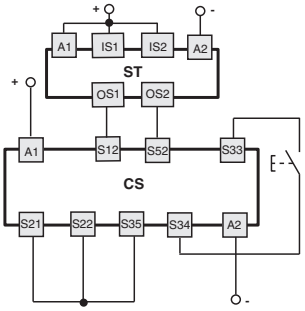
Connection with safety modules

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

Input configuration with monitored start

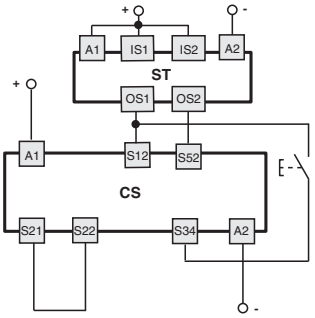
2 channels / Category 4 / up to SIL 3 / PL e



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

Input configuration with manual start (CS AR-05••••) or monitored start (CS AR-06••••)

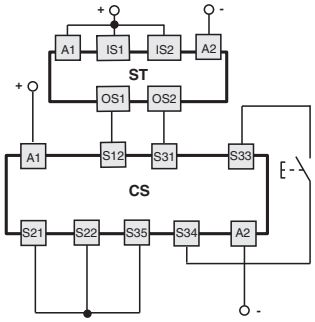
2 channels / Category 4 / up to SIL 3 / PL e



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

Input configuration with monitored start

2 channels / Category 4 / up to SIL 3 / PL e

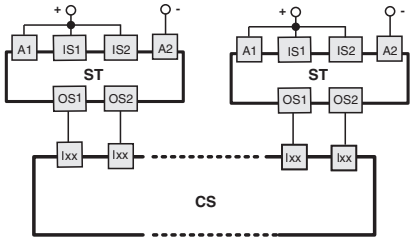


For features of the safety modules see page 305.

Connection with safety module CS MP••••0

The connections vary according to the program of the module

Category 4 / up to SIL 3 / PL e



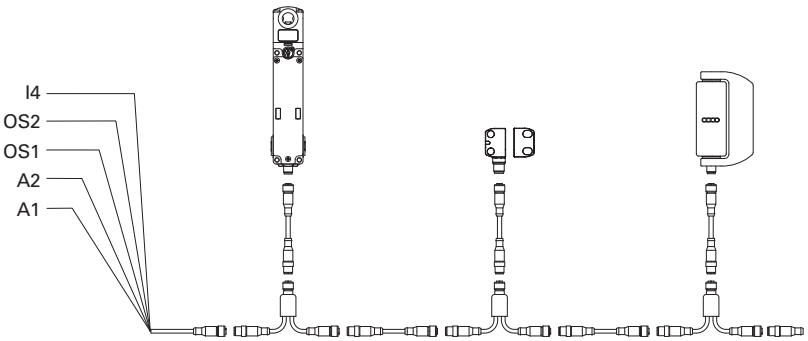
For application examples, see page 368.

Series connection

To simplify series connections of the devices, various M12 connectors are available that allow complete wiring.

This solution significantly reduces installation times while at the same time maintaining the maximum safety levels PL e and SIL 3.

For more information see page 426.



Multitag function

This version of the device is supplied with two or more high level coded actuators, all of which can be acknowledged by the same sensor.

The internal firmware of the sensor can be factory programmed, memorising up to 16 actuators and associating a different device behaviour to each of the same once the actuator has been acknowledged by the sensor.

The new multitag function lets you activate or deactivate the sensor outputs, and also send the information on which actuator is in front of the sensor, using a serial signal via the O3 signalling output. This signal can be sent and processed by a PLC.

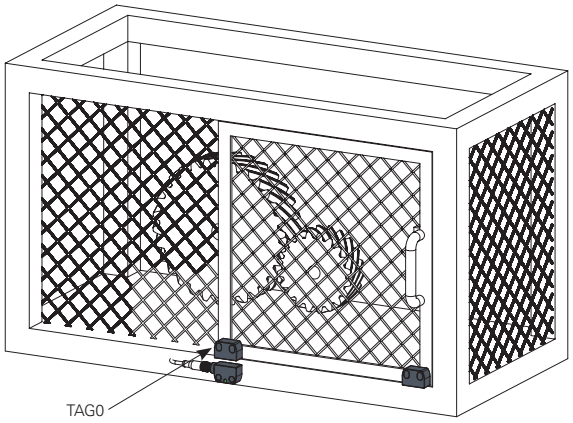
Programming code	Number of actuators	Programming
P1	2 x SM G1T	TAG0 activates the OS safety outputs TAG1 activates the O3 signalling output
P2	2 x SM G1T	TAG0 activates the OS safety outputs and sends "0" to O3 TAG1 activates the OS safety outputs and sends "1" to O3
P3	3 x SM G1T	TAG0 activates the OS safety outputs and sends "0" to O3 TAG1 activates the OS safety outputs and sends "1" to O3 TAG2 activates the OS safety outputs and sends "2" to O3
P4	4 x SM G1T	TAG0 activates the OS safety outputs and sends "0" to O3 TAG1 activates the OS safety outputs and sends "1" to O3 TAG2 activates the OS safety outputs and sends "2" to O3 TAG3 activates the OS safety outputs and sends "3" to O3

Note: The actuators are supplied with an indelible laser-engraved ID code.

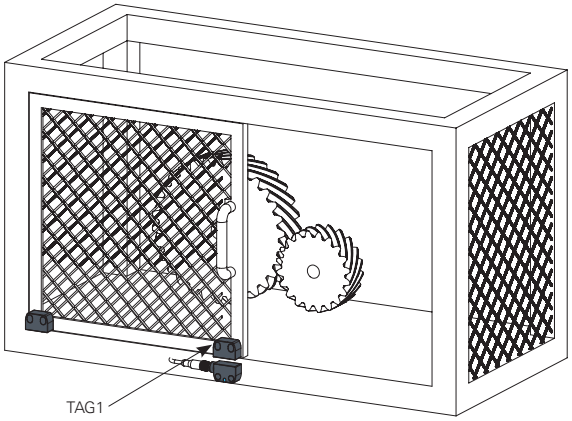
Other programming options are available on request.
Contact technical support for more information.

Attention! As required by EN ISO 14119 to be used in safety applications, all the actuators must be fixed immovably on the machine, and none of them can be used as a bypass to activate the device.

Application example for ST G••••••-P1 articles



A. Guard closed



B. Guard fully open

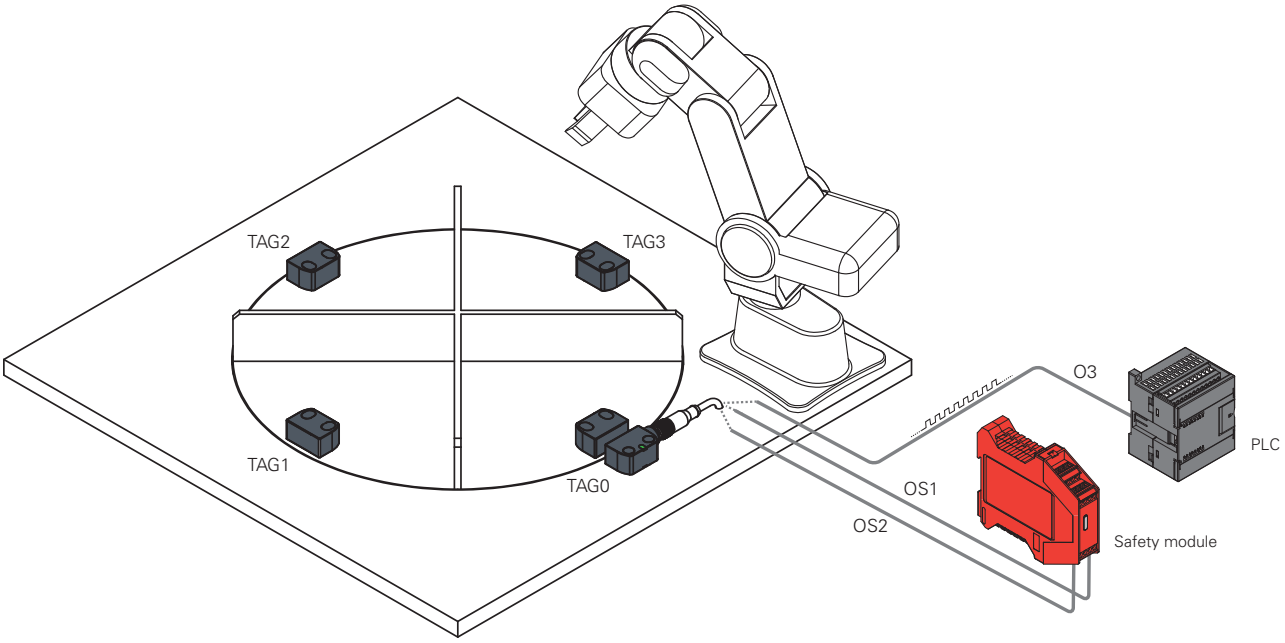
Article ST G••••••-P1 has a sensor with two actuators.

Compared to a traditional configuration with one single actuator, the device is able to not only recognise "guard closed" status through actuator 0 (in this case activating the OS safety outputs), but also "guard fully open" status, through actuator 1, which activates signalling output O3.

By sending this information to the machine control logic you can eliminate uncertainties caused by incomplete guard opening, increasing the precision and intrinsic safety of the machine.

This device is typically used on a press or any automatic machine in general, which uses a robot to load and unload workpieces if you want the robot to operate only when the guard is fully open.

Application example for ST G••••••-P4 articles



Article ST G••••••-P4 has a sensor with four actuators.

On a rotary table assembly station, the ST G sensor can be installed in combination with as many actuators as the available work stations (4 in the example shown).

When recognised by the sensor, each actuator activates the OS safety outputs and sends a string of bits with its ID code ("0" for TAG0, "1" for TAG1, up to "F" for TAG15, according to hexadecimal numbering). In this way, in every situation you can know which is the active work station, for example in the machine start-up phase or after an unexpected blackout.

The device has been designed for processing and assembly plants with multiple stations, robotised islands and machining centres.

Transmission protocol on signalling output O3

The articles with multitag programming (in the special versions) can transmit an actuator identification code with a serial signal sent through the O3 signalling output when the actuator is in front of the sensor.

The information is sent in a sequence of bits (0, 1) which represents the ASCII code of the hexadecimal number associated with the actuator (TAG0 = 0, TAG1 = 1 ... TAG9 = 9, TAG10= A ... TAG15 = F). 8 bits are required for each TAG to complete the transmission.

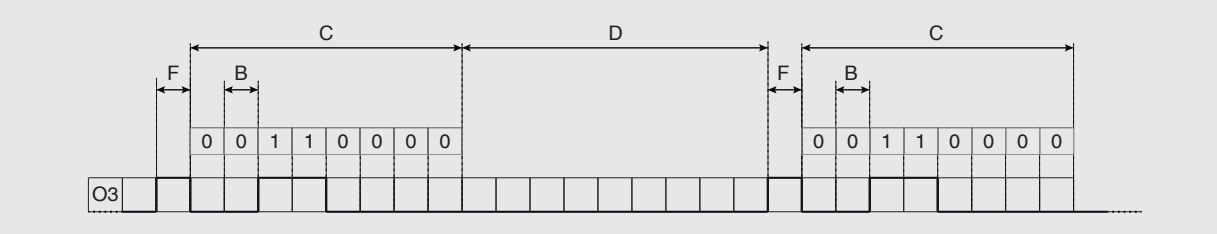
For example, ID code "0" of the first actuator is sent by the sensor as a sequence of the following bits:

00110000 (ASCII code: “zero” digit)

The start bit is used at the beginning of the sequence to signal the start of the transmission, while the network goes into a rest state at the end of the transmission (network idle low or equal to 0, no stop bit) for a pre-set interval of time.

All you need is a PLC with a program that can code the O3 input transmission, to process the information so it can be used in the machine control logic.

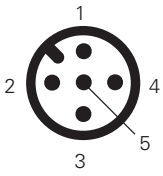
Transmission parameters		
A	Coding type:	serial
B	Bit duration:	20 ms
C	Byte length:	160 ms (8 bit)
D	Interval:	200 ms
E	Network idle:	low
F	Start bit:	1
G	Stop bit:	none



Internal device connections

5-pole versions
ST ••1••••, ST ••2••••, ST ••6••••

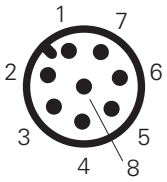
M12 connector	Cable	Connection
1	brown	A1 (+)
2	white	OS1
3	blue	A2 (-)
4	black	OS2
5	grey	O3 [a]



[a] deactivated output for ST ••1•••• articles.

8-pole versions
ST ••3••••, ST ••4••••, ST ••5••••,
ST ••7••••, ST ••8••••, ST ••9••••

M12 connector	Cable	Connection
1	white	A1 (+)
2	brown	IS1
3	green	A2 (-)
4	yellow	OS1
5	grey	O3
6	pink	IS2
7	blue	OS2
8	red	not connected [a] I3 [b] EDM [c]



[a] for articles ST ••3••••, ST ••7••••.
[b] for articles ST ••4••••, ST ••8••••.
[c] for articles ST ••5••••, ST ••9••••.

Legend

A1-A2: supply
IS1-IS2 Safety inputs
OS1-OS2: safety outputs
O3: signalling output
I3: programming input
EDM: input for monitoring of NC contacts of the contactors

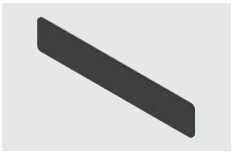
Note: Versions with customised pin assignments are available on request.

For female connectors, see page 419.

Ambient temperature for sensors with cable

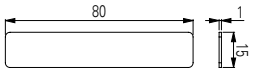
	Connection type	Output with cable			Output with cable and M12 connector	
Cable features	Cable type	N	N	H		
	Conductors	8x0.25 mm²	5x0.25 mm²	8x0.25 mm²	8x0.25 mm²	5x0.25 mm²
	Application field	General	General	General, mobile installation	General	General
	In compliance with standards	03VV5-H	03VV5-H	03E7Q-H	03VV5-H	03VV5-H
	Sheath	PVC OIL RESISTANT	PVC OIL RESISTANT	PUR Halogen Free	PVC OIL RESISTANT	PVC OIL RESISTANT
	Self-extinguishing	IEC 60332-1-2 UL 758:FT1	IEC 60332-1-2 UL 758:FT1	IEC 60332-1-2 UL 758:FT1	IEC 60332-1-2 UL 758:FT1	IEC 60332-1-2 UL 758:FT1
	Oil resistant	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210
	Max. speed	50 m/min.	50 m/min.	300 m/min.	50 m/min.	50 m/min.
	Max. acceleration	5 m/s²	5 m/s²	30 m/s²	5 m/s²	5 m/s²
	Minimum bending radius	90 mm	75 mm	70 mm	90 mm	75 mm
	Outer diameter	6 mm	6 mm	6 mm	6 mm	6 mm
	End stripped	80 mm	80 mm	80 mm	/	/
	Copper conductors	Class 6 IEC 60228	Class 6 IEC 60228	Class 6 IEC 60228	Class 6 IEC 60228	Class 6 IEC 60228
	Engraving	6275	6267	6284	6275	6267
Ambient temperature standard	Cable, fixed installation	-25°C ... +70°C	-25°C ... +70°C	-25°C ... +70°C	-25°C ... +70°C	-25°C ... +70°C
	Cable, flexible installation	-15°C ... +70°C	-15°C ... +70°C	-25°C ... +70°C	-15°C ... +70°C	-15°C ... +70°C
	Cable, mobile installation	-15°C ... +70°C	-15°C ... +70°C	-25°C ... +70°C	-15°C ... +70°C	-15°C ... +70°C
Ambient temperature extended (T8)	Cable, fixed installation	-35°C ... +85°C	-35°C ... +85°C	-35°C ... +85°C	-35°C ... +85°C	-35°C ... +85°C
	Cable, flexible installation	-15°C ... +85°C	-15°C ... +85°C	-15°C ... +85°C	-15°C ... +85°C	-15°C ... +85°C
	Cable, mobile installation	-15°C ... +85°C	-15°C ... +85°C	-15°C ... +85°C	-15°C ... +85°C	-15°C ... +85°C
	Approvals	CE cULus TUV EAC	CE cULus TUV EAC	CE cULus TUV EAC	CE cULus TUV EAC	CE cULus TUV EAC

Accessories



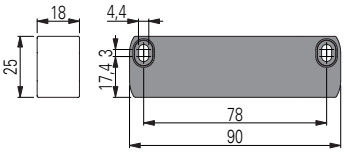
Article	Description
VS SP5CA1	Polyurethane foam adhesive strip for SM H•T actuators

Protective polyurethane foam strip, with adhesive, applicable on SM H•T actuators, reduces noise and force in case of impact between sensor and actuator.



Article	Description
SM H9ZF	Door holding magnet (holding force 40 N)
SM H9ZQ	Door holding magnet (holding force 40 N, opposite polarity to SM H9ZF)

Holding magnets for use on machinery doors. The magnets are sealed inside a plastic cover and will not rust even in damp environments.

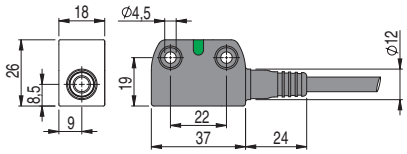


All values in the drawings are in mm

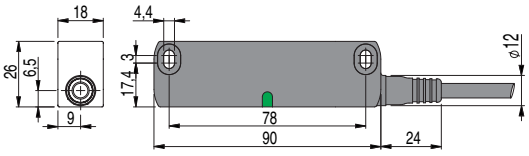
→ The 2D and 3D files are available at **www.pizzato.com**

Dimensional drawings

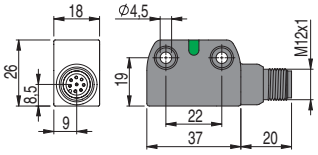
ST G••••N• sensor with cable



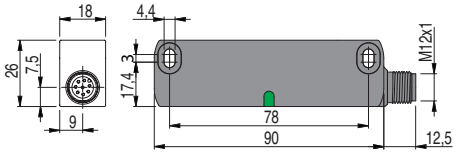
ST H••••N• sensor with cable



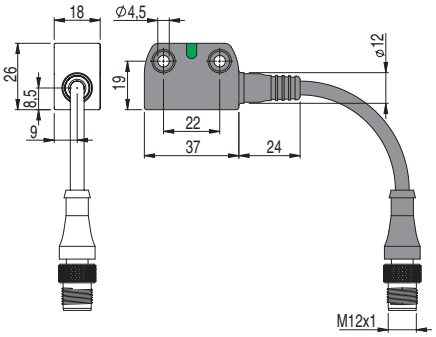
ST G••••M• sensor with M12 connector



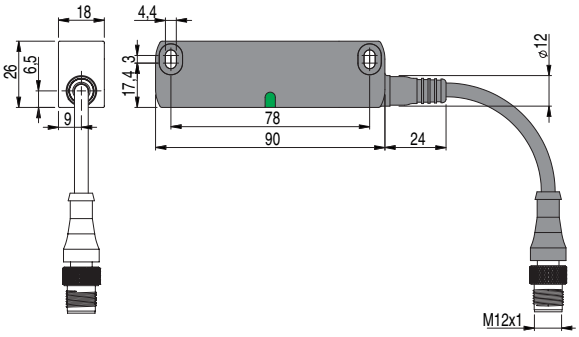
ST H••••M• sensor with M12 connector



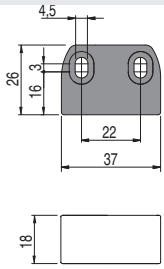
ST G••••M0.2 sensor with cable and M12 connector



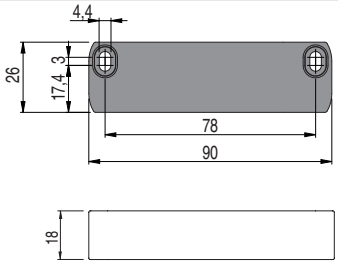
ST H••••M0.2 sensor with cable and M12 connector



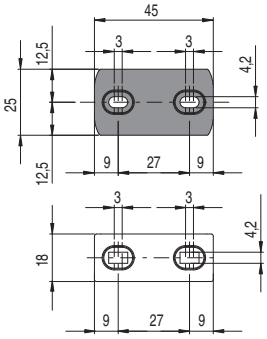
SM G•T actuator



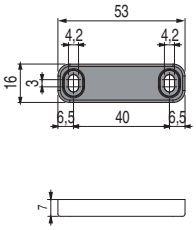
SM H•T actuator



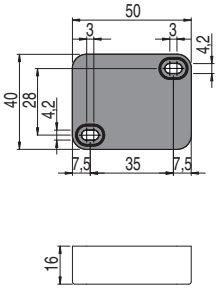
SM D•T actuator



SM L•T actuator



SM E•T actuator



All values in the drawings are in mm

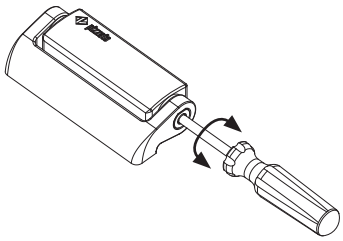
➔ The 2D and 3D files are available at **www.pizzato.com**

HP-HC series safety hinge switches

Description

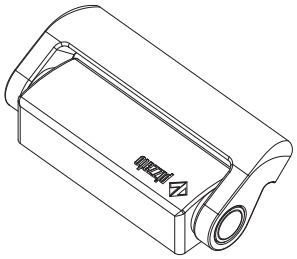
The HP - HC series hinge switches from Pizzato Elettrica combine safety and style in a single product. The electric switch is fully integrated into the mechanical hinge so that it is virtually invisible to an inexpert eye. This, asides from being an aesthetic advantage, guarantees greater safety as a switch which is difficult to identify is consequently even more difficult to tamper with. The rear mounting without screws in sight and the very precise line mean the switch can be perfectly integrated even with guards of machinery with a very precise design. Complementary hinges with purely mechanical functions are also available to ensure perfect alignment with the rest of the machine.

Adjustment of the switching point



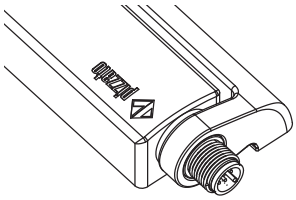
The switching point of the switches can be set with a screwdriver.
Adjusting the switching point allows for any calibration for large size guards. After calibrating the switch, it is always necessary to close the hole using the safety cap supplied.

Basic activation angle variants



On request, versions with a switch activation angle of 15° multiples (e.g. 45° or 90°) are available.
The different activation angle does not exclude the possibility of adjustment of the switching point by means of the adjustment screw in the switch. Any change in the operating angle clearly does not alter the maximum mechanical switch travel.

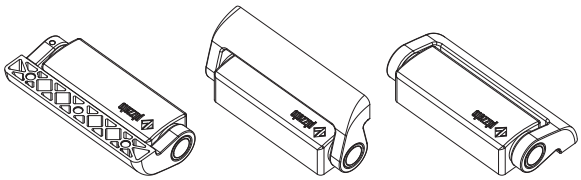
Integrated M12 connector



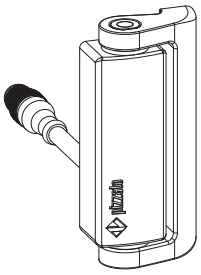
Versions with connection from the top or the bottom are available with integrated M12 connector.
The use of versions with connectors permits faster wiring if guards need to be moved from the test location to the installation site.

Opening angle up to 180°

The mechanical design of the switch also allows use on guards with an opening angle of up to 180°.

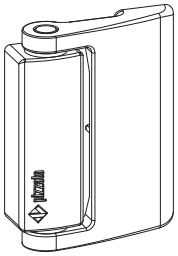


Cable with connector at the back



The version with a rear cable and M12 connector is the best combination between aesthetics and connection ease.
If machines need to assembled at the customer's site, this solution allows the wiring to be hidden. At the same time, it facilitates the connection and disconnection of the wiring from inside the machinery.

Versions for glass or polycarbonate doors



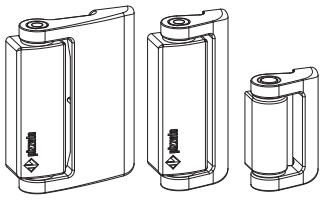
A version of the switch developed exclusively for glass and polycarbonate doors without frame is available.
Installation is facilitated by the larger supporting arm and the spaced fixing points; these also prevent the formation of cracks caused by holes located too close to the edge of the guard.
It is necessary to verify that the switch is not used as a mechanical stop for the door.

Protection degrees IP67 and IP69K

IP69K
IP67

These devices are designed to be used under the toughest environmental conditions, and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where the maximum degree of protection is required for the housing. Due to their special design, these devices are suitable for use in equipment subjected to cleaning with high pressure hot water jets. These devices meet the IP69K test requirements according to ISO 20653 (water jets with 100 bar and 80°C).

Additional hinges

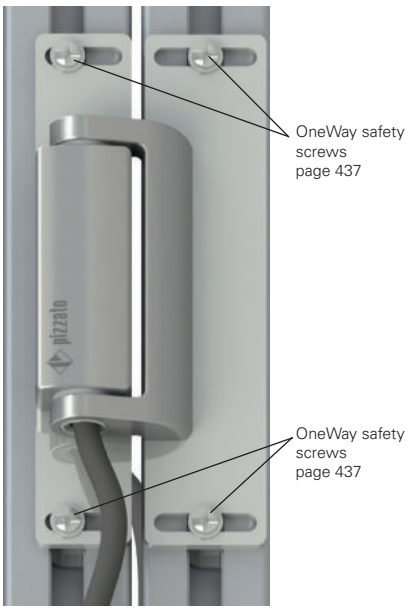


To complete the installation, various types of additional hinges are available to be used in a variable number depending on the weight of the guard.
These hinges have the same aesthetic but cost less as they contain no electrical parts.

Application examples

- Switch without mounting plate.
- Rear fixing.
- Cable output at the back.

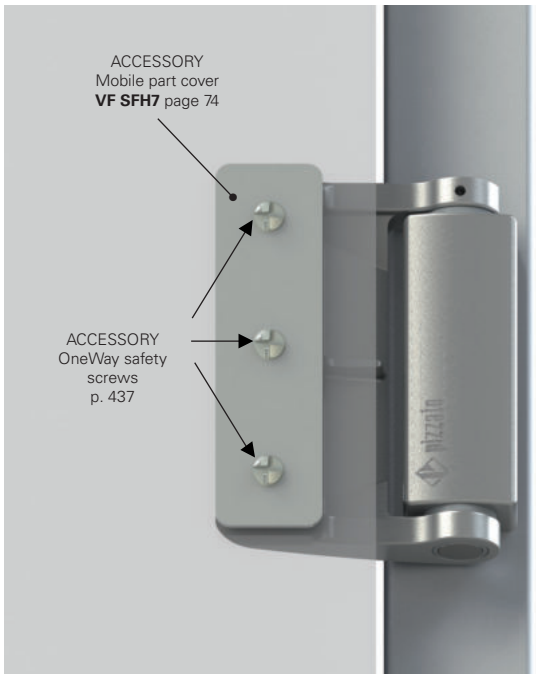
- Switch with angular mounting plate for slotted profile.
- Fixing with internal screws.
- Output with M12 connector at the bottom.



- Switch with straight mounting plate for front slotted profile.
- Fixing with screws at the back.
- Cable output at the bottom.

Closed door

Open door



- Direct fixing to the polycarbonate plate.
- Switch without mounting plate.
- Fixing with internal screws.
- Output with connector at the back.

Selection diagram

DESIGNS

A

100x45 mm movable part, metal

B

100x75 mm movable part, metal

CABLES AND CONNECTORS

S

Cable output, bottom (standard)

A

Cable output, top

P

Cable output, back

KSM

M12 connector, bottom

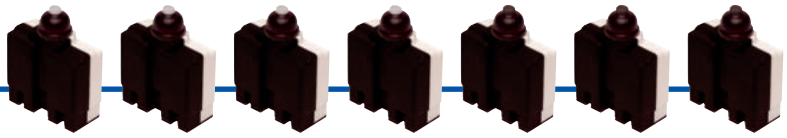
KAM

M12 connector, top

0.2PM

Cable, length: 0.2 m, with M12 connector, at back

CONTACT BLOCKS



52C
1NO+1NC slow action

52D
2NC slow action

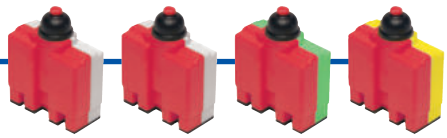
52F
1NO+2NC slow action

52M
2NO+2NC slow action

53C
1NO+1NC slow action, make before break

53F
1NO+2NC slow action, make before break

53M
2NO+2NC slow action, make before break



50C
1NO+1NC snap action

50D
2NC snap action

50F
1NO+2NC snap action

50M
2NO+2NC snap action

ADDITIONAL HINGES

HC LL

HC AA

HC AB

product option

Code structure

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

article: HP AA052C-2SN — options: GH15T6

Movable part

A	100x45 mm movable part, metal
B	100x75 mm movable part, metal

Ambient temperature

	-25°C … +80°C
T6	-40°C … +80°C

Contact block

52C	1NO+1NC, slow action
52D	2NC, slow action
52F	1NO+2NC, slow action
52M	2NO+2NC, slow action
53C	1NO+1NC, slow action, make before break
53F	1NO+2NC, slow action, make before break
53M	2NO+2NC, slow action, make before break
50C	1NO+1NC, snap action
50D	2NC, snap action
50F	1NO+2NC, snap action
50M	2NO+2NC, snap action

The versions with snap-action contact blocks are recommended for doors having a radius not greater than 600 mm.

Activation angle

	0° activation angle (standard)
H15	15° activation angle
H30	30° activation angle
H45	45° activation angle
H60	60° activation angle
H75	75° activation angle
H90	90° activation angle
H105	105° activation angle
H120	120° activation angle
H135	135° activation angle
H345	345° activation angle

Contact type

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

Connection type

0.2	cable, length: 0.2 m with M12 connector (available for 0.2 PM versions only)
0.5	cable, length: 0.5 m
...	…
2	cable, length: 2 m (standard)
...	…
10	cable, length: 10 m
K	integrated M12 connector

Cable or connector type

N	PVC cable, IEC 60332-1-2 oil-resistant (standard)
E	PVC cable, IEC 60332-1-2 (with 2 contacts only)
H	PUR cable, halogen free
R	cable for railway applications (EN 50306-4)
M	M12 connector

Output direction, connections

S	movable part at the right and bottom output
P	movable part at the right and output at the back
A	movable part at the right and output at top
Q	movable part at the left and output at the back

Code structure for additional hinges

article: HC AA — options: V46

Movable part

HC AA	100x45 mm
HC AB	100x75 mm
HC LL	65x45 mm

Ground connection

	with no ground connection between the fixed par and the moving part (standard)
V46	with ground connection between the fixed part and the moving part

HP-HC series safety hinge switches

Main features

- Metal housing, cable output at top, bottom or back
- 4 types of integrated cable available
- Versions with M12 connector
- Protection degrees IP67 and IP69K
- 11 contact blocks with positive opening ⊕
- Additional hinges without contacts

Quality marks:

IMQ approval:	CA02.03746
UL approval:	E131787
CCC approval:	2021000305000108
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

Metal housing, powder-coated
Versions with integrated cable, length 2 m, other lengths from 0.5 … 10 m on request
Versions with integrated M12 connector
Versions with M12 connector and 0.2 m cable, other lengths from 0.1 … 3 m on request

Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)
Corrosion resistance in saline mist:	≥ 300 hours in NSS acc. to ISO 9227

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061*
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1*
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	5,000,000 for NC contacts
Mission time	20 years
Ambient temperature for hinges without cable:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Ambient temperature for hinges with cable:	See table on page 70
Max. actuation frequency:	1200 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	90°/s
Min. actuation speed:	2°/s
Mounting position:	any
Tightening torque, M5 screws:	3 … 5 Nm

Electrical data

Rated impulse withstand voltage U_{imp}:	4 kV
Conditional short circuit current:	1000 A acc. to EN 60947-5-1
Pollution degree:	3

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN IEC 63000, ISO 20653, UL 508, CSA C22.2 No. 14.

Approvals:
EN 60947-5-1, UL 508, CSA C22.2 No. 14, GB/T14048.5

Compliance with the requirements of:
Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU.

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 the instructions given on pages 439 to 454.

⚠ Important: Switch off the circuit voltage before disconnecting the connector from the switch. The connector is not suitable for separation of electrical loads. According to EN 60204-1, versions with 8-pole M12 (2NO+2NC) connector can be used only in SELV circuits.

Features approved by IMQ

Rated insulation voltage (U_i):	250 Vac
Conventional free air thermal current (Ith):	10 A (1-2 contacts) / 6 A (2-3 contacts) / 4 A (4 contacts or 5-pole M12 connector)
Protection against short circuits (fuse):	10 A (1-2 contacts) / 6 A (2-3 contacts) / 4 A (4 contacts or 5-pole M12 connector) type gG
Rated impulse withstand voltage (U_{imp}):	4 kV
Protection degree of the housing:	IP67
MA terminals (crimped terminals)	
Pollution degree:	3
Utilization category:	AC15 / DC13 (with connector)
Operating voltage (U_e):	250 Vac (50 Hz) / 24 Vdc (with connector)
Operating current (I_e):	3 A / 2 A (with connector)

Forms of the contact element: X, Y, Zb, X+X, Y+Y, Y+Y+X, X+X+Y, X+X+Y+Y
Positive opening contacts on contact blocks 50A, 50C, 50D, 50F, 50G, 50M, 51A, 51C, 51D, 51F, 51G, 51M, 52A, 52C, 52D, 52F, 52G, 52M, 53A, 53C, 53D, 53F, 53G, 53M

In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

Features approved by UL

Electrical Ratings:	R300 pilot duty (28 VA, 125-250 Vdc) B300 pilot duty (360 VA, 120-240 Vac) (1-2-3 cont.) C300 pilot duty (180 VA, 120-240 Vac) (4 cont.) 24 Vac, Class 2, 2 A pilot duty (M12 connector) 24 Vdc, Class 2, 0.22 A pilot duty (M12 connector)
Environmental Ratings:	Type 1

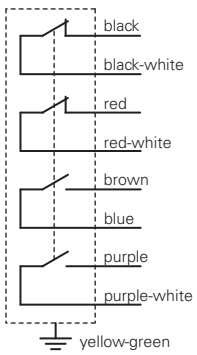
Please contact our technical department for the list of approved products.

Ambient temperatures for hinges with cable and electrical data

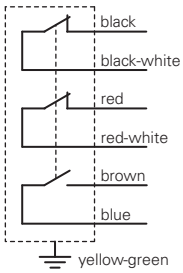
	Connection type	Output with cable								Output with M12 connector	
	Contact blocks	2 contacts				3 contacts		4 contacts		2 contacts	3 or 4 contacts
	Cable or connector type	E	N	H	R	N	H	N	R	M12 connector, 5-pole	M12 connector, 8-pole
Cable features	Conductors	5x0.75 mm²	5x0.75 mm²	5x0.75 mm²	5x0.5mm²	7x0.5 mm²	7x0.5 mm²	9x0.34 mm²	9x0.5 mm²	5x0.25 mm²	8x0.25 mm²
	Application field	General	General	General, mobile installation	Rail	General	General, mobile installation	General	Rail	General	General
	In compliance with standards	H05VV-F	05VV5-F	05EQ-H	EN50306-4 1E-300V 5G0.5 mm² MM-90 EN 50306-4 EN 45545	03VV-F	03E7Q-H	03VV-F	EN50306-4 1P-300V- 9G0.5 mm² MM-90 EN 50306-4 EN 45545	03VV-H	03VV-H
	Sheath	PVC	PVC OIL RESISTANT	PUR HALOGEN FREE	/	PVC OIL RESISTANT	PUR HALOGEN FREE	PVC OIL RESISTANT	/	PVC OIL RESISTANT	PVC OIL RESISTANT
	Self-extinguishing	IEC 60332-1-2	IEC 60332-1-2 UL 758:FT1 CEI 20-22 II	IEC 60332-1-2 UL 758:FT1	IEC 60332-1 EN 50305 EN 50306-1	IEC 60332-1-2 UL 758:FT1 CEI 20-22 II	IEC 60332-1-2 UL 758:FT1	IEC 60332-1-2 UL 758:FT1 CEI 20-22 II	IEC 60332-1 EN 50305 EN 50306-1	IEC 60332-1-2 CEI 20-22 II UL 758:FT1	IEC 60332-1-2 CEI 20-22 II UL 758:FT1
	Oil resistant	/	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210	/	UL 758 CSA 22.2 N°210	UL 758	UL 758 CSA 22.2 N°210	/	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210
	Max. speed	/	/	300 m/min	/	/	300 m/min	/	/	50 m/min	50m/min
	Max. acceleration	/	/	30 m/s²	/	/	30 m/s²	/	/	5 m/s²	5m/s²
	Minimum bending radius	80 mm	80 mm	80 mm	60 mm	108 mm	80 mm	108 mm	65 mm	75 mm	90 mm
	Outer diameter	8 mm	8 mm	8 mm	6 mm	7 mm	7 mm	7 mm	6.5 mm	6 mm	6 mm
	End stripped	80 mm	80 mm	80 mm	80 mm	80 mm	80 mm	80 mm	80 mm	/	/
	Copper conductors IEC 60228	Class 5	Class 5	Class 6	Class 5	Class 5	Class 6	Class 5	Class 5	Class 6	Class 6
	Engraving	Standard	6268	6280	Standard	6274	6282	6278	Standard	6267	6275
Ambient temperature with cable standard	Cable, fixed installation	-15°C +60°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C
	Cable, flexible installation	+5°C +60°C	-5°C +80°C	-25°C +80°C	-25°C +80°C	-5°C +80°C	-25°C +80°C	-5°C +80°C	-25°C +80°C	-15°C +80°C	-15°C +80°C
	Cable, mobile installation	/	/	-25°C +80°C	/	/	-25°C +80°C	/	/	-15°C +80°C	-15°C +80°C
Ambient temperature with cable extended (T6)	Cable, fixed installation	/	/	-40°C +80°C	-40°C +80°C	/	-40°C +80°C	/	-40°C +80°C	/	/
	Cable, flexible installation	/	/	-40°C +80°C	-40°C +80°C	/	-40°C +80°C	/	-40°C +80°C	/	/
	Cable, mobile installation	/	/	-40°C +80°C	/	/	-40°C +80°C	/	/	/	/
Electrical data	Thermal current Ith	10 A	10 A	10 A	6 A	6 A	6 A	3 A	4 A	4 A	2 A
	Rated insulation voltage Ui	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac 300 Vdc	30 Vac 36 Vdc
	Protection against short circuits (fuse)	10 A 500 V type gG	10 A 500 V type gG	10 A 500 V type gG	6 A 500 V type gG	6 A 500 V type gG	6 A 500 V type gG	3 A 500 V type gG	4 A 500 V type gG	4 A 500 V type gG	2 A 500V type gG
	Utilization category DC13 — 24 V	2 A	2 A	2 A	2 A	2 A	2 A	2 A	2 A	2 A	2 A
	Utilization category DC13 — 125 V	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	/
	Utilization category DC13 — 250 V	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	/
	Utilization category AC15 — 24 V	4 A	4 A	4 A	4 A	4 A	4 A	3 A	4 A	4 A	2 A
	Utilization category AC15 — 120 V	4 A	4 A	4 A	4 A	4 A	4 A	3 A	4 A	4 A	/
	Utilization category AC15 — 250 V	4 A	4 A	4 A	4 A	4 A	4 A	3 A	4 A	4 A	/
	Approvals	CE cULus IMQ EAC CCC	CE cULus IMQ EAC CCC	CE cULus IMQ EAC CCC	CE IMQ EAC CCC	CE cULus IMQ EAC CCC	CE cULus IMQ EAC CCC	CE cULus IMQ EAC CCC	CE IMQ EAC CCC	CE cULus IMQ EAC CCC	CE cULus EAC

Internal cable wiring

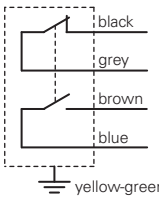
2NO+2NC



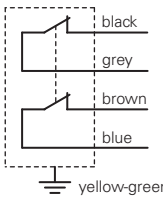
1NO+2NC



1NO+1NC



2NC



Connector pin assignment

2NO+2NC

1-2 NC
3-4 NC
5-6 NO
7-8 NO

1NO+2NC

3-4 NC
5-6 NC
7-8 NO
1 ⏚

1NO+1NC

1-2 NC
3-4 NO
5 ⏚

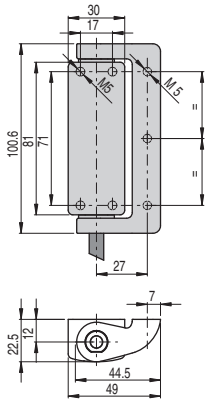
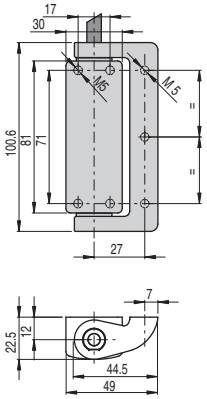
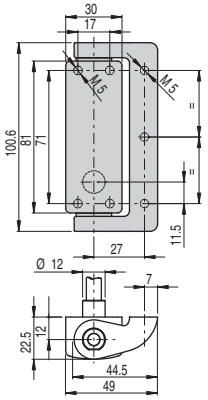
2NC

1-2 NC
3-4 NC
5 ⏚

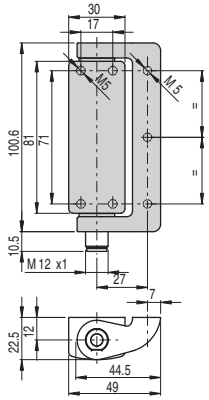
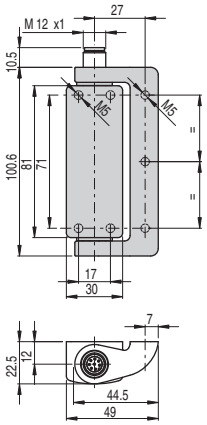
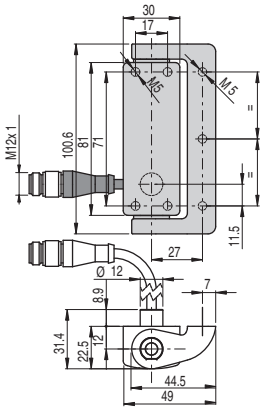
Female connectors See page 419

HP-HC series safety hinge switches

Contact type
L = slow action
LO = slow action, make before break

Contact block		2 m cable, bottom		2 m cable, top		2 m cable, back	
							
52C	L	HP AA052C-2SN	1NO+1NC	HP AA052C-2AN	1NO+1NC	HP AA052C-2PN	1NO+1NC
52D	L	HP AA052D-2SN	2NC	HP AA052D-2AN	2NC	HP AA052D-2PN	2NC
52F	L	HP AA052F-2SN	1NO+2NC	HP AA052F-2AN	1NO+2NC	HP AA052F-2PN	1NO+2NC
52M	L	HP AA052M-2SN	2NO+2NC	HP AA052M-2AN	2NO+2NC	HP AA052M-2PN	2NO+2NC
53C	LO	HP AA053C-2SN	1NO+1NC	HP AA053C-2AN	1NO+1NC	HP AA053C-2PN	1NO+1NC
53F	LO	HP AA053F-2SN	1NO+2NC	HP AA053F-2AN	1NO+2NC	HP AA053F-2PN	1NO+2NC
53M	LO	HP AA053M-2SN	2NO+2NC	HP AA053M-2AN	2NO+2NC	HP AA053M-2PN	2NO+2NC
Actuating force		0.3 Nm (0.65 Nm →)		0.3 Nm (0.65 Nm →)		0.3 Nm (0.65 Nm →)	
Travel diagrams		page 74 - group 1		page 74 - group 1		page 74 - group 1	

Contact type
L = slow action
LO = slow action, make before break

Contact block		M12 connector, bottom		M12 connector, top		cable (0.2 m) with M12 connector, back	
							
52C	L	HP AA052C-KSM	1NO+1NC	HP AA052C-KAM	1NO+1NC	HP AA052C-0.2PM	1NO+1NC
52D	L	HP AA052D-KSM	2NC	HP AA052D-KAM	2NC	HP AA052D-0.2PM	2NC
52F	L	HP AA052F-KSM	1NO+2NC	HP AA052F-KAM	1NO+2NC	HP AA052F-0.2PM	1NO+2NC
52M	L	HP AA052M-KSM	2NO+2NC	HP AA052M-KAM	2NO+2NC	HP AA052M-0.2PM	2NO+2NC
53C	LO	HP AA053C-KSM	1NO+1NC	HP AA053C-KAM	1NO+1NC	HP AA053C-0.2PM	1NO+1NC
53F	LO	HP AA053F-KSM	1NO+2NC	HP AA053F-KAM	1NO+2NC	HP AA053F-0.2PM	1NO+2NC
53M	LO	HP AA053M-KSM	2NO+2NC	HP AA053M-KAM	2NO+2NC	HP AA053M-0.2PM	2NO+2NC
Actuating force		0.3 Nm (0.65 Nm →)		0.3 Nm (0.65 Nm →)		0.3 Nm (0.65 Nm →)	
Travel diagrams		page 74 - group 1		page 74 - group 1		page 74 - group 1	

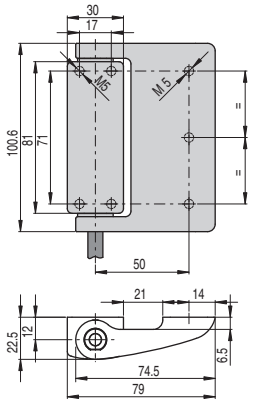
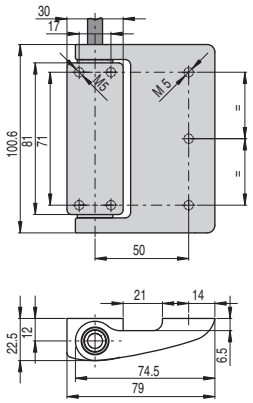
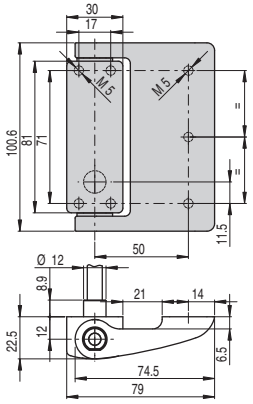
Attention! The safety hinge switch can be combined together exclusively with one or more Pizzato Elettrica hinges (HP or HC series). The use of whichever other hinge does not guarantee the correct operation of the safety device.

All values in the drawings are in mm

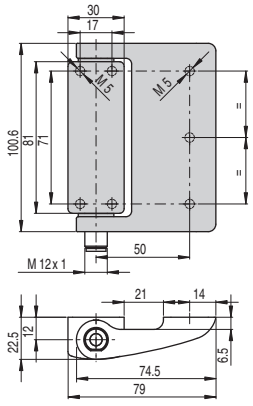
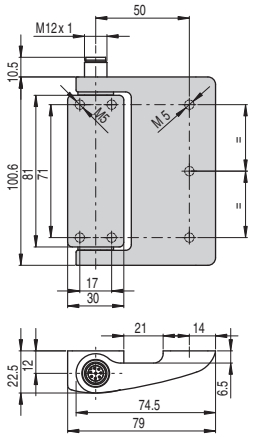
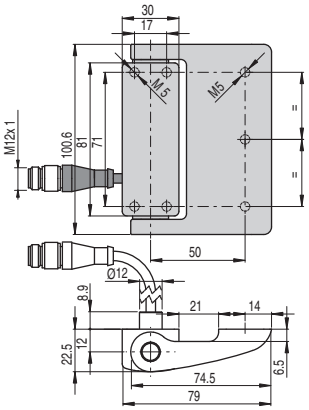
Accessories See page 419

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

Contact type
L = slow action
LO = slow action, make before break

Contact block		2 m cable, bottom		2 m cable, top		2 m cable, back	
							
52C	L	HP AB052C-2SN	1NO+1NC	HP AB052C-2AN	1NO+1NC	HP AB052C-2PN	1NO+1NC
52D	L	HP AB052D-2SN	2NC	HP AB052D-2AN	2NC	HP AB052D-2PN	2NC
52F	L	HP AB052F-2SN	1NO+2NC	HP AB052F-2AN	1NO+2NC	HP AB052F-2PN	1NO+2NC
52M	L	HP AB052M-2SN	2NO+2NC	HP AB052M-2AN	2NO+2NC	HP AB052M-2PN	2NO+2NC
53C	LO	HP AB053C-2SN	1NO+1NC	HP AB053C-2AN	1NO+1NC	HP AB053C-2PN	1NO+1NC
53F	LO	HP AB053F-2SN	1NO+2NC	HP AB053F-2AN	1NO+2NC	HP AB053F-2PN	1NO+2NC
53M	LO	HP AB053M-2SN	2NO+2NC	HP AB053M-2AN	2NO+2NC	HP AB053M-2PN	2NO+2NC
Actuating force		0.3 Nm (0.65 Nm)		0.3 Nm (0.65 Nm)		0.3 Nm (0.65 Nm)	
Travel diagrams		page 74 - group 1		page 74 - group 1		page 74 - group 1	

Contact type
L = slow action
LO = slow action, make before break

Contact block		M12 connector, bottom		M12 connector, top		cable (0.2 m) with M12 connector, back	
							
52C	L	HP AB052C-KSM	1NO+1NC	HP AB052C-KAM	1NO+1NC	HP AB052C-0.2PM	1NO+1NC
52D	L	HP AB052D-KSM	2NC	HP AB052D-KAM	2NC	HP AB052D-0.2PM	2NC
52F	L	HP AB052F-KSM	1NO+2NC	HP AB052F-KAM	1NO+2NC	HP AB052F-0.2PM	1NO+2NC
52M	L	HP AB052M-KSM	2NO+2NC	HP AB052M-KAM	2NO+2NC	HP AB052M-0.2PM	2NO+2NC
53C	LO	HP AB053C-KSM	1NO+1NC	HP AB053C-KAM	1NO+1NC	HP AB053C-0.2PM	1NO+1NC
53F	LO	HP AB053F-KSM	1NO+2NC	HP AB053F-KAM	1NO+2NC	HP AB053F-0.2PM	1NO+2NC
53M	LO	HP AB053M-KSM	2NO+2NC	HP AB053M-KAM	2NO+2NC	HP AB053M-0.2PM	2NO+2NC
Actuating force		0.3 Nm (0.65 Nm)		0.3 Nm (0.65 Nm)		0.3 Nm (0.65 Nm)	
Travel diagrams		page 74 - group 1		page 74 - group 1		page 74 - group 1	

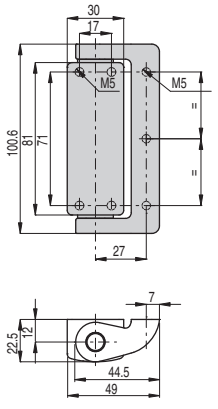
Attention! The safety hinge switch can be combined together exclusively with one or more Pizzato Elettrica hinges (HP or HC series). The use of whichever other hinge does not guarantee the correct operation of the safety device.

All values in the drawings are in mm

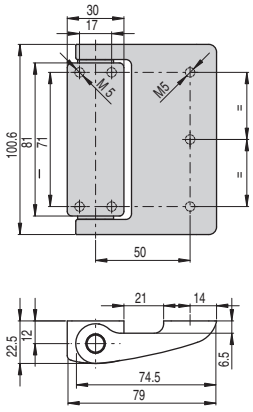
Accessories See page 419

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

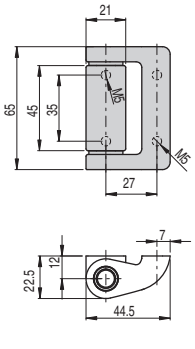
Additional hinges



HC AA



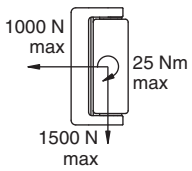
HC AB



HC LL

Maximum forces and loads HP AA••••-•••, HC AA, HC LL

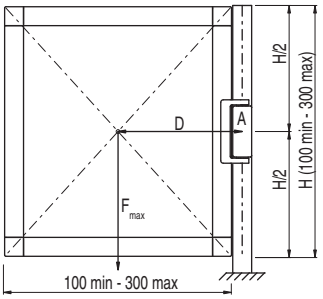
Admitted max. loads, independent of utilization conditions.



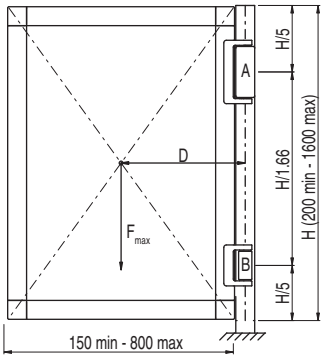
Attention: Never exceed the loads listed above under any circumstances.

The loads have been verified by a fatigue test of one million operating cycles with a 90° opening angle.

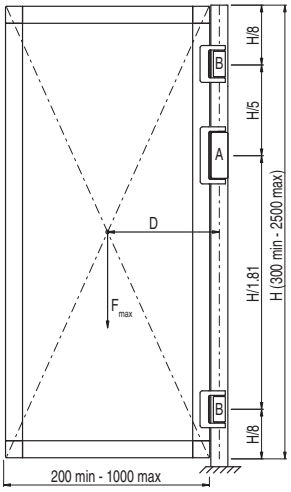
Doors with one safety hinge
F_{max} (N)=25,000/D (mm)



Doors with one safety hinge and one additional hinge
F_{max}(N)=200,000/D (mm)



Doors with one safety hinge and two additional hinges
F_{max} (N)=250,000/D (mm)

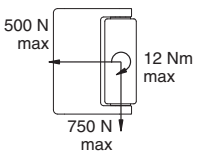


Legend

F_{max}	Force exerted by the weight of the door (N)
D (mm)	Distance from the centre of gravity of the door to the axis of the hinge
A	Safety hinge
B	Additional hinge

Maximum forces and loads HP AB••••-•••, HC AB

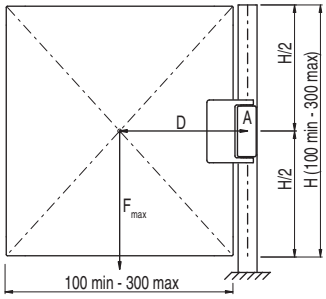
Admitted max. loads, independent of utilization conditions.



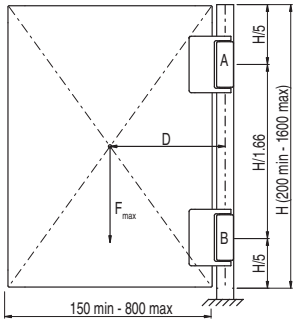
Attention: Never exceed the loads listed above under any circumstances.

The loads have been verified by a fatigue test of one million operating cycles with a 90° opening angle.

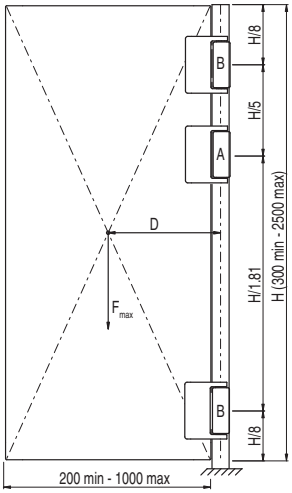
Doors with one safety hinge
F_{max} (N)=12,500/D (mm)



Doors with one safety hinge and one additional hinge
F_{max}(N)=100,000/D (mm)



Doors with one safety hinge and two additional hinges
F_{max} (N)=200,000/D (mm)



Legend

F_{max}	Force exerted by the weight of the door (N)
D (mm)	Distance from the centre of gravity of the door to the axis of the hinge
A	Safety hinge
B	Additional hinge

Accessories

Article	Description
VF AC7032	Protection cap for adjustment screw

The cap is supplied with every hinge and must always be inserted after the adjustment of the switching point.

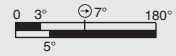
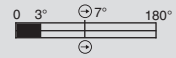
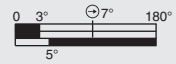
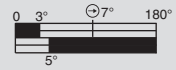
In case of loss or damage, the cap can be ordered separately.

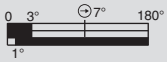
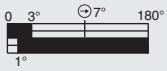
All values in the drawings are in mm

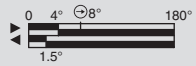
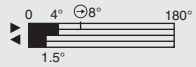
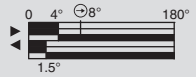
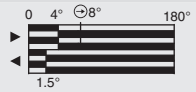
Accessories See page 419

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

Travel diagrams

Contact block	Group 1
52C 1NO+1NC	
52D 2NC	
52F 1NO+2NC	
52M 2NO+2NC	

Contact block	Group 1
53C 1NO+1NC	
53F 1NO+2NC	
53M 2NO+2NC	

Contact block	Group 1
50C 1NO+1NC	
50D 2NC	
50F 1NO+2NC	
50M 2NO+2NC	

Legend

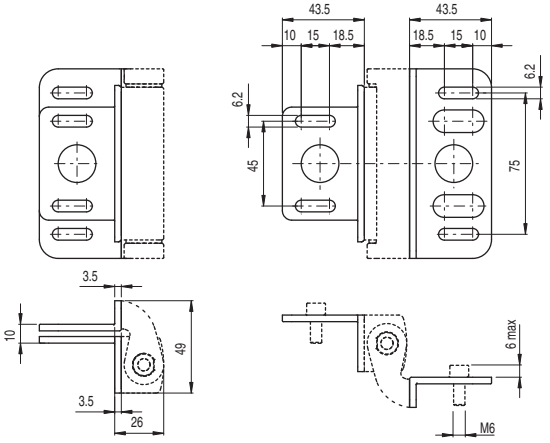
- Closed contact
- Open contact
- Positive opening travel
- Switch pressed / Switch released

The switching point of the contacts can be adjusted from 0° to +4° compared to that indicated in the travel diagrams. The hinge is supplied without pre-adjustment.

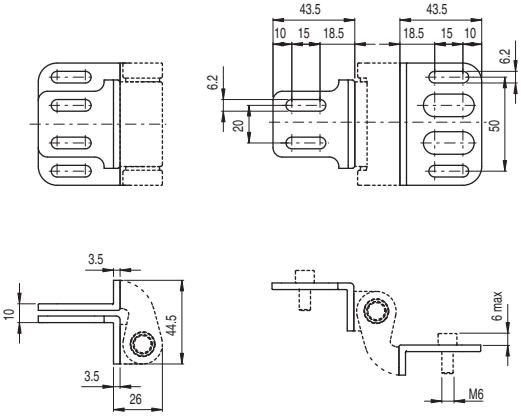
Fixing plates

Fastening screws for profile not supplied.

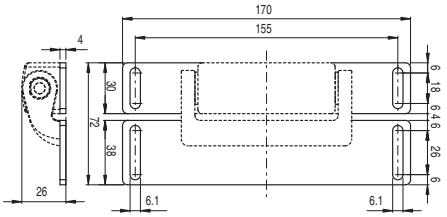
Article	Description
VF SFH1-C	Couple of angular plates for HP AA and HC AA supplied with fastening screws for attachment of the switch



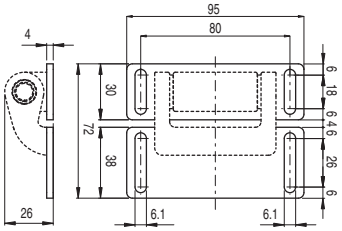
Article	Description
VF SFH2-C	Couple of angular plates for HC LL supplied with fastening screws for attachment of the switch



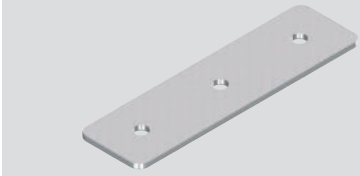
Article	Description
VF SFH3-C	Couple of plane plates for HP AA and HC AA supplied with fastening screws for attachment of the switch

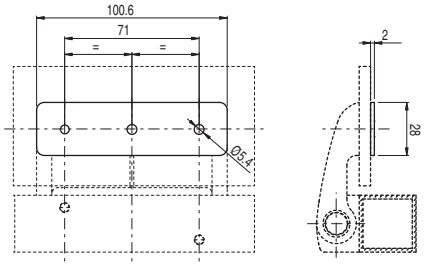


Article	Description
VF SFH4-C	Couple of plane plates for HC LL supplied with fastening screws for attachment of the switch



Article	Description
VF SFH7	HP AB series mobile part cover in stainless steel





All values in the drawings are in mm

Accessories See page 419

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

HX series safety hinge switches

Description

The HX series hinge switches from Pizzato Elettrica combine safety and style in a single product.
The electric switch is fully integrated into the mechanical hinge so that it is virtually invisible to an inexpert eye. This, asides from being an aesthetic advantage, guarantees greater safety as a switch which is difficult to identify is consequently even more difficult to tamper with. The rear mounting without screws in sight and the very precise line mean the switch can be perfectly integrated even with guards of machinery with a very precise design.
As the HX series safety hinge switches are in stainless steel, they can be used in environments where particular attention must be paid to hygiene making them suitable for a variety of applications, ranging from the food and pharmaceutical sectors to the chemical and marine sectors.

Maximum safety with a single device

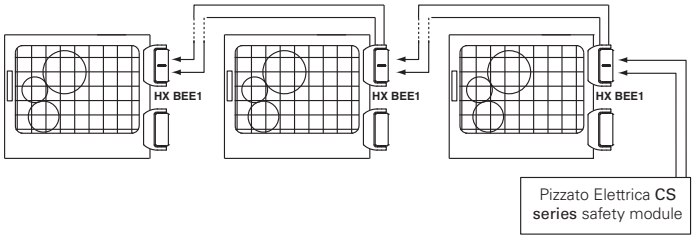
PL e + SIL 3

The HX BEE1 series hinge switches are constructed with redundant electronics. As a result, the maximum PL e and SIL 3, safety levels can still be achieved through the use of a single device on a guard. This avoids expensive wiring in the field and allows faster installation. Inside the control cabinet, the two electronic safety outputs must be connected to a module suitable for managing devices with solid state outputs, or to a safety PLC.

Series connection of several switches

PL e + SIL 3

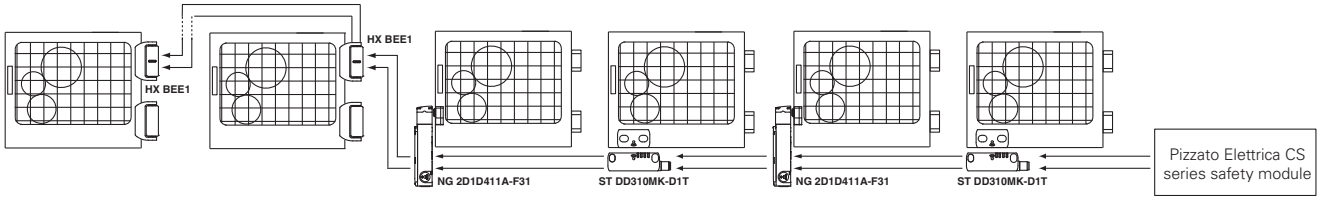
One of the most important features of the HX series is the possibility of connecting up to 32 sensors in series, while still maintaining the maximum safety levels PL e laid down in EN 13849-1 and SIL 3 acc. to EN 62061.
This connection type is permissible in safety systems which have a safety module at the end of the chain that monitors the outputs of the last HX switch.
The fact that the PL e safety level can be maintained even with 32 sensors connected in series demonstrates the extremely secure structure of each single device.



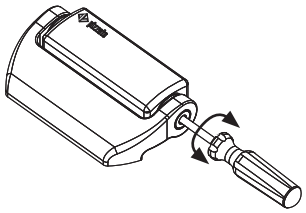
Series connection with other devices

PL e + SIL 3

The HX BEE1 series hinge switch features two safety inputs and two safety 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, stainless steel safety hinges (HX BEE1 series), transponder sensors (ST series) and door lock sensors (NG series) can be connected in series while still maintaining the maximum PL e and SIL 3 safety levels.



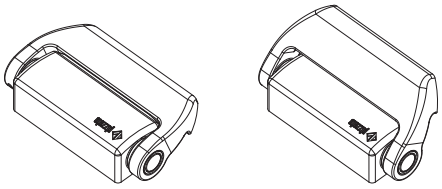
Adjustment of the switching point



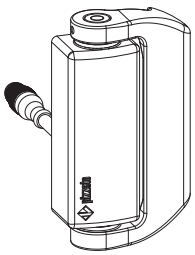
The switching point of the switches can be set with a screwdriver.
Adjusting the switching point allows for any calibration for large size guards. After calibrating the switch, it is always necessary to close the hole using the safety cap supplied.

Basic activation angle variants

On request, versions with a switch base activation angle of 15° multiples (e.g. 45° or 90°) are available.
The different activation angle does not exclude the possibility of fine adjustment of the switching point by means of the adjustment screw in the switch. Any change in the base operating angle does not alter the maximum mechanical switch travel.



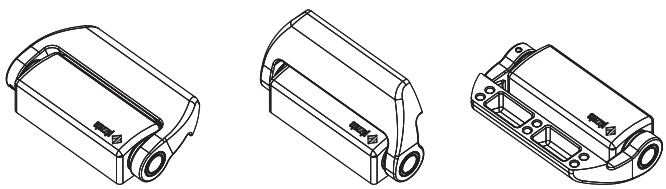
Cable with connector at the back



The version with a cable with M12 connector at the back offers the best combination of aesthetics and simple connection.
This solution allows the wiring to be hidden. At the same time, it facilitates the connection and disconnection of the wiring from inside the machinery.

Opening angle up to 180°

The mechanical design of the switch also allows use on guards with an opening angle of up to 180°.

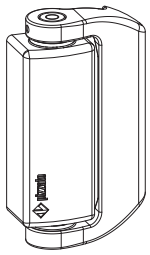


Protection degrees IP67 and IP69K

IP69K
IP67

These devices are designed to be used under the toughest environmental conditions, and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where the maximum degree of protection is required for the housing. Due to their special design, these devices are suitable for use in equipment subjected to cleaning with high pressure hot water jets. These devices meet the IP69K test requirements according to ISO 20653 (water jets with 100 bar and 80°C).

Additional hinges



To complete the installation, various types of additional hinges are available to be used in a variable number depending on the weight of the guard.
These hinges have the same aesthetic and mechanical structure but cost less as they contain no electrical parts.

Materials

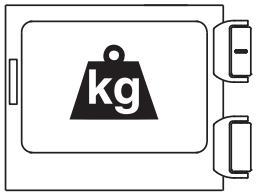
AISI
316L

With this new series in AISI316L stainless steel, Pizzato Elettrica offers an extensive range of devices suitable for environments where special attention must be paid to cleanliness and hygiene.
The accurate surface finish allows these devices to be used for a variety of applications, ranging from the food and pharmaceutical sectors to the chemical and marine sectors.

Laser engraving

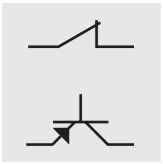
Pizzato Elettrica has introduced a new laser engraving system for stainless steel switches of the HX series.
Thanks to this new system, engravings on the products are indelible.

For heavy duty applications



Specially designed for heavy industrial applications, these hinges are made of high-thickness microfusion materials with high strength mechanical properties. The maximum loads indicated in the technical specifications are those that the hinge can withstand without any lubrication, for one million opening and closing cycles, while maintaining its features as a safety device in perfect efficiency.

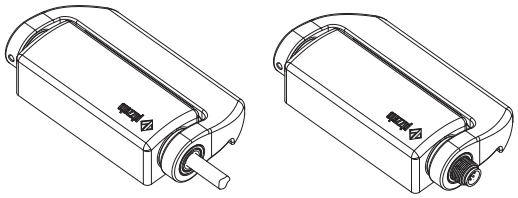
Mechanical or electronic contact blocks



Internally equipped with innovative concepts, the HX series safety switches can be supplied both with electromechanical safety contacts with positive opening, or with self monitoring redundant electronic safety outputs. This allows the customer to choose between the most cost-effective solution (mechanical contacts) or a maximum security solution (electronic outputs).

With cable or connector

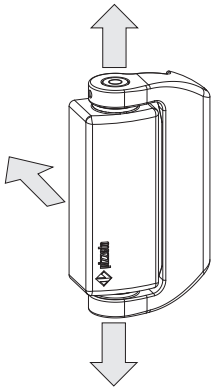
The electrical connection via integrated cable or M12 connector option makes the device suitable for the most diverse applications. The connector versions allow faster device replacement and installation, by making incorrect wiring connection impossible. The cable versions, on the other hand, offer the best value for money. Both the cable as well as the connector versions are available with mechanical or electronic contact blocks.



Four LEDs for immediate diagnosis

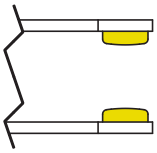
The versions with electronic contact block are equipped with four signalling LEDs. Each LED represents a specific hinge function, this greatly facilitates switching point adjustment via the immediate visual indication for the installer during the adjustment phase. There are also three separate LEDs available: one for input status, one for output status, and one for general device status. For serial applications, this independence enables identification of any interruptions in the safety chain and of any internal errors. All of this at a glance, without needing to decode complex flashing sequences.

Three different output directions



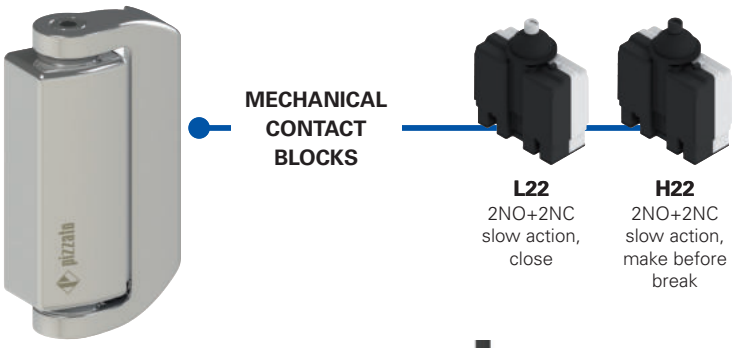
Designed for flexibility, the HX series safety hinges are equipped with three different output directions for the electrical conductors. Directions from below or from above allow the same exit direction of the conductor to be maintained, both for right and for left-hand doors. The direction from behind has the ultimate aesthetic, cleanliness and hygiene result. All three electrical output directions are available with output cables in various lengths or with M12 connector.

Gold-plated contacts



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

Selection diagram



MECHANICAL CONTACT BLOCKS

L22
2NO+2NC slow action, close

H22
2NO+2NC slow action, make before break

CABLES AND CONNECTORS

•SN
Cable output, bottom (standard)

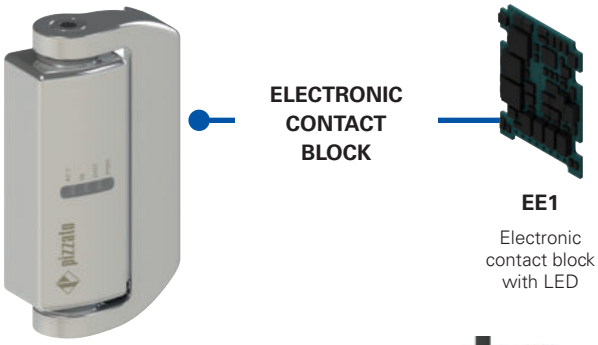
•AN
Cable output, top

•PN
Cable output, back

KSM
M12 connector, bottom

KAM
M12 connector, top

0.2PM
Cable, length: 0.2 m, with M12 connector, at back



ELECTRONIC CONTACT BLOCK

EE1
Electronic contact block with LED

CABLES AND CONNECTORS

•SN
Cable output, bottom (standard)

•AN
Cable output, top

•PN
Cable output, back

KSM
M12 connector, bottom

KAM
M12 connector, top

0.2PM
Cable, length: 0.2 m, with M12 connector, at back

ADDITIONAL HINGES

HX CB

HX CD

product option

Code structure

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

article: **HX BL22-2PN** | options: **GH15**

Body and movable part dimensions	
B	126x76x31 mm

Contact block	
L22	2NO+2NC, slow action, close
H22	2NO+2NC, slow action, make before break
EE1	electronic contact block with LED 2 PNP safety outputs 1 PNP signalling output 2 PNP safety inputs

Activation angle	
	0° activation angle (standard)
H15	15° activation angle
H30	30° activation angle
H45	45° activation angle
H60	60° activation angle
H75	75° activation angle
H90	90° activation angle
H345	345° activation angle

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

Connection type	
0.2	cable, length: 0.2 m (available for 0.2 PM versions only)
0.5	cable, length: 0.5 m
...	...
2	cable, length: 2 m (standard)
...	...
10	cable, length: 10 m
K	with integrated connector

Other cable lengths on request.

Cable or connector type	
N	PVC cable, IEC 60332-1-2 oil-resistant
M	cable with M12 connector

Output direction, connections	
S	movable part at the right and bottom output
P	movable part at the right and output at the back
A	movable part at the right and output at top
Q	movable part at the left and output at the back (on request)

Code structure for additional hinges

article: **HX CB** | options: **V46**

Additional hinges	
CB	126x76x31 mm, movable part at the right
CD	126x76x31 mm, movable part at the left

Ground connection	
	with no ground connection between the fixed par and the moving part (standard)
V46	with ground connection between the fixed part and the moving part

Main features

- AISI 316L stainless steel housing
- Protection degrees IP67 and IP69K
- Electronic contact block with LED
- Versions with M12 connector
- Additional hinge without contacts

Quality marks:

0123

EC type examination certificate: M6A 075157 0030
UL approval: E131787
TÜV SÜD approval: Z10 075157 0028
EAC approval: RU C-IT.УТ03.B.00035/19

In compliance 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, ISO 20653,
IEC 61508-1, IEC 61508-2, IEC 61508-3,
EN ISO 13849-1, EN ISO 13849-2, EN 62061,
EN 61326-1, EN 61326-3-1, EN 61326-3-2,
EN IEC 63000, UL 508, CSA C22.2 No. 14.

Compliance with the requirements of:
Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EU,
RoHS Directive 2011/65/EU.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

Technical data

Housing
Metal housing, polished, AISI 316L stainless steel
Versions with integrated cable, length 2 m, other lengths from 0.5 … 10 m on request
Versions with integrated M12 connector
Versions with M12 connector and 0.2 m cable, other lengths from 0.1 … 3 m on request

Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)
Corrosion resistance in saline mist:	≥ 1000 hours in NSS acc. to ISO 9227

General data

SIL (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters HX B•22-•••	
B_{10D}:	5,000,000 for NC contacts
Safety parameters HX BEE1-•••	
$MTTF_D$:	2413 years
PFH_D:	1.24E-09
DC:	High
Mission time:	20 years
Ambient temperature:	see table on page 80
Max. actuation frequency:	600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	90°/s
Min. actuation speed:	2°/s
Mounting position:	any
Tightening torque, M6 screws:	10 … 12 Nm

Electrical data (L22 - H22 mechanical contact blocks)

Rated impulse withstand voltage U_{imp}:	4 kV
Conditional short circuit current:	1000 A acc. to EN 60947-5-1
Pollution degree:	3

Electrical data (EE1 electronic contact block)

Rated operating voltage U_e:	24 Vdc (-15%…+10%) SELV/PELV
Consumption at voltage U_e:	< 1W
Rated impulse withstand voltage U_{imp}:	1.5 kV
Resettable internal protection fuse:	1.1 A
Overvoltage category:	III
IS1/IS2 safety inputs	
Rated operating voltage U_e:	24 Vdc
Rated current consumption:	5 mA
OS1/OS2 safety outputs	
Rated operating voltage U_e:	24 Vdc
Output type:	PNP type OSSD
Utilisation category:	DC13; U_e=24 Vdc; I_e=0.25 A
Short circuit detection:	Yes
Overcurrent protection:	Yes
Duration of the deactivation impulses at the safety outputs:	< 300 us
Permissible capacitance between outputs:	< 200 nF
Permissible capacitance between output and ground:	< 200 nF
O3 signalling output	
Rated operating voltage U_e:	24 Vdc
Output type:	PNP
Utilisation category:	DC13; U_e=24 Vdc; I_e=0.1 A
Short circuit detection:	No
Overcurrent protection:	Yes

⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 439 to 454.

⚠ Important: Switch off the circuit voltage before disconnecting the connector from the switch. The connector is not suitable for separation of electrical loads. According to EN 60204-1, versions with 8-pole M12 connector can be used only in SELV circuits.

Features approved by UL

Electrical Ratings:	R300 pilot duty (28 VA, 125-250 Vdc)
	C300 pilot duty (180 VA, 120-240 Vac)
	24 Vac, Class 2, 2 A pilot duty (M12 connector)
	24 Vdc, Class 2, 0.22 A pilot duty (M12 connector)
	24 Vdc / 0.25 A (electronic version)
Environmental Ratings:	Types 1, 4X, 6, 12, 13

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

Features approved by TÜV SÜD

Supply voltage: 24 Vdc
Rated operating current (max.): 0.25 A
Ambient temperature: -25°C … +70°C
Protection degree: IP67 and IP69K
PL, category: PL e, category 4
Response time to deactivation of contacts/inputs: maximum 12 ms

In compliance with standards: IEC 61508-1:2010 (SIL 3), IEC 61508-2:2010 (SIL 3), IEC 61508-3:2010 (SIL 3), EN IEC 62061:2021, EN ISO 13849-1:2015 (PL e, Cat. 4), EN 60947-5-1:2017/AC:2020, EN ISO 14119:2013

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

Utilization temperatures and electrical data for L22/H22 mechanical contact blocks

			N type cable 9 x 0.34 mm²	M12 connector, 8-pole
Ambient temperature	Cable, fixed installation		-25°C … +80°C	-25°C … +80°C
	Cable, flexible installation		-5°C … +80°C	-5°C … +80°C
	Cable, mobile installation		/	/
Electrical data	Thermal current I_{th}		3 A	2 A
	Rated insulation voltage U_i		250 Vac	30 Vac 36 Vdc
	Protection against short circuits (fuse)		3 A 500 V type gG	2 A 500V type gG
	Utilization category DC13	24 V	2 A	2 A
		125 V	0.4 A	/
		250 V	0.3 A	/
	Utilization category AC15	24 V	3 A	2 A
		120 V	3 A	/
		250 V	3 A	/
	Approvals		CE cULus TÜV EAC	CE cULus TÜV EAC

Utilization temperatures and electrical data for EE1 electronic contact block

			N type cable 8 x 0.34 mm²	M12 connector, 8-pole
Ambient temperature	Cable, fixed installation		-25°C … +70°C	-25°C … +70°C
	Cable, flexible installation		-5°C … +70°C	-5°C … +70°C
	Cable, mobile installation		/	/
Electrical data	Thermal current I_{th}		0.25 A	0.25 A
	Rated insulation voltage U_i		32 Vdc	32 Vdc
	Protection against short circuits (fuse)		1 A	1 A
	Utilization category DC13	24 V	0.25 A	0.25 A
	Approvals		CE cULus TÜV EAC	CE cULus TÜV EAC

Internal device connections

Mechanical contact blocks (HX B•22-•••)

Contacts	Versions with cable	Versions with M12 connector
NC	black	1
	black-white	2
NC	red	3
	red-white	4
NO	brown	5
	blue	6
NO	purple	7
	purple-white	8
⏚	yellow/green	/

Legend:
NC normally closed contact
NO normally open contact
⏚ ground connection

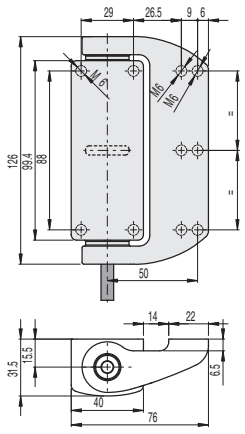
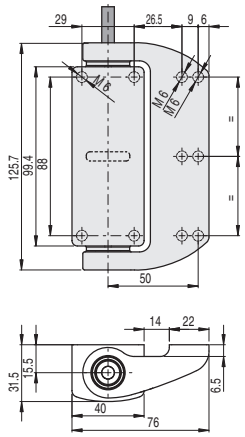
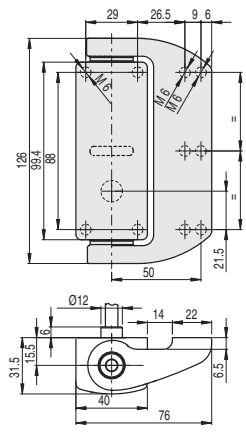
Electronic contact blocks (HX BEE1-•••)

Connection	Versions with cable	Versions with M12 connector
A1	brown	1
IS1	red	2
A2	blue	3
OS1	red-white	4
O3	black	5
IS2	purple	6
OS2	black-white	7
not connected	purple-white	8

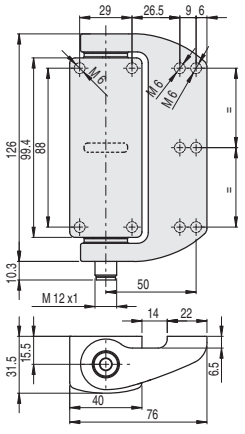
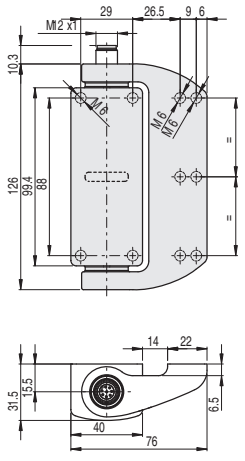
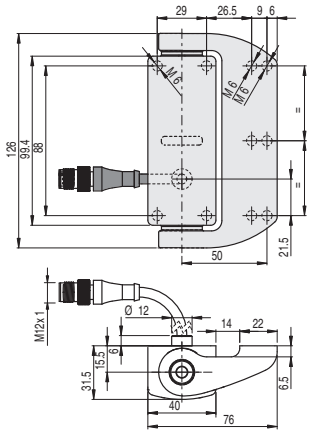
Legend:
A1-A2 supply
IS1-IS2 safety inputs
OS1-OS2 safety outputs
O3 signalling output

HX series safety hinge switches

Contact type
LA = slow action close
LO = slow action, make before break
= electronic, PNP

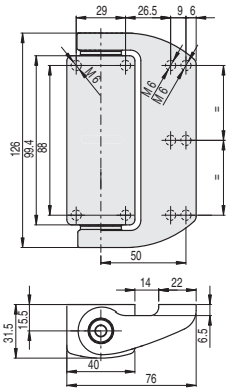
Contact block		2 m cable, bottom		2 m cable, top		2 m cable, back	
							
L22	LA	HX BL22-2SN	2NO+2NC	HX BL22-2AN	2NO+2NC	HX BL22-2PN	2NO+2NC
H22	LO	HX BH22-2SN	2NO+2NC	HX BH22-2AN	2NO+2NC	HX BH22-2PN	2NO+2NC
EE1		HX BEE1-2SN	PNP	HX BEE1-2AN	PNP	HX BEE1-2PN	PNP
Actuating force		0.3 Nm (0.65 Nm)		0.3 Nm (0.65 Nm)		0.3 Nm (0.65 Nm)	

Contact type
LA = slow action close
LO = slow action, make before break
= electronic, PNP

Contact block		M12 connector, bottom		M12 connector, top		cable (0.2 m) with M12 connector, back	
							
L22	LA	HX BL22-KSM	2NO+2NC	HX BL22-KAM	2NO+2NC	HX BL22-0.2PM	2NO+2NC
H22	LO	HX BH22-KSM	2NO+2NC	HX BH22-KAM	2NO+2NC	HX BH22-0.2PM	2NO+2NC
EE1		HX BEE1-KSM	PNP	HX BEE1-KAM	PNP	HX BEE1-0.2PM	PNP
Actuating force		0.3 Nm (0.65 Nm)		0.3 Nm (0.65 Nm)		0.3 Nm (0.65 Nm)	

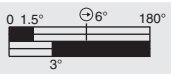
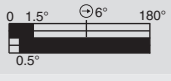
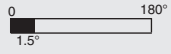
To order a product with a movable part at the left replace P with Q in the codes shown above.
Example: HX BL22-2**P**N → HX BL22-2**Q**N

Additional hinges



HX CB

Travel diagrams

Contact block	Group 1
L22 2NO+2NC	
H22 2NO+2NC	
EE1 PNP	

The switching point of the contacts can be adjusted ± 1° compared to that indicated in the travel diagrams.
The hinge is supplied without pre-adjustment.

Legend

- Closed contact /Outputs OS1, OS2, O3 active
- Open contact /Outputs OS1, OS2, O3 not active
- Positive opening travel

All values in the drawings are in mm

Accessories See page 419

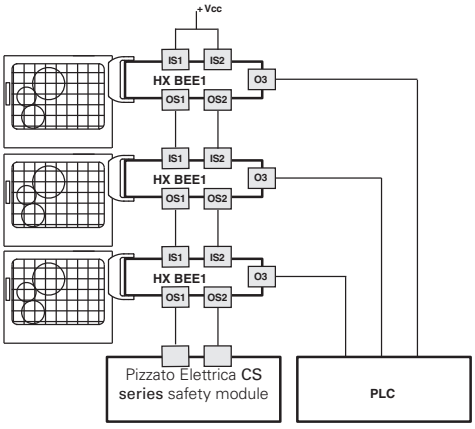
→ The 2D and 3D files are available at **www.pizzato.com**

Complete safety system

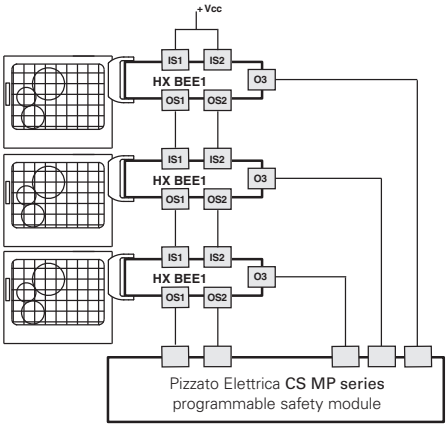
The use of complete and tested solutions guarantees the electrical compatibility between the hinge of the HX series and the safety modules from Pizzato Elettrica, as well as high reliability. The sensors have been tested with the modules listed in the adjacent table.

Switch	Compatible safety modules	Safety module output contacts		
		Instantaneous safety contacts	Delayed safety contacts	Signalling contacts
HX BEE1-•••	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 369		
	CS MF••••••	see page 401		

The hinges with HX BEE1-••• electronic contact block can be connected to safety modules or safety PLCs with OSSD inputs provided compatibility is ensured in advance.

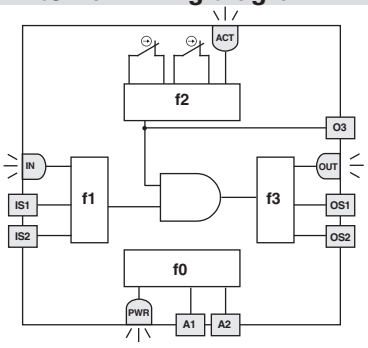


Possibility of series connection of multiple hinges for simplifying the wiring of the safety system, whereby only the outputs of the last hinge are evaluated by a Pizzato Elettrica safety module (see table with compatible safety modules). Each HX switch is provided with a signalling output, which is activated when the respective guard is closed. Depending on the specific requirements of the application, this information can be evaluated by a PLC.



Possibility of series connection of multiple hinges for simplifying the wiring of the safety system, whereby only the outputs of the last hinge are evaluated by a Pizzato Elettrica safety module of the CS MP series. Both the safety-relevant evaluation and the evaluation of the signalling outputs are performed by the CS MP series.

Internal wiring diagram



The adjacent diagram illustrates 4 logical, linked sub-functions of the hinge switch.

Function f0 is a basic function and includes the monitoring of the power supply as well as internal, cyclical tests.

The task of function f1 is to evaluate the status of the device inputs, whereas function f2 checks the opening of the guard. Function f3 is intended to activate or deactivate the safety outputs and check for any faults or short circuits in the outputs.

The safety-related function, which combines the sub-functions mentioned above, only activates the safety outputs if the input signals are correctly applied and the guard is in closed position.

The status of each function is displayed by the corresponding LED (PWR, IN, ACT, LOCK, OUT), in such a way that the general device status becomes immediately obvious to the operator.

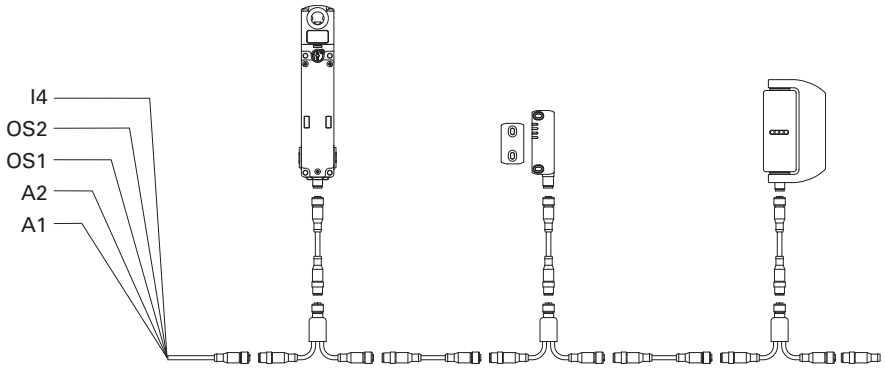
LED	Function
ACT	state of actuator / O3 output
IN	status of safety inputs
OUT	status of safety outputs
PWR	Power supply / self-diagnosis

Series connection

To simplify series connections of the devices, various M12 connectors are available that allow complete wiring.

This solution significantly reduces installation times while at the same time maintaining the maximum safety levels PL e and SIL 3.

For further information see page 426.



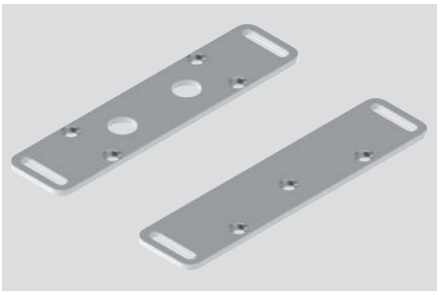
Accessories

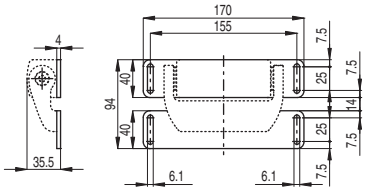
Article	Description
VF AC7032	Protection cap of adjustment screw

The cap is supplied with every hinge and must always be attached after the fine adjustment of the switching point.
In case of loss or damage, the cap can be ordered separately.

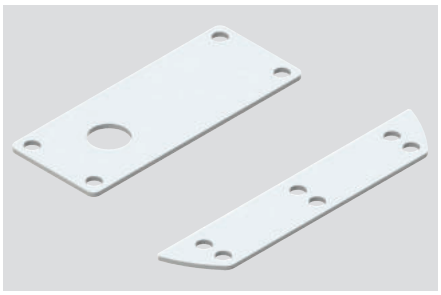
Fixing plates

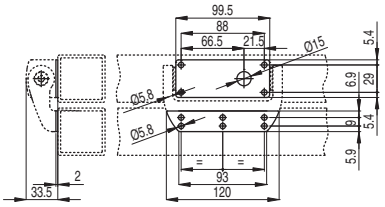
Article	Description
VF SFH10-TX	Couple of stainless steel plane plates supplied with fastening screws for attachment of the switch.



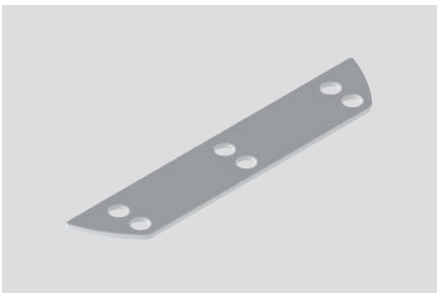


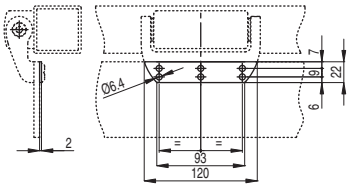
Article	Description
VF SFH9	Polyethylene gaskets for the food industry. Seals the contact surface between the hinge and the frame.





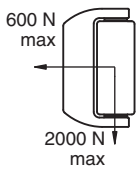
Article	Description
VF SFH8	Mobile part cover in stainless steel. Ideal for fixing the mobile part with polycarbonate guards.





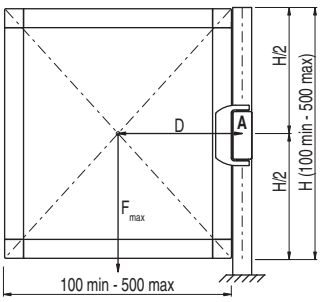
Max. forces and loads HX

Admitted max. loads, independent of utilization conditions.

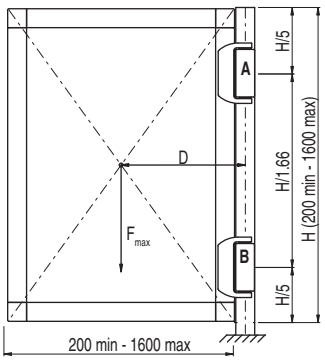


Attention: Never exceed the loads listed above under any circumstances.
The loads have been verified by a fatigue test of one million operating cycles with a 90° opening angle.

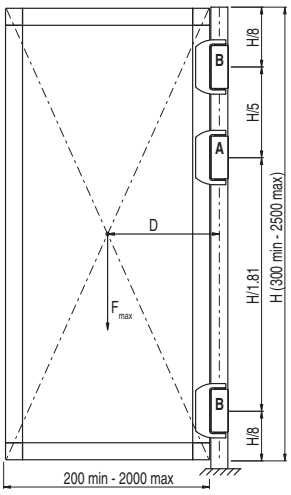
Doors with one safety hinge
F_{max} (N)=50,000/D (mm)



Doors with one safety hinge and one additional hinge
F_{max}(N)=400,000/D (mm)



Doors with one safety hinge and two additional hinges
F_{max} (N)=500,000/D (mm)



Legend

F_{max}	Force exerted by the weight of the door (N)
D	Distance from the centre of gravity of the door to the axis of the hinge (mm)
A	Safety hinge
B	Additional hinge

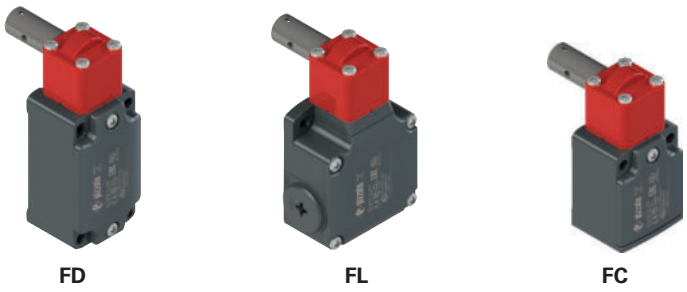
All values in the drawings are in mm

Accessories See page 419

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

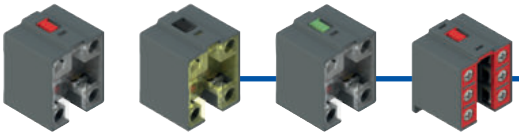
Notes

Selection diagram



FD FL FC

CONTACT BLOCKS

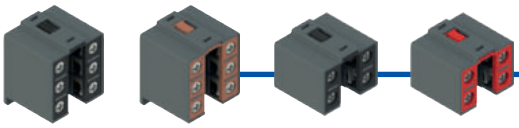


7 1NO+1NC slow action, make before break

9 2NC slow action

18 1NO+1NC 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

CONDUIT ENTRIES

Threaded conduit entry (standard)

With cable gland

With M12 metal connector

Product options

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 1895-GM2K50T6

Housing	
FD	metal, one conduit entry
FL	metal, three conduit entries

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

Contact block	
7	1NO+1NC, slow action, make before break
9	2NC, slow action
18	1NO+1NC, 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

Pre-installed cable glands or connectors	
	no cable gland or connector (standard)
K23	cable gland for cables Ø 6 … 12 mm
...	…
K50	M12 metal connector, 5-pole
...	…

For the complete list of possible combinations please contact our technical department.

Contact type	
	silver contacts (standard)
G	silver contacts with 1 µm gold coating
G1	silver contacts, 2.5 µm gold coating (not for contact blocks 20, 21, 22, 33, 34)

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

article | options | options

FC 3395-GM2K50T6

Housing	
FC	metal, one conduit entry

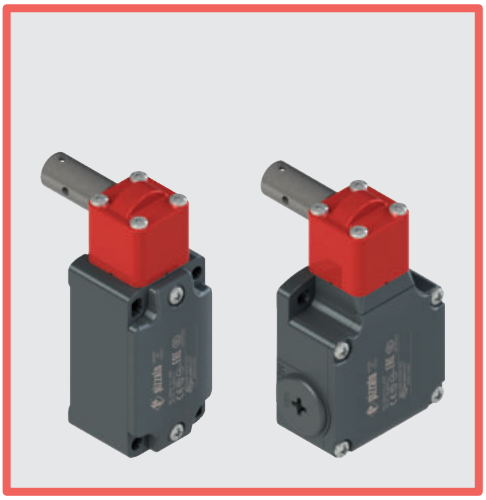
Ambient temperature	
	-25°C … +80°C (standard)
T6	-40°C … +80°C

Contact block	
33	1NO+1NC, slow action
34	2NC, slow action

Pre-installed cable glands or connectors	
	no cable gland (standard)
K23	cable gland for cables Ø 6 … 12 mm
K50	M12 metal connector, 5-pole

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

Threaded conduit entry	
M2	M20x1.5 (standard)
	PG 11



Main features
- Metal housing, from one to three conduit entries
- Protection degree IP67
- 8 contact blocks available
- Stainless steel actuator
- Versions with M12 connector
- Versions with gold-plated silver contacts

Quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2021000305000099
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing
FD, FL and FC series: metal housing, baked powder coating.
Stainless steel actuator.

FD, FC series: one threaded conduit entry:	M20x1.5 (standard)
FL series: three threaded conduit entries:	M20x1.5 (standard)
Protection degree:	IP67 acc. to EN 60529 with cable gland of equal or higher protection degree

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	5,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	180°/s
Min. actuation speed:	2°/s
Tightening torques for installation:	see page 441
Wire cross-sections and wire stripping lengths:	see page 461

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN IEC 63000, UL 508, CSA C22.2 No. 14.
Approvals:
EN 60947-5-1, UL 508, CSA C22.2 No. 14, GB/T14048.5

Compliance with the requirements of:
Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

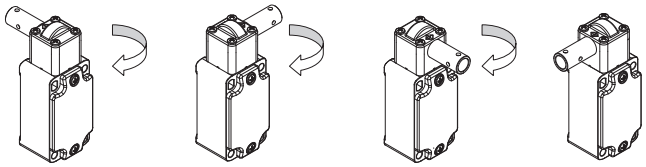
⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 439 to 454.**

Electrical data			Utilization category
without connector	Thermal current (I_{th}):	10 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	U_e (V) 250 400 500 I_e (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	U_e (V) 24 125 250
	Protection against short circuits:	type aM fuse 10 A 500 V	I_e (A) 3 0.55 0.3
	Pollution degree:	3	
with M12 connector, 4 or 5-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	U_e (V) 24 120 250 I_e (A) 4 4 4
	Protection against short circuits:	type gG fuse 4 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	U_e (V) 24 I_e (A) 2
	Protection against short circuits:	type gG fuse 2 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 I_e (A) 2

Description

These safety switches are designed to monitor gates or guards that safeguard dangerous parts of machines without inertia. They are very sensitive, open the contacts after few degrees of rotation and immediately send the stop signal. The head, which can be turned in 90° steps, enables installation in multiple positions.
The metal housing and the stainless steel actuator enable use even under operating conditions in which dust and dirt could inhibit the operation of normal safety switches with separate actuator.

Head with variable orientation



For all switches, the head can be adjusted in 90° steps after removing the four fastening screws. This allows you to use the same switch on both right- and left-facing door fronts.

Laser engraving

All devices are marked using a dedicated indelible laser system. These engravings are therefore suitable for extreme environments too. Thanks to this system that does not use labels, the loss of plate data is prevented and a greater resistance of the marking is achieved over time.

Protection degree IP67

IP67

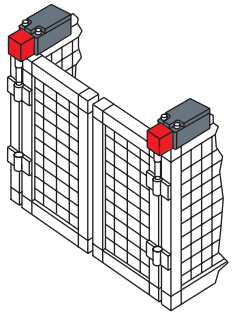
These devices are designed to be used under the toughest environmental conditions, and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where the maximum degree of protection is required for the housing.

Extended temperature range

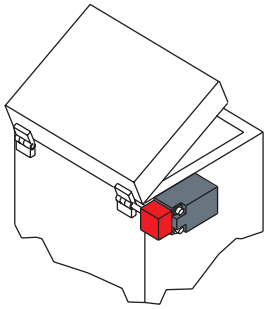
-40°C

These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +80°C.
They can therefore be used for applications in cold stores, sterilisers and other equipment with low temperature environments. The special materials used to produce these versions retain their characteristics even under these conditions, thereby expanding the installation possibilities.

Application examples



Safety switches for hinges, mounting on double door



Safety switch for hinges, mounting outside the safety guard

Adjustable switching point

When installing the device, the contact switching point can be adjusted over the entire 360° range. By fixing the stud screw, it is possible to check the correct setting of the activation angle and quickly and easily adjust it if necessary. Once adjustment is complete, you can render the device tamper-proof against commonly used tools using the supplied lock pin.

Features approved by IMQ

Rated insulation voltage (Ui):	500 Vac 400 Vac (for contact blocks 2, 11, 12, 20, 21, 22, 28, 29, 30, 33, 34, 37)
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, 28, 29, 30, 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: Za, Za+Za, X+X, Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X, Y, X.
Positive opening of contacts on contact blocks 5, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 20, 21, 22, 28, 29, 30, 33, 34, 37, 38, 39, 66.
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

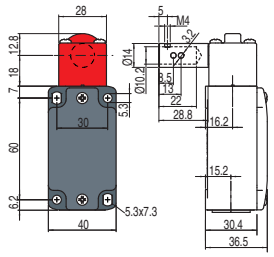
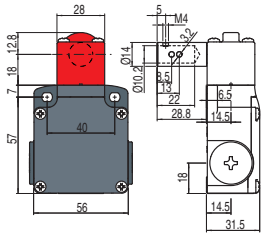
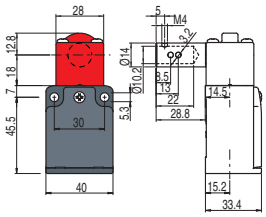
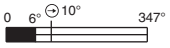
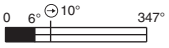
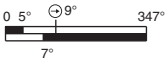
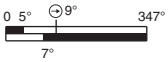
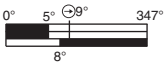
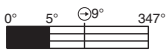
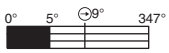
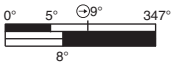
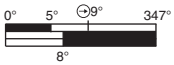
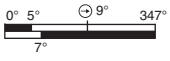
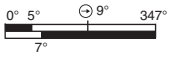
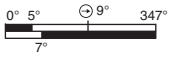
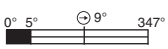
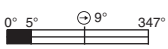
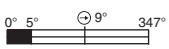
Features approved by UL

Electrical Ratings:	Q300 pilot duty (69 VA, 125-250 V dc) A600 pilot duty (720 VA, 120-600 V ac)
Environmental Ratings:	Types 1, 4X, 12, 13

Use 60 or 75 °C copper (Cu) conductor and wire size range 12, 14 AWG, stranded or solid. The terminal tightening torque of 7.1 lb in (0.8 Nm).

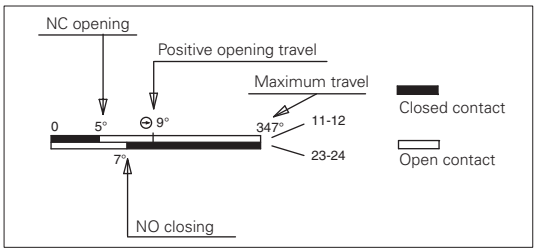
Please contact our technical department for the list of approved products.

Contact type:
L = slow action
LO = slow action, make before break

Contact block		Metal housing Stainless steel actuator	Metal housing Stainless steel actuator	Metal housing Stainless steel actuator
				
7	LO	FD 795-M2 → 1NO+1NC 	FL 795-M2 → 1NO+1NC 	/
9	L	FD 995-M2 → 2NC 	FL 995-M2 → 2NC 	/
18	L	FD 1895-M2 → 1NO+1NC 	FL 1895-M2 → 1NO+1NC 	/
20	L	FD 2095-M2 → 1NO+2NC 	FL 2095-M2 → 1NO+2NC 	/
21	L	FD 2195-M2 → 3NC 	FL 2195-M2 → 3NC 	/
22	L	FD 2295-M2 → 2NO+1NC 	FL 2295-M2 → 2NO+1NC 	/
33	L	FD 3395-M2 → 1NO+1NC 	FL 3395-M2 → 1NO+1NC 	FC 3395-M2 → 1NO+1NC 
34	L	FD 3495-M2 → 2NC 	FL 3495-M2 → 2NC 	FC 3495-M2 → 2NC 
Actuating force		0.15 Nm (0.4 Nm →)	0.15 Nm (0.4 Nm →)	0.15 Nm (0.4 Nm →)

How to read travel diagrams

All values in the diagrams are in degrees



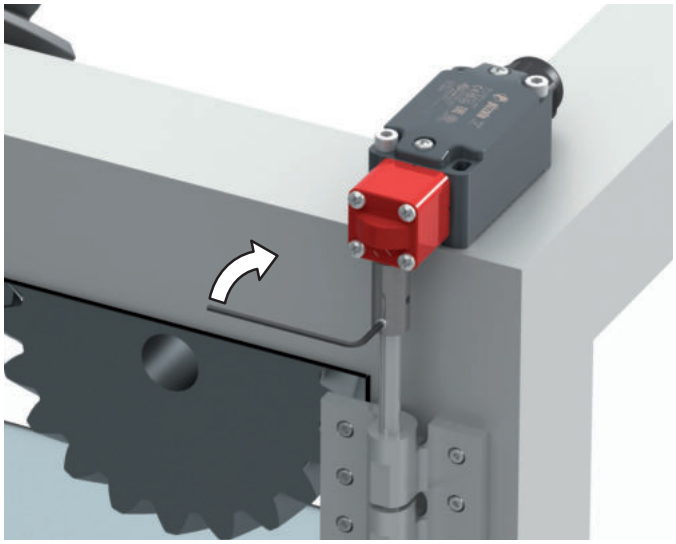
IMPORTANT:
In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol →. Actuate the switch **at least with the positive opening force**, reported in brackets below each article, next to the actuating force value.

All values in the drawings are in mm

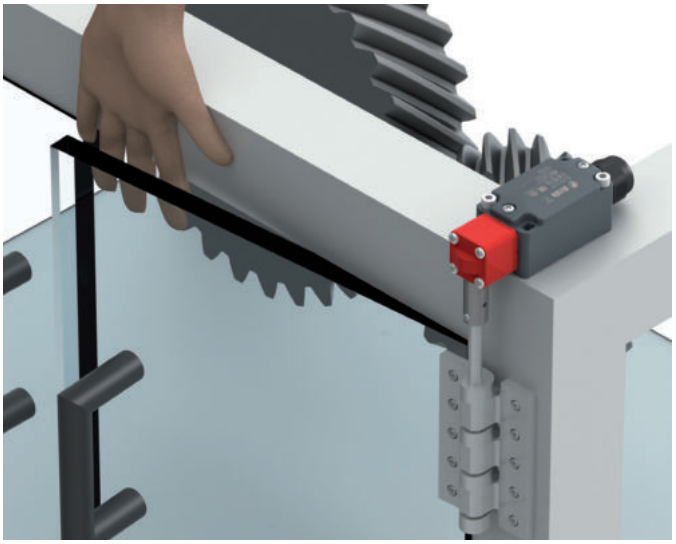
Accessories See page 419

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

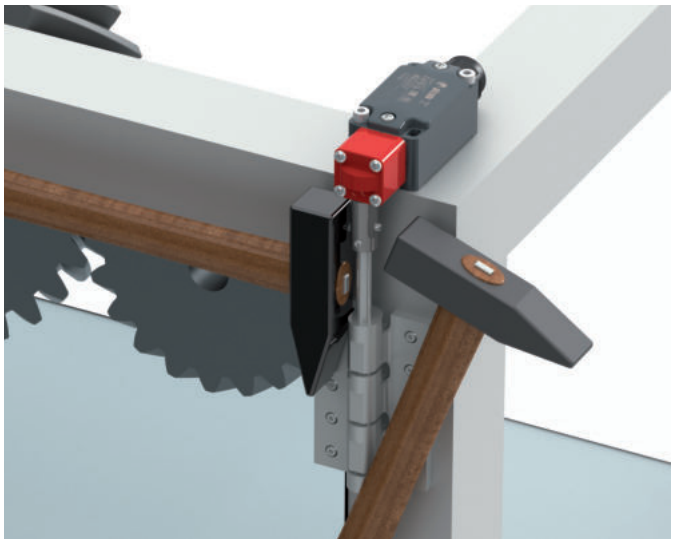
Adjustment of the switching point



Temporary locking of the actuator
(stud screw provided).

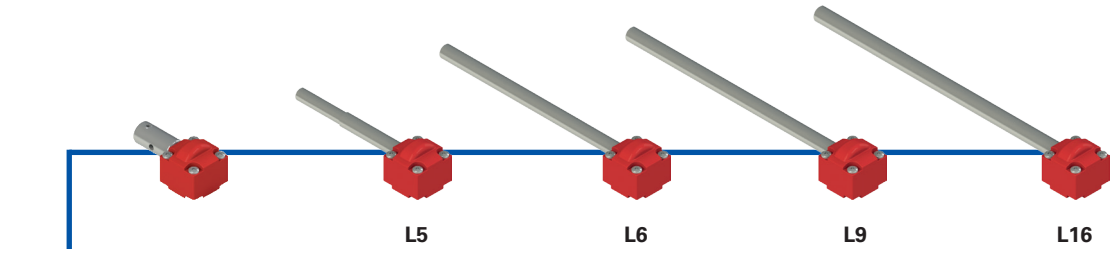


Verify the switching point according to EN ISO 13857
and recalibrate if necessary.

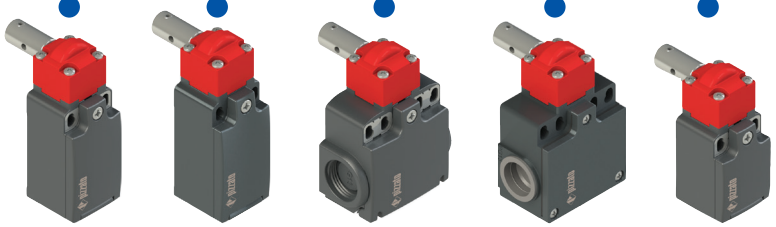


Pin the switch (pin is provided).

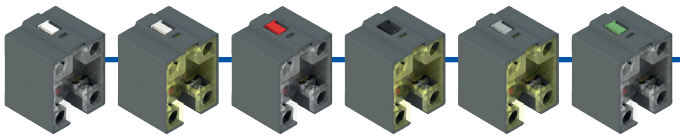
Selection diagram



ACTUATORS



CONTACT BLOCKS



5 1NO+1NC snap action

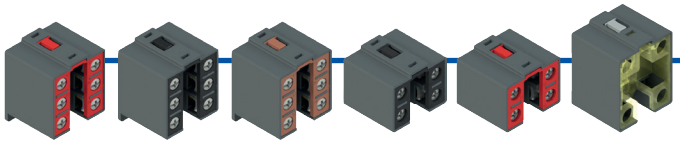
6 1NO+1NC slow action

7 1NO+1N slow action, make before break

9 2NC slow action

14 2NC slow action, shifted

18 1NO+1NC slow action, close



20 1NO+2NC slow action

21 3NC slow action

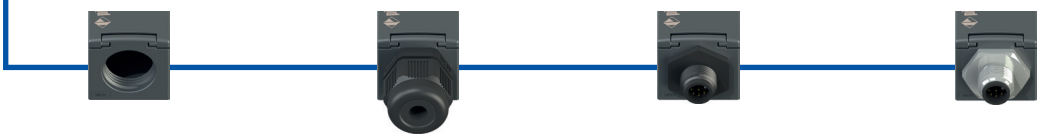
22 2NO+1NC slow action

33 1NO+1NC slow action

34 2NC slow action

66 1NC slow action

CONDUIT ENTRIES



Threaded conduit entry (standard)

With cable gland

With M12 plastic connector

With M12 metal connector

Product options

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

FR 1896-XGL16M2K70T6

Housing	
FR	technopolymer, one conduit entry
FM	metal, one conduit entry
FX	technopolymer, two conduit entries
FZ	metal, two conduit entries

Contact blocks	
5	1NO+1NC, snap action
6	1NO+1NC, slow action
7	1NO+1NC, slow action, make before break
9	2NC, slow action
14	2NC, slow action, shifted
18	1NO+1NC, slow action, close
20	1NO+2NC, slow action
21	3NC, slow action
22	2NO+1NC, slow action
33	1NO+1NC, slow action
34	2NC, slow action
66	1NC, slow action

External metallic parts	
	zinc-plated steel (standard)
X	stainless steel

Contact type	
	silver contacts (standard)
G	silver contacts with 1 µm gold coating
G1	silver contacts, 2.5 µm gold coating (not for contact blocks 20, 21, 22, 33, 34)

Actuator design	
	actuator with hole (standard)
L5	Ø8x69 mm, tapered Ø6.9
L6	Ø8x120 mm
L9	Ø8x140 mm
L16	Ø8.7x165 mm, stainless steel

Threaded conduit entry	
M2	M20x1.5 (standard)
M1	M16x1.5 (FR-FX housing only)
	PG 13.5
A	PG 11 (FR-FX housing only)

Pre-installed cable glands or connectors	
	no cable gland or connector (standard)
K23	cable gland for cables Ø 6 … 12 mm
...	…
K70	M12 plastic connector, 4-pole
...	…

For the complete list of possible combinations please contact our technical department.

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

article | options | options

FK 3396-XGL16M2K24T6

Housing	
FK	technopolymer, one conduit entry

Contact blocks	
33	1NO+1NC, slow action
34	2NC, slow action

External metallic parts	
	zinc-plated steel (standard)
X	stainless steel

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

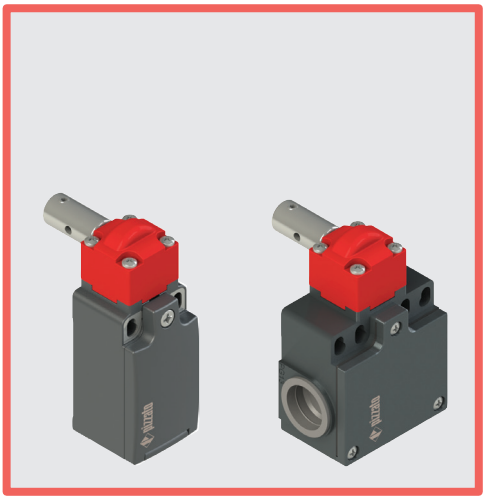
Actuator design	
	actuator with hole (standard)
L5	Ø8x69 mm, tapered Ø6.9
L6	Ø8x120 mm
L9	Ø8x140 mm
L16	Ø8.7x165 mm, stainless steel

Threaded conduit entry	
M2	M20x1.5 (standard)
	PG 11

Pre-installed cable glands or connectors	
	no cable gland or connector (standard)
K24	cable gland for cables Ø 5 … 10 mm
K70	M12 plastic connector, 4-pole

For the complete list of possible combinations please contact our technical department.

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



Main features

- Metal housing or technopolymer housing, from one to two conduit entries
- Hinged cover, fixed with single captive screw (FR, FM, FK, FX)
- Metal plates on mounting holes of the housing (FR, FX, FK)
- Protection degree IP 67 and IP69K
- 12 contact blocks available
- Versions with M12 connector
- Versions with gold-plated silver contacts
- Versions with stainless steel external metallic parts

Quality marks:

IMQ approval:	EG610
UL approval:	E131787
CCC approval:	2021000305000101
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

FR, FX and FK series housing made of glass fibre reinforced technopolymer, self-extinguishing, shock-proof and with double insulation: ⧈
FM and FZ series: metal housing, baked powder coating.

FR, FM series: one threaded conduit entry:	M20x1.5 (standard)
FK series: one threaded conduit entry:	M16x1.5 (standard)
FX series: two knock-out threaded conduit entries:	M20x1.5 (standard)
FZ series: two threaded conduit entries:	M20x1.5 (standard)
Protection degree FR, FM, FK, FX:	IP67 acc. to EN 60529 (with cable gland of equal or higher protection degree) IP69K acc. to ISO 20653 (with cable gland of equal or higher protection degree)
Protection degree FZ:	IP67 acc. to EN 60529 (with cable gland of equal or higher protection degree)

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	5,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	180°/s
Min. actuation speed:	2°/s
Tightening torques for installation:	see page 443
Wire cross-sections and wire stripping lengths:	see page 461

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN IEC 63000, UL 508, CSA C22.2 No. 14.
Approvals:
EN 60947-5-1, UL 508, CSA C22.2 No. 14, GB/T14048.5

Compliance with the requirements of:
Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

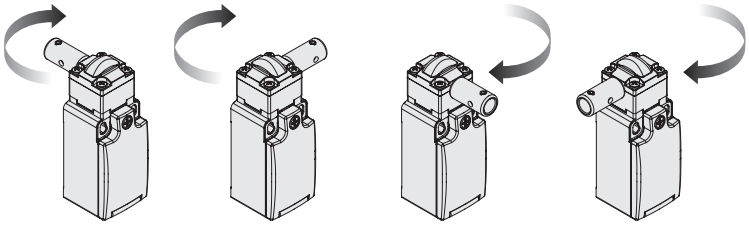
⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 443 to 454.**

Electrical data			Utilization category
without connector	Thermal current (I_{th}):	10 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	U_e (V) 250 400 500 I_e (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	U_e (V) 24 125 250
	Protection against short circuits:	type aM fuse 10 A 500 V	I_e (A) 3 0.55 0.3
	Pollution degree:	3	
with M12 connector, 4 and 5-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	U_e (V) 24 120 250
	Protection against short circuits:	type gG fuse 4 A 500 V	I_e (A) 4 4 4
	Pollution degree:	3	Direct current: DC13
			U_e (V) 24 125 250
			I_e (A) 3 0.55 0.3
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	U_e (V) 24
	Protection against short circuits:	type gG fuse 2 A 500 V	I_e (A) 2
	Pollution degree:	3	Direct current: DC13
			U_e (V) 24
			I_e (A) 2

Description

These safety switches are designed to monitor gates or guards that safeguard dangerous parts of machines without inertia. They are very sensitive, open the contacts after few degrees of rotation and immediately send the stop signal. The head, which can be turned in 90° steps, enables installation in multiple positions. Available with technopolymer or metal housings, with protection degree IP67. The special design allows it to be used even under operating conditions in which dust and dirt could inhibit the operation of normal safety switches with separate actuator.

Head with variable orientation



For all switches, the head can be adjusted in 90° steps after removing the four fastening screws. This allows you to use the same switch on both right- and left-facing door fronts.

Protection degrees IP67 and IP69K

IP69K
IP67

These devices are designed to be used under the toughest environmental conditions, and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where the maximum degree of protection is required for the housing. Due to their special design, these devices are suitable for use in equipment subjected to cleaning with high pressure hot water jets. These devices meet the IP69K test requirements according to ISO 20653 (water jets with 100 bar and 80°C).

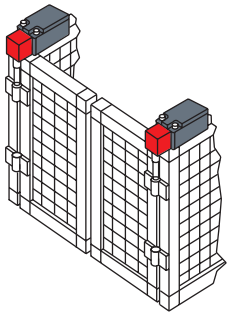
Extended temperature range

-40°C

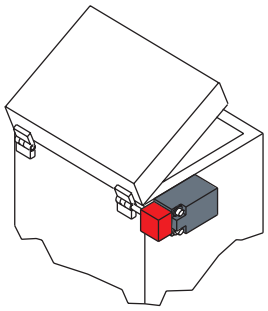
These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +80°C.

They can therefore be used for applications in cold stores, sterilisers and other equipment with low temperature environments. The special materials used to produce these versions retain their characteristics even under these conditions, thereby expanding the installation possibilities.

Application examples

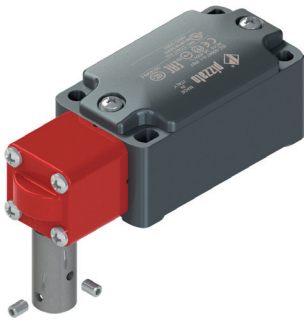


Safety switches for hinges, mounting on double door



Safety switch for hinges, mounting outside the safety guard

Adjustable switching point



When installing the device, the contact switching point can be adjusted over the entire 360° range. By fixing the stud screw, it is possible to check the correct setting of the activation angle and quickly and easily adjust it if necessary. Once adjustment is complete, you can render the device tamper-proof against commonly used tools using the supplied lock pin.

Features approved by IMQ

Rated insulation voltage (Ui):	500 Vac 400 Vac (for contact blocks 2, 11, 12, 20, 21, 22, 28, 29, 30, 37, 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, 28, 29, 30, 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: Za, Za+Za, X+X, Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X, Y, X.
Positive opening of contacts on contact blocks 5, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 20, 21, 22, 28, 29, 30, 33, 34, 37, 38, 39, 66.
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

Features approved by UL

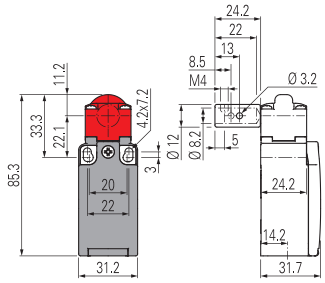
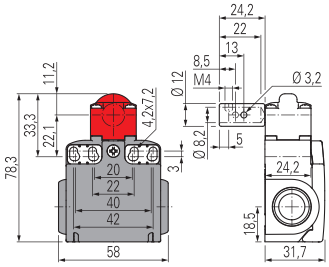
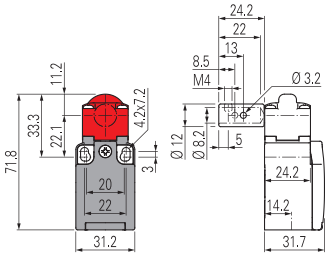
Electrical Ratings:	Q300 pilot duty (69 VA, 125-250 V dc) A600 pilot duty (720 VA, 120-600 V ac)
Environmental Ratings:	FR: Types 1, 4X FM, FX, FZ, FK: Types 1, 4X, 12, 13

Use 60 or 75 °C copper (Cu) conductor and wire size range 12, 14 AWG, stranded or solid. The terminal tightening torque of 7.1 lb in (0.8 Nm).

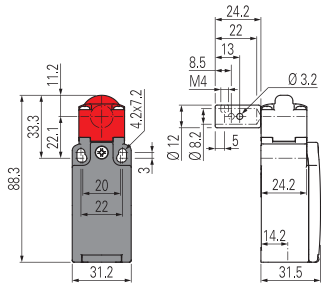
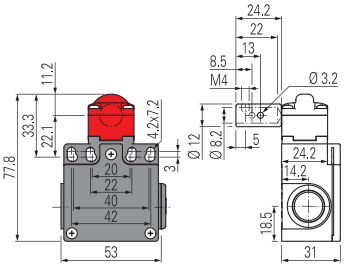
For FR, FX, FK series: the hub is to be connected to the conduit before the hub is connected to the enclosure.

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

Contact type:
R = snap action
L = slow action
LO = slow action make before break
LS = slow action shifted

Contact blocks		Technopolymer housing		Technopolymer housing		Technopolymer housing	
							
5	R	FR 596-M2	1NO+1NC	FX 596-M2	1NO+1NC	/	
6	L	FR 696-M2	1NO+1NC	FX 696-M2	1NO+1NC	/	
7	LO	FR 796-M2	1NO+1NC	FX 796-M2	1NO+1NC	/	
9	L	FR 996-M2	2NC	FX 996-M2	2NC	/	
14	LS	FR 1496-M2	2NC	FX 1496-M2	2NC	/	
18	L	FR 1896-M2	1NO+1NC	FX 1896-M2	1NO+1NC	/	
20	L	FR 2096-M2	1NO+2NC	FX 2096-M2	1NO+2NC	/	
21	L	FR 2196-M2	3NC	FX 2196-M2	3NC	/	
22	L	FR 2296-M2	2NO+1NC	FX 2296-M2	2NO+1NC	/	
33	L	FR 3396-M2	1NO+1NC	FX 3396-M2	1NO+1NC	FK 3396-M2	1NO+1NC
34	L	FR 3496-M2	2NC	FX 3496-M2	2NC	FK 3496-M2	2NC
66	L	FR 6696-M2	1NC	FX 6696-M2	1NC	/	
Actuating force		0.15 Nm (0.4 Nm)		0.15 Nm (0.4 Nm)		0.15 Nm (0.4 Nm)	
Travel diagrams		page 446 - group 9		page 446 - group 9		page 446 - group 9	

Contact type:
R = snap action
L = slow action
LO = slow action make before break
LS = slow action shifted

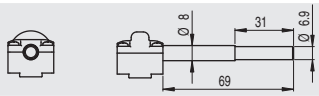
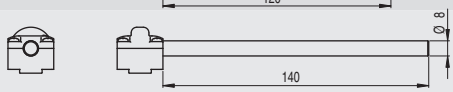
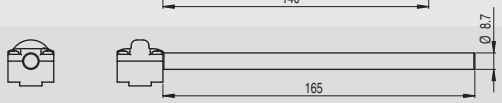
Contact blocks		Metal housing		Metal housing	
					
5	R	FM 596-M2	1NO+1NC	FZ 596-M2	1NO+1NC
6	L	FM 696-M2	1NO+1NC	FZ 696-M2	1NO+1NC
7	LO	FM 796-M2	1NO+1NC	FZ 796-M2	1NO+1NC
9	L	FM 996-M2	2NC	FZ 996-M2	2NC
14	LS	FM 1496-M2	2NC	FZ 1496-M2	2NC
18	L	FM 1896-M2	1NO+1NC	FZ 1896-M2	1NO+1NC
20	L	FM 2096-M2	1NO+2NC	FZ 2096-M2	1NO+2NC
21	L	FM 2196-M2	3NC	FZ 2196-M2	3NC
22	L	FM 2296-M2	2NO+1NC	FZ 2296-M2	2NO+1NC
33	L	FM 3396-M2	1NO+1NC	FZ 3396-M2	1NO+1NC
34	L	FM 3496-M2	2NC	FZ 3496-M2	2NC
66	L	FM 6696-M2	1NC	FZ 6696-M2	1NC
Actuating force		0.15 Nm (0.4 Nm)		0.15 Nm (0.4 Nm)	
Travel diagrams		page 446 - group 9		page 446 - group 9	

All values in the drawings are in mm

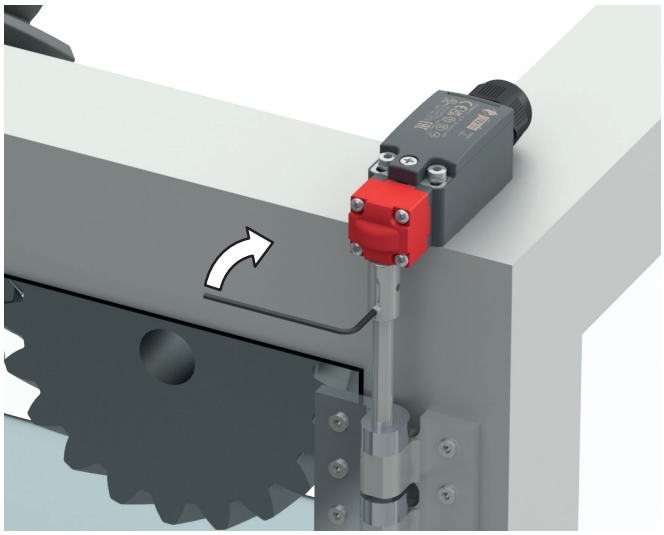
Accessories See page 419

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

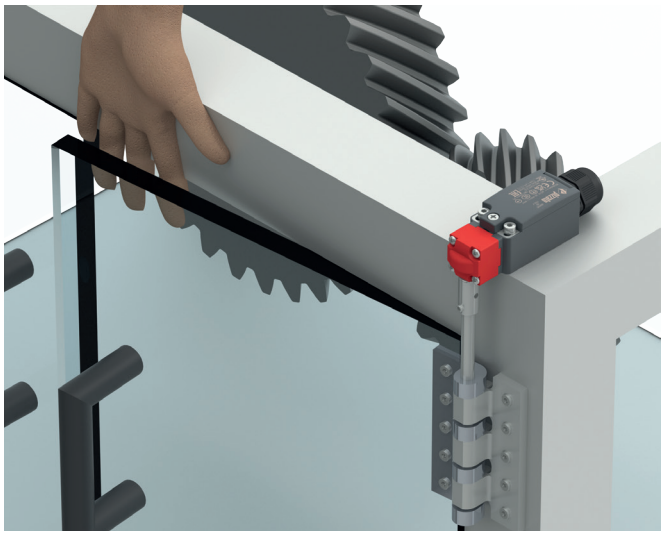
Dimensional drawings for actuators

Option	Drawing
L5	
L6	
L9	
L16	

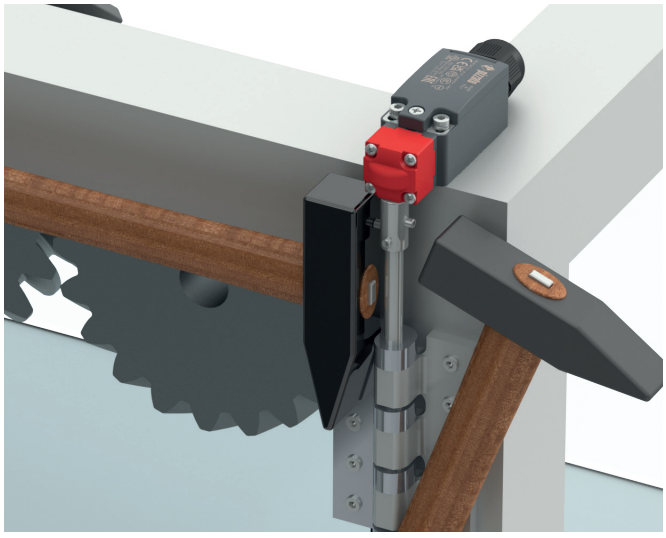
Adjustment of the switching point



Temporary locking of the actuator
(stud screw provided).



Verify the switching point according to EN ISO 13857
and recalibrate if necessary.



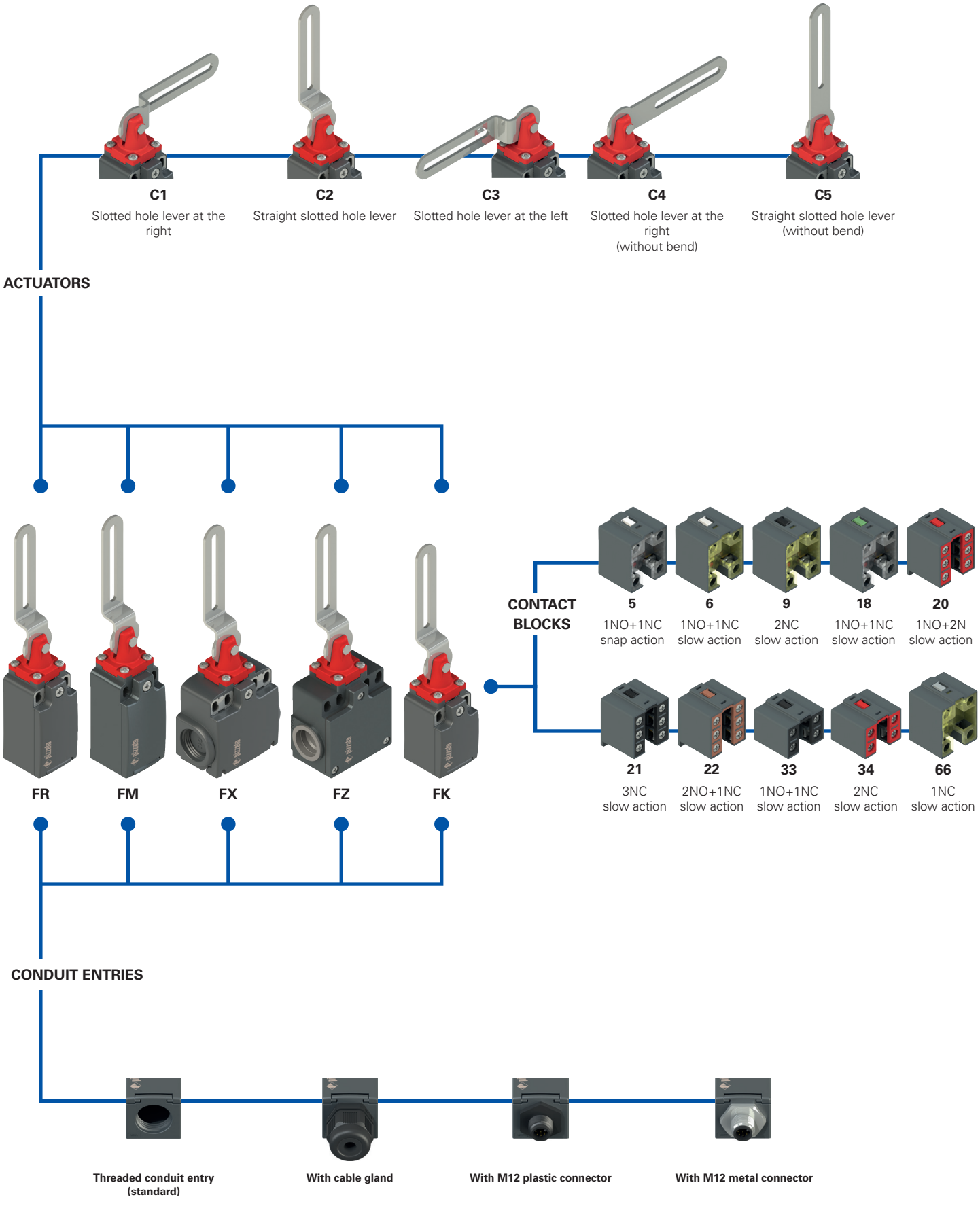
Pin the switch (pin is provided).

All values in the drawings are in mm

Accessories See page 419

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

Selection diagram



Product options

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

FR 18C1-GM2K70T6

Housing	
FR	technopolymer, one conduit entry
FM	metal, one conduit entry
FX	technopolymer, two conduit entries
FZ	metal, two conduit entries

Contact block	
5	1NO+1NC, snap action
6	1NO+1NC, slow action
9	2NC, slow action
18	1NO+1NC, 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
66	1NC, slow action

Actuators	
C1	slotted hole lever at the right
C2	straight slotted hole lever
C3	slotted hole lever at the left
C4	slotted hole lever at the right (without bend)
C5	straight slotted hole lever (without bend)

Contact type	
	silver contacts (standard)
G	silver contacts with 1 µm gold coating
G1	silver contacts, 2.5 µm gold coating (not for contact blocks 20, 21, 22, 33, 34)

Threaded conduit entry	
M2	M20x1.5 (standard)
M1	M16x1.5 (FR-FX housing only)
	PG 13.5
A	PG 11 (FR-FX housing only)

Pre-installed cable glands or connectors	
	no cable gland or connector (standard)
K23	cable gland for cables Ø 6 … 12 mm
...	…
K70	M12 plastic connector, 4-pole
...	…

For the complete list of possible combinations please contact our technical department.

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

article | options | options

FK 33C1-GM2K24T6

Housing	
FK	technopolymer, one conduit entry

Contact blocks	
33	1NO+1NC, slow action
34	2NC, slow action

Actuators	
C1	slotted hole lever at the right
C2	straight slotted hole lever
C3	slotted hole lever at the left
C4	slotted hole lever at the right (without bend)
C5	straight slotted hole lever (without bend)

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

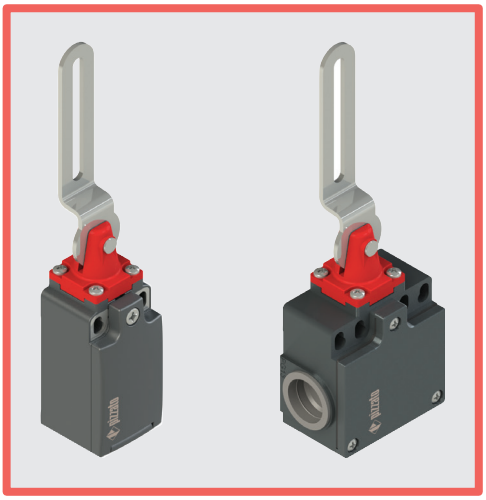
Threaded conduit entry	
M2	M20x1.5 (standard)
	PG 11

Pre-installed cable glands or connectors	
	no cable gland or connector (standard)
K24	cable gland for cables Ø 5 … 10 mm
K70	M12 plastic connector, 4-pole

For the complete list of possible combinations please contact our technical department.

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

Safety switches **with slotted hole lever**



Main features
- Metal housing or technopolymer housing, from one to two conduit entries
- Protection degree IP67
- 10 contact blocks available
- Versions with M12 connector
- Versions with gold-plated silver contacts

Technical data

Housing
FR, FX and FK series housing made of glass fibre reinforced technopolymer, self-extinguishing, shock-proof and with double insulation: ⧈
FM and FZ series: metal housing, baked powder coating.

FR, FM series: one threaded conduit entry:	M20x1.5 (standard)
FK series: one threaded conduit entry:	M16x1.5 (standard)
FX series: two knock-out threaded conduit entries:	M20x1.5 (standard)
FZ series: two threaded conduit entries:	M20x1.5 (standard)
Protection degree:	IP67 acc. to EN 60529 (with cable gland of equal or higher protection degree)

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	2,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	180°/s
Min. actuation speed:	2°/s
Tightening torques for installation:	see page 443
Wire cross-sections and wire stripping lengths:	see page 461

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN IEC 63000, UL 508, CSA C22.2 No. 14.
Approvals:
EN 60947-5-1, UL 508, CSA C22.2 No. 14, GB/T14048.5.

Compliance with the requirements of:
Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

Quality marks:

IMQ approval:	EG610
UL approval:	E131787
CCC approval:	2021000305000101
EAC approval:	RU C-IT.УТ03.B.00035/19

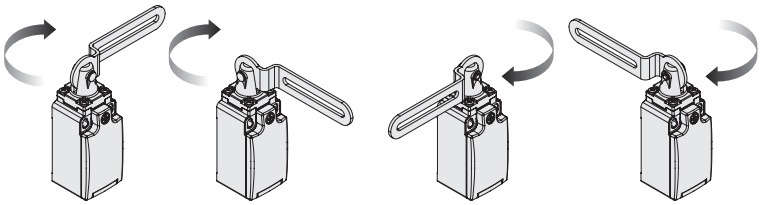
⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 443 to 454.

	Electrical data		Utilization category
without connector	Thermal current (I_{th}):	10 A	
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	Alternating current: AC15 (50÷60 Hz) U_e (V) 250 400 500 I_e (A) 6 4 1 Direct current: DC13 U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 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-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 120 250 I_e (A) 4 4 4 Direct current: DC13 U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	
	Protection against short circuits:	type gG fuse 4 A 500 V	
	Pollution degree:	3	
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 I_e (A) 2 Direct current: DC13 U_e (V) 24 I_e (A) 2
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	
	Protection against short circuits:	type gG fuse 2 A 500 V	
	Pollution degree:	3	

Description

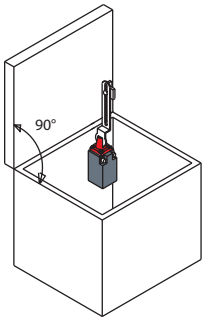
These safety switches are used to control gates or guards with hinges protecting dangerous parts of machines without inertia. Easy to install, they do not need the interaction with the hinge of the guard. They are very sensitive, open the contacts after few degrees of rotation and immediately send the stop signal.

Head with variable orientation

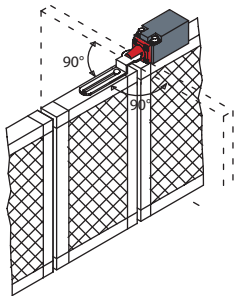


For all switches, the head can be adjusted in 90° steps after removing the four fastening screws. This allows you to use the same switch on both right- and left-facing door fronts.

Application examples



Safety switch with slotted hole lever, mounting inside the safety guard



Safety switch with slotted hole lever, mounting on guards which open up to 180°

Protection degree IP67

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

Extended temperature range

-40°C These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +80°C.

They can therefore be used for applications in cold stores, sterilisers and other equipment with low temperature environments. The special materials used to produce these versions retain their characteristics even under these conditions, thereby expanding the installation possibilities.

Features approved by IMQ

Rated insulation voltage (Ui):	500 Vac 400 Vac (for contact blocks 2, 11, 12, 20, 21, 22, 28, 29, 30, 37, 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, 28, 29, 30, 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: Za, Za+Za, X+X, Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X, Y, X.
Positive opening of contacts on contact blocks 5, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 20, 21, 22, 28, 29, 30, 33, 34, 37, 38, 39, 66.
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

Features approved by UL

Electrical Ratings:	Q300 pilot duty (69 VA, 125-250 V dc) A600 pilot duty (720 VA, 120-600 V ac)
Environmental Ratings:	FR: Types 1, 4X FM, FX, FZ, FK: Types 1, 4X, 12, 13

Use 60 or 75 °C copper (Cu) conductor and wire size range 12, 14 AWG, stranded or solid. The terminal tightening torque of 7.1 lb in (0.8 Nm).

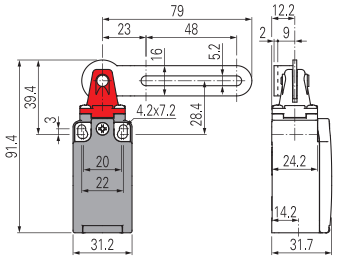
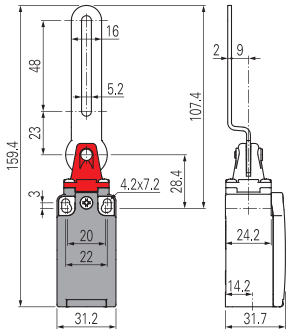
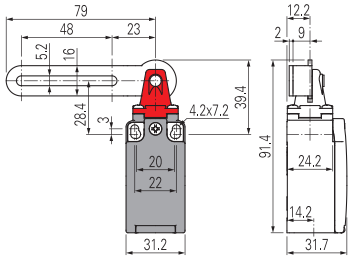
For FR, FX, FK series: the hub is to be connected to the conduit before the hub is connected to the enclosure.

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

Safety switches **with slotted hole lever**

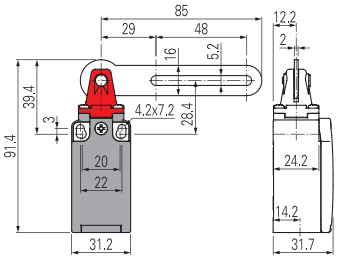
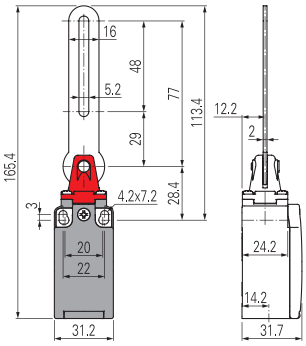
Contact type:

R = snap action
L = slow action
LA = slow action close

Contact blocks		Technopolymer housing	Technopolymer housing	Technopolymer housing
				
5	R	FR 5C1-M2	FR 5C2-M2	FR 5C3-M2
6	L	FR 6C1-M2	FR 6C2-M2	FR 6C3-M2
9	L	FR 9C1-M2	FR 9C2-M2	FR 9C3-M2
18	LA	FR 18C1-M2	FR 18C2-M2	FR 18C3-M2
20	L	FR 20C1-M2	FR 20C2-M2	FR 20C3-M2
21	L	FR 21C1-M2	FR 21C2-M2	FR 21C3-M2
22	L	FR 22C1-M2	FR 22C2-M2	FR 22C3-M2
33	L	FR 33C1-M2	FR 33C2-M2	FR 33C3-M2
34	L	FR 34C1-M2	FR 34C2-M2	FR 34C3-M2
66	L	FR 66C1-M2	FR 66C2-M2	FR 66C3-M2
		1NO+1NC / 2NC / 1NO+2NC / 3NC / 2NO+1NC / 1NC	1NO+1NC / 2NC / 1NO+2NC / 3NC / 2NO+1NC / 1NC	1NO+1NC / 2NC / 1NO+2NC / 3NC / 2NO+1NC / 1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 446 - group 10	page 446 - group 11	page 446 - group 10

Contact type:

R = snap action
L = slow action
LA = slow action close

Contact block		Technopolymer housing	Technopolymer housing
			
5	R	FR 5C4-M2	FR 5C5-M2
6	L	FR 6C4-M2	FR 6C5-M2
9	L	FR 9C4-M2	FR 9C5-M2
18	LA	FR 18C4-M2	FR 18C5-M2
20	L	FR 20C4-M2	FR 20C5-M2
21	L	FR 21C4-M2	FR 21C5-M2
22	L	FR 22C4-M2	FR 22C5-M2
33	L	FR 33C4-M2	FR 33C5-M2
34	L	FR 34C4-M2	FR 34C5-M2
66	L	FR 66C4-M2	FR 66C5-M2
		1NO+1NC / 2NC / 1NO+2NC / 3NC / 2NO+1NC / 1NC	1NO+1NC / 2NC / 1NO+2NC / 3NC / 2NO+1NC / 1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 446 - group 10	page 446 - group 11

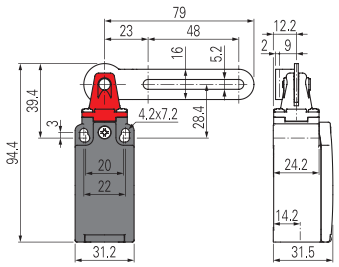
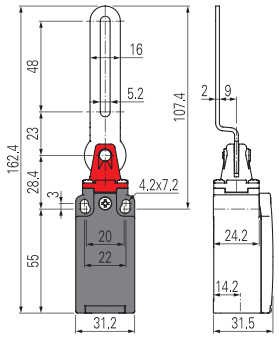
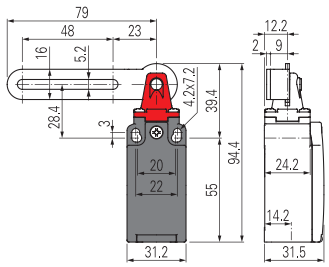
All values in the drawings are in mm

Accessories See page 419

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

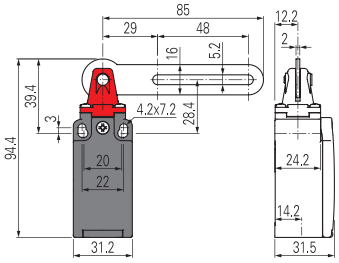
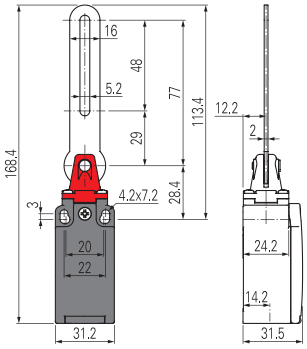
Contact type:

R = snap action
L = slow action
LA = slow action close

Contact block		Metal housing	Metal housing	Metal housing
				
5	R	FM 5C1-M2	FM 5C2-M2	FM 5C3-M2
6	L	FM 6C1-M2	FM 6C2-M2	FM 6C3-M2
9	L	FM 9C1-M2	FM 9C2-M2	FM 9C3-M2
18	LA	FM 18C1-M2	FM 18C2-M2	FM 18C3-M2
20	L	FM 20C1-M2	FM 20C2-M2	FM 20C3-M2
21	L	FM 21C1-M2	FM 21C2-M2	FM 21C3-M2
22	L	FM 22C1-M2	FM 22C2-M2	FM 22C3-M2
33	L	FM 33C1-M2	FM 33C2-M2	FM 33C3-M2
34	L	FM 34C1-M2	FM 34C2-M2	FM 34C3-M2
66	L	FM 66C1-M2	FM 66C2-M2	FM 66C3-M2
		1NO+1NC	1NO+1NC	1NO+1NC
		1NO+1NC	1NO+1NC	1NO+1NC
		2NC	2NC	2NC
		1NO+1NC	1NO+1NC	1NO+1NC
		1NO+2NC	1NO+2NC	1NO+2NC
		3NC	3NC	3NC
		2NO+1NC	2NO+1NC	2NO+1NC
		1NO+1NC	1NO+1NC	1NO+1NC
		2NC	2NC	2NC
		1NC	1NC	1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 446 - group 10	page 446 - group 11	page 446 - group 10

Contact type:

R = snap action
L = slow action
LA = slow action close

Contact block		Metal housing	Metal housing
			
5	R	FM 5C4-M2	FM 5C5-M2
6	L	FM 6C4-M2	FM 6C5-M2
9	L	FM 9C4-M2	FM 9C5-M2
18	LA	FM 18C4-M2	FM 18C5-M2
20	L	FM 20C4-M2	FM 20C5-M2
21	L	FM 21C4-M2	FM 21C5-M2
22	L	FM 22C4-M2	FM 22C5-M2
33	L	FM 33C4-M2	FM 33C5-M2
34	L	FM 34C4-M2	FM 34C5-M2
66	L	FM 66C4-M2	FM 66C5-M2
		1NO+1NC	1NO+1NC
		1NO+1NC	1NO+1NC
		2NC	2NC
		1NO+1NC	1NO+1NC
		1NO+2NC	1NO+2NC
		3NC	3NC
		2NO+1NC	2NO+1NC
		1NO+1NC	1NO+1NC
		2NC	2NC
		1NC	1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 446 - group 10	page 446 - group 11

All values in the drawings are in mm

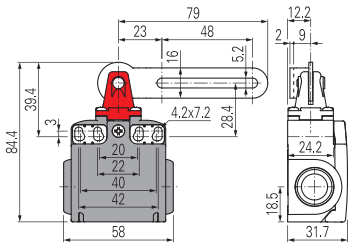
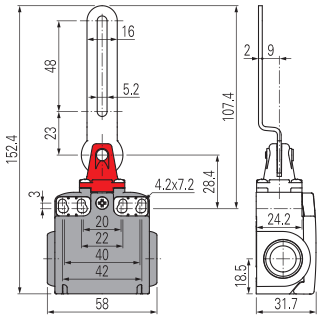
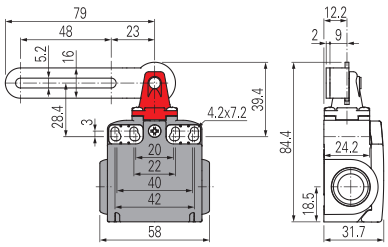
Accessories See page 419

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

Safety switches **with slotted hole lever**

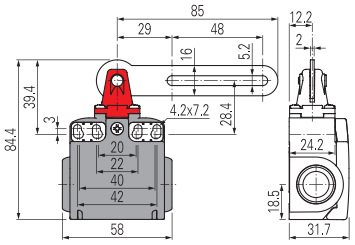
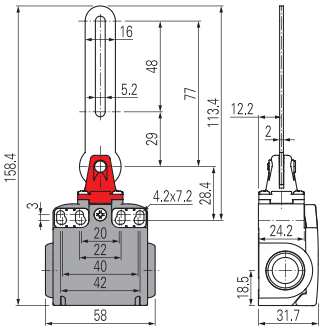
Contact type:

R = snap action
L = slow action
LA = slow action close

Contact block		Technopolymer housing	Technopolymer housing	Technopolymer housing
				
5	R	FX 5C1-M2 → 1NO+1NC	FX 5C2-M2 → 1NO+1NC	FX 5C3-M2 → 1NO+1NC
6	L	FX 6C1-M2 → 1NO+1NC	FX 6C2-M2 → 1NO+1NC	FX 6C3-M2 → 1NO+1NC
9	L	FX 9C1-M2 → 2NC	FX 9C2-M2 → 2NC	FX 9C3-M2 → 2NC
18	LA	FX 18C1-M2 → 1NO+1NC	FX 18C2-M2 → 1NO+1NC	FX 18C3-M2 → 1NO+1NC
20	L	FX 20C1-M2 → 1NO+2NC	FX 20C2-M2 → 1NO+2NC	FX 20C3-M2 → 1NO+2NC
21	L	FX 21C1-M2 → 3NC	FX 21C2-M2 → 3NC	FX 21C3-M2 → 3NC
22	L	FX 22C1-M2 → 2NO+1NC	FX 22C2-M2 → 2NO+1NC	FX 22C3-M2 → 2NO+1NC
33	L	FX 33C1-M2 → 1NO+1NC	FX 33C2-M2 → 1NO+1NC	FX 33C3-M2 → 1NO+1NC
34	L	FX 34C1-M2 → 2NC	FX 34C2-M2 → 2NC	FX 34C3-M2 → 2NC
66	L	FX 66C1-M2 → 1NC	FX 66C2-M2 → 1NC	FX 66C3-M2 → 1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 446 - group 10	page 446 - group 11	page 446 - group 10

Contact type:

R = snap action
L = slow action
LA = slow action close

Contact block		Technopolymer housing	Technopolymer housing
			
5	R	FX 5C4-M2 → 1NO+1NC	FX 5C5-M2 → 1NO+1NC
6	L	FX 6C4-M2 → 1NO+1NC	FX 6C5-M2 → 1NO+1NC
9	L	FX 9C4-M2 → 2NC	FX 9C5-M2 → 2NC
18	LA	FX 18C4-M2 → 1NO+1NC	FX 18C5-M2 → 1NO+1NC
20	L	FX 20C4-M2 → 1NO+2NC	FX 20C5-M2 → 1NO+2NC
21	L	FX 21C4-M2 → 3NC	FX 21C5-M2 → 3NC
22	L	FX 22C4-M2 → 2NO+1NC	FX 22C5-M2 → 2NO+1NC
33	L	FX 33C4-M2 → 1NO+1NC	FX 33C5-M2 → 1NO+1NC
34	L	FX 34C4-M2 → 2NC	FX 34C5-M2 → 2NC
66	L	FX 66C4-M2 → 1NC	FX 66C5-M2 → 1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 446 - group 10	page 446 - group 11

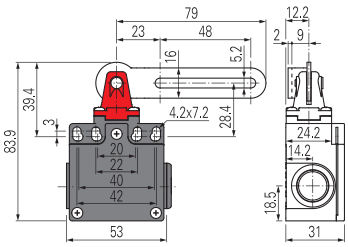
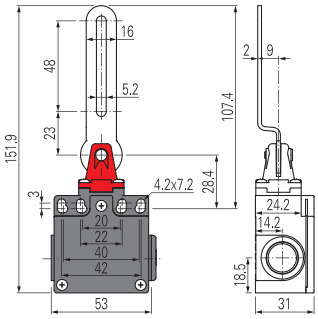
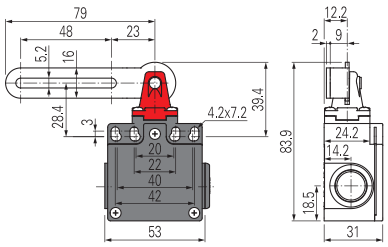
All values in the drawings are in mm

Accessories See page 419

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

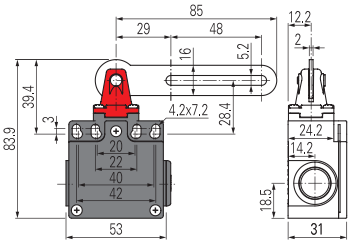
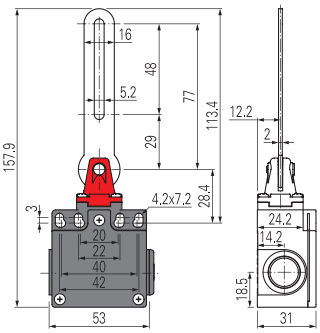
Contact type:

R = snap action
L = slow action
LA = slow action close

Contact block		Metal housing		Metal housing		Metal housing	
							
5	R	FZ 5C1-M2	1NO+1NC	FZ 5C2-M2	1NO+1NC	FZ 5C3-M2	1NO+1NC
6	L	FZ 6C1-M2	1NO+1NC	FZ 6C2-M2	1NO+1NC	FZ 6C3-M2	1NO+1NC
9	L	FZ 9C1-M2	2NC	FZ 9C2-M2	2NC	FZ 9C3-M2	2NC
18	LA	FZ 18C1-M2	1NO+1NC	FZ 18C2-M2	1NO+1NC	FZ 18C3-M2	1NO+1NC
20	L	FZ 20C1-M2	1NO+2NC	FZ 20C2-M2	1NO+2NC	FZ 20C3-M2	1NO+2NC
21	L	FZ 21C1-M2	3NC	FZ 21C2-M2	3NC	FZ 21C3-M2	3NC
22	L	FZ 22C1-M2	2NO+1NC	FZ 22C2-M2	2NO+1NC	FZ 22C3-M2	2NO+1NC
33	L	FZ 33C1-M2	1NO+1NC	FZ 33C2-M2	1NO+1NC	FZ 33C3-M2	1NO+1NC
34	L	FZ 34C1-M2	2NC	FZ 34C2-M2	2NC	FZ 34C3-M2	2NC
66	L	FZ 66C1-M2	1NC	FZ 66C2-M2	1NC	FZ 66C3-M2	1NC
Actuating force		0.11 Nm (0.15 Nm)		0.11 Nm (0.15 Nm)		0.11 Nm (0.15 Nm)	
Travel diagrams		page 446 - group 10		page 446 - group 11		page 446 - group 10	

Contact type:

R = snap action
L = slow action
LA = slow action close

Contact block		Metal housing		Metal housing	
					
5	R	FZ 5C4-M2	1NO+1NC	FZ 5C5-M2	1NO+1NC
6	L	FZ 6C4-M2	1NO+1NC	FZ 6C5-M2	1NO+1NC
9	L	FZ 9C4-M2	2NC	FZ 9C5-M2	2NC
18	LA	FZ 18C4-M2	1NO+1NC	FZ 18C5-M2	1NO+1NC
20	L	FZ 20C4-M2	1NO+2NC	FZ 20C5-M2	1NO+2NC
21	L	FZ 21C4-M2	3NC	FZ 21C5-M2	3NC
22	L	FZ 22C4-M2	2NO+1NC	FZ 22C5-M2	2NO+1NC
33	L	FZ 33C4-M2	1NO+1NC	FZ 33C5-M2	1NO+1NC
34	L	FZ 34C4-M2	2NC	FZ 34C5-M2	2NC
66	L	FZ 66C4-M2	1NC	FZ 66C5-M2	1NC
Actuating force		0.11 Nm (0.15 Nm)		0.11 Nm (0.15 Nm)	
Travel diagrams		page 446 - group 10		page 446 - group 11	

All values in the drawings are in mm

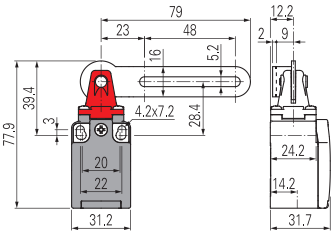
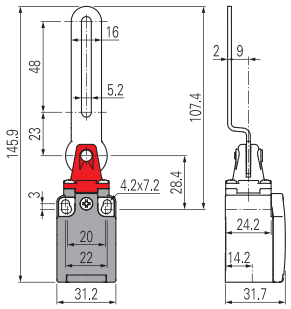
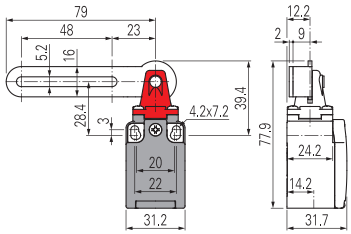
Accessories See page 419

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

Safety switches **with slotted hole lever**

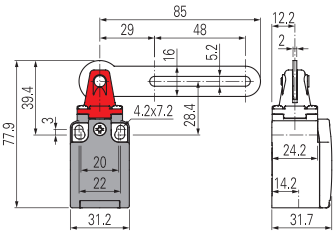
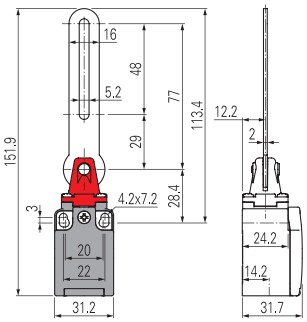
Contact type:

L = slow action

Contact block		Technopolymer housing	Technopolymer housing	Technopolymer housing
				
33	L	FK 33C1-M2 → 1NO+1NC	FK 33C2-M2 → 1NO+1NC	FK 33C3-M2 → 1NO+1NC
34	L	FK 34C1-M2 → 2NC	FK 34C2-M2 → 2NC	FK 34C3-M2 → 2NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 446 - group 10	page 446 - group 11	page 446 - group 10

Contact type:

L = slow action

Contact block		Technopolymer housing	Technopolymer housing
			
33	L	FK 33C4-M2 → 1NO+1NC	FK 33C5-M2 → 1NO+1NC
34	L	FK 34C4-M2 → 2NC	FK 34C5-M2 → 2NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 446 - group 10	page 446 - group 11

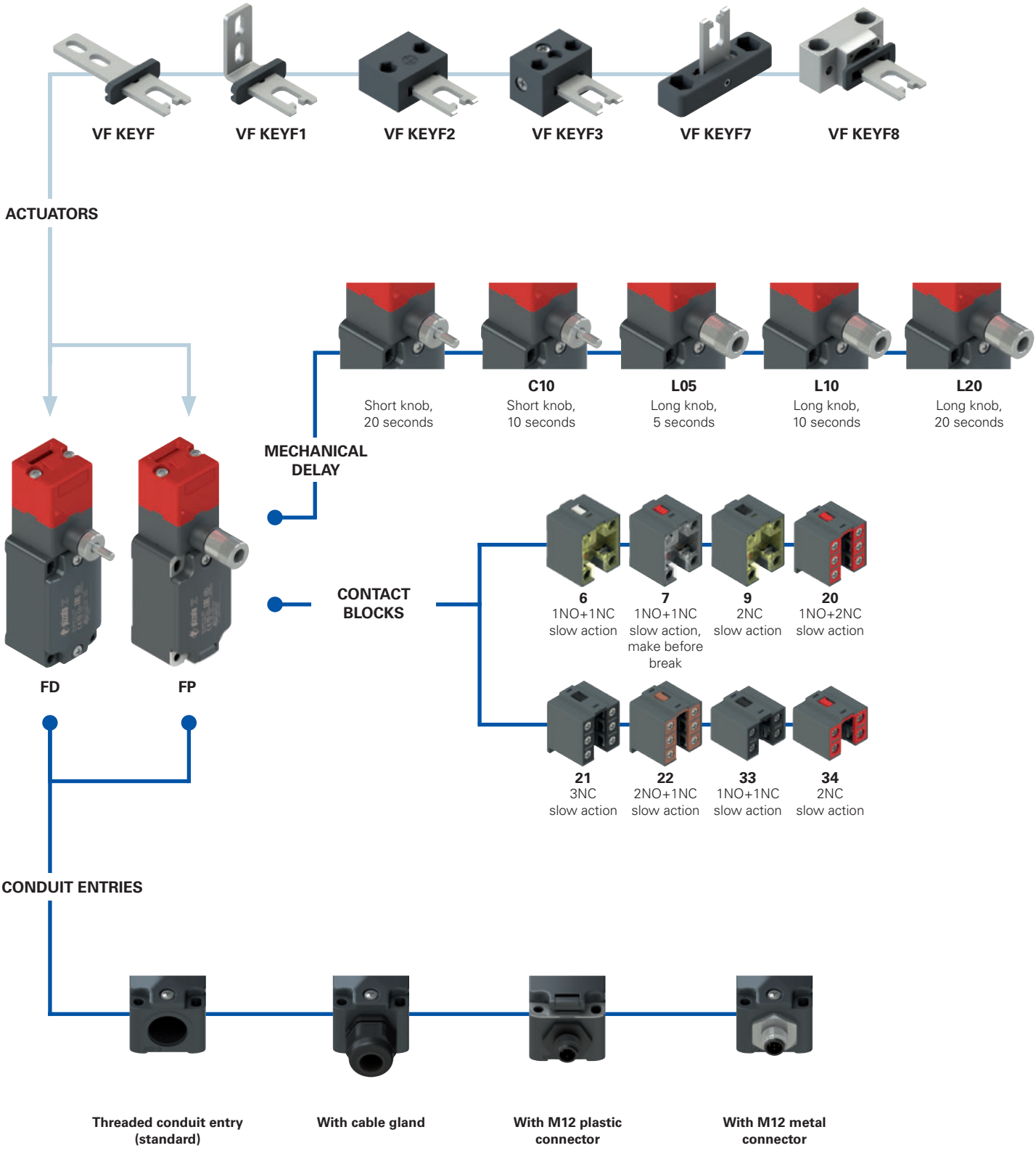
All values in the drawings are in mm

Accessories See page 419

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

Notes

Selection diagram



product option

Sold separately as accessory

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, make before break
9	2NC, slow action
20	1NO+2NC, slow action
21	3NC, slow action
22	2NO+1NC, slow action
33	1NO+1NC, slow action
34	2NC, slow action

Mechanical delay	
	short knob, 20 s (standard)
C10	short knob, 10 s
L05	long knob, 5 s
L10	long knob, 10 s
L20	long knob, 20 s

Actuators	
	without actuator (standard)
F	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

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

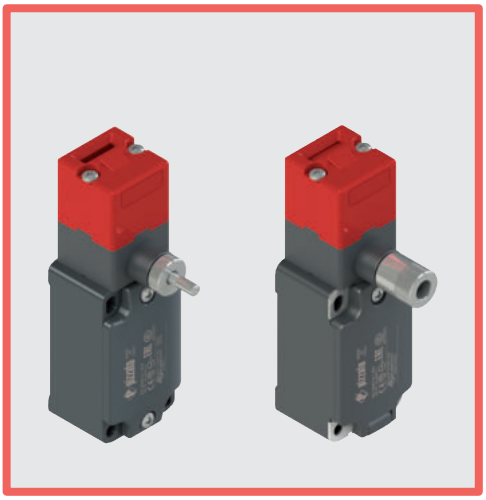
Contact type	
	silver contacts (standard)
G	silver contacts with 1 µm gold coating
G1	silver contacts, 2.5 µm gold coating (not for contact blocks 20, 21, 22, 33, 34)

Pre-installed cable glands or connectors	
	no cable gland or connector (standard)
K23	cable gland for cables Ø 6 … 12 mm
…	…
K50	M12 metal connector, 5-pole
…	…

For the complete list of possible combinations please contact our technical department.

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

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 release
- Versions with different release delay times

Quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2021000305000099
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

FP series housing made of glass fibre 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 of equal or higher protection degree

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	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
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	360 operating cycles/hour
Mechanical endurance:	500,000 operating cycles
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 acc. to EN ISO 14119
Max. clearance of the actuator:	4.5 mm
Tightening torques for installation:	see page 441
Wire cross-sections and wire stripping lengths:	see page 461

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN IEC 63000, BG-GS-ET-15, UL 508, CSA C22.2 No. 14.
Approvals:
EN 60947-5-1, UL 508, CSA C22.2 No. 14, GB/T14048.5

Compliance with the requirements of:
Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU.
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 the instructions given on pages 443 to 454.**

Electrical data			Utilization category
without connector	Thermal current (I_{th}):	10 A	
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	Alternating current: AC15 (50÷60 Hz) U_e (V) 250 400 500 I_e (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	U_e (V) 24 125 250
	Protection against short circuits:	type aM fuse 10 A 500 V	I_e (A) 3 0.55 0.3
	Pollution degree:	3	
with M12 connector, 4 and 5-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 120 250 I_e (A) 4 4 4
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	
	Protection against short circuits:	type gG fuse 4 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 I_e (A) 2
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	
	Protection against short circuits:	type gG fuse 2 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 I_e (A) 2

Features approved by IMQ

Rated insulation voltage (Ui):	500 Vac 400 Vac (for contact blocks 2, 11, 12, 20, 21, 22, 28, 29, 30, 33, 34, 37)
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, 28, 29, 30, 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: Za, Za+Za, X+X, Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X, Y, X.
Positive opening of contacts on contact blocks 5, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 20, 21, 22, 28, 29, 30, 33, 34, 37, 38, 39, 66.
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

Features approved by UL

Electrical Ratings:	Q300 pilot duty (69 VA, 125-250 V dc) A600 pilot duty (720 VA, 120-600 V ac)
Environmental Ratings:	Types 1, 4X, 12, 13

Use 60 or 75 °C copper (Cu) conductor and wire size range 12, 14 AWG, stranded or solid. The terminal tightening torque of 7.1 lb in (0.8 Nm).

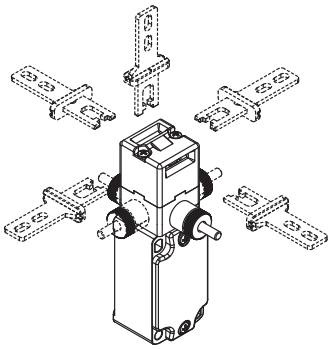
For FP series: the hub is to be connected to the conduit before the hub is connected to the enclosure.

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

Description

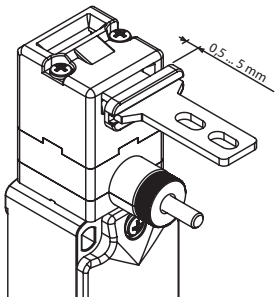
These switches are used on machines where the hazardous conditions remain for a while, even after the machine has been switched off, for example because of mechanical inertia of the pulleys, saw disks, mills. This switch has its ideal application where the guard is not opened frequently and the installation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

Head and knobs with variable orientation



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

Adjustment range



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

Protection degree IP67

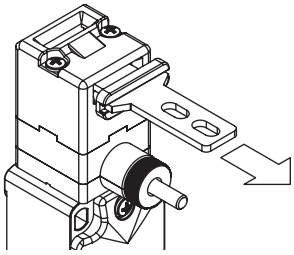
IP67

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

Contact block

Contact blocks with captive screws, finger protection, twin bridge contacts and double interruption for higher contact reliability. Available in multiple versions with shifted, simultaneous or overlapping actuation paths. They are suitable for many different 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 guards are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked guards in their position with a retaining force of approx. 30 N, stopping any vibrations or gusts of wind from opening them.

Extended temperature range

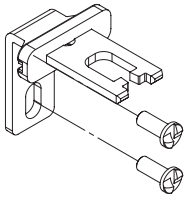
-40°C

These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +80°C.
They can therefore be used for applications in cold stores, sterilisers and other equipment with low temperature environments. The special materials used to produce these versions retain their characteristics even under these conditions, thereby expanding the installation possibilities.

Laser engraving

All devices are marked using a dedicated indelible laser system. These engravings are therefore suitable for extreme environments too. Thanks to this system that does not use labels, the loss of plate data is prevented and a greater resistance of the marking is achieved over time.

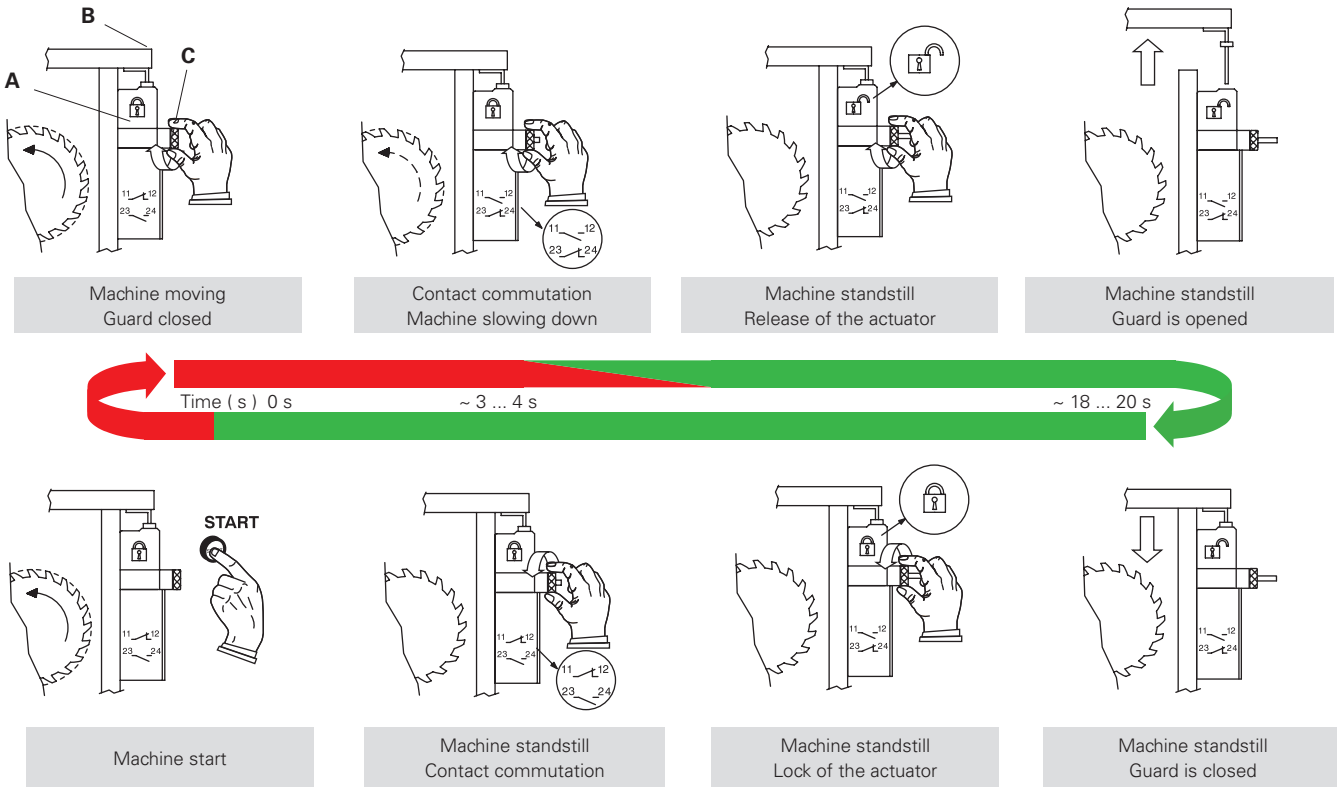
Safety screws for actuators



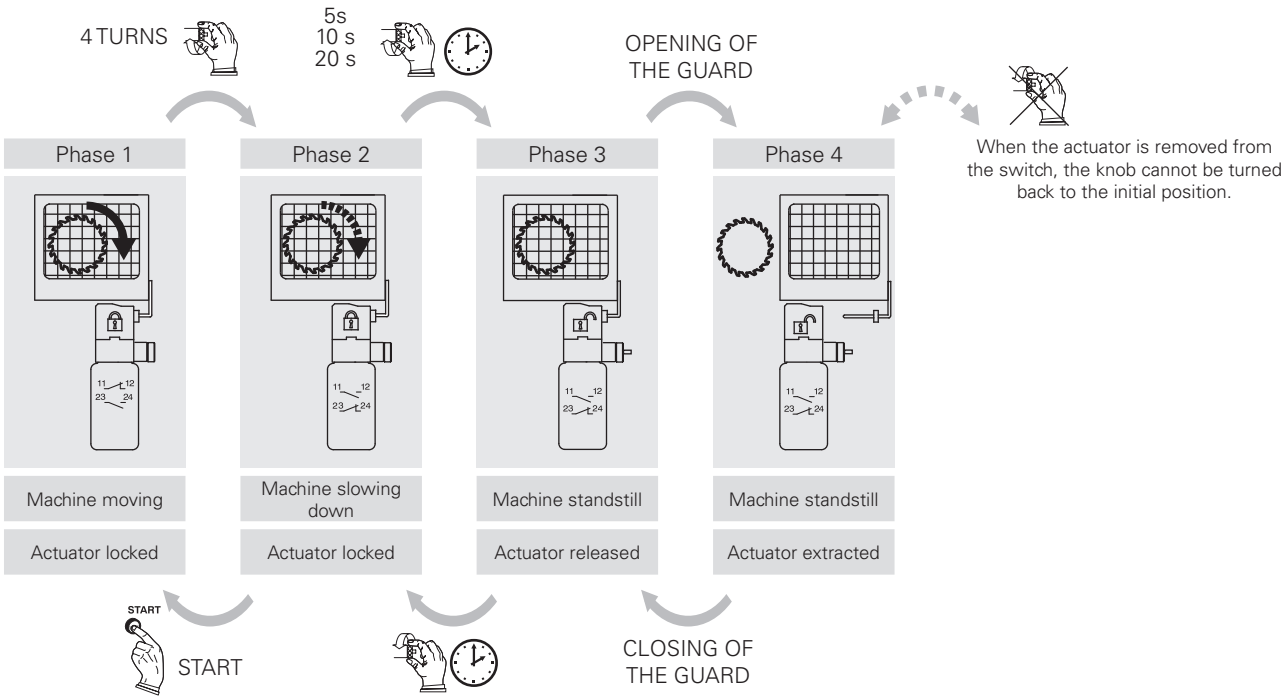
As required by EN ISO 14119, the actuator must be fixed immovably to the guard frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered by using common tools. See accessories on page 419.

Operation (FP 6R2-M2F1)

The switch is fastened 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 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.



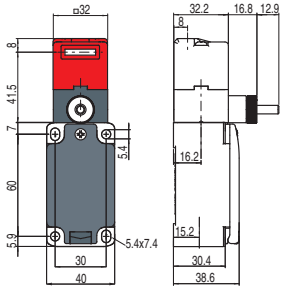
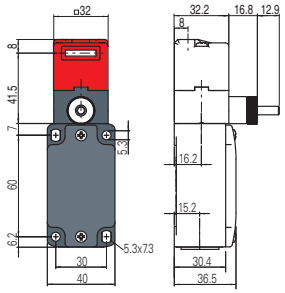
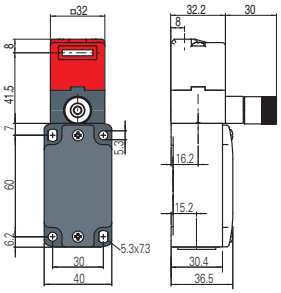
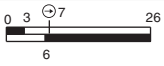
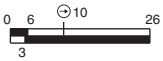
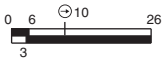
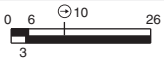
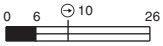
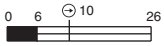
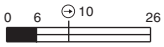
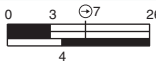
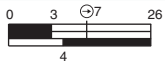
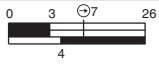
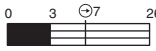
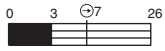
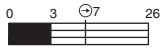
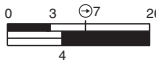
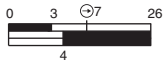
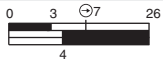
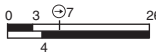
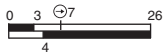
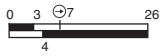
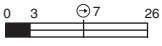
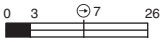
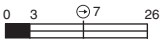
Operating phases (FD 6R2-M2F1)



Contact type:

L = slow action
LO = slow action, make before break

Contact block

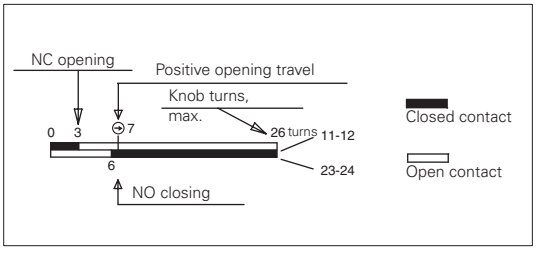
		Technopolymer housing Without actuator	Metal housing Without actuator	Metal housing Without actuator
				
6	L	FP 6R2-M2 1NO+1NC	FD 6R2-M2 1NO+1NC	FD 6R2-L10M2 1NO+1NC
				
7	LO	FP 7R2-M2 1NO+1NC	FD 7R2-M2 1NO+1NC	FD 7R2-L10M2 1NO+1NC
				
9	L	FP 9R2-M2 2NC	FD 9R2-M2 2NC	FD 9R2-L10M2 2NC
				
20	L	FP 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
				
Actuating force		10 N (18 N ⊖)	10 N (18 N ⊖)	10 N (18 N ⊖)

All values in the diagrams are in turns of the knob

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

How to read travel diagrams

All values in the diagrams are in turns of the knob



IMPORTANT:
The state of the NC contact refers to the switch with inserted actuator and with the knob turned anti-clockwise up to the end of the travel. For**installation in safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol ⊖. Actuate the switch **at least with the positive opening force**, reported in brackets below each article, next to the actuating force value.

Limits of use

Do not use where dust and dirt may penetrate in any way into the head and deposit there. Especially not where powder, shavings, concrete or chemicals are sprayed. Adhere to the EN ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with presence of explosive or flammable gas. In these cases, use ATEX products (see dedicated 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 these cases, the maintenance personnel must use the actuator entry locking device VF KB1 shown on page 114.

All values in the drawings are in mm

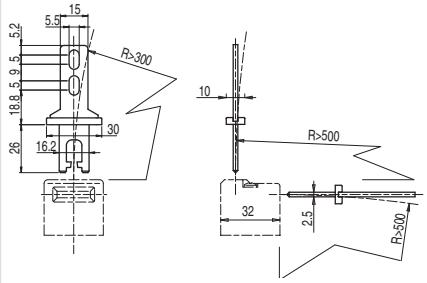
Accessories See page 419

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

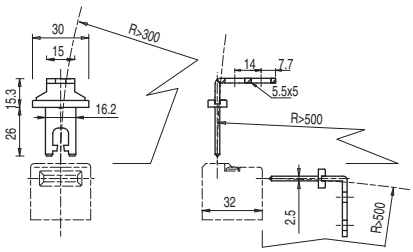
Stainless steel actuators

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

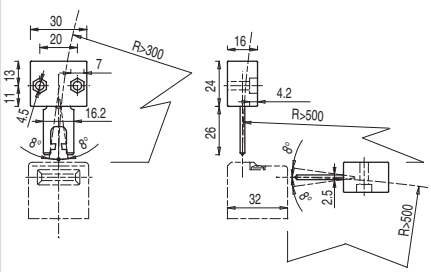
Article	Description
VF KEYF	Straight actuator



Article	Description
VF KEYF1	Angled actuator

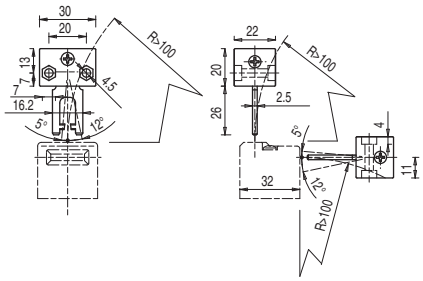


Article	Description
VF KEYF2	Jointed actuator



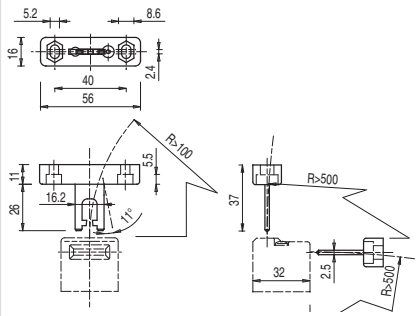
The actuator can flex in four directions for applications where the guard alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions



Actuator adjustable in two directions for guards with reduced dimensions.

Article	Description
VF KEYF7	Actuator adjustable in one direction



Actuator adjustable in one direction for guards with reduced dimensions.

All values in the drawings are in mm

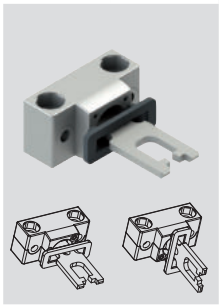
Accessories See page 419

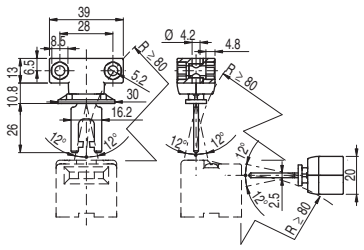
→ The 2D and 3D files are available at **www.pizzato.com**

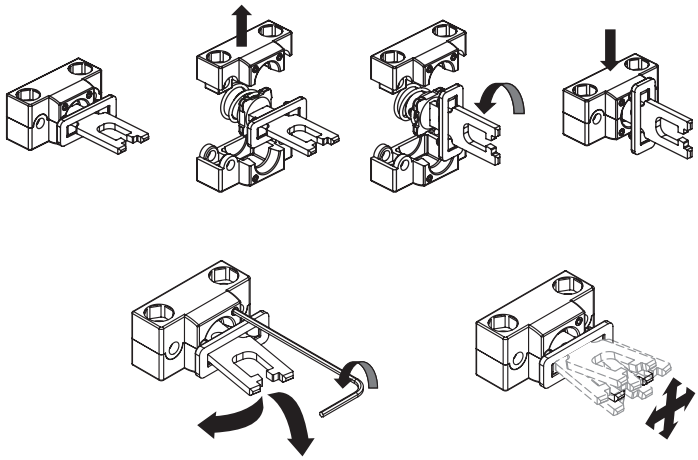
Universal actuator VF KEYF8

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

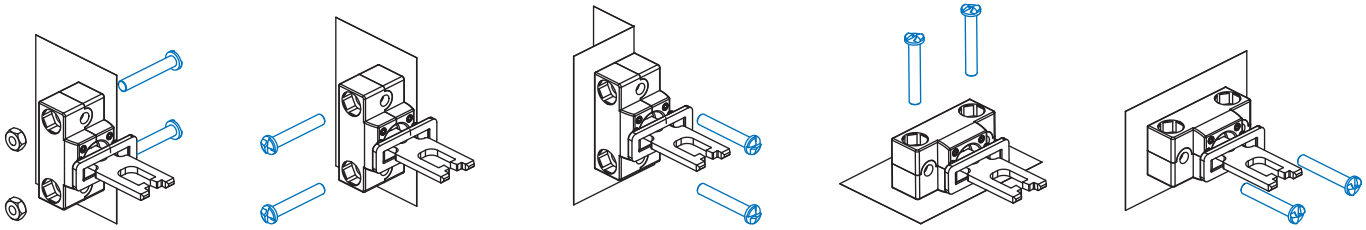
Article	Description
VF KEYF8	Universal actuator





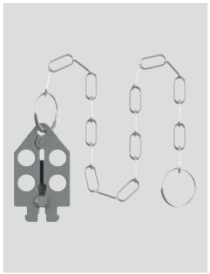


Jointed actuator for guards with poor alignment, adjustable in two dimensions for small doors; can be mounted in various positions.
The metal fixing body has two pairs of bore holes; it is provided for rotating the working plane of the actuator by 90°.



Accessories

Article	Description
VF KB1	Lock out device



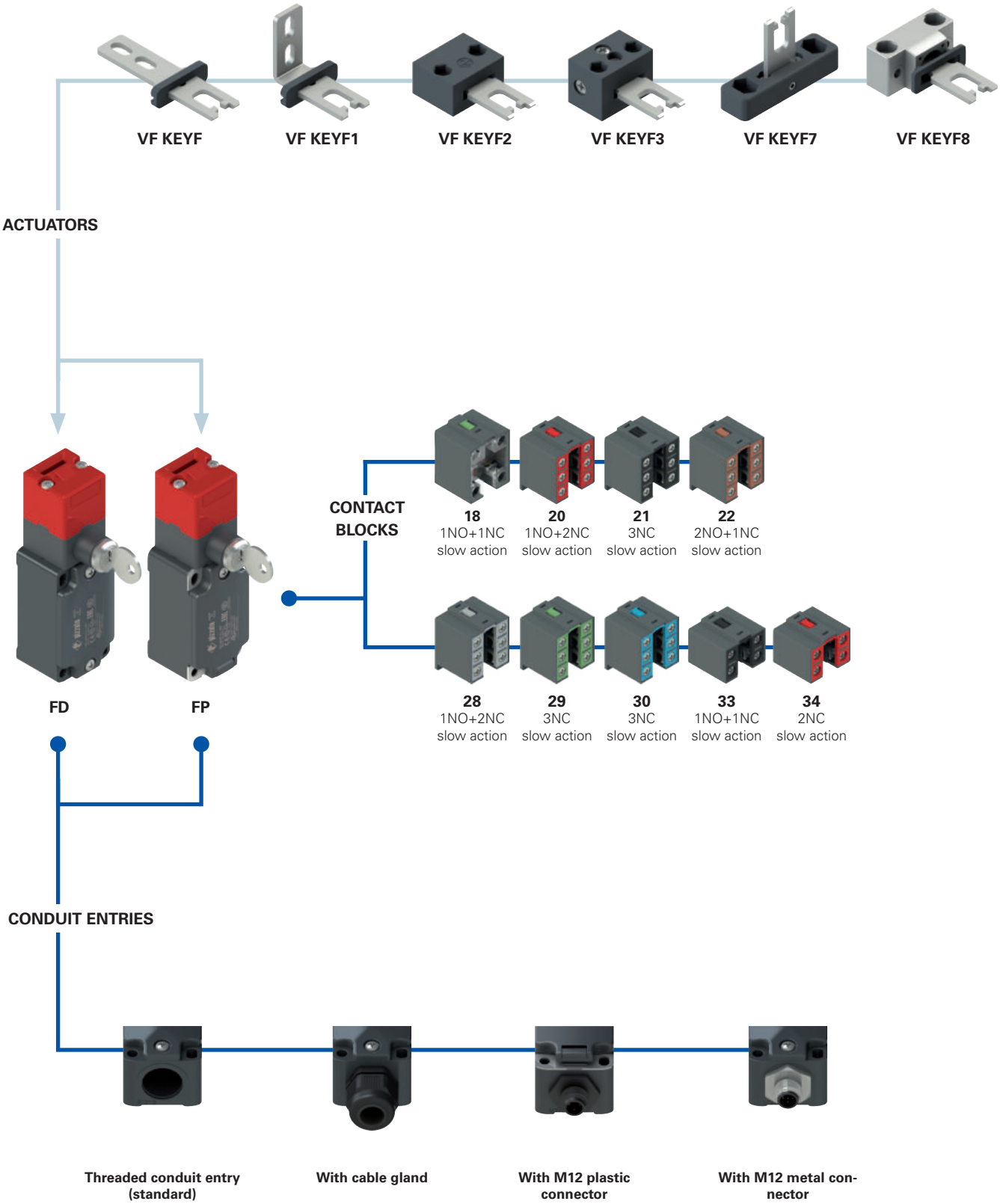
Padlockable lock out device to prevent the actuator entry and the accidental closing of the door behind operators while they are in the danger area.
Hole diameter for padlocks: 9 mm.

All values in the drawings are in mm

Accessories See page 419

→ 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-F1GM2K50T6V200

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

Contact block		
	Contacts activated by the lock	Contacts 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
G1	silver contacts, 2.5 µm gold coating (not for contact blocks 20, 21, 22, 28, 29, 30, 33, 34)

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

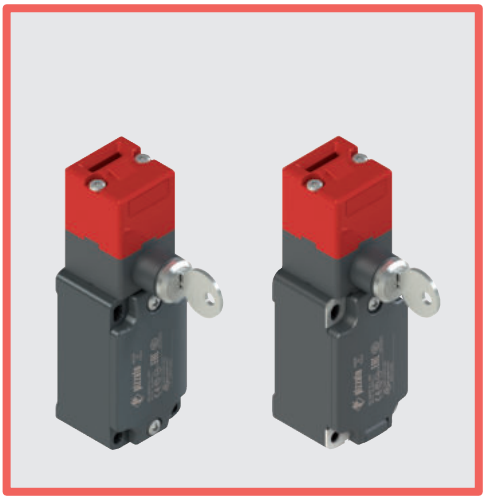
Pre-installed cable glands or connectors	
	no cable gland or connector (standard)
K23	cable gland for cables Ø 6 … 12 mm
…	…
K50	M12 metal connector, 5-pole
…	…

For the complete list of possible combinations please contact our technical department.

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

Lock key coding	
	one standard key coding (371)
V200	up to 8 different key codings

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

Quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2021000305000099
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	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
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	500,000 operating cycles
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 acc. to EN ISO 14119
Max. clearance of the actuator:	4.5 mm
Actuator extraction force:	30 N
Tightening torques for installation:	see page 441
Wire cross-sections and wire stripping lengths:	see page 461

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN IEC 63000, BG-GS-ET-15, UL 508, CSA C22.2 No. 14.
Approvals:
EN 60947-5-1, UL 508, CSA C22.2 No. 14, GB/T14048.5

Compliance with the requirements of:
Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU.
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 the instructions given on pages 443 to 454.**

Electrical data			Utilization category
without connector	Thermal current (I_{th}):	10 A	
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)	Alternating current: AC15 (50÷60 Hz) U_e (V) 250 400 500 I_e (A) 6 4 1
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)	Direct current: DC13 U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
	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-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 120 250 I_e (A) 4 4 4
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	Direct current: DC13 U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
	Protection against short circuits:	type gG fuse 4 A 500 V	
	Pollution degree:	3	
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 I_e (A) 2
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	Direct current: DC13 U_e (V) 24 I_e (A) 2
	Protection against short circuits:	type gG fuse 2 A 500 V	
	Pollution degree:	3	

Features approved by IMQ

Rated insulation voltage (Ui):	500 Vac 400 Vac (for contact blocks 2, 11, 12, 20, 21, 22, 28, 29, 30, 33, 34, 37)
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, 28, 29, 30, 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: Za, Za+Za, X+X, Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X, Y, X.
Positive opening of contacts on contact blocks 5, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 20, 21, 22, 28, 29, 30, 33, 34, 37, 38, 39, 66.
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

Features approved by UL

Electrical Ratings:	Q300 pilot duty (69 VA, 125-250 V dc) A600 pilot duty (720 VA, 120-600 V ac)
Environmental Ratings:	Types 1, 4X, 12, 13

Use 60 or 75 °C copper (Cu) conductor and wire size range 12, 14 AWG, stranded or solid. The terminal tightening torque of 7.1 lb in (0.8 Nm).

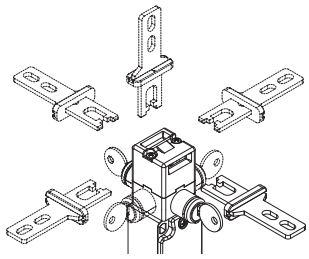
For FP series: the hub is to be connected to the conduit before the hub is connected to the enclosure.

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

Description

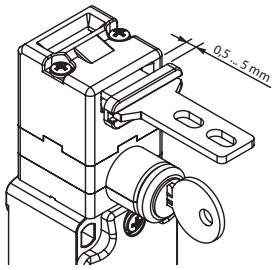
In these switches, equipped with a sturdy lock, the actuator can be removed from the head only after a complete 180° rotation of the key in the lock. The electrical contacts are switched as the key is turned; the actuator is released only after the NC contacts have been positively opened. Contacts activated by the lock are reset to the initial position only with inserted actuator and with the key in the 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 guard locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

Head and release devices with variable orientation



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

Adjustment range



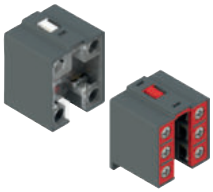
The actuation head of this switch features a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5 mm) without causing unwanted machine shutdowns. This wide range of travel is available in all actuators in order to ensure maximum device reliability.

Protection degree IP67

IP67

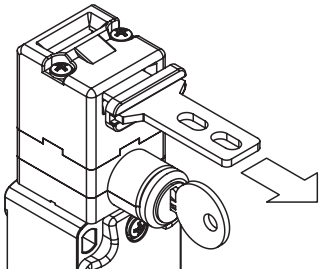
These devices are designed to be used under the toughest environmental conditions, and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where the maximum degree of protection is required for the housing.

Contact block



Contact blocks with captive screws, finger protection, twin bridge contacts and double interruption for 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 guards are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked guards in their position with a retaining force of approx. 30 N, stopping any vibrations or gusts of wind from opening them.

Extended temperature range

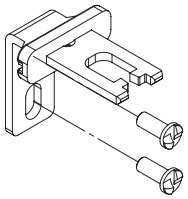
-40°C

These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +80°C.
They can therefore be used for applications in cold stores, sterilisers and other equipment with low temperature environments. The special materials used to produce these versions retain their characteristics even under these conditions, thereby expanding the installation possibilities.

Laser engraving

All devices are marked using a dedicated indelible laser system. These engravings are therefore suitable for extreme environments too. Thanks to this system that does not use labels, the loss of plate data is prevented and a greater resistance of the marking is achieved over time.

Safety screws for actuators

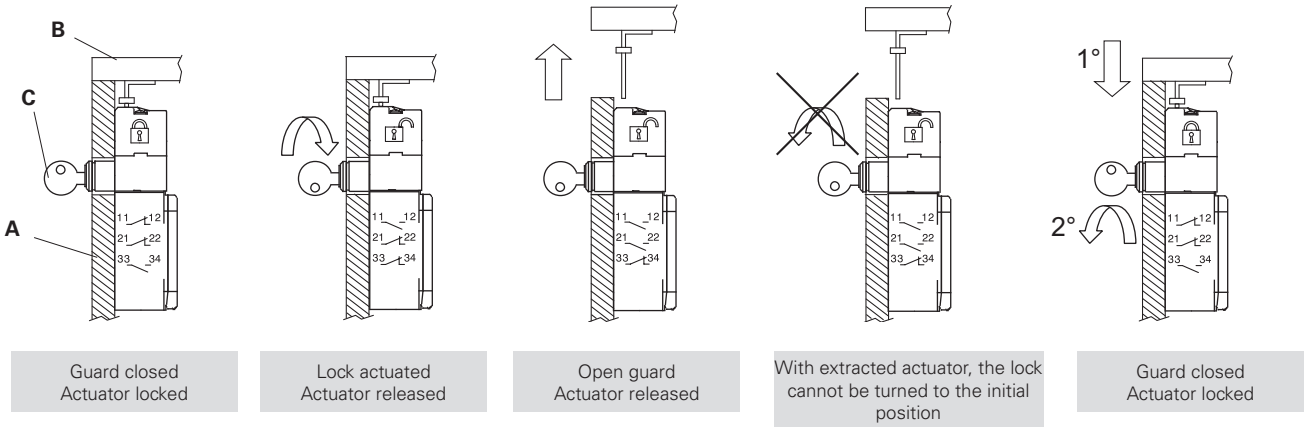


As required by ISO 14119, the actuator must be fixed immovably to the guard frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered by using common tools. See accessories on page 419.

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

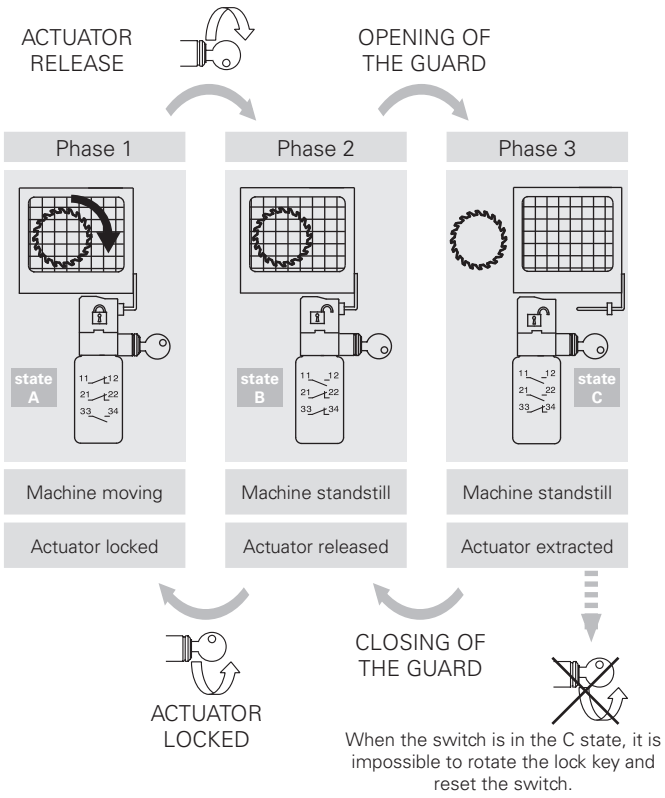
Operation

The switch is fastened 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, the lock must be unlocked by turning the key (C). When the actuator is removed, the key cannot be put into the initial position anymore. The example shows how the contacts of the lock and actuator are switched and how the switch can be installed within the machine in such a way that only the release device is visible from the outside.



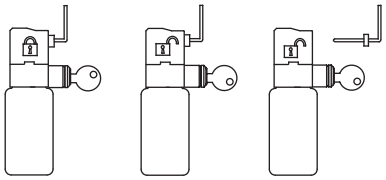
Guard closed Actuator locked	Lock actuated Actuator released	Open guard Actuator released	With extracted actuator, the lock cannot be turned to the initial position	Guard closed Actuator locked

Operating phases



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

Contact positions related to switch states

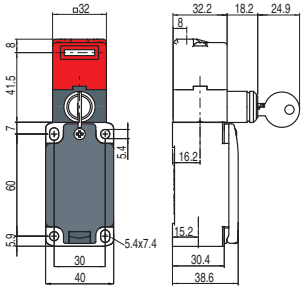
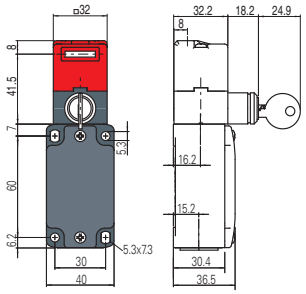
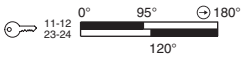
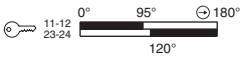
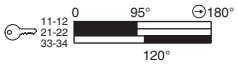
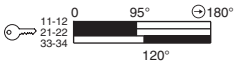
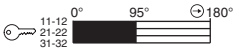
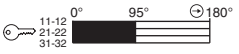
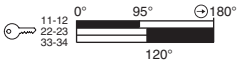
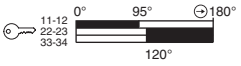
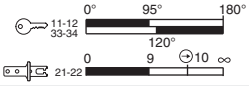
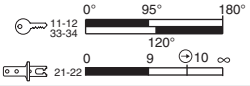
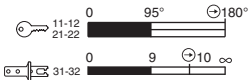
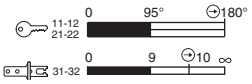
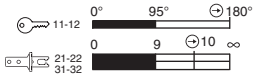
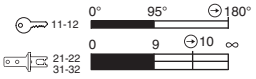
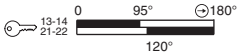
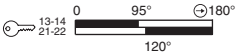
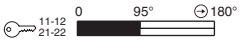
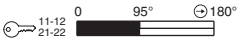
Operating state	state A	state B	state C
Actuator	Inserted and locked	Inserted and released	Extracted
Lock	Closed	Open	Open
Contact blocks			
FD 1899 1NO+1NC controlled by the lock	11–12 23–24	11 12 23 24	11 12 23 24
FD 2099 1NO+2NC controlled by the lock	11–12 21–22 33–34	11 12 21 22 33 34	11 12 21 22 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 2NO+1NC 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 locked or released actuator.

Limits of use

Do not use where dust and dirt may penetrate in any way into the head and deposit there. Especially not where powder, shavings, concrete or chemicals are sprayed. Adhere to the EN ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with presence of explosive or flammable gas. In these cases, use ATEX products (see dedicated Pizzato catalogue).

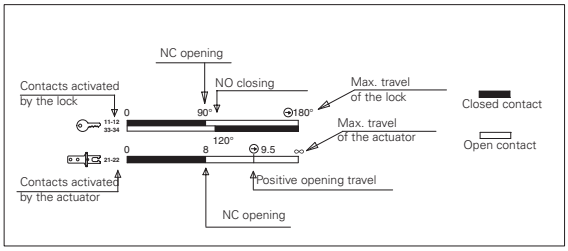
Attention! These switches alone are not suitable for applications where operators may physically enter the dangerous area, because an eventual closing of the door behind them could restart the machine operation. In these cases, the maintenance personnel must use the actuator entry locking device VF KB1 shown on page 122.

Contact type: L = slow action / Contact block		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
			
Actuating force		30 N (40 N ⊖)	30 N (40 N ⊖)

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

How to read travel diagrams

All values in the diagrams are in mm or in degrees



IMPORTANT:
The state of the NC contact (⊂) refers to the switch with inserted actuator and locked lock. In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol ⊖. Actuate the switch **at least with the positive opening force**, reported in brackets below each article, next to the actuating force value.

All values in the drawings are in mm

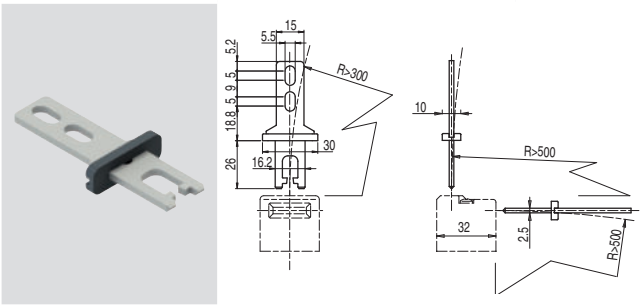
Accessories See page 419

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

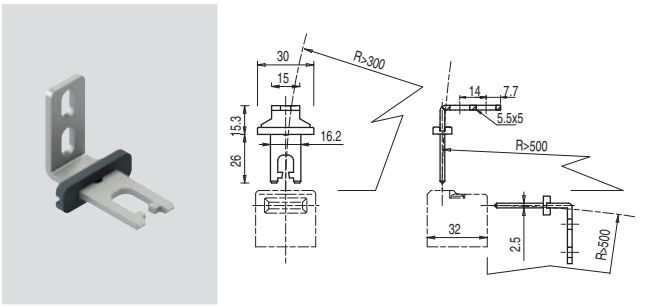
Stainless steel actuators

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

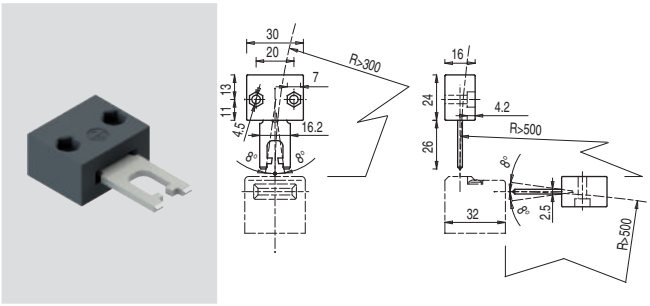
Article	Description
VF KEYF	Straight actuator



Article	Description
VF KEYF1	Angled actuator

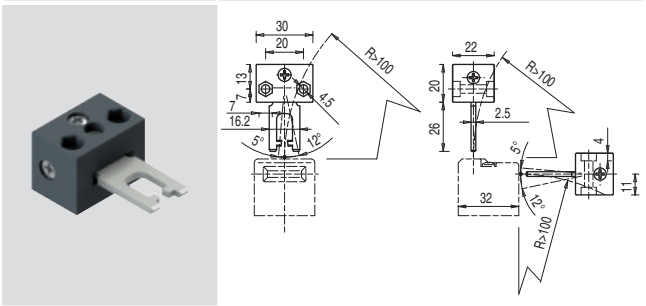


Article	Description
VF KEYF2	Jointed actuator



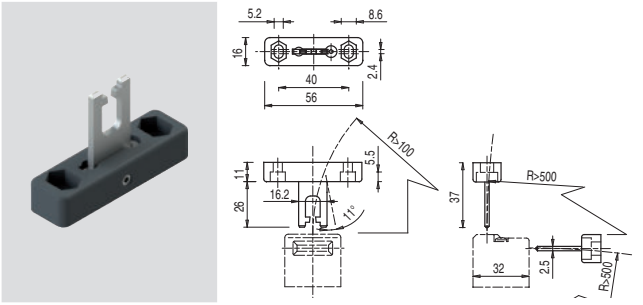
The actuator can flex in four directions for applications where the guard alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions



Actuator adjustable in two directions for guards with reduced dimensions.

Article	Description
VF KEYF7	Actuator adjustable in one direction



Actuator adjustable in one direction for guards with reduced dimensions.

All values in the drawings are in mm

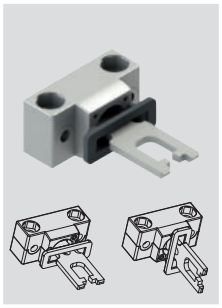
Accessories See page 419

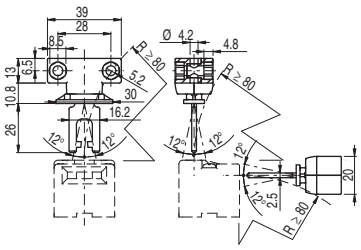
→ The 2D and 3D files are available at **www.pizzato.com**

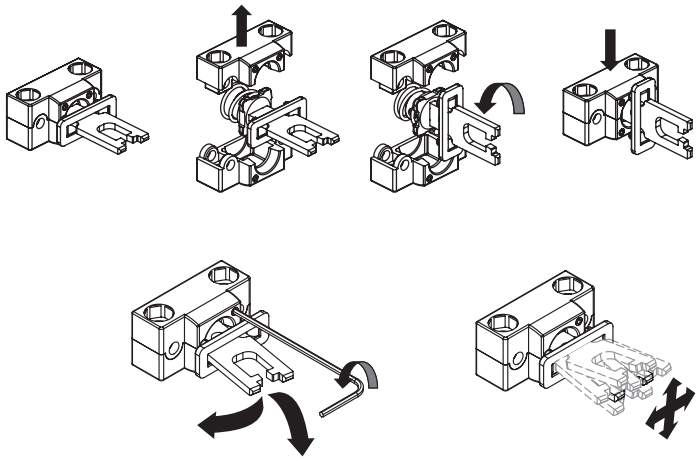
Universal actuator VF KEYF8

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

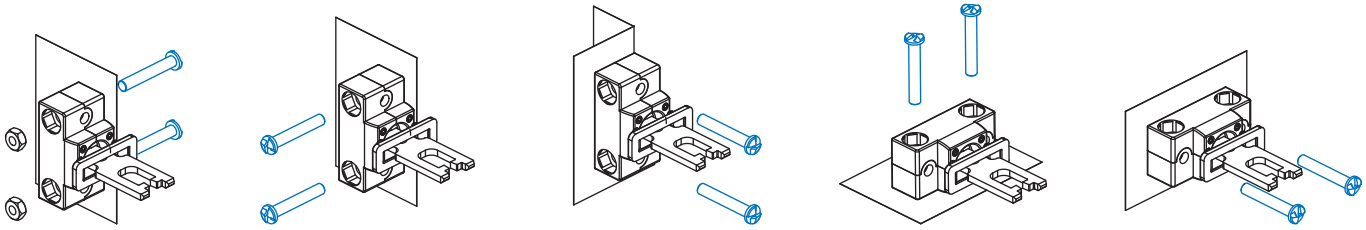
Article	Description
VF KEYF8	Universal actuator





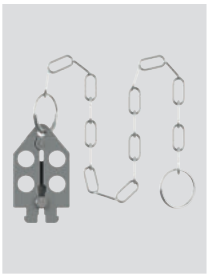


Jointed actuator for guards with poor alignment, adjustable in two dimensions for small doors; can be mounted in various positions.
The metal fixing body has two pairs of bore holes; it is provided for rotating the working plane of the actuator by 90°.



Accessories

Article	Description
VF KB1	Lock out device



Padlockable lock out device to prevent the actuator entry and the accidental closing of the door behind operators while they are in the danger area.
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.

All values in the drawings are in mm

Accessories See page 419

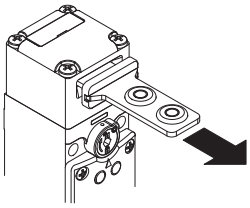
➔ The 2D and 3D files are available at **www.pizzato.com**

FG series safety switches with separate actuator with lock

Description

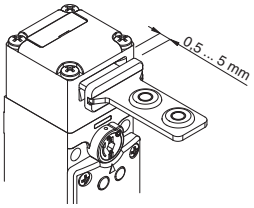
These switches are used on machines where the hazardous conditions remain for a while, even after the machines have been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. Thus, the switches can also be used if individual guards are only to be opened under certain conditions.
The versions with solenoid actuated NC contacts are considered interlocks with locking in accordance with ISO 14119, and the product's label is marked with the symbol shown.

Holding force of the locked actuator



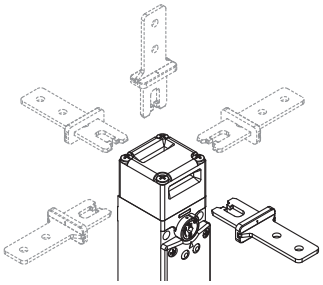
The strong interlocking system guarantees a maximum actuator holding force of F_{1max} = 3000 N.

Wide-ranging actuator travel



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

Heads and devices with variable orientation

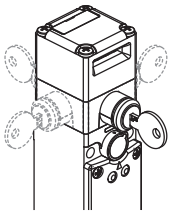


The system can be variably configured by loosening the 4 screws on the head.
The key release device and the release button can also be rotated and secured independently of one another in steps of 90°. The device can thus assume 32 different configurations.

Contact blocks with 4 contacts

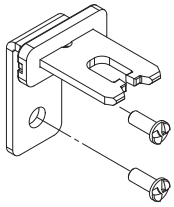
Innovative contact block with 4 contacts, available in various contact configurations for monitoring the actuator or the solenoid (patented). The unit is supplied with captive screws and self-lifting clamping plates. Removable finger protection for eyelet terminal.
High-reliability electrical contacts with 4 contact points and double interruption.

Turnable key release with lock



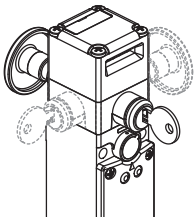
The auxiliary key release device is used to allow the maintenance or the entry into the machinery to authorized personnel only. Turning the key corresponds to actuating the solenoid: the actuator is released. The device can be turned, thereby enabling installation of the safety switch in the machine while the release device remains accessible on the outside of the guard.

Safety screws for actuators



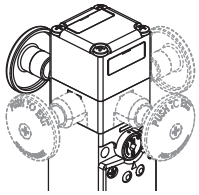
As required by EN ISO 14119, the actuator must be fixed immovably to the guard frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered by using common tools. See accessories on page 419.

Key release device and escape release button



This device performs simultaneously the two functions mentioned above. The lock and button can be rotated in this case as well; the release button can be ordered with various lengths. The release button has priority over the lock, i.e., the emergency escape can be actuated to unlock the switch even if the lock is locked. To reset the switch, the lock and the button must be returned to their initial position.

Escape release button

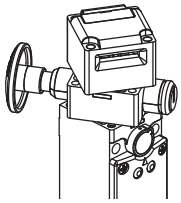


This device is used to safeguard a hazardous area that an operator may enter with his entire body. The release button, which is oriented towards the inside of the danger zone, allows the operator to escape even in the event of a power failure. Pushing the button results in the same function as the auxiliary release device. To reset the switch, simply return the button to its initial position. The escape release button can be rotated and is available with different lengths. It is fixed to the switch by means of a screw allowing the installation of the switch both inside and outside the guards.

Key release with triangular key

The auxiliary key release is also available with option V73, a variant with triangular key acc. to DIN 22417. This option can be used with installations in which the auxiliary release is to be actuated with a triangular key that is not normally available.
On request, option V70 is also available, with which the auxiliary release returns to the initial position with the aid of a spring.

Non-detachable heads and release devices



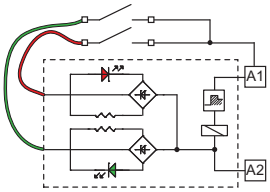
The head and the release device can be rotated but cannot be detached from each other. This makes the switch more secure since the problem of incorrect assembly by the installer cannot occur; in addition, the risk of damage is lower (loss of small parts, penetration of dirt, etc.).

LED display unit, type A

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

LED display unit, types B and C

In the version with LED display unit of type B, connection wires from two LEDs are available, one green and one red. By means of suitable connections on the contact block, various operating states of the switch can be displayed externally.

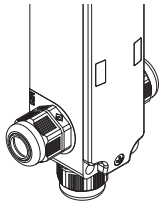


Protection degree IP67

IP67

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

Three conduit entries



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

Extended temperature range

-40°C

These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +60°C.

They can therefore be used for applications in cold stores, sterilisers, and other equipment operated in very low-temperature environments. The special materials used to produce these versions retain their characteristics even under these conditions, thereby expanding the installation possibilities.

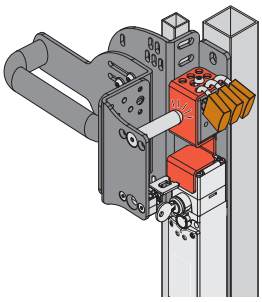
Sealable auxiliary release device

Switches with locked actuator with deactivated solenoid (function principle D) are equipped with an auxiliary release device for the solenoid to simplify installation of the switch and to facilitate entry into the danger zone in the event of a power failure. The auxiliary release device acts on the switch exactly as if the solenoid was energised. As a result, it also actuates the electrical contacts. Can only be actuated with the use of two tools; this ensures adequate protection against tampering. If necessary, it can be sealed using the appropriate hole.

Laser engraving

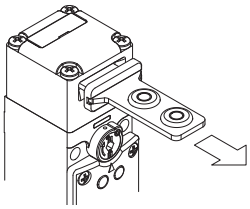
All FG series switches are permanently marked with a special laser system. As a result, the marking remains legible even under extreme operating conditions. Thanks to this system that does not use labels, the loss of plate data is prevented and a greater resistance of the marking is achieved over time.

Access monitoring



These safety switches alone do not provide sufficient personal protection to the operators or maintenance personnel in situations where they completely enter the danger zone, since unintentional closing of a door after entry could cause the machine to re-start. If the re-start release is completely dependent on these switches, a system for preventing this danger must be provided, e.g. a padlockable device for actuator entry locking VF KB2 (page 137) or a safety handle, such as a P-KUBE 1 (page 209).

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 guards are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked guards in their position with a retaining force of approx. 30 N, stopping any vibrations or gusts of wind from opening them.

LED signalling lights

Thanks to the three threaded cable entries, the high luminosity LED signalling lights of the VF SL series can be installed on the switch.

The LED signalling lights can be be easily installed by screwing them on one of the conduit entries not used for electric cables. They can be used for many different purposes: for example, to signal, from a distance, whether the switch has been actuated; whether the guard has closed correctly; or whether the guard is locked or unlocked.

For more information see chapter Accessories, page 419.