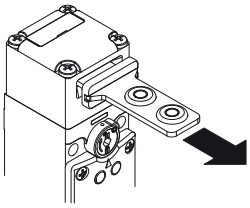
Safety switches **with solenoid and separate actuator**

Description

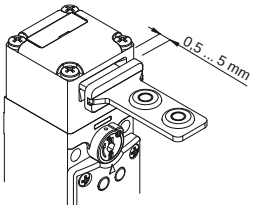
These switches are used on machines where the hazardous conditions remain for a while, even after the machines have been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. They can also be used when it is necessary to control machine guards allowing the opening of protections only under specific conditions.
The versions with solenoid actuated NC contacts are considered interlocks with locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

Holding force of the locked actuator



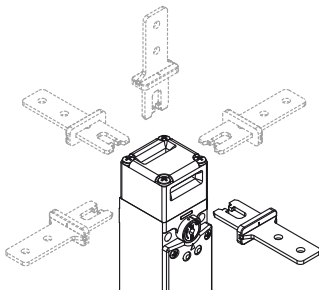
The strong interlocking system guarantees a maximum actuator holding force of F_{1max} = 2800 N.

Wide-ranging actuator travel



The head of this switch is equipped with an actuator with a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5mm) without causing unwanted machine shutdowns. This extensive travel is available in all actuators, in order to ensure maximum device reliability.

Orientable heads and devices

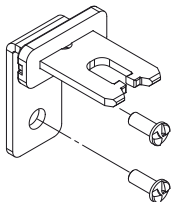


The head can be quickly oriented in four different directions after unscrewing the 4 fixing screws.
Also the key release device and the release button can be rotated in 90° steps, thus obtaining as many as 32 different configurations with the same article.

Contact blocks with 4 contacts

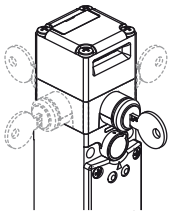
Innovative contact block with 4 contacts, available in different contact configurations to monitor the actuator or the solenoid (patented). The unit is supplied with captive screws and self-lifting plates. Removable finger protection for eyelet terminals.
Highly reliable electric contacts with four support points and double interruption

Safety screws for actuators



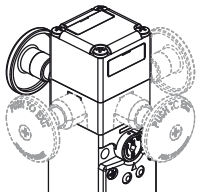
As required by EN ISO 14119, the actuator must be fixed immovably to the door frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered with using common tools. See accessories on page 295.

Key release device with orientable lock



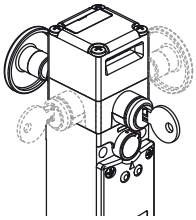
The auxiliary key release device is used to allow the maintenance or the entry into the machinery to authorized personnel only. Rotating the key, will make the same action of the solenoid, that is move solenoid contacts and release the actuator. The device can be rotated allowing the installation of the safety switch inside the machinery and making the release device accessible outside the protection. In this way, the switch is better protected against possible tampering and the external side/surface of the machinery remains smooth.

Emergency release button



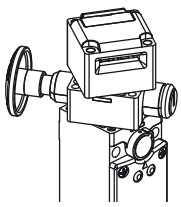
This device is used when the safety switch controls hazardous areas where operators may physically enter with all their body. The release button, oriented towards inside the machinery, allows the exit of the operator accidentally trapped also in case of possible black-out. Pushing the button, it will be actuated the same function of the auxiliary release device. To reset the switch, just return the button to its initial position. The emergency button can be rotated, is 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.

Key release device and emergency release 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 it is still possible to press the button and release the switch. To reset the switch it is necessary to bring lock and button to their initial position.

Not detachable heads and devices



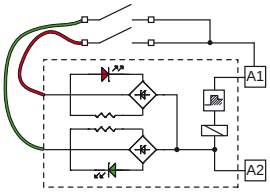
The head and the release device can be adjusted but cannot be detached from each other. This makes the switch more secure since the installer does not need to worry about how to assemble the various pieces, and the switch is less likely to become damaged (small parts being lost, dirt getting in etc.)

Signalling LED type A

In the version with signalling LED type A, two green LEDs 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 see the different states of the switch from the exterior.

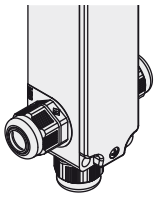


Protection degree IP67

IP67

These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529.
They can therefore be used in all environments where the maximum protection of the housing is required.

Three conduit entries



The switch is equipped with three cable entries in different directions. This allows its application in series connections or in narrow places.

Extended temperature range

-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.
They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

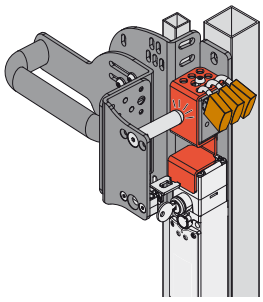
Sealable auxiliary release device

Versions with working principle D are supplied with a sealable auxiliary release device used by technicians during the installation or to access the machine in case of black-out. The auxiliary release device acts on the switch exactly as if the solenoid was energised, actuating therefore also the corresponding electrical contacts. Can only be actuated with a couple of tools, this ensures adequate resistance to tampering. If required it can be sealed by means of the hole provided.

Laser engraving

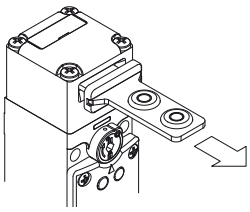
All the FG series switches are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Access monitoring



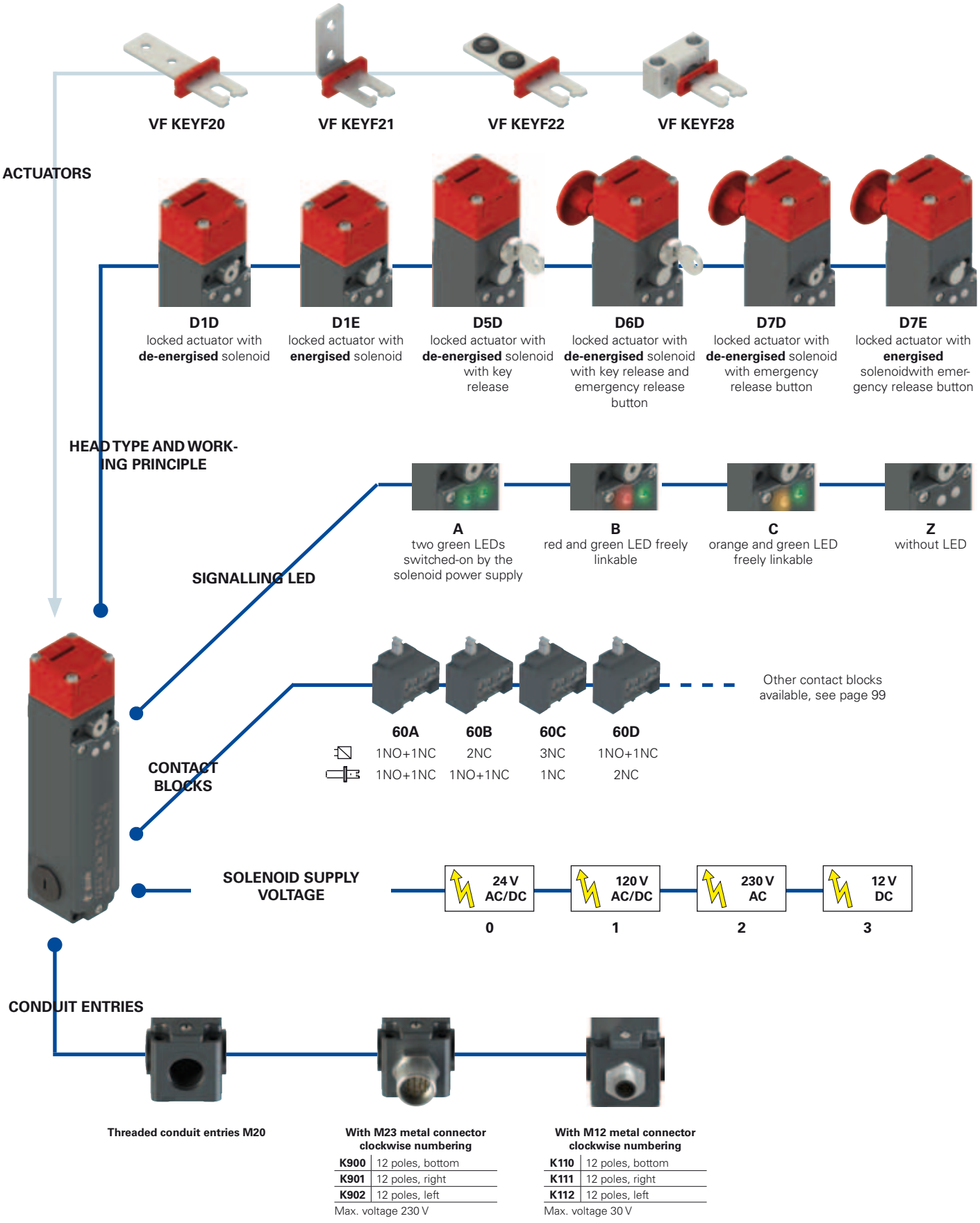
These switches alone cannot protect operators or maintenance men where they may physically enter with all their body in the hazardous area, because a voluntary closing of the protection behind them could allow the restart of the machine. If the authorization to the machine restart is completely granted by these switches, it must be foresee a system to avoid that risk, as for example the pad lockable device to lock the actuator entry, item VF KB2 at page 104 or a safety handle with padlocks as for example VF AP-P11B-200P (page 143).

Holding force of the unlocked actuator



The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several doors are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked doors in their position with a retaining force of 30 N~, stopping any vibrations or gusts of wind from opening them.

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: **FG 60AD1D0A** — options: **-LP30F20GK900T6**

Contact blocks

	Contacts activated by the solenoid	Contacts activated by the actuator
60A	1NO+1NC	1NO+1NC
60B	2NC	1NO+1NC
60C	3NC	1NC
60D	1NO+1NC	2NC
60E	1NO+2NC	1NC
60 F	1NO+2NC	1NO
60G	2NC	2NC
60H	4NC	/
60I	3NC	1NO
60L	2NO+1NC	1NC
60M	2NO+1NC	1NO
60N	1NO+1NC	2NO
60P	1NC	3NC
60R	2NO+2NC	/
60S	1NC	2NO+1NC
60T	1NC	1NO+2NC
60U	/	4NC
60 V	2NC	2NO
60X	1NO	3NC
60Y	1NO	1NO+2NC
61A	/	3NC+1NO
61B	/	2NC+2NO
61C	/	1NC+3NO
61D	1NC	3NO
61E	1NO	1NC+2NO
61G	2NO	1NC+1NO
61H	2NO	2NC
61M	3NO	1NC
61R	3NC+1NO	/
61S	1NC+3NO	/

Working principle

D1D	locked actuator with de-energised solenoid
D1E	locked actuator with energised solenoid
D5D	locked actuator with de-energised solenoid. With key release
D6D	locked actuator with de-energised solenoid. With key release and emergency release button
D7D	locked actuator with de-energised solenoid. With emergency release button
D7E	locked actuator with energised solenoid. With emergency release button

Solenoid supply voltage

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

Signalling LED

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

Release button length

	for max. 15 mm wall thickness (standard)
LP30	for max. 30 mm wall thickness
LP40	for max. 40 mm wall thickness
LP60	for max. 60 mm wall thickness
LPRG	adjustable, for wall thickness from 60 mm to 500 mm

Actuators

	without actuator (standard)
F20	straight actuator VF KEYF20
F21	angled actuator VF KEYF21
F22	actuator with rubber mountings VF KEYF22
F28	universal actuator VF KEYF28

Contact type

	silver contacts (standard)
G	silver contacts with 1 µm gold coating

Preinstalled connectors

	without connector (standard)
K900	M23 metal connector, 12 poles, bottom
...	...
K110	M12 metal connector, 12 poles, bottom
...	...

Please contact our technical service for the complete list of possible combinations.

Ambient temperature

	-25°C ... +80°C (standard)
T6	-40°C ... +80°C

Safety switches **with solenoid and separate actuator**

Main features

- Actuator holding force F1max: 2800 N
- 30 contact blocks with 4 contacts
- Metal housing, three conduit entries M20
- Protection degree IP67
- Versions with key release and emergency release button
- 4 stainless steel actuators
- Orientable head and devices, not detachable
- Signalling LED
- Operation with energised or de-energised solenoid

Markings and quality marks:

IMQ approval:	CA02.03848
UL approval:	E131787
CCC approval:	2013010305602309
EAC approval:	RU C-IT ДМ94.B.01024

Technical data

Housing

Metal head and housing, baked powder coating.	
Three threaded conduit entries:	M20x1.5 (standard)
Protection degree:	IP67 acc. to EN 60529 with cable gland having equal or higher protection degree

General data

For safety applications up to:	SIL 3 acc. to EN 62061 PL e acc. to EN ISO 13849-1
Interlock with mechanical lock, coded:	type 2 acc. to EN ISO 14119
Coding level:	Low acc. to EN ISO 14119
Safety parameters:	
B_{10d}:	5,000,000 for NC contacts
Service life:	20 years
Ambient temperature:	-25°C … +60°C
Max. actuation frequency:	600 operating cycles[1]/hour
Mechanical endurance:	1 million operating cycles[1]
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{1max}:	2800 N acc. to EN ISO 14119
Max. holding force F_{Zh}:	2150 N acc. to EN ISO 14119
Maximum play of locked actuator:	4.5 mm
Released actuator extraction force:	30 N
Tightening torques for installation:	see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks:	min.	1 x 0.34 mm²	(1 x AWG 22)
	max.	2 x 1.5 mm²	(2 x AWG 16)

In conformity with standards:
IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, EN 61000-6-2, EN 61000-6-3, BG-GS-ET-15, UL 508, CSA 22.2 N. 14.
Approvals:
IEC 60947-5-1, UL 508, CSA 22.2 N. 14.

In conformity with the requirements of:
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

Solenoid

Duty cycle:	100% ED
Solenoid protection 12 V:	type gG fuse 1 A
Solenoid protection 24 V:	type gG fuse 0.5 A
Solenoid protection 120 V:	fuse 315 mA, delayed
Solenoid protection 230 V:	fuse 315 mA, delayed
Solenoid consumption:	9 VA

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see chapter utilization requirements from page 297 to page 308.**

Electrical data			Utilization category
without connector	Thermal current (Ith):	10 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (Ui):	400 Vac 300 Vdc	Ue (V) 120 250 400
	Rated impulse withstand voltage (U_{imp}):	6 kV	Ie (A) 6 5 3
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	Direct current: DC13
	Protection against short circuits:	type gG fuse 10 A 500 V	Ue (V) 24 125 250
	Pollution degree:	3	Ie (A) 3 0.7 0.4
with M23 connector 12 poles	Thermal current (Ith):	8 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (Ui):	250 Vac 300 Vdc	Ue (V) 120 250
	Protection against short circuits:	type gG fuse 8 A 500 V	Ie (A) 6 5
	Pollution degree:	3	Direct current: DC13
			Ue (V) 24 125 250
			Ie (A) 3 0.7 0.4
with M12 connector 12 poles	Thermal current (Ith):	1.5 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (Ui):	30 Vac 36 Vdc	Ue (V) 24
	Protection against short circuits:	type gG fuse 1.5 A	Ie (A) 1.5
	Pollution degree:	3	Direct current: DC13
			Ue (V) 24
			Ie (A) 1.5

Characteristics approved by IMQ

Rated insulation voltage (Ui): 400 Vac
Conventional free air thermal current (Ith): 10 A
Protection against short circuits: type gG fuse 10 A, 500 V
Rated impulse withstand voltage (U_{imp}): 6 kV
Protection degree of the housing: IP67
MV terminals (screw terminals)
Pollution degree 3
Utilization category: AC15
Operating voltage (Ue): 400 Vac (50 Hz)
Operating 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 all contact blocks: 60A, 60B, 60C, 60D, 60E, 60F, 60G, 60H, 60I, 60L, 60M, 60N, 60P, 60R, 60S, 60T, 60U, 60V, 60X, 60Y, 61A, 61B, 61C, 61D, 61E, 61G, 61H, 61M, 61R, 61S

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

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

Characteristics approved by UL

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

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

In conformity with standard: UL508, CSA 22.2 N. 14

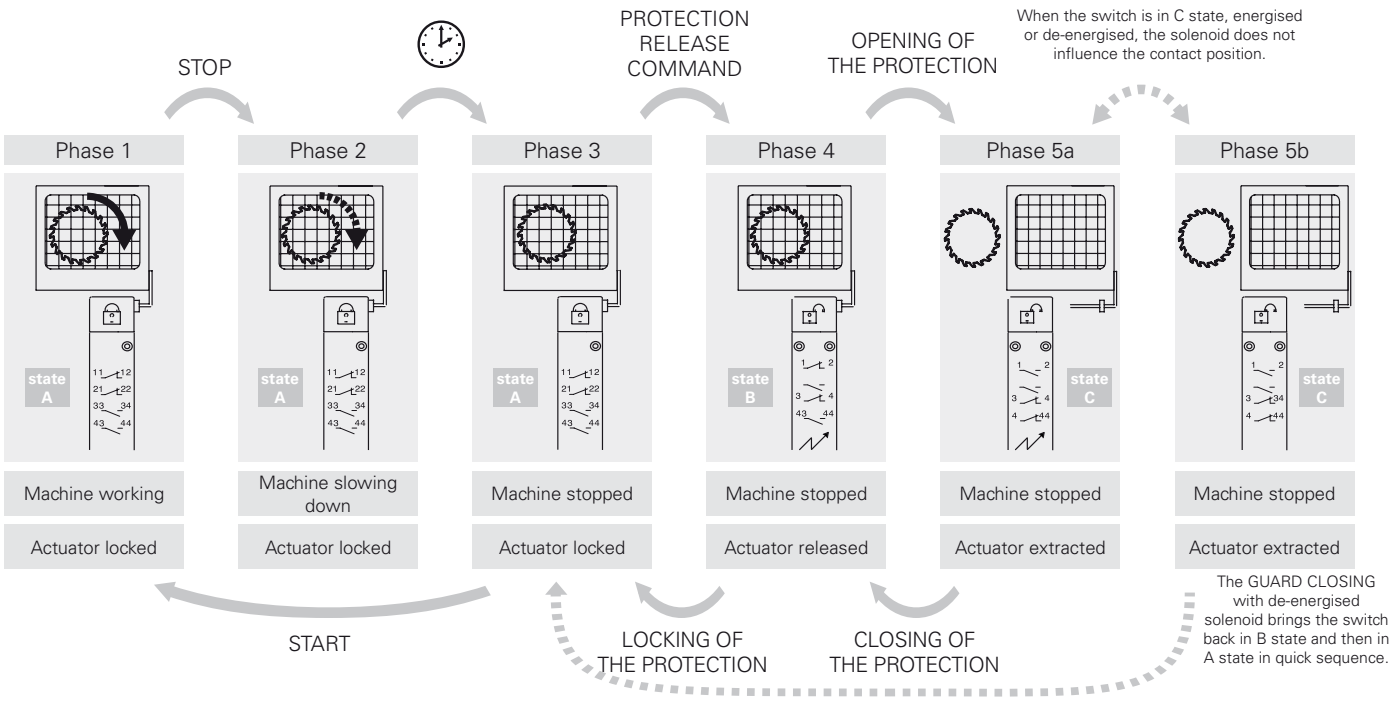
Please contact our technical service for the list of approved products.

Working principle

The working principle of these safety switches allows three different working states:
state A: with inserted and locked actuator
state B: with inserted actuator, not locked
state C: with extracted actuator
All or some of these states may be controlled through NO contacts or positive opening NC 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:

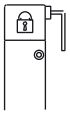
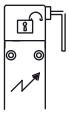
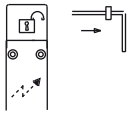
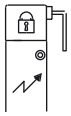
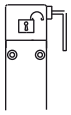
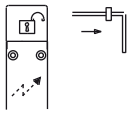
Working principle
It is also possible to choose between two working principles for the actuator locking:
- **Working principle D**: Actuator locked with de-energised solenoid. Actuator release is obtained by power supply to the solenoid (see example of working cycle steps).
- **Working principle E**: Actuator locked with energised solenoid. The release 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.

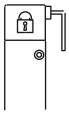
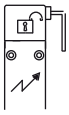
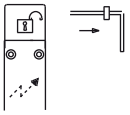
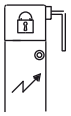
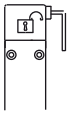
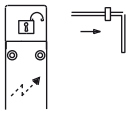
Example of working cycle steps with FG 60AD1D0A-F21 (switch with working principle D)



Safety switches **with solenoid and separate actuator**

Contact positions related to switch states

Operating state	**Working principle D** locked actuator with de-energised solenoid			**Working principle E** locked actuator with energised solenoid		
	state A	state B	state C	state A	state B	state C
Actuator	Inserted and locked	Inserted and released	Extracted	Inserted and locked	Inserted and released	Extracted
Solenoid	De-energised	Energised	-	Energised	De-energised	-
						
FG 60A••••• 1NO+1NC controlled by the solenoid 1NO+1NC controlled by the actuator	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44
FG 60B••••• 2NC controlled by the solenoid 1NO+1NC controlled by the actuator	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44
FG 60C••••• 3NC controlled by the solenoid 1NC 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 60D••••• 1NO+1NC controlled by the solenoid 2NC controlled by the actuator	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42
FG 60E••••• 1NO+2NC controlled by the solenoid 1NC controlled by the actuator	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44
FG 60F••••• 1NO+2NC controlled by the solenoid 1NO controlled by the actuator	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44
FG 60G••••• 2NC controlled by the solenoid 2NC 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 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 1NO controlled by the actuator	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44
FG 60L••••• 2NO+1NC controlled by the solenoid 1NC controlled by the actuator	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44
FG 60M••••• 2NO+1NC controlled by the solenoid 1NO controlled by the actuator	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44
FG 60N••••• 1NO+1NC controlled by the solenoid 2NO controlled by the actuator	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44
FG 60P••••• 1NC controlled by the solenoid 3NC 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 60R••••• 2NO+2NC controlled by the solenoid	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44
FG 60S••••• 1NC controlled by the solenoid 2NO+1NC controlled by the actuator	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44

Operating state	Working principle D locked actuator with de-energised solenoid			Working principle E locked actuator with energised solenoid		
	state A	state B	state C	state A	state B	state C
Actuator	Inserted and locked	Inserted and released	Extracted	Inserted and locked	Inserted and released	Extracted
Solenoid	De-energised	Energised	-	Energised	De-energised	-
						
	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44
	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
	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44
	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42	13 14 21 22 31 32 41 42
	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44
FG 61A••••• 1NO+3NC controlled by the actuator	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44
FG 61B••••• 2NO+2NC controlled by the actuator	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44	11 12 21 22 33 34 43 44
FG 61C••••• 3NO+1NC controlled by the actuator	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44
FG 61D••••• 1NC controlled by the solenoid 3NO controlled by the actuator	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44
FG 61E••••• 1NO controlled by the solenoid 2NO+1NC controlled by the actuator	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44
FG 61G••••• 2NO controlled by the solenoid 1NO+1NC controlled by the actuator	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44
FG 61H••••• 2NO controlled by the solenoid 2NC controlled by the actuator	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44
FG 61M•••• 3NO controlled by the solenoid 1NC controlled by the actuator	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44
FG 61R••••• 1NO+3NC controlled by the solenoid	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44	11 12 21 22 31 32 43 44
FG 61S••••• 3NO+1NC controlled by the solenoid	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44	13 14 21 22 33 34 43 44

Safety switches **with solenoid and separate actuator**

Dimensional drawings

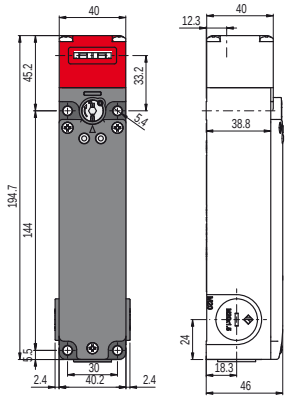
All measures in the drawings are in mm

Contact type:

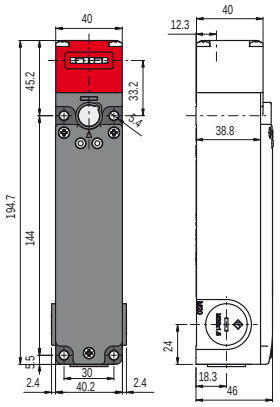
L = slow action

Contact blocks

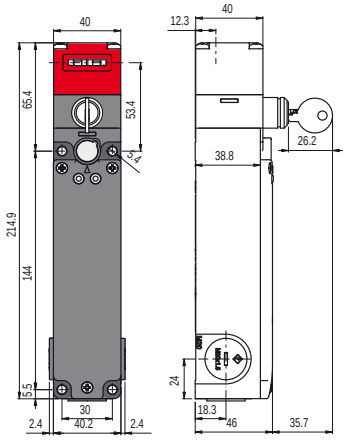
Working principle D, supplied with sealable auxiliary release device and without actuator



Working principle E, supplied without actuator



Working principle D, supplied with key release and without actuator



		Working principle D, supplied with sealable auxiliary release device and without actuator			Working principle E, supplied without actuator			Working principle D, supplied with key release and without actuator		
60A	L	FG 60AD1D0A	1NO+1NC	1NO+1NC	FG 60AD1E0A	1NO+1NC	1NO+1NC	FG 60AD5D0A	1NO+1NC	1NO+1NC
60B	L	FG 60BD1D0A	2NC	1NO+1NC	FG 60BD1E0A	2NC	1NO+1NC	FG 60BD5D0A	2NC	1NO+1NC
60C	L	FG 60CD1D0A	3NC	1NC	FG 60CD1E0A	3NC	1NC	FG 60CD5D0A	3NC	1NC
60D	L	FG 60DD1D0A	1NO+1NC	2NC	FG 60DD1E0A	1NO+1NC	2NC	FG 60DD5D0A	1NO+1NC	2NC
60E	L	FG 60ED1D0A	1NO+2NC	1NC	FG 60ED1E0A	1NO+2NC	1NC	FG 60ED5D0A	1NO+2NC	1NC
60F	L	FG 60FD1D0A	1NO+2NC	1NO	FG 60FD1E0A	1NO+2NC	1NO	FG 60FD5D0A	1NO+2NC	1NO
60G	L	FG 60GD1D0A	2NC	2NC	FG 60GD1E0A	2NC	2NC	FG 60GD5D0A	2NC	2NC
60H	L	FG 60HD1D0A	4NC	/	FG 60HD1E0A	4NC	/	FG 60HD5D0A	4NC	/
60I	L	FG 60ID1D0A	3NC	1NO	FG 60ID1E0A	3NC	1NO	FG 60ID5D0A	3NC	1NO
60L	L	FG 60LD1D0A	2NO+1NC	1NC	FG 60LD1E0A	2NO+1NC	1NC	FG 60LD5D0A	2NO+1NC	1NC
60M	L	FG 60MD1D0A	2NO+1NC	1NO	FG 60MD1E0A	2NO+1NC	1NO	FG 60MD5D0A	2NO+1NC	1NO
60N	L	FG 60ND1D0A	1NO+1NC	2NO	FG 60ND1E0A	1NO+1NC	2NO	FG 60ND5D0A	1NO+1NC	2NO
60P	L	FG 60PD1D0A	1NC	3NC	FG 60PD1E0A	1NC	3NC	FG 60PD5D0A	1NC	3NC
60R	L	FG 60RD1D0A	2NO+2NC	/	FG 60RD1E0A	2NO+2NC	/	FG 60RD5D0A	2NO+2NC	/
60S	L	FG 60SD1D0A	1NC	2NO+1NC	FG 60SD1E0A	1NC	2NO+1NC	FG 60SD5D0A	1NC	2NO+1NC
60T	L	FG 60TD1D0A	1NC	1NO+2NC	FG 60TD1E0A	1NC	1NO+2NC	FG 60TD5D0A	1NC	1NO+2NC
60U	L	FG 60UD1D0A		4NC	FG 60UD1E0A		4NC	FG 60UD5D0A		4NC
60V	L	FG 60VD1D0A	2NC	2NO	FG 60VD1E0A	2NC	2NO	FG 60VD5D0A	2NC	2NO
60X	L	FG 60XD1D0A	1NO	3NC	FG 60XD1E0A	1NO	3NC	FG 60XD5D0A	1NO	3NC
60Y	L	FG 60YD1D0A	1NO	1NO+2NC	FG 60YD1E0A	1NO	1NO+2NC	FG 60YD5D0A	1NO	1NO+2NC
61A	L	FG 61AD1D0A		3NC+1NO	FG 61AD1E0A		3NC+1NO	FG 61AD5D0A		3NC+1NO
61B	L	FG 61BD1D0A		2NC+2NO	FG 61BD1E0A		2NC+2NO	FG 61BD5D0A		2NC+2NO
61C	L	FG 61CD1D0A		1NC+3NO	FG 61CD1E0A		1NC+3NO	FG 61CD5D0A		1NC+3NO
61D	L	FG 61DD1D0A	1NC	3NO	FG 61DD1E0A	1NC	3NO	FG 61DD5D0A	1NC	3NO
61E	L	FG 61ED1D0A	1NO	1NC+2NO	FG 61ED1E0A	1NO	1NC+2NO	FG 61ED5D0A	1NO	1NC+2NO
61G	L	FG 61GD1D0A	2NO	1NC+1NO	FG 61GD1E0A	2NO	1NC+1NO	FG 61GD5D0A	2NO	1NC+1NO
61H	L	FG 61HD1D0A	2NO	2NC	FG 61HD1E0A	2NO	2NC	FG 61HD5D0A	2NO	2NC
61M	L	FG 61MD1D0A	3NO	1NC	FG 61MD1E0A	3NO	1NC	FG 61MD5D0A	3NO	1NC
61R	L	FG 61RD1D0A	3NC+1NO		FG 61RD1E0A	3NC+1NO		FG 61RD5D0A	3NC+1NO	
61S	L	FG 61SD1D0A	1NC+3NO		FG 61SD1E0A	1NC+3NO		FG 61SD5D0A	1NC+3NO	
Min. force		30 N (60 N ⊖)			30 N (60 N ⊖)			30 N (60 N ⊖)		
Travel diagrams		page 103 - group 1			page 103 - group 1			page 103 - group 1		

Legend: ⊖ With positive opening according to EN 60947-5-1, interlock with lock monitoring in accordance with EN ISO 14119

Items with code on **green** background are stock items

Accessories See page 287

→ The 2D and 3D files are available at **www.pizzato.com**

Contact type:

L = slow action

Contact blocks

		Working principle D, supplied with key release, emergency release button, without actuator			Working principle D, supplied with emergency release button, without actuator			Working principle E, supplied with emergency release button, without actuator		
60A	L	FG 60AD6D0A	1NO+1NC	1NO+1NC	FG 60AD7D0A	1NO+1NC	1NO+1NC	FG 60AD7E0A	1NO+1NC	1NO+1NC
60B	L	FG 60BD6D0A	2NC	1NO+1NC	FG 60BD7D0A	2NC	1NO+1NC	FG 60BD7E0A	2NC	1NO+1NC
60C	L	FG 60CD6D0A	3NC	1NC	FG 60CD7D0A	3NC	1NC	FG 60CD7E0A	3NC	1NC
60D	L	FG 60DD6D0A	1NO+1NC	2NC	FG 60DD7D0A	1NO+1NC	2NC	FG 60DD7E0A	1NO+1NC	2NC
60E	L	FG 60ED6D0A	1NO+2NC	1NC	FG 60ED7D0A	1NO+2NC	1NC	FG 60ED7E0A	1NO+2NC	1NC
60F	L	FG 60FD6D0A	1NO+2NC	1NO	FG 60FD7D0A	1NO+2NC	1NO	FG 60FD7E0A	1NO+2NC	1NO
60G	L	FG 60GD6D0A	2NC	2NC	FG 60GD7D0A	2NC	2NC	FG 60GD7E0A	2NC	2NC
60H	L	FG 60HD6D0A	4NC	/	FG 60HD7D0A	4NC	/	FG 60HD7E0A	4NC	/
60I	L	FG 60ID6D0A	3NC	1NO	FG 60ID7D0A	3NC	1NO	FG 60ID7E0A	3NC	1NO
60L	L	FG 60LD6D0A	2NO+1NC	1NC	FG 60LD7D0A	2NO+1NC	1NC	FG 60LD7E0A	2NO+1NC	1NC
60M	L	FG 60MD6D0A	2NO+1NC	1NO	FG 60MD7D0A	2NO+1NC	1NO	FG 60MD7E0A	2NO+1NC	1NO
60N	L	FG 60ND6D0A	1NO+1NC	2NO	FG 60ND7D0A	1NO+1NC	2NO	FG 60ND7E0A	1NO+1NC	2NO
60P	L	FG 60PD6D0A	1NC	3NC	FG 60PD7D0A	1NC	3NC	FG 60PD7E0A	1NC	3NC
60R	L	FG 60RD6D0A	2NO+2NC	/	FG 60RD7D0A	2NO+2NC	/	FG 60RD7E0A	2NO+2NC	/
60S	L	FG 60SD6D0A	1NC	2NO+1NC	FG 60SD7D0A	1NC	2NO+1NC	FG 60SD7E0A	1NC	2NO+1NC
60T	L	FG 60TD6D0A	1NC	1NO+2NC	FG 60TD7D0A	1NC	1NO+2NC	FG 60TD7E0A	1NC	1NO+2NC
60U	L	FG 60UD6D0A		4NC	FG 60UD7D0A		4NC	FG 60UD7E0A		4NC
60V	L	FG 60VD6D0A	2NC	2NO	FG 60VD7D0A	2NC	2NO	FG 60VD7E0A	2NC	2NO
60X	L	FG 60XD6D0A	1NO	3NC	FG 60XD7D0A	1NO	3NC	FG 60XD7E0A	1NO	3NC
60Y	L	FG 60YD6D0A	1NO	1NO+2NC	FG 60YD7D0A	1NO	1NO+2NC	FG 60YD7E0A	1NO	1NO+2NC
61A	L	FG 61AD6D0A		3NC+1NO	FG 61AD7D0A		3NC+1NO	FG 61AD7E0A		3NC+1NO
61B	L	FG 61BD6D0A		2NC+2NO	FG 61BD7D0A		2NC+2NO	FG 61BD7E0A		2NC+2NO
61C	L	FG 61CD6D0A		1NC+3NO	FG 61CD7D0A		1NC+3NO	FG 61CD7E0A		1NC+3NO
61D	L	FG 61DD6D0A	1NC	3NO	FG 61DD7D0A	1NC	3NO	FG 61DD7E0A	1NC	3NO
61E	L	FG 61ED6D0A	1NO	1NC+2NO	FG 61ED7D0A	1NO	1NC+2NO	FG 61ED7E0A	1NO	1NC+2NO
61G	L	FG 61GD6D0A	2NO	1NC+1NO	FG 61GD7D0A	2NO	1NC+1NO	FG 61GD7E0A	2NO	1NC+1NO
61H	L	FG 61HD6D0A	2NO	2NC	FG 61HD7D0A	2NO	2NC	FG 61HD7E0A	2NO	2NC
61M	L	FG 61MD6D0A	3NO	1NC	FG 61MD7D0A	3NO	1NC	FG 61MD7E0A	3NO	1NC
61R	L	FG 61RD6D0A	3NC+1NO		FG 61RD7D0A	3NC+1NO		FG 61RD7E0A	3NC+1NO	
61S	L	FG 61SD6D0A	1NC+3NO		FG 61SD7D0A	1NC+3NO		FG 61SD7E0A	1NC+3NO	
Min. force		30 N (60 N →)			30 N (60 N →)			30 N (60 N →)		
Travel diagrams		page 103 - group 1			page 103 - group 1			page 103 - group 1		

Items with code on **green** background are stock items

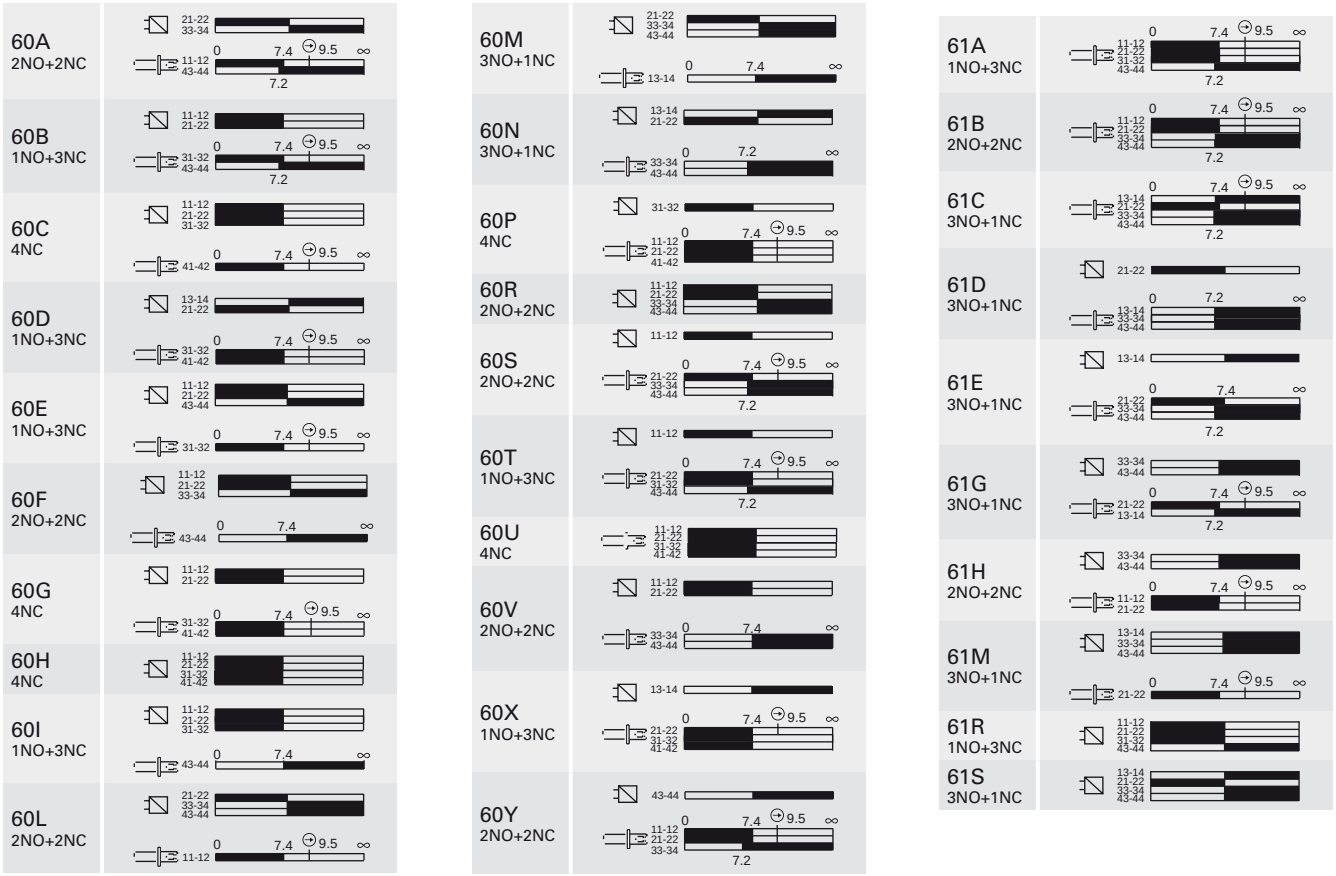
Accessories See page 287

→ The 2D and 3D files are available at **www.pizzato.com**

Safety switches **with solenoid and separate actuator**

Travel diagrams table

All measures in the drawings are in mm



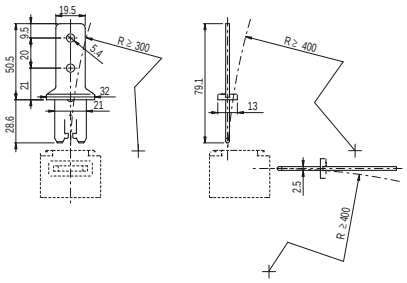
Legend:

- Closed contact
- Open contact
- Contacts activated by the actuator
- Contacts activated by the solenoid
- Positive opening travel

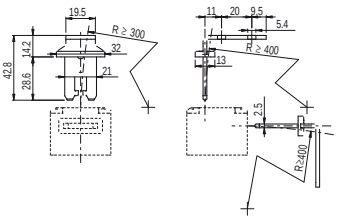
Stainless steel actuators

IMPORTANT: These actuators must be used with items of the FG series only (e.g. FG 60AD1D0A).
Low level of coding acc. to EN ISO 14119.

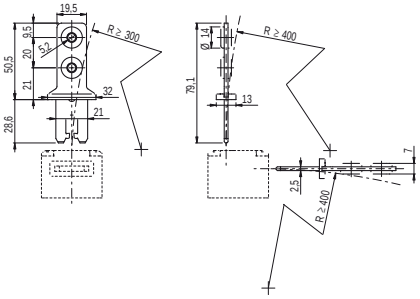
Article	Description
VF KEYF20	Straight actuator



Article	Description
VF KEYF21	Angled actuator



Article	Description
VF KEYF22	Actuator with rubber mountings



Items with code on **green** background are stock items

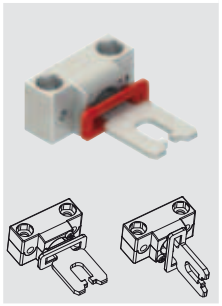
Accessories See page 287

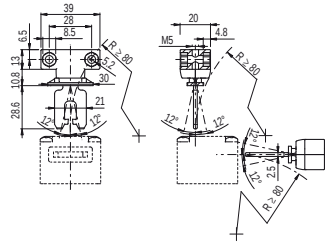
➔ The 2D and 3D files are available at **www.pizzato.com**

Universal actuator VF KEYF28

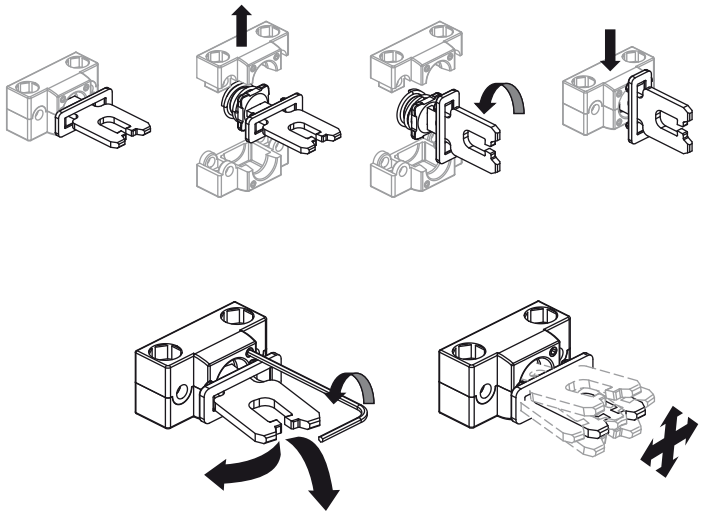
IMPORTANT: These actuators must be used with items of the FG series only (e.g. FG 60AD1D0A).
Low level of coding acc. to EN ISO 14119.

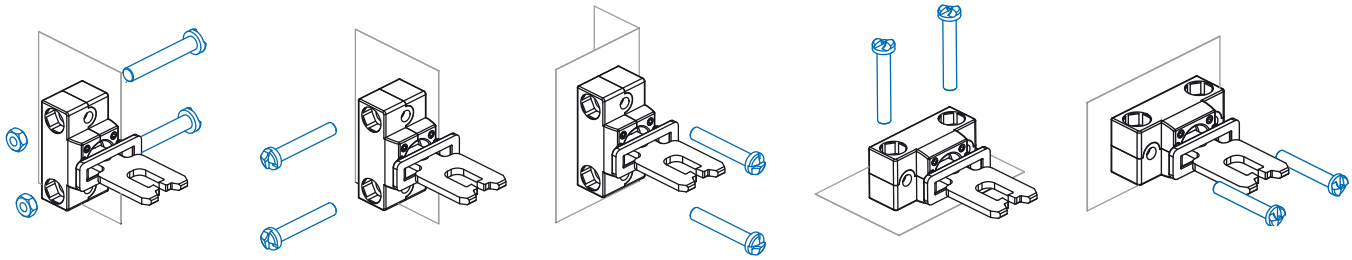
Article	Description
VF KEYF28	Universal actuator





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.





Accessories for sealing

Pliers, steel wire and lead seals used to seal the auxiliary release device (versions D1D and D7D only).

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

Article	Description
VF FSFI-400	400 metre wire roll
VF FSFI-10	10 metre wire roll

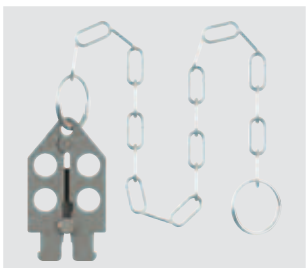
Article	Description
VF FSPZ	Pliers without logo

Utilization limits

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. Adhere to the EN ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific Pizzato catalogue).

Accessories

Article	Description
VF KB2	Actuator entry locking device



Padlockable device to lock the actuator entry (patented) in order to prevent the accidental closing of the door behind operators while they are inside the machine. To be used only with FG series switches (e.g. FG 60AD1D0A). Hole diameter for padlocks 9 mm.

Article	Description
VF KLA371	Set of two locking keys

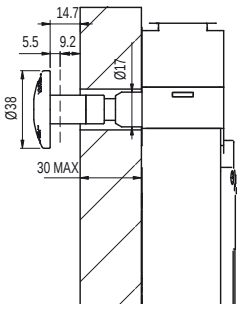
Extra copy of the locking keys to be purchased if further keys are needed (standard supply 2 units). The keys of all switches have the same code. Other codes on request.

Items with code on **green** background are stock items

Accessories See page 287

→ The 2D and 3D files are available at **www.pizzato.com**

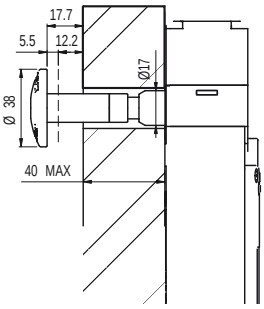
Other release button lengths



-LP30

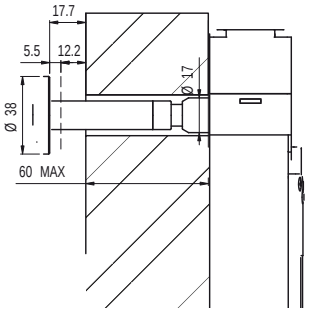
For wall thickness
15 … 30 mm

- Avoid torsion and bending on the release button bar.
- To guarantee the correct device operation, keep a distance of 10 to 25 mm between the wall and the release button.
- Keep clean the release 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.



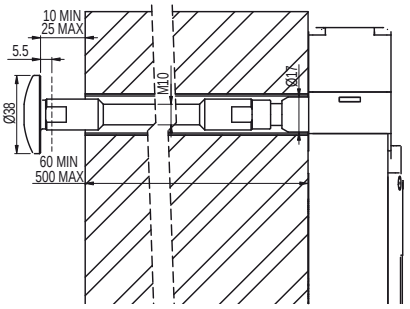
-LP40

For wall thickness
30 … 40 mm



-LP60

For wall thickness
40 … 60 mm



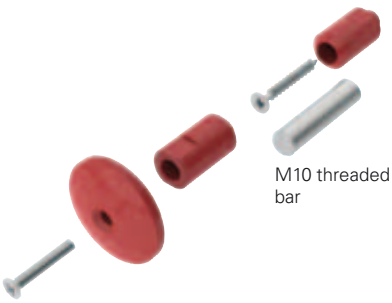
-LPRG

For wall thickness
60 ... 500 mm

- 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.
Do not exceed an overall length of 500 mm between the release button and the switch.
- To guarantee the correct device operation, keep a distance of 10 to 25 mm between the wall and the release button.
- Keep clean the release 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 button

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



M10 threaded bar

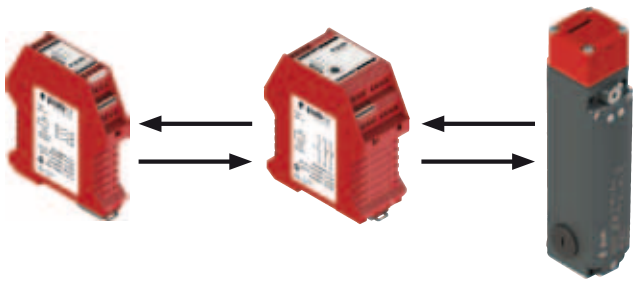
Article	Description
VF FG-LPRG	Metal release button for wall thickness from 60 to 500 mm, supplied with 2 supports and 2 screws, without M10 threaded bar.

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

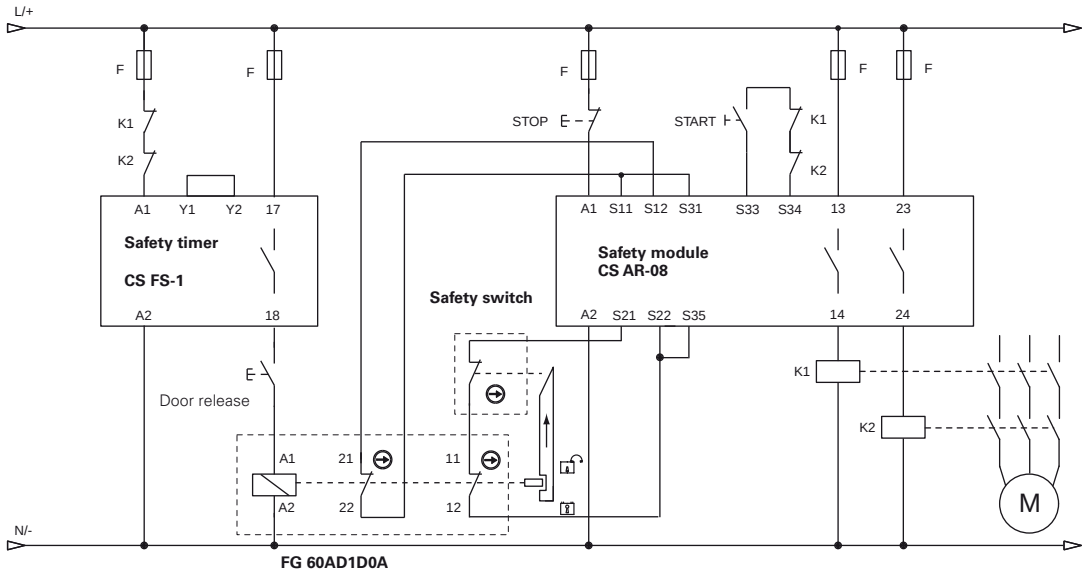
Safety modules

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. Safety modules with instantaneous or delayed contacts are available for the realization of emergency circuits type 0 (immediate stop) or type 1 (monitored stop).

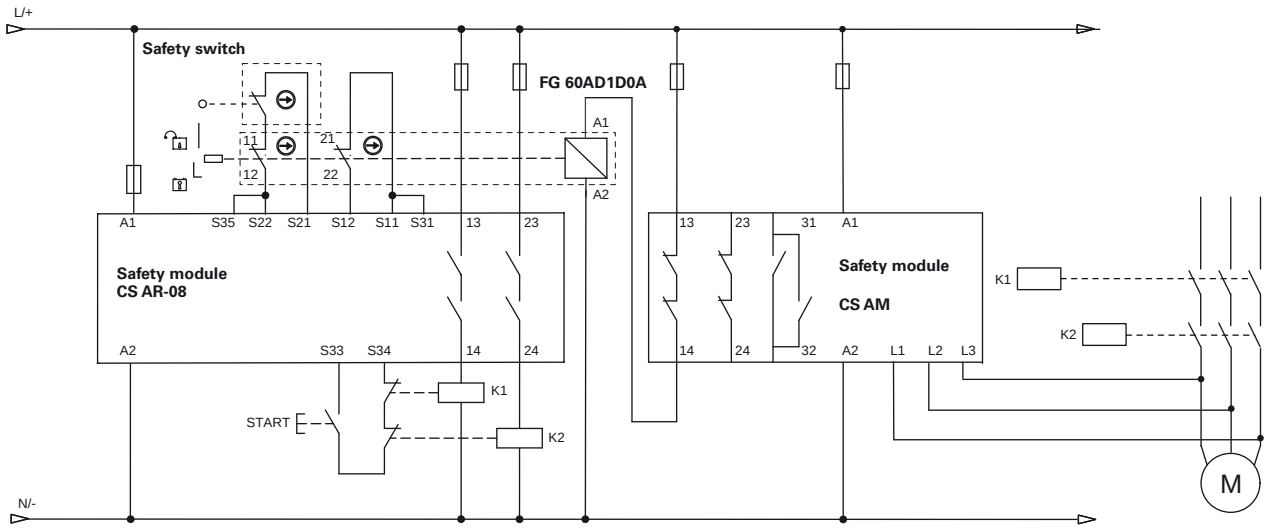
Safety switches with solenoid series FG can be connected to safety modules in order to obtain safety circuits up to PL e in accordance with EN ISO 13849. For any technical information or wiring diagram please contact the technical department.



Application example with safety timer



Application example with standstill monitor

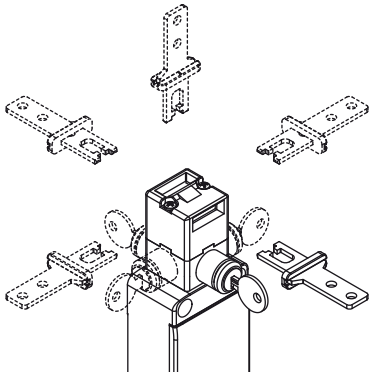


Safety switches **with solenoid and separate actuator**

Description

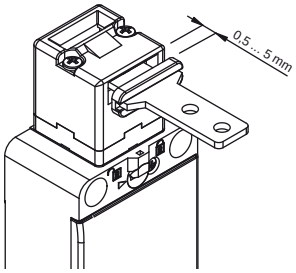
These switches are used on machines where the hazardous conditions remain for a while, even after the machines have been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. They can also be used when it is necessary to control machine guards allowing the opening of protections only under specific conditions.
The versions with solenoid actuated NC contacts are considered interlocks with locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

Orientable head and release device



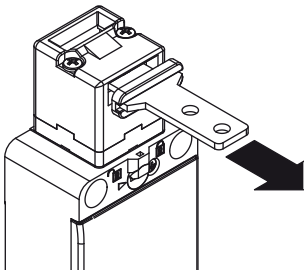
The head can be quickly turned on each of the four sides of the switch by unfastening the two fixing screws.
The auxiliary key release device can be rotated in 90° steps as well. This enables the switch to assume 32 different configurations.

Wide-ranging actuator travel



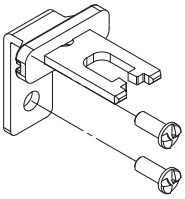
The head of this switch is equipped with an actuator with a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5mm) without causing unwanted machine shutdowns. This extensive travel is available in all actuators, in order to ensure maximum device reliability.

Holding force of the locked actuator



The strong interlocking system guarantees a maximum actuator holding force of F_{1max} = 1100 N (head 96).

Safety screws for actuators



As required by EN ISO 14119, the actuator must be fixed immovably to the door frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered with using common tools. See accessories on page 295.

Protection degree IP67

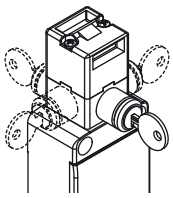
IP67

These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529.
They can therefore be used in all environments where the maximum protection of the housing is required.

Contact blocks

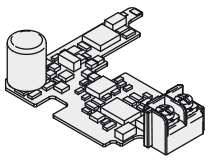
Contact blocks with captive screws, finger protection, twin bridge contacts and double interruption for a higher contact reliability. Versions with gold-plated contacts available. Available in multiple variants activated by actuator or by solenoid.

Key release device with orientable lock



The auxiliary key release device 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 better protected against possible tampering and the external side/surface of the machinery remains smooth.

Electronic control board for solenoids power consumption

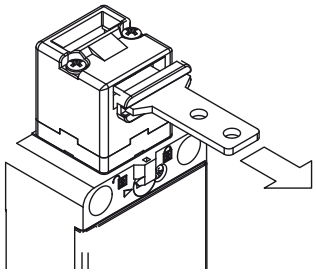


This technical solution resolves the problems that may derive from not stable power supply (machine distance from main transformers, tension variation between night/day hours), allowing also a low solenoid power consumption and consequently enlarging the working temperatures range of the switch.

Laser engraving

All the FG series switches are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Holding force of the unlocked actuator



The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several doors are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked doors in their position with a retaining force of 30 N~, stopping any vibrations or gusts of wind from opening them.

Two working principles

D or E

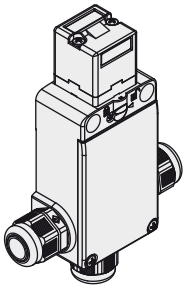
The safety switches with solenoid offer two different operating principles for the actuator locking:

Working principle D: locked actuator with de-energised solenoid. Actuator release is obtained by power supply to the solenoid.
Working principle E: locked actuator with energised solenoid. The release 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.

Sealable auxiliary release device

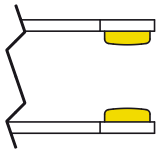
Versions with working principle D are supplied with a sealable auxiliary release device used by technicians during the installation or to access the machine in case of black-out. The auxiliary release device acts on the switch exactly as if the solenoid was energised, actuating therefore also the corresponding electrical contacts. Can only be actuated with a couple of tools, this ensures adequate resistance to tampering. If required it can be sealed by means of the hole provided.

Cable outputs



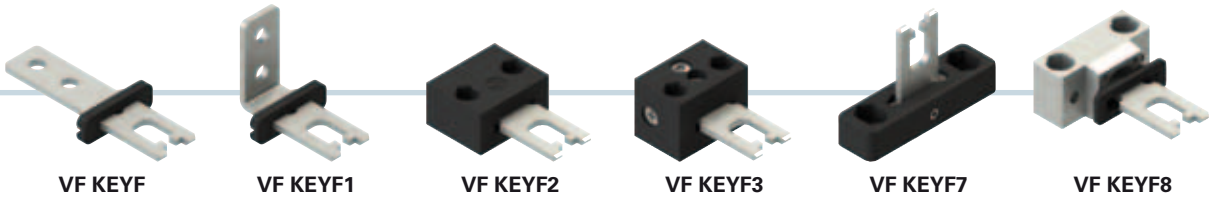
The switch is equipped with three cable entries in different directions. This allows its application in series connections or in narrow places.

Gold-plated contacts



The contact blocks of these devices can be supplied gold-plated upon request. It is ideal for all applications with low voltages or currents and it ensures greater contact reliability. The high-thickness coating > 1 micron ensures the mechanical endurance of the coating over time.

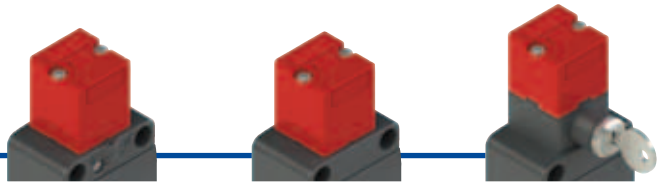
Selection diagram



VF KEYF | VF KEYF1 | VF KEYF2 | VF KEYF3 | VF KEYF7 | VF KEYF8

ACTUATORS

HEAD TYPE AND WORKING PRINCIPLE

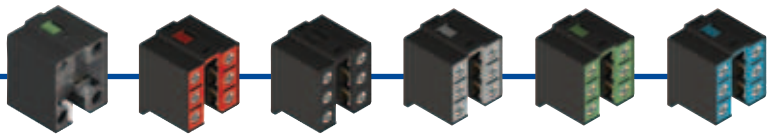


96D
locked actuator with de-energised solenoid

96E
locked actuator with energised solenoid

98D
locked actuator with de-energised solenoid with auxiliary key release

CONTACT BLOCKS

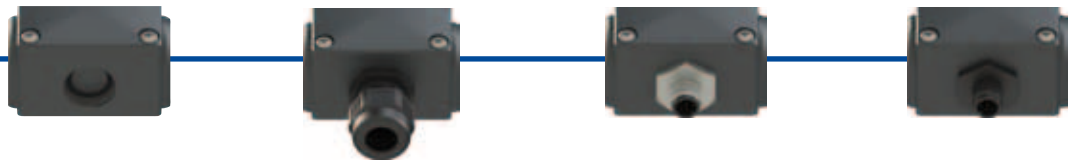


	18	20	21	28	29	30
	1NO+1NC	1NO+2NC	3NC	1NO+1NC	2NC	1NC
	/	/	/	1NC	1NC	2NC

SOLENOID SUPPLY VOLTAGE

24 V AC/DC	120 V AC/DC	230 V AC
024	120	230

CONDUIT ENTRIES



Threaded conduit entries (standard)

With cable gland

With M12 metal connector

K40	8 poles, bottom
K41	8 poles, right
K42	8 poles, left

Max. voltage 30 V

With M12 plastic connector

K45	8 poles, bottom
K46	8 poles, right
K47	8 poles, left

Max. voltage 30 V

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 | options

FS 1896D024-F1GM2K40

Contact blocks

	Contacts activated by the solenoid	Contacts activated by the actuator
18	1NO+1NC	/
20	1NO+2NC	/
21	3NC	/
28	1NO+1NC	1NC
29	2NC	1NC
30	1NC	2NC

Pre-installed cable glands or connectors

	without cable gland or connector (standard)
K23	cable gland for cables Ø 6…Ø 12 mm
...	.....
K40	M12 metal connector, 8 poles
...	.....
K45	M12 plastic connector, 8 poles
...	.....

Please contact our technical service for the complete list of possible combinations.

Head type and working principle

96D	locked actuator with de-energised solenoid
96E	locked actuator with energised solenoid
98D	locked actuator with de-energised solenoid with auxiliary key release

Threaded conduit entry

M2	M20x1.5 (standard)
	PG 13.5

Solenoid supply voltage

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

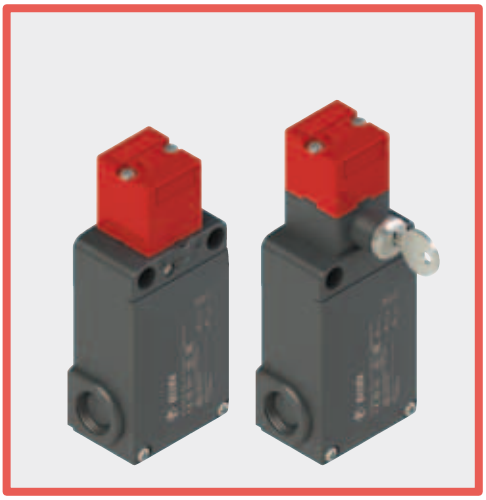
Contact type

	silver contacts (standard)
G	silver contacts with 1 µm gold coating

Actuators

	without actuator (standard)
F	straight actuator VF KEYF
F1	angled actuator VF KEYF1
F2	jointed actuator VF KEYF2
F3	jointed actuator adjustable in two directions VF KEYF3
F7	jointed actuator adjustable in one direction VF KEYF7
F8	universal actuator VF KEYF8

Safety switches **with solenoid and separate actuator**



Main features

- Technopolymer housing, three conduit entries
- Protection degree IP67
- 6 contact blocks available
- 6 stainless steel actuators available
- 3 solenoid supply voltages available
- Versions with orientable auxiliary release device or key release
- Versions with energised or de-energised solenoid

Markings and quality marks:

IMQ approval:	CA02.00792
UL approval:	E131787
CCC approval:	2007010305230011
EAC approval:	RU C-IT ДМ94.B.01024

Technical data

Housing

Housing made of glass fiber reinforced technopolymer, self-extinguishing, shock-proof and with double insulation:	⧈
Three knock-out threaded conduit entries:	M20x1.5 (standard)
Protection degree:	IP67 acc. to EN 60529 with cable gland having equal or higher protection degree

General data

For safety applications up to:	SIL 3 acc. to EN 62061 PL e acc. to EN ISO 13849-1
Interlock with mechanical lock, coded:	type 2 acc. to EN ISO 14119
Coding level:	Low acc. to EN ISO 14119
Safety parameters:	
B_{10d}:	4,000,000 for NC contacts
Service life:	20 years
Ambient temperature:	-25°C … +60°C
Max. actuation frequency:	600 operating cycles[1]/hour
Mechanical endurance:	800,000 operating cycles[1]
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{1max}:	1100 N (head 96), 900 N (head 98) acc. to EN ISO 14119
Max. holding force F_{Zh}:	846 N (head 96), 692 N (head 98) acc. to EN ISO 14119
Maximum play of locked actuator:	4.5 mm
Released actuator extraction force:	30 N
Tightening torques for installation:	see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 28, 29, 30:	min.	1 x 0.34 mm²	(1 x AWG 22)
	max.	2 x 1.5 mm²	(2 x AWG 16)
Contact block 18:	min.	1 x 0.5 mm²	(1 x AWG 20)
	max.	2 x 2.5 mm²	(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 ISO 14119, EN ISO 12100, IEC 60529, EN 60529, EN 61000-6-2, EN 61000-6-3, BG-GS-ET-15, UL 508, CSA 22.2 N. 14.
Approvals:
IEC 60947-5-1, UL 508, CSA 22.2 N. 14, GB14048.5-2001.

In conformity with the requirements of:
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

Solenoid

Duty cycle:	100% ED
Solenoid inrush:	20 VA 0.1 s (24 V) 18 VA 0.1 s (120 V) 18 VA 0.1 s (230 V)
Solenoid consumption:	4 VA
Medium total consumption:	10 VA
Solenoid protection 24 V:	fuse 500 mA, delayed
Solenoid protection 120 V:	fuse 315 mA, delayed
Solenoid protection 230 V:	fuse 160 mA, delayed

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.

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see chapter utilization requirements from page 297 to page 308.**

	Electrical data		Utilization category
without connector	Thermal current (Ith): Rated insulation voltage (Ui): Rated impulse withstand voltage (U_{imp}): Conditional short circuit current: Protection against short circuits: Pollution degree:	10 A 500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 28, 29, 30) 6 kV 4 kV (contact blocks 20, 21, 28, 29, 30) 1000 A acc. to EN 60947-5-1 type aM fuse 10 A 500 V 3	Alternating current: AC15 (50÷60 Hz) Ue (V) 250 400 500 Ie (A) 6 4 1 Direct current: DC13 Ue (V) 24 125 250 Ie (A) 6 1.1 0.4
with M12 connector 8 poles	Thermal current (Ith): Rated insulation voltage (Ui): Protection against short circuits: Pollution degree:	2 A 30 Vac 36 Vdc type gG fuse 2 A 500 V 3	Alternating current: AC15 (50÷60 Hz) Ue (V) 24 Ie (A) 2 Direct current: DC13 Ue (V) 24 Ie (A) 2

Characteristics approved by IMQ

Rated insulation voltage (Ui): 500 Vac
400 Vac (for contact blocks 20, 21, 28, 29, 30)
Conventional free air thermal current (Ith): 10 A
Protection against short circuits: type aM fuse 10 A 500 V
Rated impulse withstand voltage (U_{imp}): 6 kV
4 kV (for contact blocks 20, 21, 28, 29, 30)
Protection degree of the housing: IP66
MV terminals (screw terminals)
Pollution degree 3
Utilization category: AC15
Operating voltage (Ue): 400 Vac (50 Hz)
Operating 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 blocks 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/EC.

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

Characteristics approved by UL

Utilization categories Q300 (69 VA, 125 … 250 Vdc)
A600 (720 VA, 120 … 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).

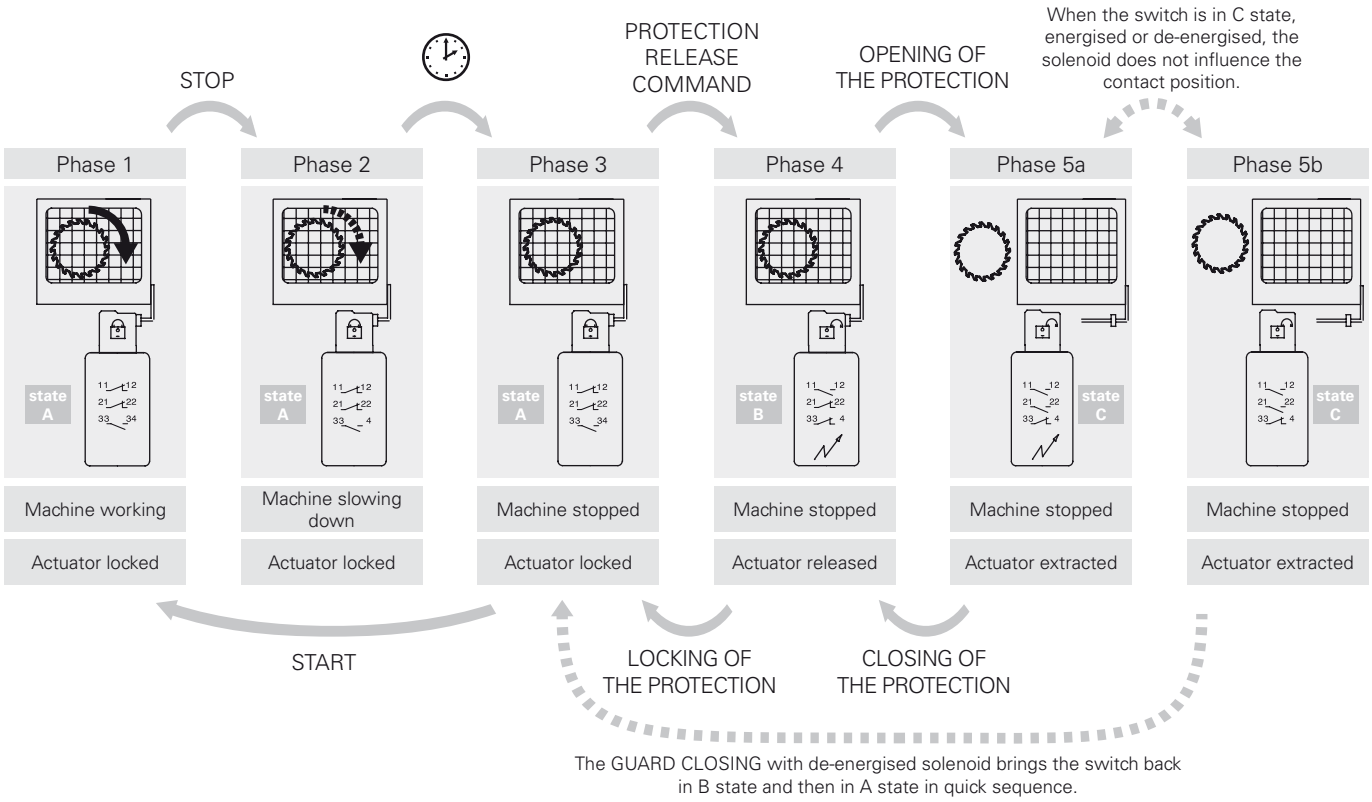
In conformity with standard: UL 508, CSA 22.2 N. 14

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

Working principle

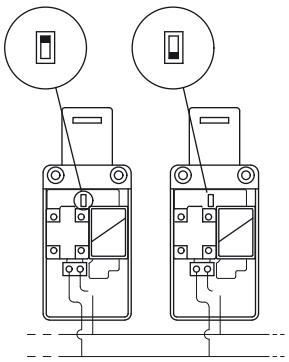
The working principle of these safety switches allows three different working states:
state A: with inserted and locked actuator
state B: with inserted actuator, not locked
state C: with extracted actuator
All or some of these states may be controlled through the positive opening contacts of the internal 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 locked with de-energised solenoid. Actuator release is obtained by power supply to the solenoid (see example of working cycle steps).
- **Working principle E:** Actuator locked with energised solenoid. The release 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.

Example of working cycle steps with FS 2896D024-F1 (switch with working principle D)

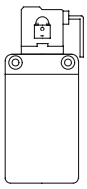
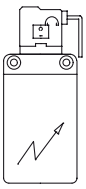
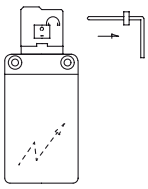
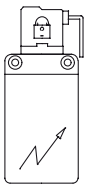
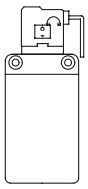
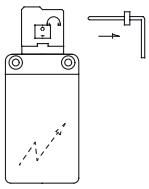


Installation of two or more switches connected to the same power supply

24 V AC/DC versions 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 two switches are installed, repeat the combinations for any next set of two switches.
- Reposition the black plastic protection and tighten the two screws with a torque of 0.8 Nm.



Contact positions related to switch states

		Working principle D locked actuator with de-energised solenoid			Working principle E locked actuator with energised solenoid		
Operating state		state A	state B	state C	state A	state B	state C
Actuator		Inserted and locked	Inserted and released	Extracted	Inserted and locked	Inserted and released	Extracted
Solenoid		De-energised	Energised	-	Energised	De-energised	-
							
FS 18•••••• 1NC+1NO controlled by the solenoid		11 12 23 24	11 12 23 24	11 12 23 24	11 12 23 24	11 12 23 24	11 12 23 24
FS 20•••••• 2NC+1NO controlled by the solenoid		11 12 21 22 33 34	11 12 21 22 33 34	11 12 21 22 33 34	11 12 21 22 33 34	11 12 21 22 33 34	11 12 21 22 33 34
FS 21•••••• 3NC controlled by the solenoid		11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32
FS 28•••••• 1NO+1NC controlled by the solenoid 1NC controlled by the actuator		11 12 21 22 33 34	11 12 21 22 33 34	11 12 21 22 33 34	11 12 21 22 33 34	11 12 21 22 33 34	11 12 21 22 33 34
FS 29•••••• 2NC controlled by the solenoid 1NC controlled by the actuator		11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32
FS 30•••••• 1NC controlled by the solenoid 2NC controlled by the actuator		11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32	11 12 21 22 31 32

Utilization limits

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. Adhere to the EN ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific Pizzato catalogue).
Attention! These switches alone are not suitable for applications where operators may physically enter the dangerous area, because an eventual closing of the door behind them could restart the machine operation. In this case the entry locking device VF KB1 shown on page 115 must be used.

Safety switches **with solenoid and separate actuator**

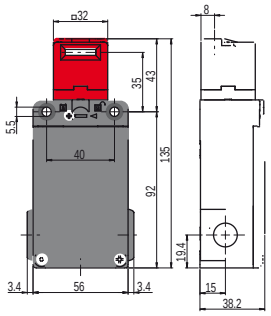
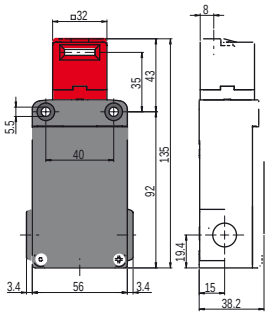
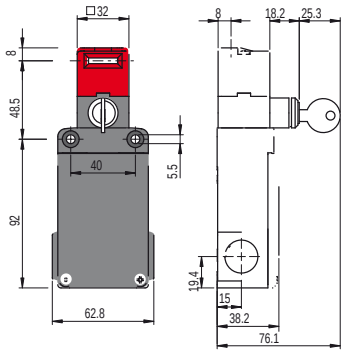
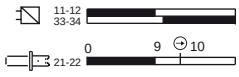
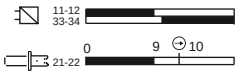
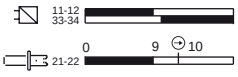
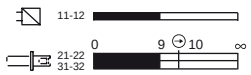
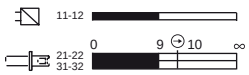
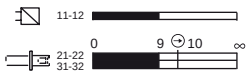
Dimensional drawings

All measures in the drawings are in mm

Contact type:

L = slow action

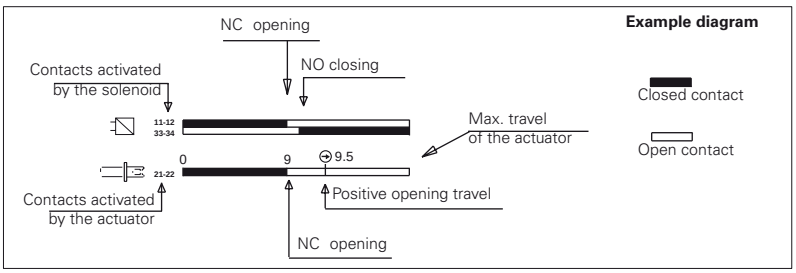
Contact blocks

		Working principle D, supplied with sealable auxiliary release device and without actuator	Working principle E, and without actuator	Working principle D, supplied with auxiliary key release and without actuator
				
18	L	FS 1896D024-M2 1NO+1NC	FS 1896E024-M2 1NO+1NC	FS 1898D024-M2 1NO+1NC
				
20	L	FS 2096D024-M2 1NO+2NC	FS 2096E024-M2 1NO+2NC	FS 2098D024-M2 1NO+2NC
				
21	L	FS 2196D024-M2 3NC	FS 2196E024-M2 3NC	FS 2198D024-M2 3NC
				
28	L	FS 2896D024-M2 1NO+2NC	FS 2896E024-M2 1NO+2NC	FS 2898D024-M2 1NO+2NC
				
29	L	FS 2996D024-M2 3NC	FS 2996E024-M2 3NC	FS 2998D024-M2 3NC
				
30	L	FS 3096D024-M2 3NC	FS 3096E024-M2 3NC	FS 3098D024-M2 3NC
				
Min. force		30 N (40 N ⊖)	30 N (40 N ⊖)	30 N (40 N ⊖)

Legend: ⊖ With positive opening according to EN 60947-5-1, interlock with lock monitoring in accordance with EN ISO 14119

How to read travel diagrams

All measures in the diagrams are in mm

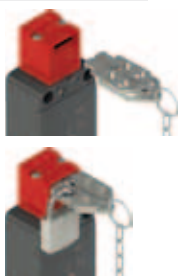


IMPORTANT:
NC contact has to be considered with inserted actuator and lock by the lock. In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol ⊖. Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.

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.
Hole diameter for padlocks 9 mm.



Article	Description
VF KLA371	Set of two locking keys

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

Items with code on **green** background are stock items

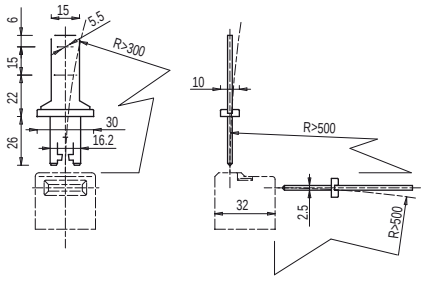
Accessories See page 287

➔ The 2D and 3D files are available at **www.pizzato.com**

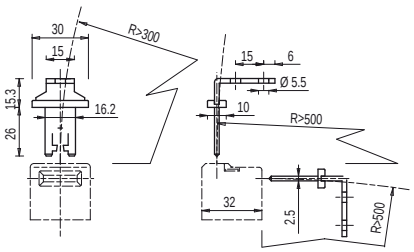
Stainless steel actuators

IMPORTANT: These actuators can be used with items of the FD, FP, FL, FC and FS series only (e.g. FS 1896D024-M2).
Low level of coding acc. to EN ISO 14119.

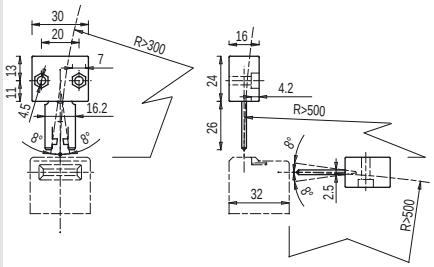
Article	Description
VF KEYF	Straight actuator



Article	Description
VF KEYF1	Angled actuator

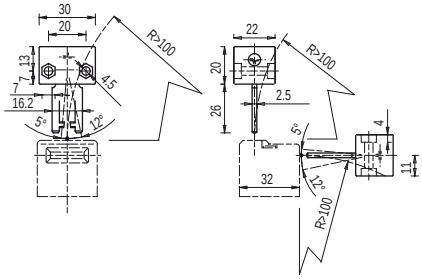


Article	Description
VF KEYF2	Jointed actuator



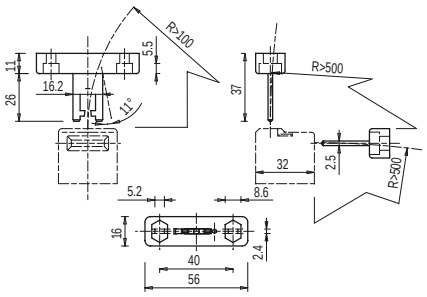
The actuator can flex in four directions for applications where the door alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions



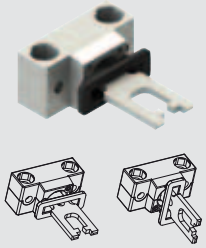
Actuator adjustable in two directions for doors with reduced dimensions.

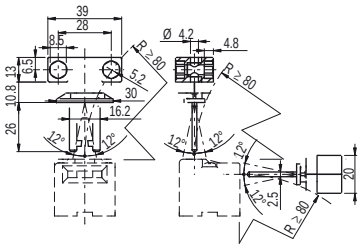
Article	Description
VF KEYF7	Actuator adjustable in one direction



Actuator adjustable in one direction for doors with reduced dimensions.

Article	Description
VF KEYF8	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.

Accessories for sealing

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

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

Article	Description
VF FSFI-400	400 metre wire roll
VF FSFI-10	10 metre wire roll

Article	Description
VF FSPZ	Pliers without logo

Items with code on **green** background are stock items

Accessories See page 287

→ The 2D and 3D files are available at **www.pizzato.com**

NG series safety switches with solenoid and RFID technology

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.

The mode 1 (active safety outputs with closed and locked guard) versions are considered interlocks with locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

Maximum safety with a single device

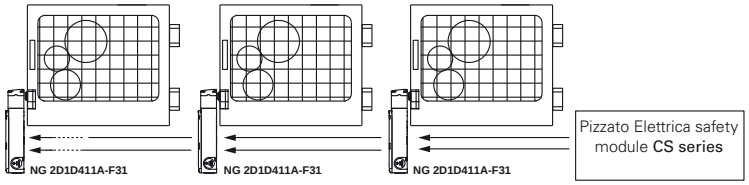
PL e + SIL 3

Constructed with redundant electronic technology, the NG series switches make it possible to create circuits having maximum PL e and SIL 3 safety levels by installing just one device on the protection. This avoids expensive wiring on the field and allows quicker installation. Inside the panel, the two electronic safety outputs must be connected to a safety module with OSSD inputs or to a safety PLC.

Connection of several switches in series

PL e + SIL 3

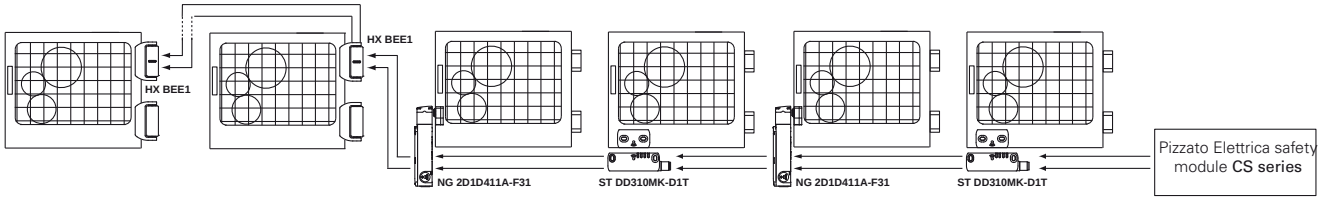
One of the most relevant features of the NG line is the optional connection in series of several switches, up to a maximum number of 32 devices, while maintaining the maximum PL e safety level prescribed by the EN 13849-1 standard and the SIL 3 safety level according to the EN 62061 standard.
This connection method is permitted in safety systems which, at the end of the chain, feature a safety module evaluating the outputs of last NG switch.
The fact that the PL e safety level can be maintained even with 32 switches connected in series indicates the presence of an extremely safe structure inside each individual device.



Series connection with other devices

PL e + SIL 3

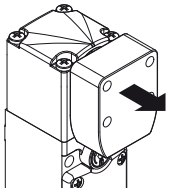
The NG series features two safe inputs and two safe outputs, which can be connected in series with other Pizzato Elettrica safety devices. This option allows the creation of safety chains containing various devices, for example the creation of circuits with connections in series, including stainless steel safety hinges (HX BEE1 series), transponder sensors (ST series) and door lock sensors (NG series), while maintaining maximum PL e and SIL 3 safety levels.



RFID actuators with high coding level

The NG series features an electronic system based on RFID technology to detect the actuator. This system gives a different coding to each actuator and makes it impossible to tamper with a device by using another actuator belonging to the same series. The actuators may have millions of different coding combinations, and are therefore classified as actuators with a high coding level, according to ISO 14119.

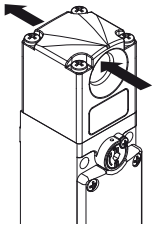
Holding force of the locked actuator



7500 N

The sturdy interlocking system guarantees the actuator a maximum holding force F_{Zh} of 7500 N which corresponds to a breaking force F_{1max} of 9750 N. This is one of the highest values available on the market today, making this device suitable for severe heavy-duty applications.

Dustproof



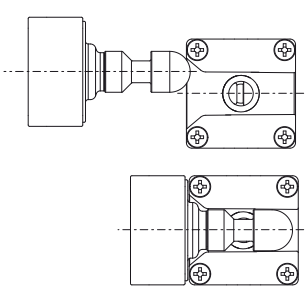
The switch is provided with a through hole for inserting the actuator and, thanks to this peculiarity, any dust which may go inside the actuator hole can always come out of the opposite side instead of being left there. Moreover, the lock pin is provided with an external diaphragm gasket which makes it suitable for any environment where dust is present.

High protection degree

IP69K
IP67

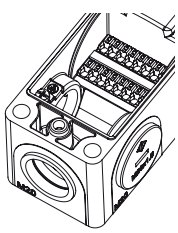
These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529. They can therefore be used in all environments where the maximum protection of the housing is required. Special measures also allow devices to be used even in machines which are subjected to washing with high pressure warm water jets. In fact these devices pass the IP69K test according to ISO 20653, using jets of water to 100 atmospheres at a temperature of 80°C.

Centering



The switch is provided with a wide centering inlet for the actuator pin. Such solution makes it easier to align the actuator with the hole found in the head during the fitting stage. Moreover, this solution drastically reduces any probable collisions between the actuator and the switch, also allowing it to be fitted on inaccurate doors.

Push-in spring connections

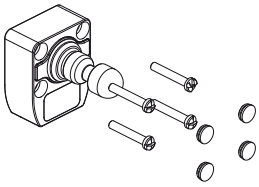


The switch is provided with a PUSH-IN type spring connection system on the inside. This technology allows a very handy quick wiring procedure, since the wire just needs to be inserted into the appropriate hole in order to be secured and to establish the electrical connection. The said operation can be carried out without the help of any tool, but simply using rigid or flexible wires with wire-end sleeves. Release is obtained by pressing the appropriate wire-releasing button.

Six LEDs for immediate diagnosis

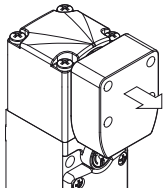
As the LEDs have been designed for quick immediate diagnosis, the status of each input and output is highlighted by one specific LED. This makes it possible to quickly identify the interruption points in the safe chain, which device is released, which door is opened and any errors inside the device. All that in a straightforward way without needing to decode complex blinking sequences.

Double anti-tampering safety



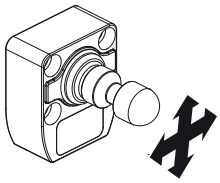
Each NG series actuator is supplied with four stainless steel tamper-proof screws, for it to be fitted on the protection. Four protection insert caps are also supplied together with the screws. Besides preventing any deposit from building up and making it easy to clean the actuator, these caps help to prevent any tampering as they obstruct access to the tamper-proof screws.

Holding force of the unlocked actuator



The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several doors are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked doors in their position with a retaining force of 30 N~, stopping any vibrations or gusts of wind from opening them.

Articulated joint for inaccurate doors

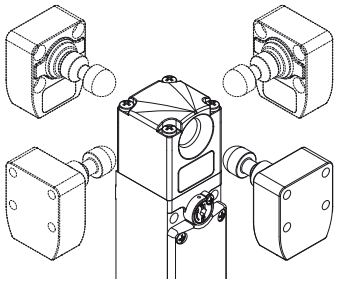


All the NG series actuators are jointed and allow the pin to match the centering hole of the switch. This way there is no need for precise actuator-switch aligning operations during the fitting stage. Moreover, thanks to its flexibility, this device can be used on doors with an activating range up to 150 mm, without having to tilt the pin beforehand.

Laser engraving

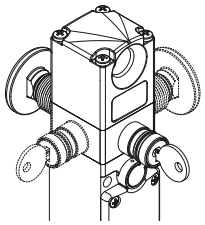
All the NG series switches are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Orientable heads and devices



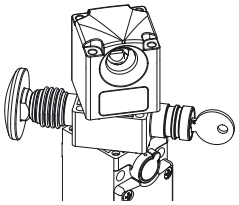
The head can be quickly oriented in four different directions after unscrewing the 4 fixing screws. Also the key release device and the emergency release button can be positioned in 90° steps, thus obtaining as many as 16 different configurations with the same article.

Key release device and emergency release button



The auxiliary lock release device is used to permit unlocking of the actuator only by personnel in possession of the key. It also works with no power supply and once actuated, prevents the guard from locking.
The emergency release button allows actuator release and immediate opening of the door. Generally used in machines within which an operator could inadvertently become trapped, it faces towards the machine interior, to allows the operator to exit even in the event of a black out. Equipped with bistable function, it can be freely extended with suitable extensions (see accessories).
Both these devices can be positioned on the four switch sides, thus allowing its installation both to the interior and to the exterior of the machine.

Not detachable head and devices



The head and the release device can be adjusted but cannot be detached from each other. This makes the switch more secure since the installer does not need to worry about how to assemble the various pieces, and the switch is less likely to become damaged (small parts being lost, dirt getting in etc.).

Two safety output actuation modes

CLOSED
OR
CLOSED & LOCK

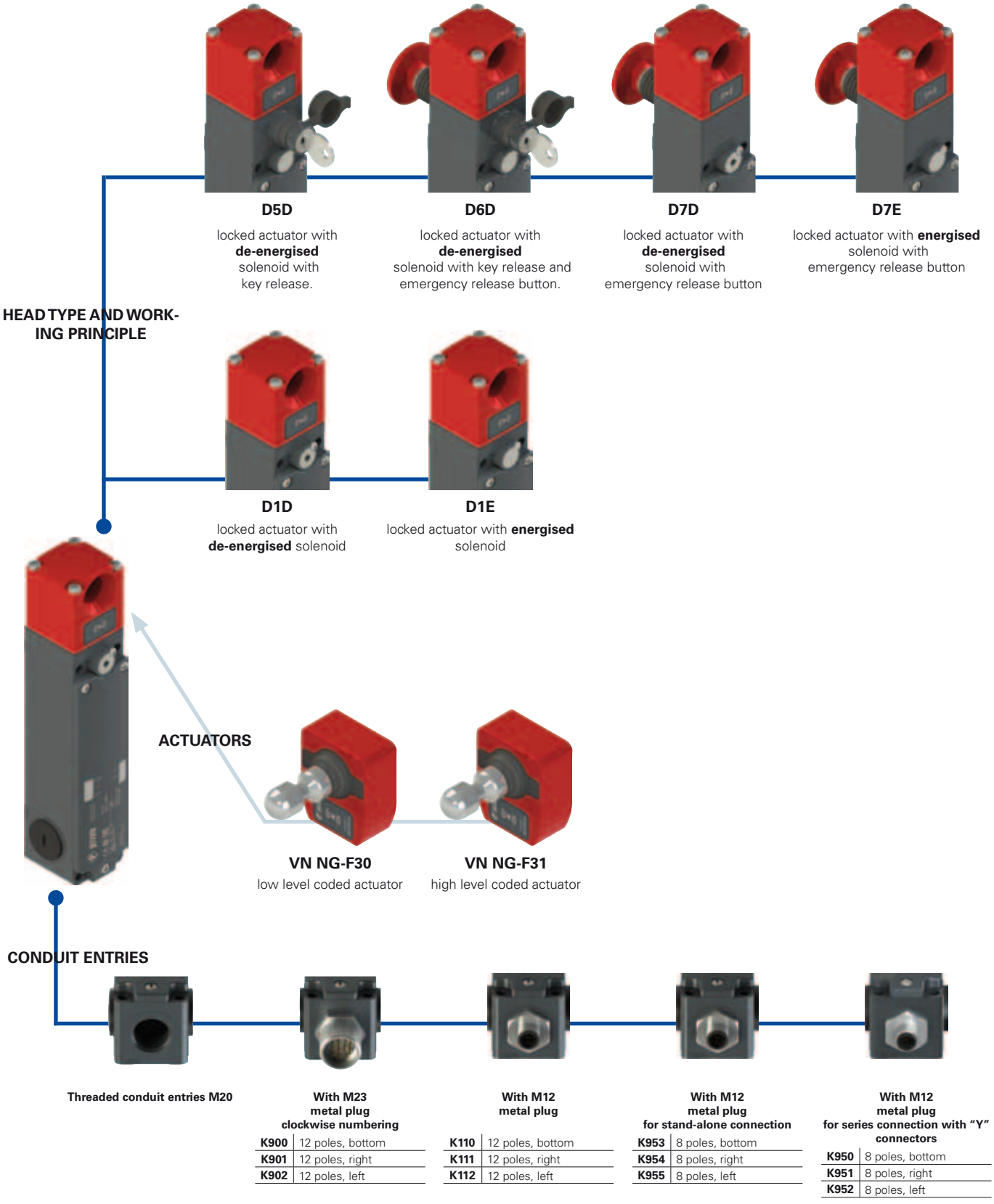
The switch can be selected from two different safety output activation modes: safety outputs active with protection closed and locked (mode 1) for machines with inertia or safety outputs active with protection closed (mode 2) for machines without inertia.

External device monitoring

EDM

On request we can supply the device with EDM (External Device Monitoring) function, so that the device itself can check the integrity of the relays connected to the safety outputs. These safety relays or safety contactors send a feedback signal to the EDM input, which verifies the consistency of the received signal with the safety outputs state.

Selection diagram



product options

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

NG 2D1D411A-F31E34K900LP30

Working principle	
D1D	locked actuator with de-energised solenoid
D1E	locked actuator with energised solenoid
D5D	locked actuator with de-energised solenoid. With key release
D6D	locked actuator with de-energised solenoid. With key release and emergency release button
D7D	locked actuator with de-energised solenoid. With emergency release button
D7E	locked actuator with energised solenoid. With emergency release button

Release button length	
	for wall thickness max. 15 mm (standard)
LP30	for wall thickness max. 30 mm
LP40	for wall thickness max. 40 mm
LP50	for wall thickness max. 50 mm
LP60	for wall thickness max. 60 mm
...	Other wall thicknesses on request

Preinstalled connectors	
	without connector (standard)
K110	M12 metal connector, 12 poles, bottom
K900	M23 metal connector, 12 poles, bottom
K953	M12 metal connector, 8 poles, bottom, for stand-alone connection
K950	M12 metal connector, 8 poles, bottom, for series connection
...	other connectors on request

Actuator extraction force	
	actuator extraction force 30 N (standard)
E34	actuator freely removable

Actuator	
F30	low level coded actuator VN NG-F30 the switch recognises any type F30 actuator
F31	high level coded actuator VN NG-F31 the switch recognises one single actuator

Inputs and outputs	
3	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: closed protection 1 signalling output O4: locked protection 1 solenoid activation input I4
4	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: closed protection 1 signalling output O4: locked protection 1 solenoid activation input I4 1 programming input I3
5	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: closed protection 1 signalling output O4: locked protection 1 solenoid activation input I4 1 programming input I3 1 EDM input I5
6	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: closed protection 1 signalling output FAULT O4 1 solenoid activation input I4 1 programming input I3

Activation of OS outputs	
1	mode 1: OS safety outputs active with locked protection
2	mode 2: OS safety outputs active with closed protection

Actuator code structure

VN NG-F30

Actuator	
F30	low level coded actuator the switch recognises any type F30 actuator
F31	high level coded actuator the switch recognises one single actuator

Main features

- Actuation without contact, using RFID technology
- Digitally coded actuator
- Actuator holding force 7500 N
- SIL 3 and PL e with a single device
- Metal housing, three conduit entries M20
- Protection degrees IP67 and IP69K
- Versions with key release and emergency release button
- PL e also in series of up to 32 devices
- Signalling LED

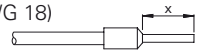
Markings and quality marks:

UL approval:	E131787
TÜV SÜD approval:	Z10 15 01 75157 005
EAC approval:	RU C-IT ДМ94.B.01024

In conformity with standards:
EN ISO 14119, EN 60947-5-3, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 12100, IEC 60529, EN 60529, EN 61000-6-2, EN 61000-6-3, BG-GS-ET-19, IEC 61508-1, IEC 61508-2, IEC 61508-3, IEC 61508-4, SN 29500, EN ISO 13849-1, EN ISO 13849-2, EN 62061, EN 61326-1, EN 61326-3-1, EN 61326-3-2, ETSI 301 489-1, ETSI 301 489-3, ETSI 300 330-2, UL 508, CSA 22.2 No.14

In conformity with the requirements of:
Machinery Directive 2006/42/EC
EMC Directive 2004/108/EC
R&TTE Directive 1999/05/EC
FCC Part 15

Connection terminals
Connection system: PUSH-IN spring type
Cross-section of rigid wires and flexible wires with wire-end sleeve:
min. 1 x 0.34 mm² (1 x AWG 22)
max. 1 x 1.5 mm² (1 x AWG 16)
Wire cross-section with pre-insulated wire-end sleeve:
min. 1 x 0.34 mm² (1 x AWG 22)
max. 1 x 0.75 mm² (1 x AWG 18)
Cable stripping length (x):



min.: 8 mm
max.: 12 mm

Technical data

Housing
Metal head and housing, baked powder coating.

Three threaded conduit entries:	M20x1.5
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 with cable gland having equal or higher protection degree

General data

SIL level (SIL CL):	up to SIL 3 acc. to EN 62061
Performance Level (PL):	up to PL e acc. to EN ISO 13849-1
Safety category:	up to cat. 4 acc. to EN ISO 13849-1
Interlock with lock, no contact, coded:	type 4 acc. to EN ISO 14119
Level of coding acc. to EN ISO 14119	Low with F30 actuator High with F31 actuator
Safety parameters:	
$MTTF_d$:	1883 years
PFH_d:	8.07 E-10
DC:	High
Ambient temperature:	-20°C … +50°C
Max. actuation frequency with actuator lock and release:	600 operating cycles[1]/hour
Mechanical endurance:	1 million operating cycles[1]
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{1max}:	9750 N acc. to EN ISO 14119
Max. holding force F_{Zh}:	7500 N acc. to EN ISO 14119
Maximum play of locked actuator:	4 mm
Released actuator extraction force:	30 N

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

Electrical data of inputs IS1/IS2/I3/I4/I5/EDM

Rated operating voltage Ue1:	24 Vdc
Rated current consumption:	5 mA

Electrical data of safety outputs OS1/OS2

Rated operating voltage Ue1:	24 Vdc
Output type:	OSSD, PNP
Maximum current per output Ie1:	0.25 A
Minimum current per output Ie1:	0.5 mA
Utilization category:	DC13; Ue=24 Vdc, Ie=0,25 A
Short circuit detection:	Yes
Protection against overcurrent:	Yes
Internal self-resetting protection fuse:	1.1 A

Duration of the deactivation impulse at the safety outputs: < 300 µs
Permissible maximum capacitance between outputs: < 200 nF
Permissible maximum capacitance between output and ground: < 200 nF

Electrical data of signalling output O3/O4

Rated operating voltage Ue1:	24 Vdc
Output type:	PNP
Maximum current per output Ie1:	0.1 A
Utilization category:	DC12; Ue=24 Vdc, Ie=0,1 A
Short circuit detection:	No
Protection against overcurrent:	Yes
Internal self-resetting protection fuse:	1.1 A

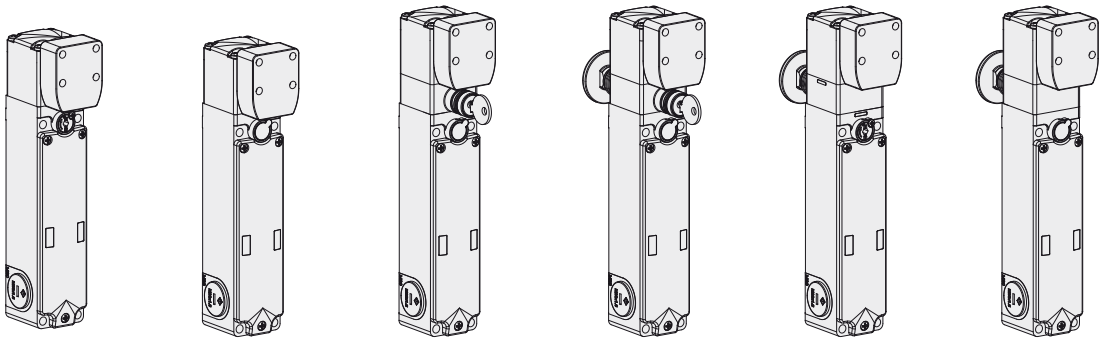
RFID sensor data

Assured operating distance S_{ao}:	2 mm
Assured release distance S_{ar}:	4 mm (actuator not locked) 10 mm (locked actuator)
Rated operating distance S_n:	2.5 mm
Repeat accuracy:	≤ 10 % S_n
Differential travel:	≤ 20 % S_n
Max. switching frequency:	1 Hz

Electrical data

Rated operating voltage Ue:	24 Vdc ±10% SELV
Operating current at voltage Ue:	
- minimum:	40 mA
- with activated solenoid:	0.4 A
- with activated solenoid and all outputs at maximum power:	1.2 A
Rated insulation voltage Ui:	32 Vdc
Thermal current Ith:	0.25 A
Rated impulse withstand voltage U_{imp}:	1.5 kV
External protection fuse:	1.5 A type F
Overvoltage category:	III
Electrical endurance:	1 million operating cycles
Solenoid duty cycle:	100% ED
Solenoid consumption:	9 W

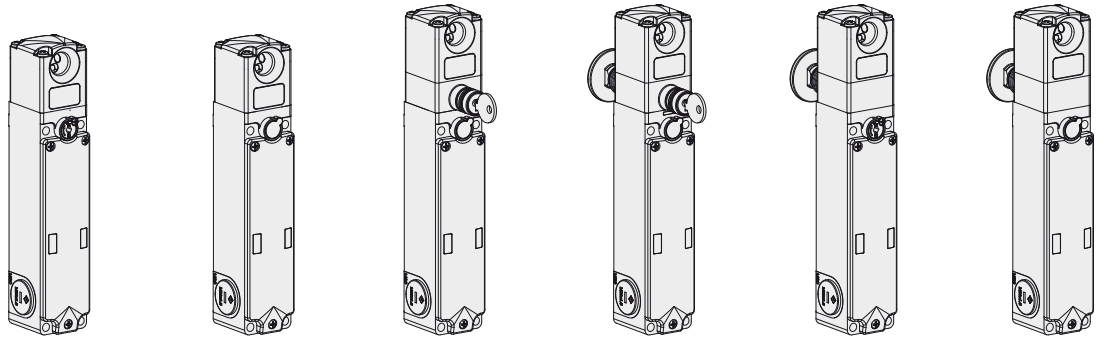
Selection table for switches with actuators



	Working principle D, with sealable auxiliary release device	Working principle E	Working principle D, with key release	Working principle D, with key release and emergency release button	Working principle D, with emergency release button and sealable auxiliary release device	Working principle E, with emergency release button
Mode 1 OS safety outputs active with locked and closed protection	NG 2D1D411A-F3•	NG 2D1E411A-F3•	NG 2D5D411A-F3•	NG 2D6D411A-F3•	NG 2D7D411A-F3•	NG 2D7E411A-F3•
Mode 2 OS safety outputs active with closed protection	NG 2D1D421A-F3•	NG 2D1E421A-F3•	NG 2D5D421A-F3•	NG 2D6D421A-F3•	NG 2D7D421A-F3•	NG 2D7E421A-F3•

To purchase a product with EDM input replace number 4 with number 5 in the codes shown above. Example: NG 2D1D**4**11A-F3• → NG 2D1D**5**11A-F3•

Switch selection table

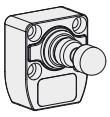


	Working principle D, with sealable auxiliary release device	Working principle E	Working principle D, with key release	Working principle D, supplied with key release and emergency release button	Working principle D, with emergency release button and sealable auxiliary release device	Working principle E, with emergency release button
Mode 1 OS safety outputs active with locked and closed protection	NG 2D1D411A	NG 2D1E411A	NG 2D5D411A	NG 2D6D411A	NG 2D7D411A	NG 2D7E411A
Mode 2 OS safety outputs active with closed protection	NG 2D1D421A	NG 2D1E421A	NG 2D5D421A	NG 2D6D421A	NG 2D7D421A	NG 2D7E421A

To purchase a product with EDM input replace number 4 with number 5 in the codes shown above. Example: NG 2D1D**4**11A → NG 2D1D**5**11A

Legend: interlock with lock monitoring in accordance with EN ISO 14119

Actuator selection table



Type of coding	Level of coding acc. to EN ISO 14119	Article
encoded	low	VN NG-F30
unequivocally encoded	high	VN NG-F31

The use of RFID technology in NG series devices makes them suitable for several applications. Pizzato Elettrica offers two different versions of actuators, in order to best suit customers' specific needs.
Type F30 actuators are all encoded with the same code. This implies that a device associated with an actuator type F30 can be activated by other actuators type F30.
Type F31 actuators are always encoded with different codes. This implies that a device associated with an actuator type F31 can be activated only by a specific actuator. Another F31 type actuator will not be recognised by the device until a new association procedure is carried out (reprogramming). After reprogramming, the old actuator F31 will no longer be recognized.

Characteristics approved by UL

Utilization categories: 24 Vdc, 0.25 A (resistive load).

Inputs supplied by remote class 2 source or limited voltage and limited energy.

In conformity with standard: UL 508, CSA 22.2 No.14

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

Characteristics approved by TÜV SÜD

Protection degree: IP67, IP69K
Ambient temperature: -20°C … +50°C
Storage temperature: -40°C … +75°C
PL, category: PL e, Cat. 4.
SIL: SIL 3 / SIL CL 3

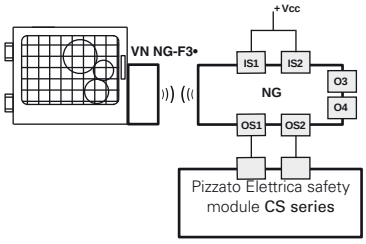
In conformity with standards: 2006/42/EC, EN 60947-1/A1:2011, EN 60947-5-2/A1:2012, EN 60947-5-3:2013, EN 14119:2013, EN 61508-1:2010 (SIL 3), EN 61508-2:2010 (SIL 3), EN 61508-3:2010 (SIL 3), EN 61508-4:2010 (SIL 3), EN 62061/A1:2013 (SIL CL 3), EN ISO 13489-1: 2008 (PL e, Cat 4).

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

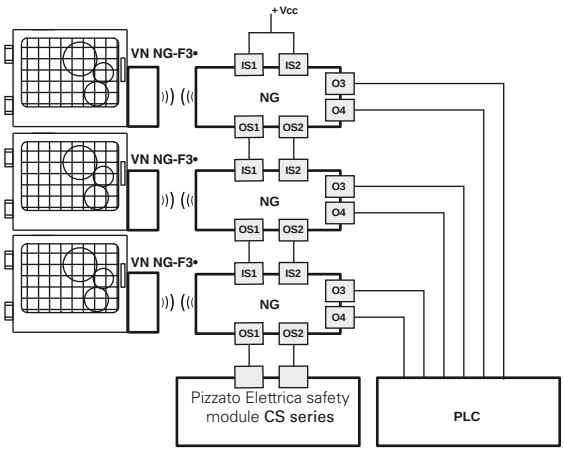
Complete safety system

The use of complete tested solutions means that the customer can be certain of the electrical compatibility between the NG series switch and Pizzato Elettrica safety modules, thus ensuring greater reliability. In fact, these sensors have been tested for operation with the modules specified in the table shown on the side.

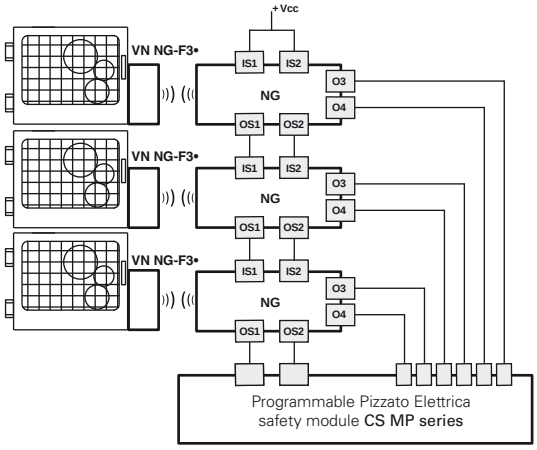
Switches	Compatible safety modules	Safety module output contacts		
		Instantaneous safety contacts	Delayed safety contacts	Signalling contacts
NG 2•••••1A	CS AR-05••••	3NO	/	1NC
	CS AR-06••••	3NO	/	1NC
	CS AR-08••••	2NO	/	/
	CS AT-0•••••	2NO	2NO	1NC
	CS AT-1•••••	3NO	2NO	/
	CS MP••••••	see page 243		
	CS MF••••••	see page 271		



The NG series switch can be used individually, prior evaluation of the safe outputs by means of a Pizzato Elettrica safety module (see table for safety modules to be combined).

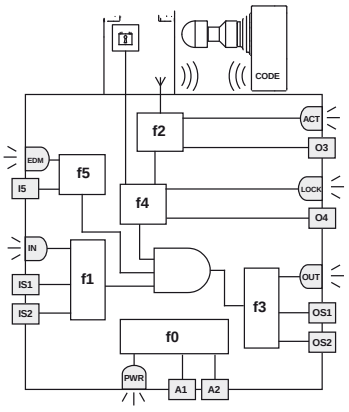


Possible connection in series of several switches in order to simplify the safety system wiring, after evaluating the outputs from the last switch in the chain by means of a Pizzato Elettrica safety module (table for safety modules to be combined). Each NG series switch is provided with two signalling outputs which are activated when the guard is closed (O3) or locked (O4). This piece of information can be managed by a PLC, depending on the specific requirements of the system installed.



Possible connection in series of several switches in order to simplify the safety system wiring, after evaluating the outputs from the last switch in the chain by means of a safety module from Pizzato Elettrica CS MP series, which allows management of both safety and signalling functions.
The examples listed above refer to applications with NG 2•••4•1A.

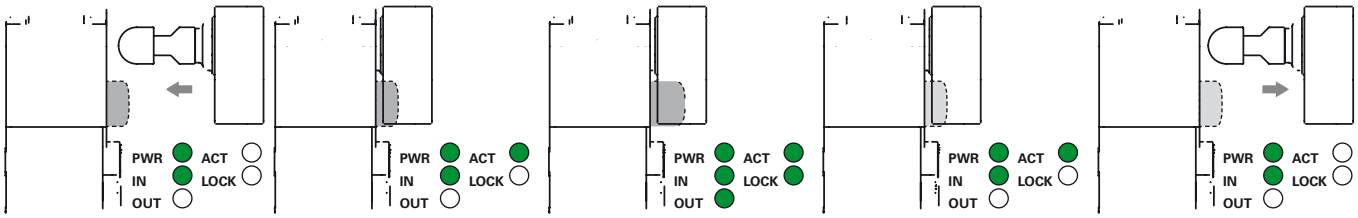
Internal diagram



The diagram on the side represents the 6 logic functions which interact inside the device.
Function f0 is a global function which deals with the device power supply and the internal tests which it cyclically undergoes. The task of function f1 is to evaluate the status of the device inputs, whereas function f2 checks the presence of the actuator inside the switch operating areas.
Function f4 checks the actuator lock condition.
Function f3 is intended to activate or deactivate the safety outputs and check for any faults or short circuits in the outputs.
In the EDM versions, the f5 function verifies the consistency of the EDM signal during safety output state changes. The macro-function, which controls the above mentioned functions, enables the safety outputs only in the presence of active inputs, of the actuator within the safe zone, and where locking of the actuator has taken place, for mode 1 switches. For mode 2 switches, the safety outputs enable only in the presence of active inputs and with the actuator within the safe zone. The status of each function is displayed by the corresponding LED (PWR, IN, OUT, ACT, LOCK, EDM), in such a way that the general device status becomes immediately obvious to the operator.

LED	Function
PWR	power supply/self-diagnosis
IN	status of safety inputs
OUT	status of safety outputs
ACT	actuator state
LOCK	actuator locked
EDM	state of EDM inputs (NG 2D••5•1A)

Actuation sequence in mode 1



The switch is supplied with power (PWR LED on, green), the IS1 and IS2 inputs are enabled (IN LED on, green), the OS1 and OS2 safety outputs are disabled (OUT LED off). The actuator is on the outside of the activation zone (LED ACT off).

When the actuator is brought inside the safe activation area (dark grey area), the switch turns on the ACT LED (green). In this position, the O3 door-closed signalling output is activated. The actuator is not locked (LOCK LED off).

The I4 input can be used to lock the actuator (LOCK LED on, green). The OS1 and OS2 safe outputs are enabled (OUT LED on, green). The O4 signalling output is activated at the same time. The safe activation area is extended in order to allow greater play for the actuator.

The I4 input can be used to unlock the actuator (LOCK LED off). The switch disables the OS1 and OS2 safety outputs and turns off the OUT LED. The O4 signalling output is deactivated at the same time. The safe activation area returns to the initial values.

When the actuator leaves the activation limit area, the device turns off the ACT LED and the O3 signalling output.

Actuation sequence in mode 2

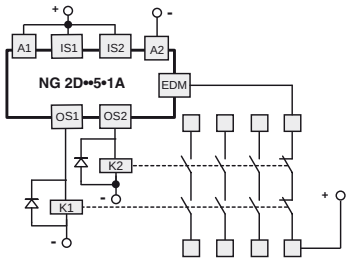
In contrast to the above mode 2 description, the safety outputs OS1 and OS2 enable when the actuator is detected, and disable when the actuator is no longer detectable.

Operating states

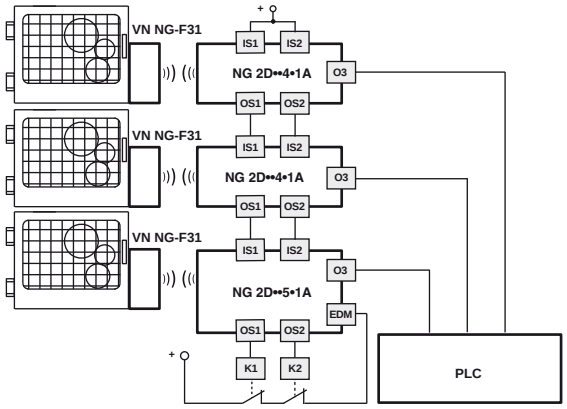
PWR LED	IN LED	OUT LED	ACT LED	LOCK LED	EDM LED (a)	Device status	Description
○	○	○	○	○	○	OFF	Device switched off.
◐	◐	◐	◐	◐	◐	POWER ON	Internal tests upon activation.
●	○	○	✳	✳	●	RUN	Safety inputs of the device not active.
●	●	✳	✳	✳	✳	RUN	Activation of safety inputs.
●	●	○	✳	✳	✳	RUN	State of the safety inputs not coherent. Recommended action: check for presence and/or wiring of inputs.
●	✳	✳	●	✳	✳	RUN	Actuator in safe area. O3 signalling output active.
●	✳	✳	●	●	○	RUN	Actuator in safe area and locked; O3 and O4 outputs active.
●	●	●	●	●	○	RUN	**Mode 1** Activation of safety inputs IS1, IS2. Actuator in safe area and locked. O3, O4, OS1 and OS2 outputs active.
●	●	●	●	✳	○	RUN	**Mode 2** Activation of safety inputs IS1, IS2. Actuator in safe area. O3, OS1 and OS2 outputs active.
●	✳	(blinking)	✳	✳	✳	ERROR	Error on safety outputs. Recommended action: check for any short circuits between the outputs, outputs and ground or outputs and power supply, then restart the device.
●	○	○	(blinking)	○	○	ERROR	Actuator detection error. Check for physical integrity of the device, if faulty replace the entire device. If undamaged, realign the actuator with the switch and restart the device.
●	○	○	○	○	○	ERROR	Internal error. Recommended action: restart the device. If the fault persists, replace the device.
●	✳	○	✳	✳	●	RUN	EDM signal active (external relay off)[a]
●	●	●	●	●	○	RUN	EDM signal not active (external relay on)[a]
●	○	○	○	○	(blinking)	ERROR	Error in function EDM[a]

Legend: ○ = off ● = on (blinking) ◐ = alternating colours ✳ = indifferent (a) Available only in versions NG 2D••5•1A

External device monitoring (EDM)



The NG 2D••5•1A version, in addition to maintaining the operating and safety characteristics of the NG series, allows control of **forcibly guided NC contacts of contactors or relays** controlled by the safety outputs of the switch itself. As an alternative to the relays or contactors you can use Pizzato Elettrica expansion modules CS ME-03. See page 235. This check is carried out via the EDM input (External Device Monitoring as defined in EN 61496-1) of the switch.



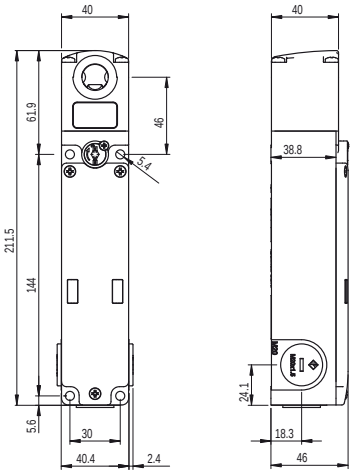
This version, with the IS safety inputs, **can be used at the end of a series** of NG switches, **up to a maximum number of 32 devices**, while maintaining the maximum PL e safety level and acc. to EN ISO 13849-1 and SIL 3 safety level acc. to EN 62061.

This solution allows you to dispense with the safety module connected to the last device in the chain.

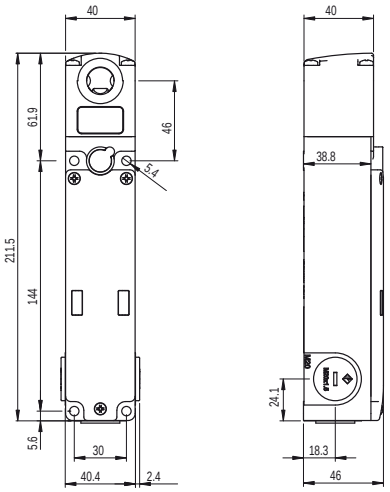
Dimensional drawings

All measures in the drawings are in mm

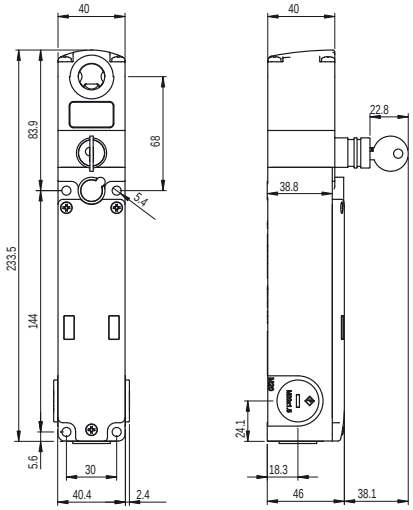
Switch NG 2D1D••1A
Working principle D, supplied with sealable auxiliary release device, without actuator



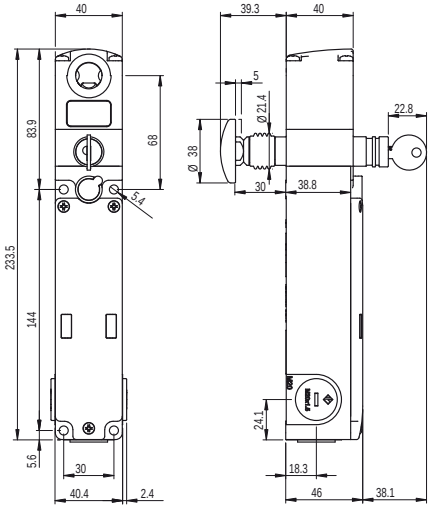
Switch NG 2D1E••1A
Working principle E, without actuator



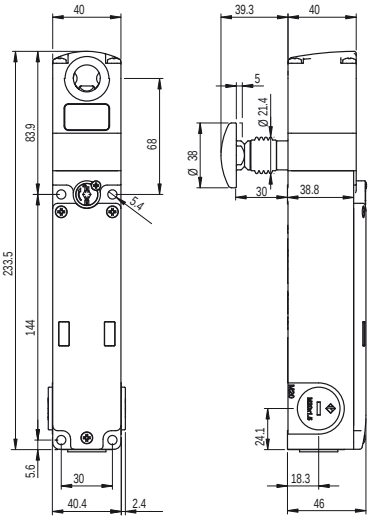
Switch NG 2D5D••1A
Working principle D, with key release, without actuator



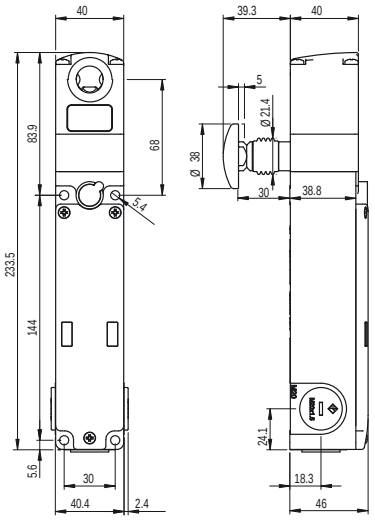
Switch NG 2D6D••1A
Working principle D, with key release, emergency release button, without actuator



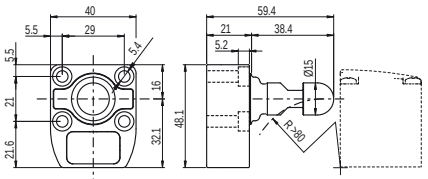
Switch NG 2D7D••1A
Working principle D, with emergency release button, without actuator



Switch NG 2D7E••1A
Working principle E, with emergency release button, without actuator



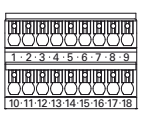
Actuator VN NG-F3•

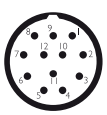


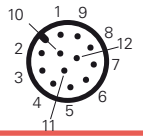
➔ The 2D and 3D files are available at **www.pizzato.com**

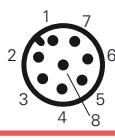
Internal connections

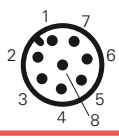
Internal terminal strip	M23 connector 12 poles	M12 connector 12 poles	M12 connector 8 poles stand-alone connection	M12 connector 8 poles series connection with "Y" connectors	Connection	
1	3	3	3	3	A2	0 V supply input
2	/	/	/	/	B2	0 V auxiliary supply output
3	10	10	8	8	I4	Solenoid activation input
4	5	5	2	/	O3	Signalling output, actuator inserted
5	9	9	5	5	O4	Signalling output, actuator inserted and locked (b)
6	8	8	6	/	I3	Actuator programming input
10	1	1	1	1	A1	+24 Vdc supply input
11	/	/	/	/	B1	Auxiliary supply output +24 Vdc, 8 A max.
12	2	2	/	2	IS1	Safety input
13	6	6	/	6	IS2	Safety input
14	11	11	/	/	I5	EDM input (a)
15	4	4	4	4	OS1	Safety output
16	7	7	7	7	OS2	Safety output











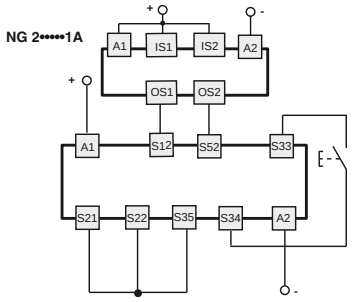
Important: terminals 7, 8, 9, 17, 18 of the internal terminal strip cannot be used.
(a) Available only in version NG 2D••5•1A.
(b) For NG 2D••6•1A the output signals the device FAULT condition.

Sockets See page 287

Connection with safety modules

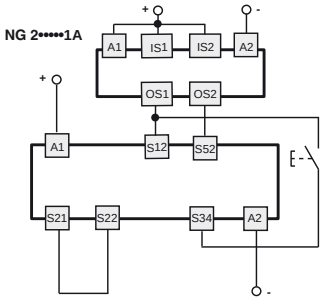
Connection with safety modules
CS AR-08••••

Input configuration with monitored start
2 channels / Category 4 / up to SIL 3 / PL e



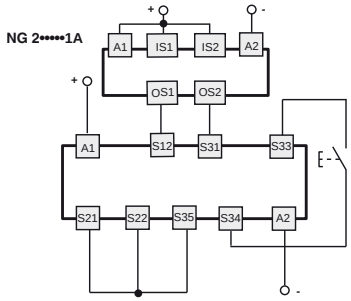
Connection with safety modules
CS AR-05•••• / CS AR-06••••

Input configuration with manual start (CSAR-05••••) or monitored start (CS AR-06••••)
2 channels / Category 4 / up to SIL 3 / PL e



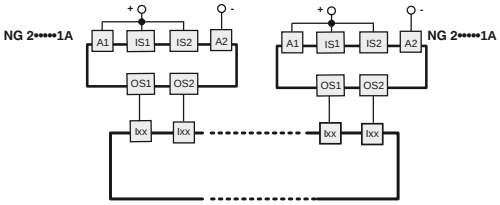
Connection with safety modules
CS AT-0••••• / CS AT-1•••••

Input configuration with monitored start
2 channels / Category 4 / up to SIL 3 / PL e



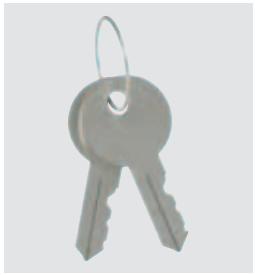
Connection with safety modules CS MF•••••, CS MP•••••

The connections vary according to the program of the module
Category 4/ up to SIL 3 / PL e



Accessories

Article	Description
VF KLB300	Set of two locking keys



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

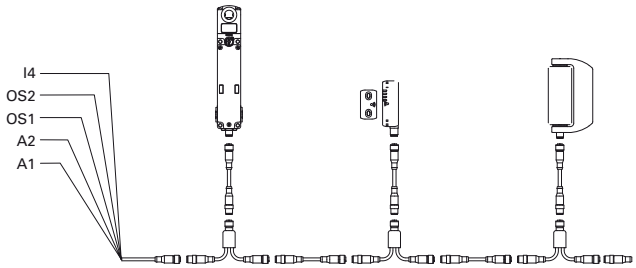
Adhesive labels for emergency release button

Polycarbonate yellow adhesive, rectangular 300x32 mm, red writing. Applied on the internal part of the jamb it helps finding the emergency release button.

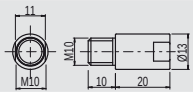
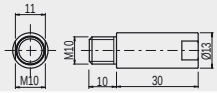
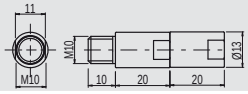
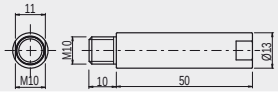
Article	Description
VF AP-A1AGR01	PREMERE PER USCIRE
VF AP-A1AGR02	PUSH TO EXIT
VF AP-A1AGR04	ZUM OFFNEN DRUCKEN
VF AP-A1AGR05	POUSSER POUR SORTIR
VF AP-A1AGR06	PULSAR PARA SALIR
VF AP-A1AGR07	НАЖАТЬ ДЛЯ ВЫХОДА
VF AP-A1AGR08	NACISNĄĆ ABY WYJŚĆ
VF AP-A1AGR09	PRESSIONAR PARA SAIR

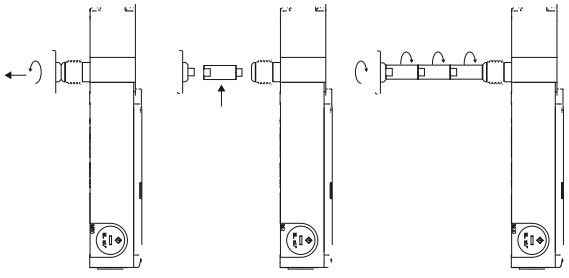
Series connection

To simplify serial connections, a series of M12 connectors are available that allow complete wiring.
This solution significantly reduces installation times, whilst maintaining the maximum PL e and SIL 3 safety levels.
For further information see page 290.



Extensions for release button

Article	Description	Drawing
VN NG-LP30	Metal extension for release button. For max. wall thickness of 30 mm	
VN NG-LP40	Metal extension for release button. For max. wall thickness of 40 mm	
VN NG-LP50	Metal extension for release button. For max. wall thickness of 50 mm	
VN NG-LP60	Metal extension for release button. For max. wall thickness of 60 mm	

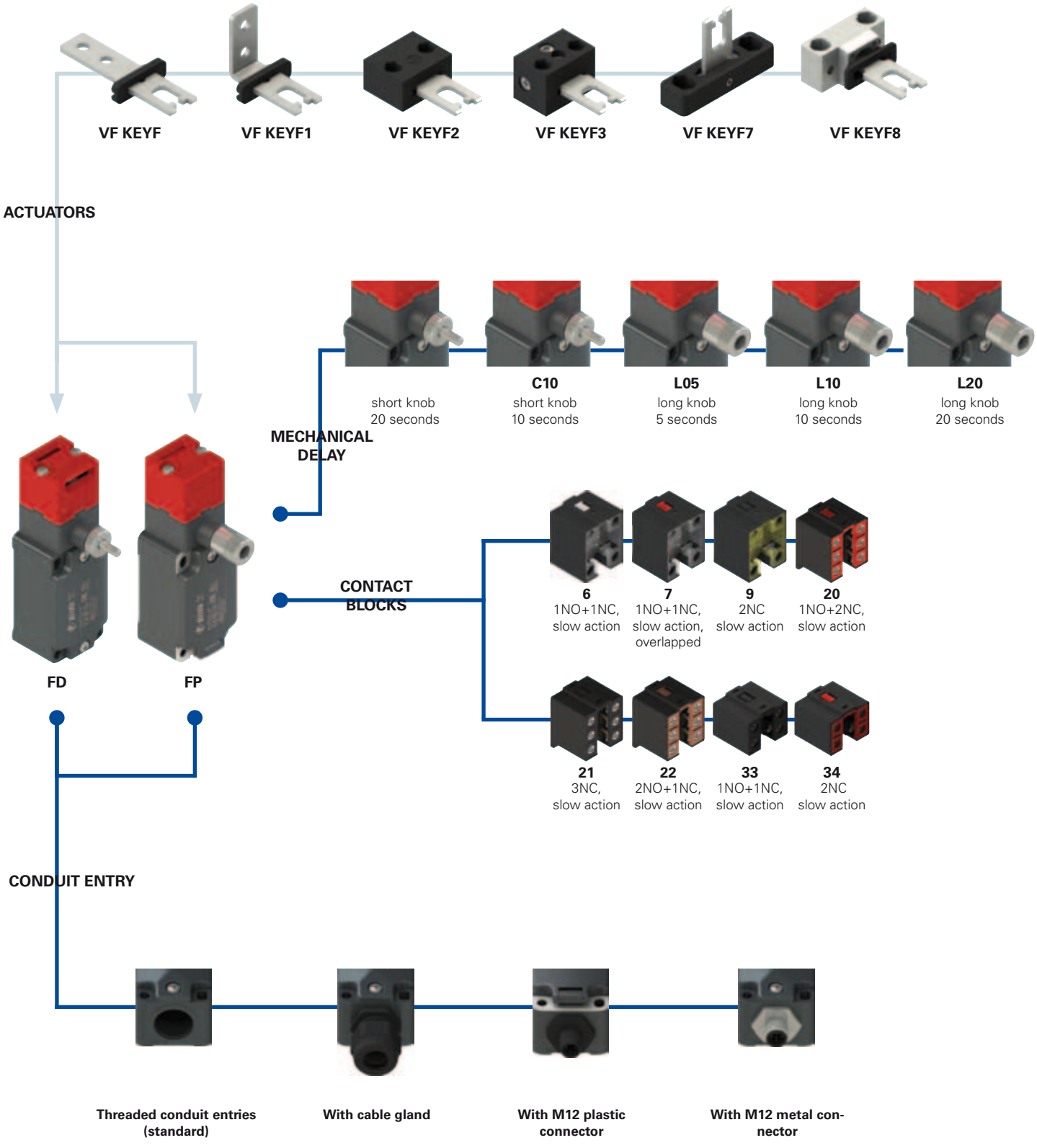


Metal extensions can be combined together until the required length is obtained. Do not exceed an overall length of 500 mm between the release button and the switch.

Items with code on **green** background are stock items

Accessories See page 287

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 | options

FD 6R2-L10F1GM2K50T6

Housing	
FD	metal, one conduit entry
FP	technopolymer, 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	short knob, 5 s
L10	short knob, 10 s
L20	short knob, 20 s

Actuators	
	without actuator (standard)
F	straight actuator VF KEYF
F1	angled actuator VF KEYF1
F2	jointed actuator VF KEYF2
F3	jointed actuator adjustable in two directions VF KEYF3
F7	jointed actuator adjustable in one direction VF KEYF7
F8	universal actuator VF KEYF8

Contact type	
	silver contacts (standard)
G	silver contacts with 1 µm gold coating

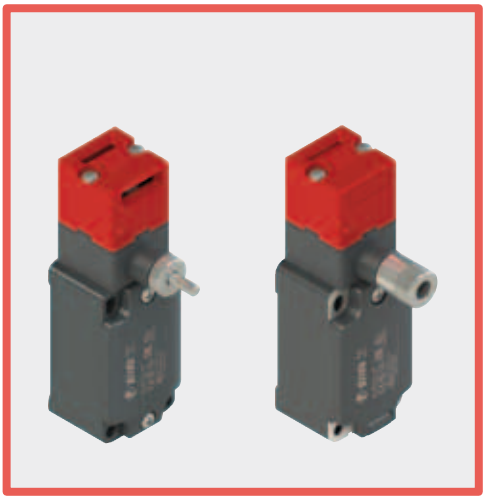
Threaded conduit entry	
M2	M20x1.5 (standard)
	PG 13.5

Ambient temperature	
	-25°C … +80°C (standard)
T6	-40°C … +80°C

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6…Ø 12 mm
...	.....
K50	M12 metal connector, 5 poles
...	.....

Please contact our technical service for the complete list of possible combinations.

Safety switches **with manual mechanical delay and separate actuator**



Main features

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

Markings and quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000 (FD series)
	2007010305230014 (FP series)
EAC approval:	RU C-IT ДМ94.В.01024

Technical data

Housing

FP series housing made of glass fiber reinforced technopolymer, self-extinguishing, shock-proof and with double insulation: ⧈
FD series: metal housing, baked powder coating.

One threaded conduit entry:	M20x1.5 (standard)
Protection degree:	IP67 acc. to EN 60529 with cable gland having equal or higher protection degree

General data

For safety applications up to:	SIL 3 acc. to EN 62061 PL e acc. to EN ISO 13849-1
Interlock with mechanical lock, coded:	type 2 acc. to EN ISO 14119
Coding level:	Low acc. to EN ISO 14119
Safety parameters:	
B_{10d}:	1,000,000 for NC contacts
Service life:	20 years
Ambient temperature:	-25°C … +80°C
Version for operation in ambient temperature from -40°C to +80° C on request	
Max. actuation frequency:	360 operating cycles[1]/hour
Mechanical endurance:	500,000 operating cycles[1]
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{1max}	1000 N acc. to EN ISO 14119
Max. holding force F_{Zh}:	770 N according to EN ISO 14119
Max. backlash of the actuator:	4.5 mm
Tightening torques for installation:	see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 33, 34:	min.	1 x 0.34 mm²	(1 x AWG 22)
	max.	2 x 1.5 mm²	(2 x AWG 16)
Contact blocks 6, 7, 9:	min.	1 x 0.5 mm²	(1 x AWG 20)
	max.	2 x 2.5 mm²	(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 ISO 14119, EN ISO 12100, IEC 60529, EN 60529, BG-GS-ET-15, UL 508, CSA 22.2 No.14 .
Approvals:
IEC 60947-5-1, UL 508, CSA 22.2 No.14 , GB14048.5-2001.

In conformity with the requirements of:
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

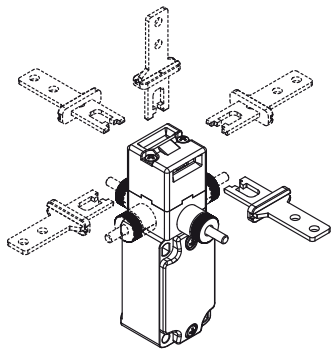
⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see chapter utilization requirements from page 297 to page 308.

Electrical data			Utilization category
without connector	Thermal current (Ith):	10 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (Ui):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	Ue (V) 250 400 500 Ie (A) 6 4 1
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)	Direct current: DC13
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	Ue (V) 24 125 250 Ie (A) 6 1.1 0.4
	Protection against short circuits:	type aM fuse 10 A 500 V	
	Pollution degree:	3	
with M12 connector 4 and 5 poles	Thermal current (Ith):	4 A	Alternating current: AC15 (50÷60 Hz) Ue (V) 24 120 250 Ie (A) 4 4 4
	Rated insulation voltage (Ui):	250 Vac 300 Vdc	Direct current: DC13
	Protection against short circuits:	type gG fuse 4 A 500 V	Ue (V) 24 125 250 Ie (A) 4 1.1 0.4
	Pollution degree:	3	
with M12 connector 8 poles	Thermal current (Ith):	2 A	Alternating current: AC15 (50÷60 Hz) Ue (V) 24 Ie (A) 2
	Rated insulation voltage (Ui):	30 Vac 36 Vdc	Direct current: DC13
	Protection against short circuits:	type gG fuse 2 A 500 V	Ue (V) 24 Ie (A) 2
	Pollution degree:	3	

Description

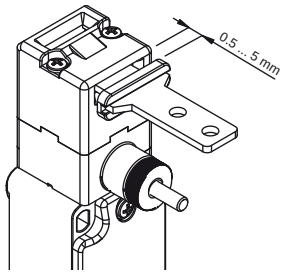
These switches are used on machines where the hazardous conditions remain for a while, even after the machine has been switched off, for example because of mechanical inertia of the pulleys, saw disks, mills. This switch has its ideal application where the guard is not open frequently and the installation of a switch with solenoid would be too expensive.
These switches are considered interlocks with locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

Orientable heads and knobs



The head can be quickly turned on each of the four 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



The head of this switch is equipped with an actuator with a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5mm) without causing unwanted machine shutdowns. This extensive travel is available in all actuators, in order to ensure maximum device reliability.

Protection degree IP67

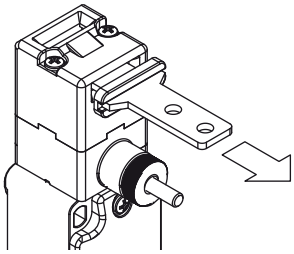
IP67

These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529.
They can therefore be used in all environments where the maximum protection of the housing is required.

Contact blocks

Contact blocks with captive screws, finger protection, twin bridge contacts and double interruption for a higher contact reliability. Available in multiple variants with shifted activation strokes, which can be simultaneous or overlapping, they are suited to a variety of applications.

Holding force of the unlocked actuator



The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several doors are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked doors in their position with a retaining force of 30 N~, stopping any vibrations or gusts of wind from opening them.

Extended temperature range

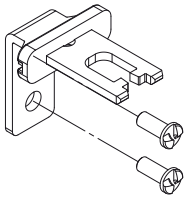
-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.
They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Laser engraving

All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Safety screws for actuators



As required by EN ISO 14119, the actuator must be fixed immovably to the door frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered with using common tools. See accessories on page 295.

Characteristics approved by IMQ

Rated insulation voltage (Ui): 500 Vac
400 Vac (for contact blocks 20, 21, 22, 33, 34)
Conventional free air thermal current (Ith): 10 A
Protection against short circuits: type aM fuse 10 A 500 V
Rated impulse withstand voltage (U_{imp}): 6 kV
4 kV (for contact blocks 20, 21, 22, 33, 34)
Protection degree of the housing: IP67
MV terminals (screw terminals)
Pollution degree 3
Utilization category: AC15
Operating voltage (Ue): 400 Vac (50 Hz)
Operating 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 blocks 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/EC.

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

Characteristics approved by UL

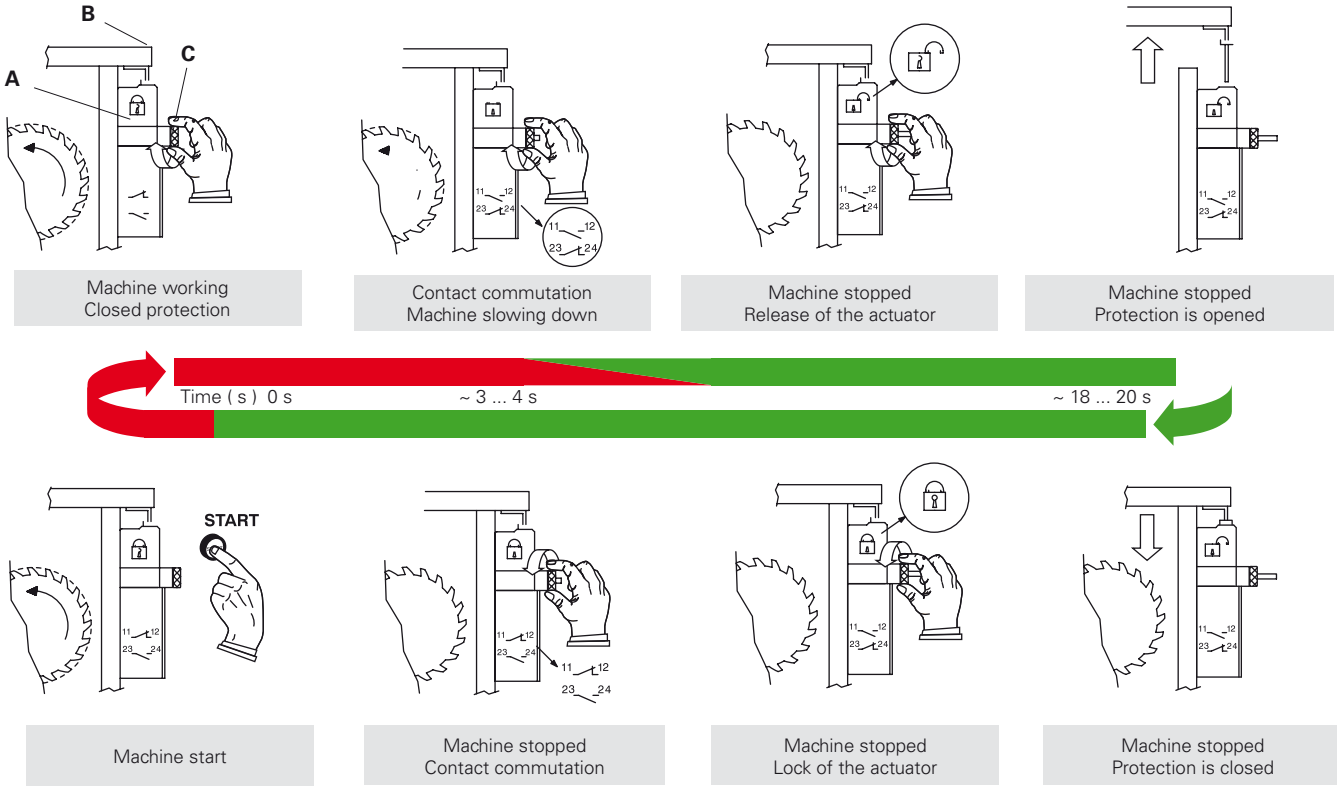
Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).

In conformity with standard: UL 508, CSA 22.2 No.14

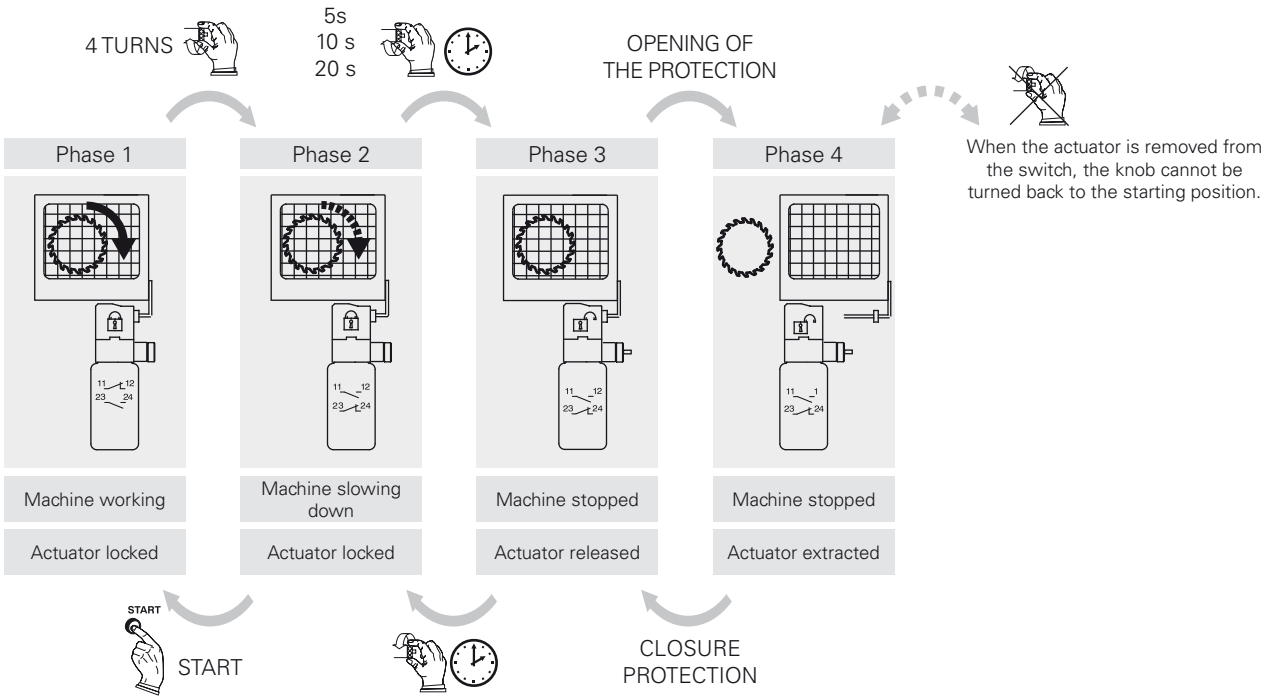
Please contact our technical service for the list of approved products.

Operation (FP 6R2-M2F1)

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.



Working cycle steps (FD 6R2-M2F1)



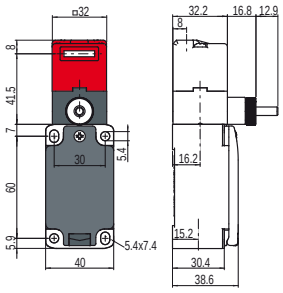
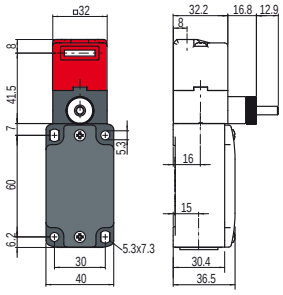
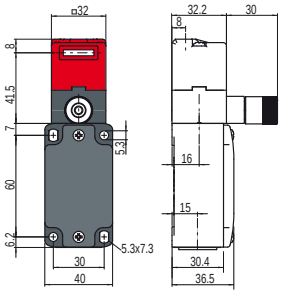
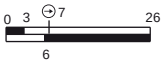
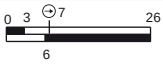
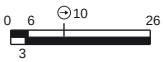
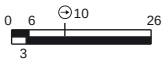
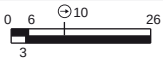
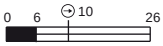
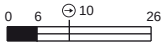
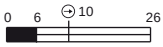
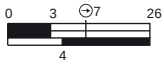
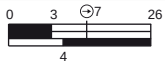
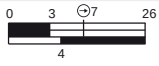
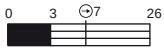
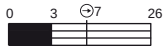
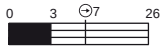
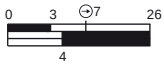
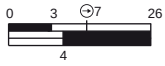
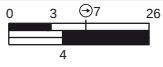
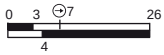
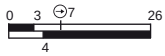
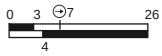
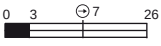
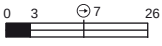
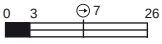
Dimensional drawings

All measures in the drawings are in mm

Contact type:

L = slow action
LO = slow action overlapped

Contact blocks

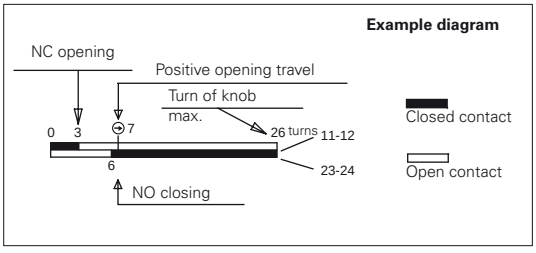
		Technopolymer housing Without actuator	Metal housing Without actuator	Metal housing Without actuator
				
6	L	FP 6R2-M2 1NO+1NC	FD 6R2-M2 1NO+1NC	FD 6R2-L10M2 1NO+1NC
				
7	LO	FP 7R2-M2 1NO+1NC	FD 7R2-M2 1NO+1NC	FD 7R2-L10M2 1NO+1NC
				
9	L	FP 9R2-M2 2NC	FD 9R2-M2 2NC	FD 9R2-L10M2 2NC
				
20	L	FP 20R2-M2 1NO+2NC	FD 20R2-M2 1NO+2NC	FD 20R2-L10M2 1NO+2NC
				
21	L	FP 21R2-M2 3NC	FD 21R2-M2 3NC	FD 21R2-L10M2 3NC
				
22	L	FP 22R2-M2 2NO+1NC	FD 22R2-M2 2NO+1NC	FD 22R2-L10M2 2NO+1NC
				
33	L	FP 33R2-M2 1NO+1NC	FD 33R2-M2 1NO+1NC	FD 33R2-L10M2 1NO+1NC
				
34	L	FP 34R2-M2 2NC	FD 34R2-M2 2NC	FD 34R2-L10M2 2NC
				
Min. force		10 N (18 N ⊕)	10 N (18 N ⊕)	10 N (18 N ⊕)

All measures in the diagrams are in turns of the knob

Legend: ⊕ With positive opening according to EN 60947-5-1, interlock with lock monitoring in accordance with EN ISO 14119

How to read travel diagrams

All measures in the diagrams are in turns of the knob



IMPORTANT:
NC contact has to be considered with inserted and blocked actuator and with the knob turned anti-clockwise up to the end of the travel. In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol ⊕. Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.

Utilization limits

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. Adhere to the EN ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific Pizzato catalogue).
Attention! These switches alone are not suitable for applications where operators may physically enter the dangerous area, because an eventual closing of the door behind them could restart the machine operation. In this case the entry locking device VF KB1 shown on page 134 must be used.

Items with code on **green** background are stock items

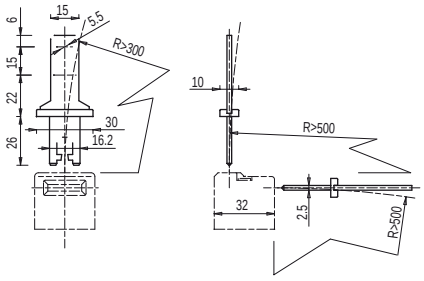
Accessories See page 287

→ The 2D and 3D files are available at **www.pizzato.com**

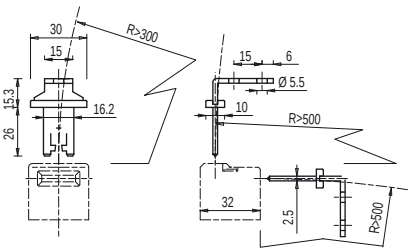
Stainless steel actuators

IMPORTANT: These actuators can be used with items of the FD, FP, FL, FC and FS series only (e.g. FD 6R2-M2).
Low level of coding acc. to EN ISO 14119.

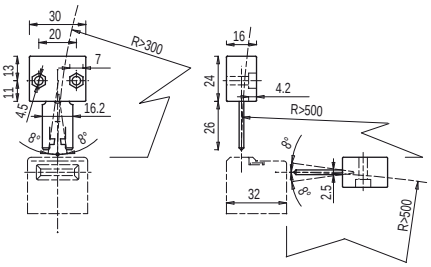
Article	Description
VF KEYF	Straight actuator



Article	Description
VF KEYF1	Angled actuator

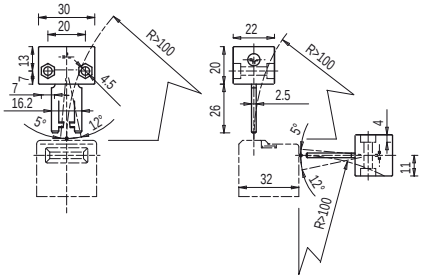


Article	Description
VF KEYF2	Jointed actuator



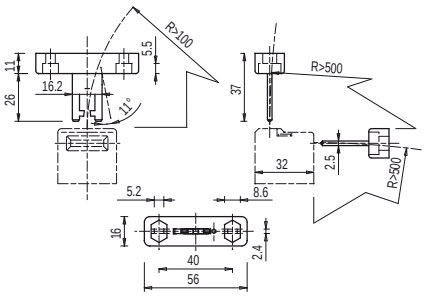
The actuator can flex in four directions for applications where the door alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions



Actuator adjustable in two directions for doors with reduced dimensions.

Article	Description
VF KEYF7	Actuator adjustable in one direction



Actuator adjustable in one direction for doors with reduced dimensions.

Items with code on **green** background are stock items

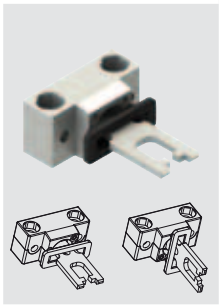
Accessories See page 287

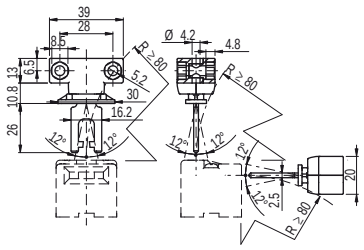
➔ The 2D and 3D files are available at **www.pizzato.com**

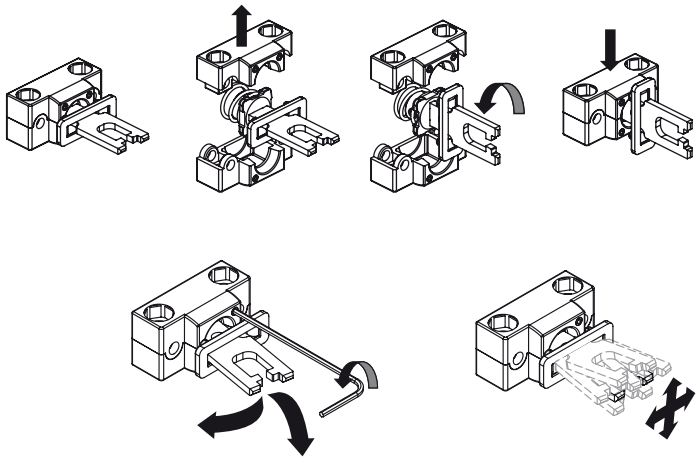
Universal actuator VF KEYF8

IMPORTANT: These actuators can be used with items of the FD, FP, FL, FC and FS series only (e.g. FD 6R2-M2).
Low level of coding acc. to EN ISO 14119.

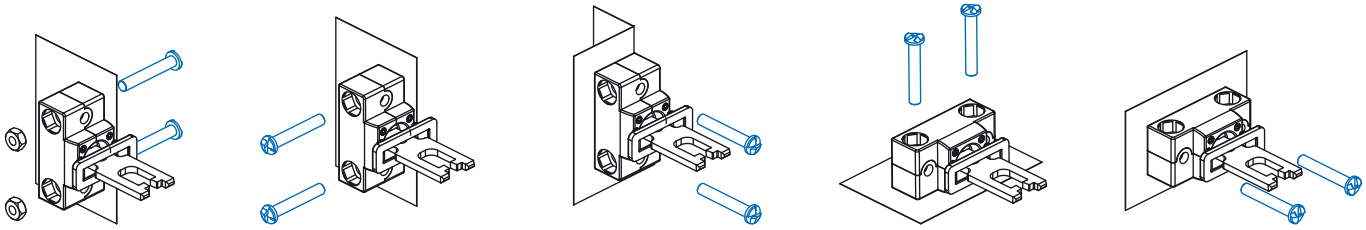
Article	Description
VF KEYF8	Universal actuator







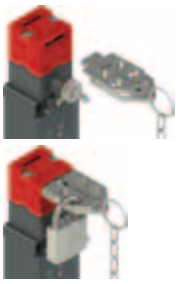
Joined and two directions adjustable actuator for doors with reduced dimensions.
The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.



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.
Hole diameter for padlocks 9 mm.

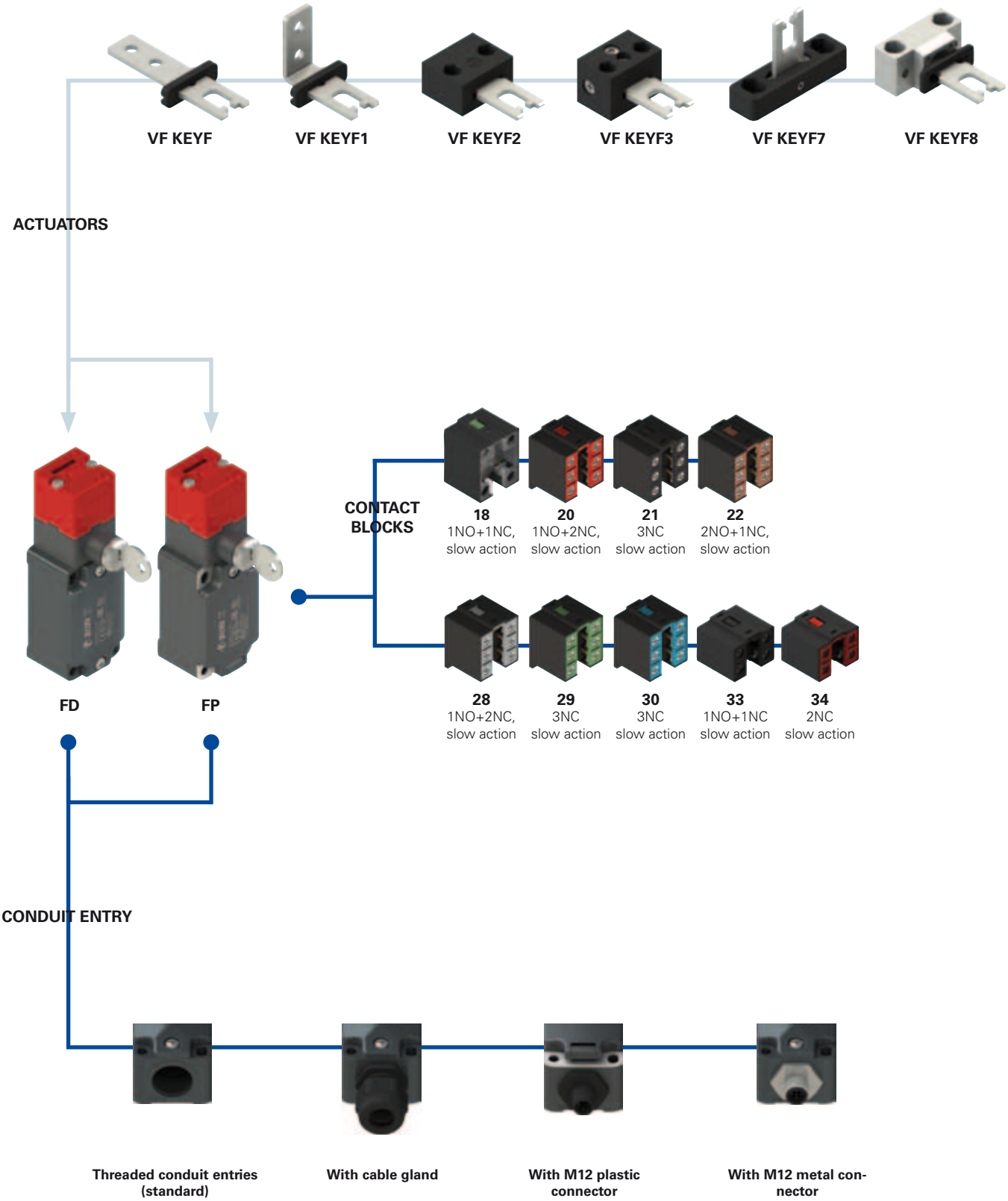


Items with code on **green** background are stock items

Accessories See page 287

→ The 2D and 3D files are available at **www.pizzato.com**

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 | options

FD 1899-F1GM2K50V200T6

Housing

FD	metal, one conduit entry
FP	technopolymer, one conduit entry

Contact blocks

	Contacts activated by the lock	Contact activated by actuator extraction
18	1NO+1NC	
20	1NO+2NC	
21	3NC	
22	2NO+1NC	
28	1NO+1NC	1NC
29	2NC	1NC
30	1NC	2NC
33	1NO+1NC	
34	2NC	

Actuators

	without actuator (standard)
F	straight actuator VF KEYF
F1	angled actuator VF KEYF1
F2	jointed actuator VF KEYF2
F3	jointed actuator adjustable in two directions VF KEYF3
F7	jointed actuator adjustable in one direction VF KEYF7
F8	universal actuator VF KEYF8

Contact type

	silver contacts (standard)
G	silver contacts with 1 µm gold coating

Threaded conduit entry

M2	M20x1.5 (standard)
	PG 13.5

Pre-installed cable glands or connectors

	without cable gland or connector (standard)
K23	cable gland for cables Ø 6…Ø 12 mm
...	.....
K50	M12 metal connector, 5 poles
...	.....

Please contact our technical service for the complete list of possible combinations.

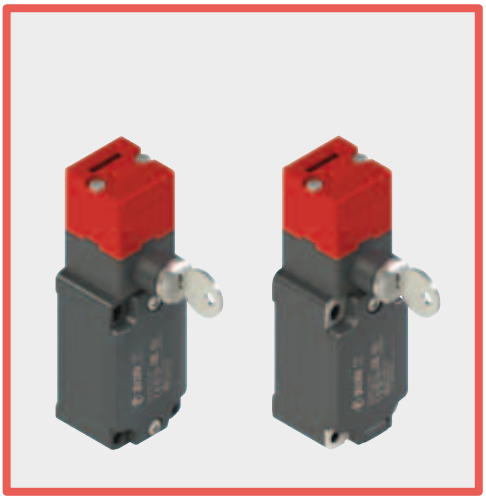
Lock key coding

	one standard key coding (371)
V200	up to 50 different key codings

Ambient temperature

	-25°C … +80°C (standard)
T6	-40°C … +80°C

Safety switches **with separate actuator** and key release



Main features

- Metal housing or technopolymer housing, one conduit entry
- Protection degree IP67
- 9 contact blocks available
- 6 stainless steel actuators available
- Versions with assembled M12 connector
- Versions with gold-plated silver contacts
- Strong actuator locking (1000 N)
- Release of the actuator by key

Markings and quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000 (FD series)
	2007010305230014 (FP series)
EAC approval:	RU C-IT ДМ94.B.01024

Technical data

Housing

FP series housing made of glass fiber reinforced technopolymer, self-extinguishing, shock-proof and with double insulation: ⧈
FD series: metal housing, baked powder coating.
Metal head, coated with baked epoxy powder.

One threaded conduit entry:	M20x1.5 (standard)
Protection degree:	IP67 acc. to EN 60529 with cable gland having equal or higher protection degree

General data

For safety applications up to:	SIL 3 acc. to EN 62061 PL e acc. to EN ISO 13849-1
Interlock with mechanical lock, coded:	type 2 acc. to EN ISO 14119
Coding level:	Low acc. to EN ISO 14119
Safety parameters:	
B_{10d}:	1,000,000 for NC contacts
Service life:	20 years
Ambient temperature:	-25°C … +80°C
Max. actuation frequency:	3600 operating cycles[1]/hour
Mechanical endurance:	500,000 operating cycles[1]
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{1max}:	1000 N acc. to EN ISO 14119
Max. holding force F_{Zh}:	770 N according to EN ISO 14119
Max. backlash of the actuator:	4.5 mm
Actuator extraction force:	30 N
Tightening torques for installation:	see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 28, 29, 30, 33, 34:	min.	1 x 0.34 mm²	(1 x AWG 22)
	max.	2 x 1.5 mm²	(2 x AWG 16)
Contact block 18:	min.	1 x 0.5 mm²	(1 x AWG 20)
	max.	2 x 2.5 mm²	(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 ISO 14119, EN ISO 12100, IEC 60529, EN 60529, BG-GS-ET-15, UL 508, CSA 22.2 No.14 .
Approvals:
IEC 60947-5-1, UL 508, CSA 22.2 No.14 , GB14048.5-2001.

In conformity with the requirements of:
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see chapter utilization requirements from page 297 to page 308.**

Electrical data

without connector	Thermal current (Ith):	10 A
	Rated insulation voltage (Ui):	500 Vac 600 Vdc 400Vac 500Vdc (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1
	Protection against short circuits:	type aM fuse 10 A 500 V
	Pollution degree:	3
with M12 connector 4 and 5 poles	Thermal current (Ith):	4 A
	Rated insulation voltage (Ui):	250 Vac 300 Vdc
	Protection against short circuits:	type gG fuse 4 A 500 V
	Pollution degree:	3
with M12 connector 8 poles	Thermal current (Ith):	2 A
	Rated insulation voltage (Ui):	30 Vac 36 Vdc
	Protection against short circuits:	type gG fuse 2 A 500 V
	Pollution degree:	3

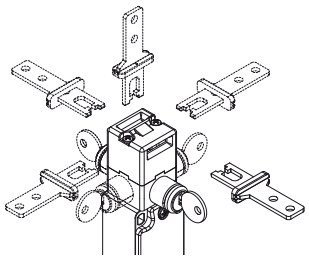
Utilization category

without connector	Alternating current: AC15 (50÷60 Hz)		
	Ue (V)	250	400	500
	Ie (A)	6	4	1
	Direct current: DC13			
	Ue (V)	24	125	250
	Ie (A)	6	1.1	0.4
with M12 connector 4 and 5 poles	Alternating current: AC15 (50÷60 Hz)		
	Ue (V)	24	120	250
	Ie (A)	4	4	4
	Direct current: DC13			
	Ue (V)	24	125	250
	Ie (A)	4	1.1	0.4
with M12 connector 8 poles	Alternating current: AC15 (50÷60 Hz)		
	Ue (V)	24	
	Ie (A)	2	
	Direct current: DC13		
	Ue (V)	24	
	Ie (A)	2	

Description

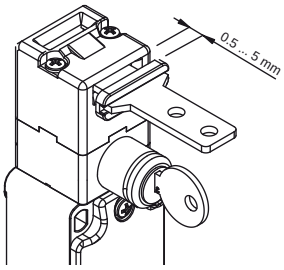
This type of switches **is applied on fences or protections where entrance is allowed to authorized personnel only. They have been studied to control large protected areas where operators may physically enter**. Supplied with a strong lock, the actuator can be removed from the head only after a complete 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 will be reset to the initial position only with inserted actuator and with key in locking position. **It is impossible to rotate the key when the key locking device is unlocked and the actuator is removed (C state).** These switches are considered interlocks with locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

Orientable head and release device



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

Actuator regulation zone



The head of this switch is equipped with an actuator with a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5mm) without causing unwanted machine shutdowns. This extensive travel is available in all actuators, in order to ensure maximum device reliability.

Protection degree IP67

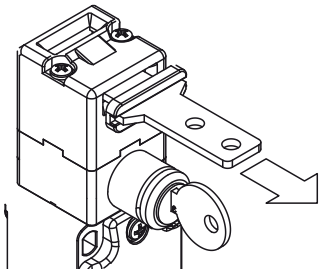
IP67

These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529.
They can therefore be used in all environments where the maximum protection of the housing is required.

Contact blocks

Contact blocks with captive screws, finger protection, twin bridge contacts and double interruption for a higher contact reliability.

Holding force of the unlocked actuator



The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several doors are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked doors in their position with a retaining force of 30 N~, stopping any vibrations or gusts of wind from opening them.

Extended temperature range

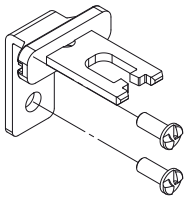
-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.
They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Laser engraving

All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Safety screws for actuators



As required by ISO 14119, the actuator must be fixed immovably to the door frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered with using common tools. See accessories on page 295.

Characteristics approved by IMQ

Rated insulation voltage (Ui): 500 Vac
400 Vac (for contact blocks 20, 21, 22, 33, 34)
Conventional free air thermal current (Ith): 10 A
Protection against short circuits: type aM fuse 10 A 500 V
Rated impulse withstand voltage (U_{imp}): 6 kV
4 kV (for contact blocks 20, 21, 22, 33, 34)
Protection degree of the housing: IP67
MV terminals (screw terminals)
Pollution degree 3
Utilization category: AC15
Operating voltage (Ue): 400 Vac (50 Hz)
Operating 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 blocks 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/EC.

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

Characteristics approved by UL

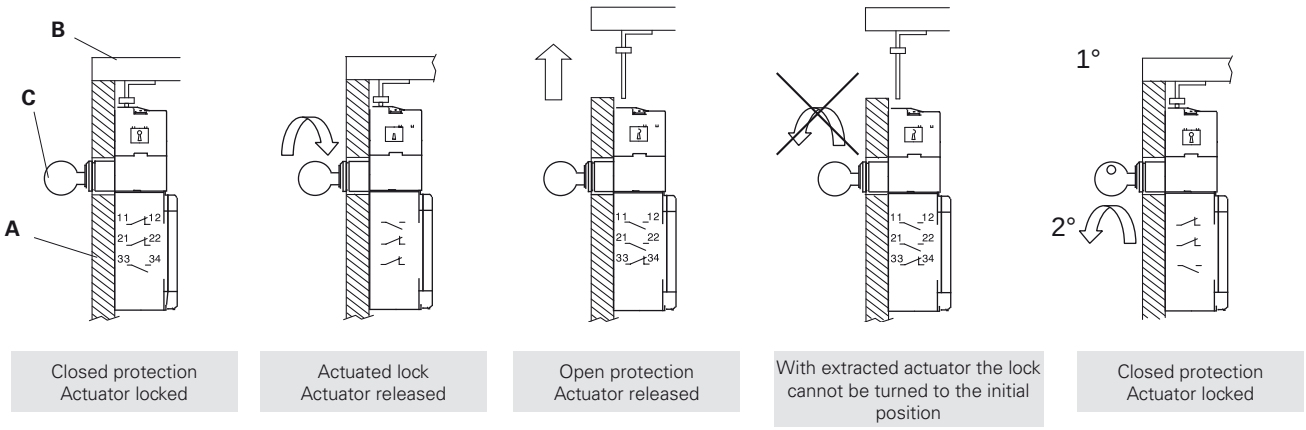
Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).

In conformity with standard: UL 508, CSA 22.2 No.14

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

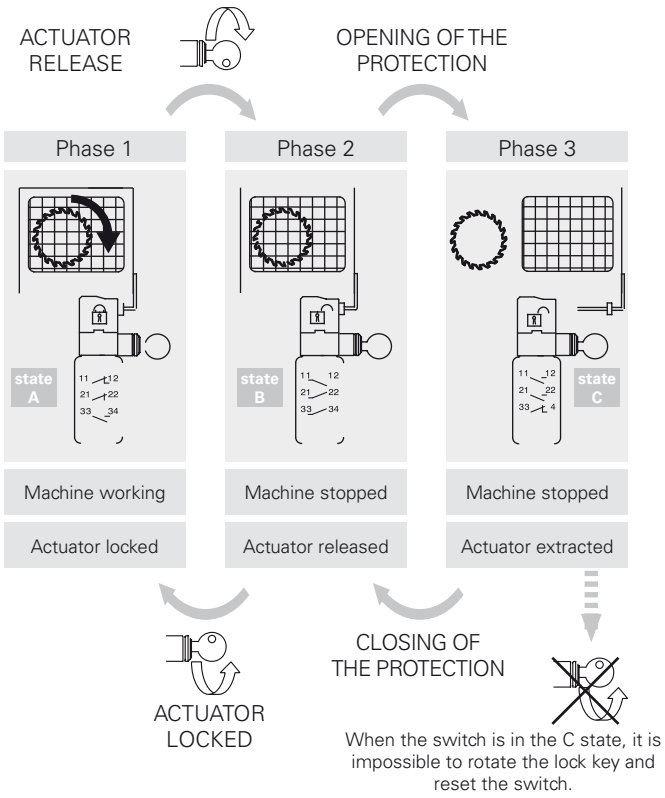
Operation

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 into the initial 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.



Closed protection Actuator locked	Actuated lock Actuator released	Open protection Actuator released	With extracted actuator the lock cannot be turned to the initial position	Closed protection Actuator locked

Working cycle steps



When the switch is in the C state, it is impossible to rotate the lock key and reset the switch.

Utilization limits

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. Adhere to the ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific Pizzato catalogue). Attention! These switches alone are not suitable for applications where operators may physically enter the dangerous area, because an eventual closing of the door behind them could restart the machine operation. In this case the entry locking device VF KB1 shown on page 142 must be used.

Contact positions related to switch states

Operating state		state A	state B	state C
Actuator		Inserted and locked	Inserted and released	Extracted
Lock		Closed	Open	Open
Contact blocks				
FD 1899 1NC+1NO controlled by the lock		11–12 23–24	11 12 23 24	11 12 23 24
FD 2099 2NC+1NO controlled by the lock		11–12 21–22 33–34	11 12 21 22 33 34	11 12 21 22 33 34
FD 2199 3NC controlled by the lock		11–12 21–22 31–32	11 12 21 22 31 32	11 12 21 22 31 32
FD 2299 1NC+2NO controlled by the lock		11–12 23–24 33–34	11 12 23 24 33 34	11 12 23 24 33 34
FD 2899 1NO+1NC controlled by the lock 1NC controlled by the actuator		11–12 21–22 33–34	11 12 21 22 33 34	11 12 21 22 33 34
FD 2999 2NC controlled by the lock 1NC controlled by the actuator		11–12 21–22 31–32	11 12 21 22 31 32	11 12 21 22 31 32
FD 3099 1NC controlled by the lock 2NC controlled by the actuator		11–12 21–22 31–32	11 12 21 22 31 32	11 12 21 22 31 32

The key can be extracted from the lock with blocked or released actuator.

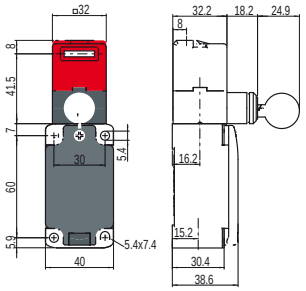
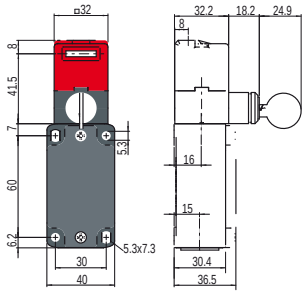
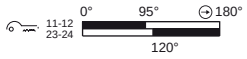
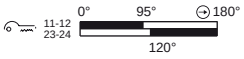
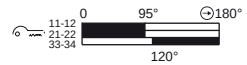
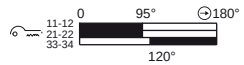
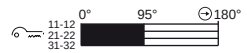
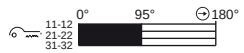
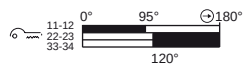
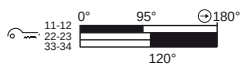
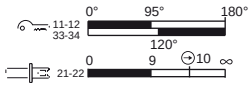
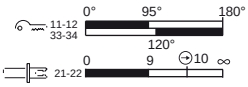
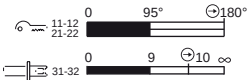
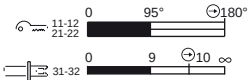
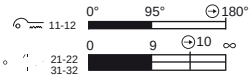
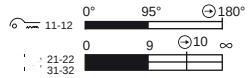
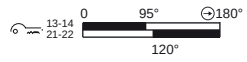
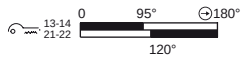
Dimensional drawings

All measures in the drawings are in mm

Contact type:

L = slow action

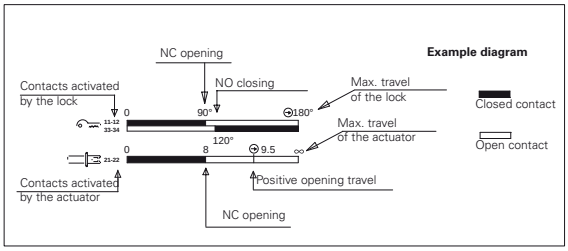
Contact blocks

		Technopolymer housing Without actuator, supplied with two keys	Metal housing Without actuator, supplied with two keys
			
18	L	FP 1899-M2 1NO+1NC	FD 1899-M2 1NO+1NC
			
20	L	FP 2099-M2 1NO+2NC	FD 2099-M2 1NO+2NC
			
21	L	FP 2199-M2 3NC	FD 2199-M2 3NC
			
22	L	FP 2299-M2 2NO+1NC	FD 2299-M2 2NO+1NC
			
28	L	FP 2899-M2 1NO+2NC	FD 2899-M2 1NO+2NC
			
29	L	FP 2999-M2 3NC	FD 2999-M2 3NC
			
30	L	FP 3099-M2 3NC	FD 3099-M2 3NC
			
33	L	FP 3399-M2 1NO+1NC	FD 3399-M2 1NO+1NC
			
34	L	FP 3499-M2 2NC	FD 3499-M2 2NC
			
Min. force		30 N (40 N ⊖)	30 N (40 N ⊖)

Legend: ⊖ With positive opening according to EN 60947-5-1, interlock with lock monitoring in accordance with EN ISO 14119

How to read travel diagrams

All measures in the diagrams are in mm or in degrees



IMPORTANT:
NC contact has (⏦) to be considered with inserted actuator and lock by the lock. In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol ⊖. Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.

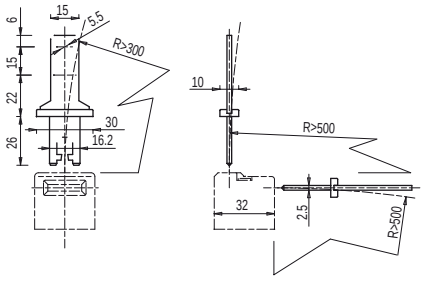
Accessories See page 287

➔ The 2D and 3D files are available at **www.pizzato.com**

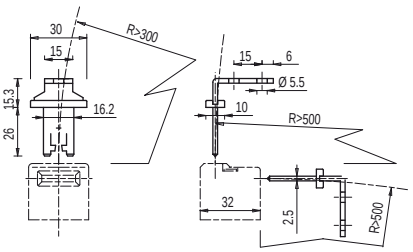
Stainless steel actuators

IMPORTANT: These actuators can be used with items of the FD, FP, FL, FC and FS series only (e.g. FD 1899-M2).
Low level of coding acc. to EN ISO 14119.

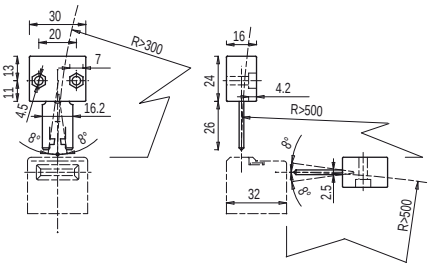
Article	Description
VF KEYF	Straight actuator



Article	Description
VF KEYF1	Angled actuator

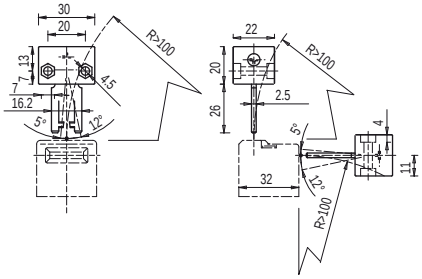


Article	Description
VF KEYF2	Jointed actuator



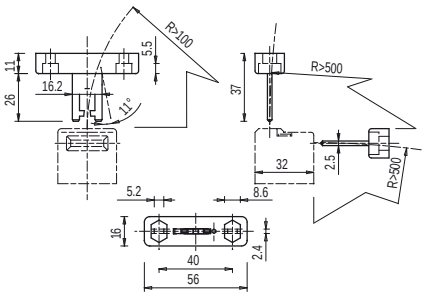
The actuator can flex in four directions for applications where the door alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions



Actuator adjustable in two directions for doors with reduced dimensions.

Article	Description
VF KEYF7	Actuator adjustable in one direction



Actuator adjustable in one direction for doors with reduced dimensions.

Items with code on **green** background are stock items

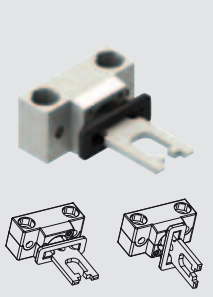
Accessories See page 287

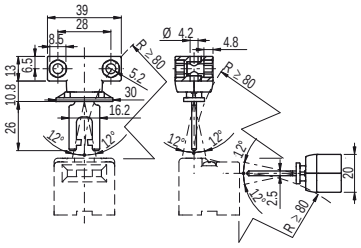
➔ The 2D and 3D files are available at **www.pizzato.com**

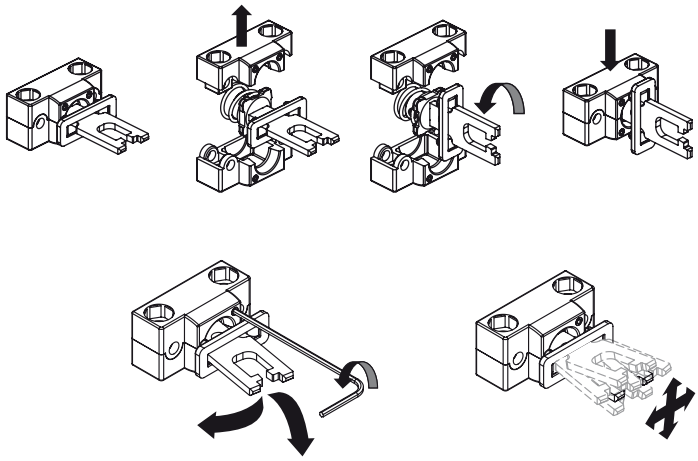
Universal actuator VF KEYF8

IMPORTANT: These actuators can be used with items of the FD, FP, FL, FC and FS series only (e.g. FD 1899-M2).
Low level of coding acc. to EN ISO 14119.

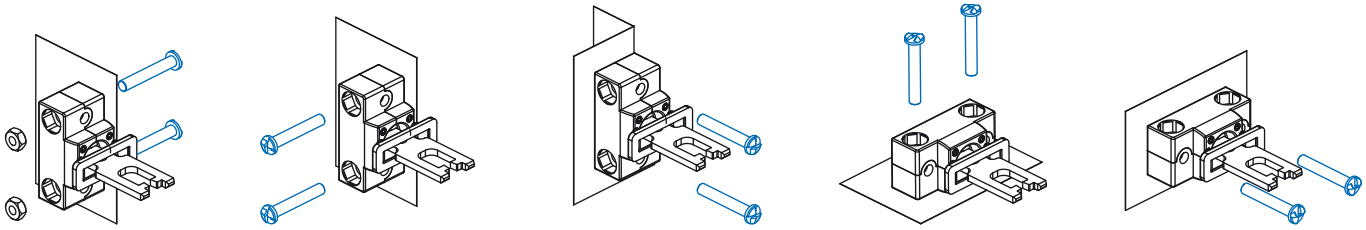
Article	Description
VF KEYF8	Universal actuator







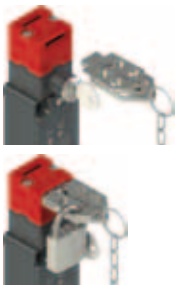
Joined and two directions adjustable actuator for doors with reduced dimensions.
The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.



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.
Hole diameter for padlocks 9 mm.



Article	Description
VF KLA371	Set of two locking keys

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

Items with code on **green** background are stock items

Accessories See page 287

→ The 2D and 3D files are available at **www.pizzato.com**