> <b>FD 1899</b> 1NC+1NO controlled by the lock FD 2099 2NC+1NO controlled by the lock FD 2199 3NC controlled by the lock FD 2299 1NC+2NO controlled by the lock FD 2899 1NO+1NC controlled by the lock 1NC controlled by the actuator FD 2999 2NC controlled by the lock 1NC controlled by the actuator FD 3099 1NC controlled by the lock 2NC controlled by the actuator	 21 — 22 13 — 14  11 — 12 21 — 22 33 — 34  11 — 12 21 — 22 31 — 32  11 — 12 23 — 24 33 — 34  11 — 12 21 — 22 33 — 34  11 — 12 21 — 22 31 — 32  11 — 12 21 — 22 31 — 32  11 — 12 21 — 22 31 — 32  11 — 12 21 — 22 31 — 32	 21 — 22 13 — 14  11 — 12 21 — 22 33 — 34  11 — 12 21 — 22 31 — 32  11 — 12 23 — 24 33 — 34  11 — 12 21 — 22 33 — 34  11 — 12 21 — 22 31 — 32  11 — 12 21 — 22 31 — 32  11 — 12 21 — 22 31 — 32  11 — 12 21 — 22 31 — 32
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The key can be extracted from the lock with the actuator blocked or with the actuator released.

## 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 release device can be rotated in 90° steps as well. This enables the switch to assume 32 different configurations.

## Limits of utilization

Do not use where dust and dirt may penetrate in any way into the head and deposit there, in particular where metal dust, concrete or chemicals are spread.

Do not use where explosive or inflammable gas is present.

Use Atex products in environments with explosion hazard (see page 2/137).

## Data type approved by IMQ, CCC and EZU

Rated insulation voltage (Ui): 500 Vac  
400 Vac (for contact blocks 20, 21, 22, 33, 34)

Thermal current (Ith): 10 A

Protection against short circuits: fuse 10 A 500 V type aM

Rated impulse withstand voltage (U<sub>imp</sub>): 6 kV  
4 kV (for contact blocks 20, 21, 22, 33, 34)

Protection degree: IP67

MV terminals (screw clamps)

Pollution degree 3

Utilization category: AC15

Operation voltage (Ue): 400 Vac (50 Hz)

Operation current (Ie): 3 A

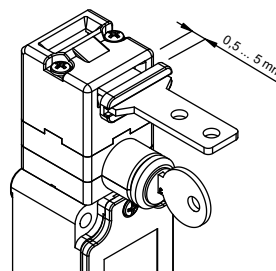
Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X

Positive opening of contacts on contact block 18, 20, 21, 22, 28, 29, 30

In conformity with standards: EN 60947-1, EN 60947-5-1 + A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/CE.

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

## Actuator regulation zone



This switch has a wide backlash of the actuator into the head (4,5 mm) for an easier installation.

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).

## 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

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 (0.8 Nm).

In conformity with standard: UL 508


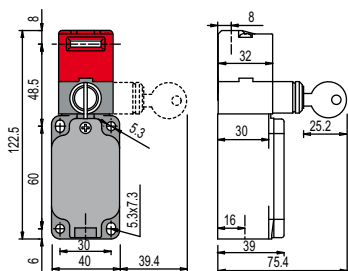
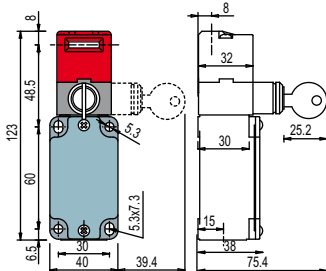


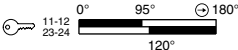

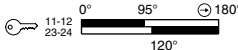


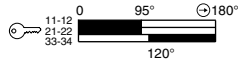

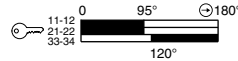


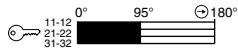

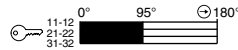


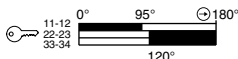

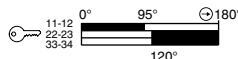


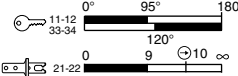

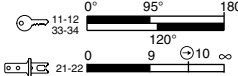







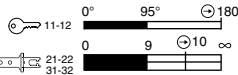

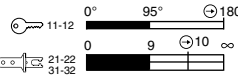


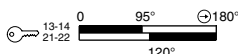

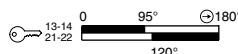


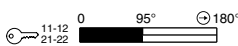

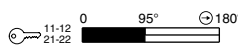


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## Dimensional drawings

Contacts type:

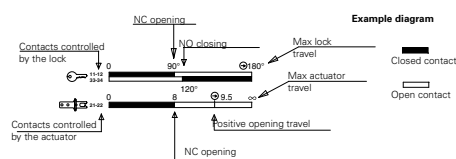
**L** = slow action

## Contact blocks

	Polymer housing	Metal housing
Contacts type:	Without actuator, supplied with two keys	Without actuator, supplied with two keys
 = slow action		
Contact blocks		
18 	<b>FP 1899</b>  1NO+1NC 	<b>FD 1899</b>  1NO+1NC 
20 	<b>FP 2099</b>  1NO+2NC 	<b>FD 2099</b>  1NO+2NC 
21 	<b>FP 2199</b>  3NC 	<b>FD 2199</b>  3NC 
22 	<b>FP 2299</b>  2NO+1NC 	<b>FD 2299</b>  2NO+1NC 
28 	<b>FP 2899</b>  1NO+2NC 	<b>FD 2899</b>  1NO+2NC 
29 	<b>FP 2999</b>  3NC 	<b>FD 2999</b>  3NC 
30 	<b>FP 3099</b>  3NC 	<b>FD 3099</b>  3NC 
33 	<b>FP 3399</b>  1NO+1NC 	<b>FD 3399</b>  1NO+1NC 
34 	<b>FP 3499</b>  2NC 	<b>FD 3499</b>  2NC 
Min. force	30 N (40 N  )	30 N (40 N  )

## How to read travel diagrams

All measures in the diagrams are in mm or in degrees





**IMPORTANT:**

NC contacts (🔑) has to be considered with inserted and blocked actuator in the key 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 between brackets, below each article, next the value of minimum force.

## Accessories

Article	Description
<b>VF KB1</b>	Actuator entry locking device
	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. Padlocks diameter holes 9 mm
	

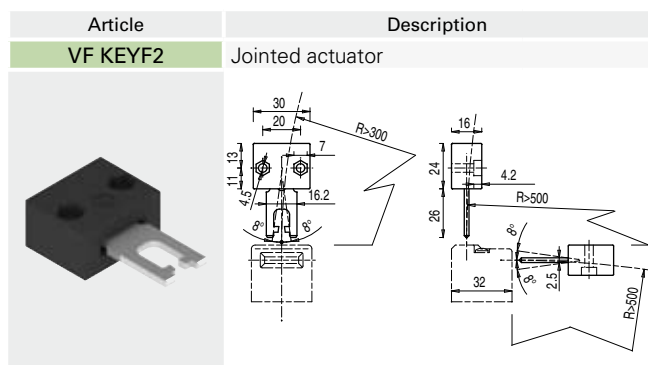
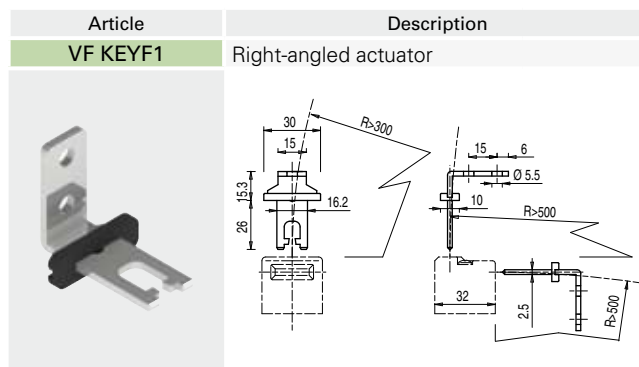
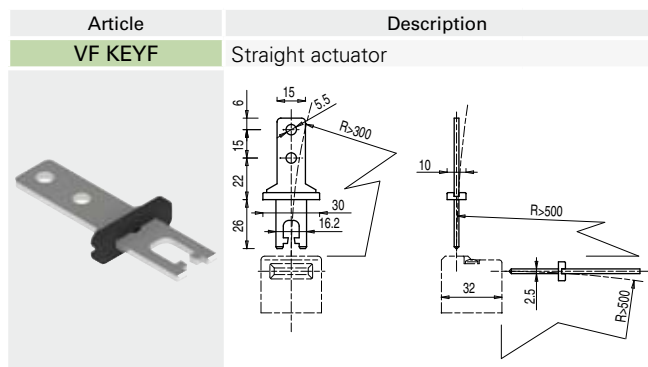
Article	Description
<b>VF KLA371</b>	Set of 2 locking keys Extra copy of the locking keys to be purchased if further keys are needed (standard supply 2 units). All switches keys have the same code. Other codes on request.

**Accessories** See page 6/1

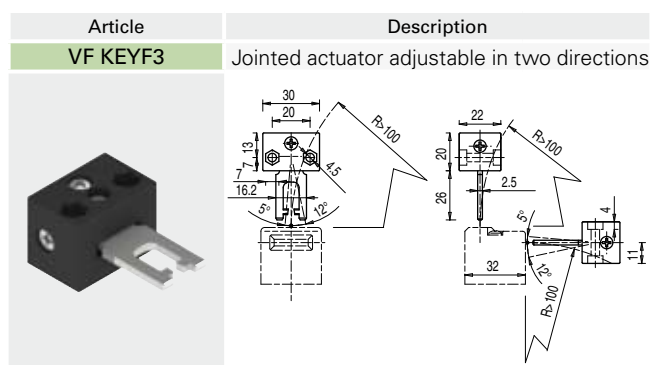


## Stainless steel actuators

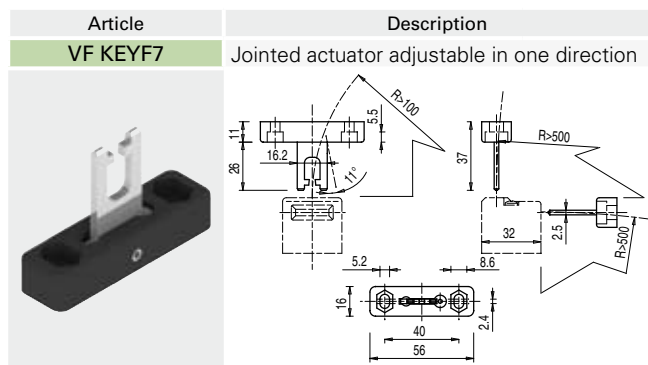
**IMPORTANT:** These actuators must be used with FD, FP, FL, FC or FS series only (e.g. FD 1899).



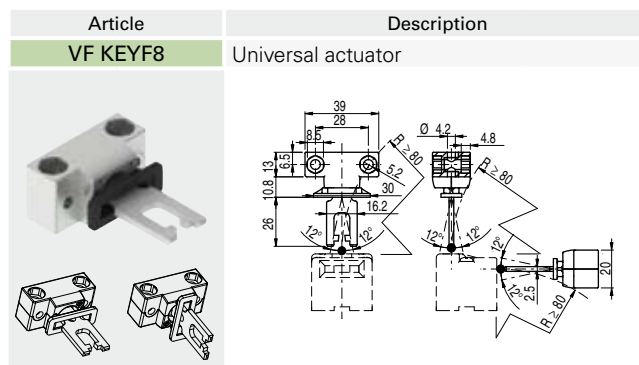
The actuator can flex in four directions for applications where the door alignment is not precise.



Actuator adjustable in two directions for doors with reduced dimensions.

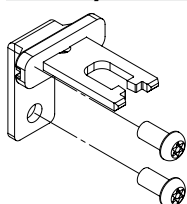


Actuator adjustable in one direction for doors with reduced dimensions.



Jointed and two directions adjustable actuator for doors with reduced dimensions. The actuator has two couples of fixing holes and it is possible to rotate the actuator-working plan (see picture).

## Safety screws for actuators



These new screws have tamper-resistant Torx buttonheads. Devices fixed with this kind of screws cannot be removed or tampered by common tools. See Accessories page 6/6.