



ATEX



Technical definitions
page 153

FD series position switches
page 155

	Category	Zone	EPL	Approvals	Product code extension	ATEX/EPL category				
						M2/Mb 2G/Gb 2D/Db		3G/Gc 3D/Dc		
						M2/Mb	2G/Gb	2D/Db	3G/Gc	3D/Dc
	3D	22	Dc	II 3D Ex tc IICT80°C Dc	-EX4	-	-	-	-	■
	2G M2	1 M2	Gb Mb	II 2G Ex ia IIC T6 Gb I M2 Ex ia I Mb	-EX7	■	■	-	■	-
	2D	21	Db	II 2D Ex tb IICT80°C D	-EX8	-	-	■	-	■

FL series position switches
page 161

	Category	Zone	EPL	Approvals	Product code extension	ATEX/EPL category				
						M2/Mb 2G/Gb 2D/Db		3G/Gc 3D/Dc		
						M2/Mb	2G/Gb	2D/Db	3G/Gc	3D/Dc
	3D	22	Dc	II 3D Ex tc IICT80°C Dc	-EX4	-	-	-	-	■
	2G M2	1 M2	Gb Mb	II 2G Ex ia IIC T6 Gb I M2 Ex ia I Mb	-EX7	■	■	-	■	-
	2D	21	Db	II 2D Ex tb IICT80°C D	-EX8	-	-	■	-	■

FM series position switches
page 167

	Category	Zone	EPL	Approvals	Product code extension	ATEX/EPL category				
						M2/Mb 2G/Gb 2D/Db		3G/Gc 3D/Dc		
						M2/Mb	2G/Gb	2D/Db	3G/Gc	3D/Dc
	2G M2	1 M2	Gb Mb	II 2G Ex ia IIC T6 Gb I M2 Ex ia I Mb	-EX7	■	■	-	■	-

FA series pre-wired position switches
page 173

	Category	Zone	EPL	Approvals	Product code extension	ATEX/EPL category				
						M2/Mb 2G/Gb 2D/Db		3G/Gc 3D/Dc		
						M2/Mb	2G/Gb	2D/Db	3G/Gc	3D/Dc
	3D 3G	22 2	Dc Gc	II 3D Ex tc IICT80°C Dc II 3G Ex nC IIC T6 Gc	-EX5	-	-	-	■	■

Accessories
page 177


ATEX Directive

The acronym ATEX (**A**tmospheres **E**xplosives) refers to two European directives concerning the risk of deflagration in potentially explosive atmospheres:

- ATEX 2014/34/EU: concerns the requirements for electrical and non-electrical equipment for use in potentially explosive environments. According to this directive, the manufacturer has to comply with the provided requirements and mark its articles according to specific categories.
- ATEX 99/92/EC: lays down minimum requirements for the safety and health protection of workers potentially at risk from explosive atmospheres.

These directives define the requirements for the protection of safety and health of persons, domestic animals and property, as well as the conformity assessment procedures to prove that the devices comply with the directives' requirements.

Classification of potentially explosive atmospheres

A potentially explosive atmosphere is an atmosphere which could become explosive due to local and/or operational conditions. These environments present a mixture with air under atmospheric conditions of flammable substances in the form of in the form of gases, vapours, mists or dusts.

The ATEX 99/92/EC Directive classifies two types of potentially explosive atmospheres, depending on presence of combustible gases or dusts in the zone. These two types of explosive atmospheres are in turn classified in three zones each, according to the frequency and duration of the explosive atmosphere. Areas in atmospheres with explosive gases are classified in zones 0, 1 and 2; whereas in atmospheres with explosive dusts in zones 20, 21 and 22:

- **Zone 0/20** : A place in which the presence of flammable gas or dust is continuously present. Constant danger. It requires at least Category 1 equipment.
- **Zone 1/21** : A place in which the presence of flammable gas or dust is likely to occur in normal operation occasionally. Potential danger. It requires at least Category 2 equipment.
- **Zone 2/22** : A place in which the presence of flammable gas or dust is not likely to occur in normal operation or, if it does occur, will persist for a short period only. Or it occurs due to a failure. Lower danger. It requires at least Category 3 equipment.

The end user has the responsibility to identify and classify the different zones and to install appropriate equipment.

Equipment categories acc. to ATEX directive and IEC standards

According to the ATEX Directive 2014/34/EU equipment is classified into two main groups:

- **Group I**: equipment and systems for mining
- **Group II**: equipment and systems for all other applications

Equipment of the group I is divided in two further categories according to the required protection level:

- **Category M1**: Equipment designed to ensure a very high level of protection
- **Category M2**: Equipment designed to ensure a high level of protection

Equipment of the group II is further subdivided into three categories according to the required protection level:

- **Category 1**: Equipment designed to ensure a very high level of protection (for use in zone 0 and 20, 1 and 21, 2 and 22)
- **Category 2**: Equipment designed to ensure a high level of protection (for use in zone 1 and 21, 2 and 22)
- **Category 3**: Equipment designed to ensure a normal level of protection (for use in zone 2 and 22)

A comparison between the EPL (Equipment Protection Levels) defined by the IEC 60079-0 standard and the categories and applications of the ATEX Directive are shown in the table below.

Table 1 – Classification of environment and equipment according to ATEX directive and IEC 60079-0 standard

Environment features				Equipment features			
Field of application	Flammable substance	Potentially explosive atmosphere	Classification of potentially explosive atmospheres: ZONE	acc. to ATEX 2014/34/EU		acc. to IEC 60079-0	
				Required marking of the device: CATEGORY	Required marking of the device: GROUP	EPL	Required protection level
Mining				M1	I	Ma	very high
				M2		Mb	high
Surface	Gases	It is present continuously, or for long periods or frequently	0	1G	II	Ga	very high
		It is likely to occur	1	2G		Gb	high
		It is not likely to occur but, if it does occur, will persist for a short period only	2	3G		Gc	normal
	Dusts	It is present continuously, or for long periods or frequently	20	1D		Da	very high
		It is likely to occur	21	2D		Db	high
		It is not likely to occur but, if it does occur, will persist for a short period only	22	3D		Dc	normal



Protective measures

To avoid the risk of explosions caused by an electrical trigger in a potentially explosive atmosphere, different protective measures can be taken:

- Use of enclosures to encapsulate dangerous part in order to limit explosions to the inside of the housing itself.
- Avoid contact between hot spots and the potentially explosive atmosphere by interposing solid, liquid or gaseous bodies.
- Take measures to limit the generation of dangerous hot spots, eliminating the possibility of failures or limiting the system power so that it is insufficient to cause the ignition.

Various protective modes have been developed and standardised for each of these modes as listed in the following table:

Table 2 - Protective measures and applicable standards

Protective measure	Symbol	Engraving	Zone GAS	Zone DUSTS	IEC / EN standard
General requirements	/	/	0, 1, 2	20, 21, 22	IEC 60079-0 EN 60079-0
Oil immersion		Ex o	1.2	/	IEC 60079-6 EN 60079-6
Pressurized enclosure		Ex px Ex py Ex pz	1 1 2	21 21 22	IEC 60079-2 EN 60079-2
Powder filling		Ex q	1.2	/	IEC 60079-5 EN 60079-5
Flameproof enclosure		Ex d	1.2	/	IEC 60079-1 EN 60079-1
Increased safety		Ex e	1.2	/	IEC 60079-7 EN 60079-7
Intrinsic safety		Ex ia Ex ib Ex ic	0 1 2	20 21 22	IEC 60079-11 EN 60079-11
Encapsulation		Ex ma Ex mb Ex mc	0 1 2	20 21 22	IEC 60079-18 EN 60079-18
Non sparking		Ex nA Ex nC Ex nR	2 2 2	/	IEC 60079-15 EN 60079-15
Protective housing		Ex ta Ex tb Ex tc	/	20 21 22	IEC 60079-31 EN 60079-31
Optical radiation		Ex op	0,1,2	/	IEC 60079-28 EN 60079-28

Marking examples

Devices for places with presence of gas

Ex II 2G Ex ia IIC T6 Gb

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

- ① EU marking
- ② Equipment group (see table 1)
- ③ Protection category (see table 1)
- ④ Prefix for safety devices according to the IEC / EN standards
- ⑤ Type of protection (see table 2)
- ⑥ Classification of gases (see table 4)
- ⑦ Temperature class (see table 3)
- ⑧ EPL acc. to IEC 60079-0 (see table 1)

Devices for places with presence of dusts

Ex II 3D Ex tc IIIC T80°C Dc

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

- ① EU marking
- ② Equipment group (see table 1)
- ③ Protection category (see table 1)
- ④ Prefix for safety devices according to the IEC / EN standards
- ⑤ Type of protection (see table 2)
- ⑥ Classification of dusts (see table 5)
- ⑦ Maximum surface temperature of the equipment
- ⑧ EPL acc. to IEC 60079-0 (see table 1)

Temperature classes

Table 3

Class	T1	T2	T3	T4	T5	T6
Maximum surface temperature of the equipment	450 °C	300 °C	200 °C	135 °C	100 °C	85 °C

Classification of gases

Table 4
excerpt from standard IEC 505

	I	IIA	IIB	IIC
T1	methane	propane, methane, ethane, benzene, ammoniac, acetic acid, carbon monoxide, methanol, toluene	acrylonitrile	hydrogen
T2		ethanol, amyl acetate, butane	ethylene	acetylene
T3		nafta, benzine, esano	hydrogen sulfide	
T4		acetaldehyde	ethyl ether	
T5				
T6				carbon bisulphide

Classification of dusts

Table 5

IIIA	IIIB	IIIC
combustible particles	non-conductive powder	conductive powder



Main features

- ATEX approval.
- Metal housing, one conduit entry
- Protection degree IP66
- Versions with gold-plated silver contacts

ATEX markings:

Product code extension	Quality mark	Certificate type and notified body
-EX4		EU declaration of conformity Pizzato Elettrica S.r.l.
-EX7		EC type examination certificate DEKRA EXAM GmbH
-EX8		EC type examination certificate by DEKRA EXAM GmbH

Technical data

Housing

Metal housing, powder-coated	M20x1.5
One threaded conduit entry:	IP66 acc. to EN 60529 with cable gland presenting same or higher protection degree
Protection degree:	

General data

Ambient temperature (-EX7):	-20°C ... +60°C
Ambient temperature (-EX4/-EX8):	-20°C ... +70°C
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	
FD ●●●●-EX●	10 million operating cycles
FD ●●93-EX●, FD ●●78-EX●, FD ●●8●-EX●, FD ●●95-EX●	500,000 operating cycles
FD ●●99-EX●, FD ●●R2-EX●	250,000 operating cycles
Mounting position:	any
Safety parameters B _{10D} (NC contacts):	
FD ●●●●-EX●	20,000,000
FD ●●93-EX●, FD ●●78-EX●, FD ●●8●-EX●	1,000,000
FD ●●99-EX●, FD ●●R2-EX●	500,000
FD ●●95-EX●	2,500,000
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Tightening torques for installation:	see page 211-222

Cable cross section (flexible copper strands)

Contact blocks 2, 20, 21, 22, 28, 29, 30, 33, 34:	min.	1 x 0.34 mm ²	(1 x AWG 22)
	max.	2 x 1.5 mm ²	(2 x AWG 16)
Contact blocks 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 37, 66, 67:	min.	1 x 0.5 mm ²	(1 x AWG 20)
	max.	2 x 2.5 mm ²	(2 x AWG 14)

In compliance with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, EN 50041, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, UL 508, CSA 22.2 No.14, IEC 60079-0, EN 60079-0, IEC 60079-11, EN 60079-11.

Compliance with the requirements of:

ATEX Directive 2014/34/EU and EMC Directive 2014/30/EU

Positive contact opening in conformity with standards:

IEC 60947-5-1, EN 60947-5-1.

Installation for safety applications:

Use only switches marked with the symbol  next to the product code. Always connect the safety circuit to the **NC contacts** (normally closed contacts: 11-12, 21-22 or 31-32) as required by **EN ISO 14119, paragraph 5.4** for specific interlock applications and **EN ISO 13849-2 tables D3** (well-trie components) and **D.8** (fault exclusions) for safety applications in general. Actuate the switch **at least up to the positive opening travel** shown in the travel diagrams on page 214. Actuate the switch **at least with the positive opening force**, reported in brackets below each article, next to the actuating force value.

 **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 211 to 222 and in the certificate.**

 **For the correct use of the switch, please use appropriate cable glands suitable for the zone in compliance with the ATEX directive, see Accessories on page 177**

Product code extension	Category	Zone	EPL	Approvals	Electrical data	Utilization category
-EX4	3D	22	Dc	 II 3D Ex tc II I CT80°C Dc	Thermal current (I _{th}): 10 A Rated insulation voltage (U _i): 500 Vac 600 Vdc 400 Vac for contact blocks 20, 28 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	Alternating current: AC15 (50±60 Hz) Ue (V) 250 400 500 Ie (A) 6 4 1 Direct current: DC13 Ue (V) 24 125 250 Ie (A) 6 1.1 0.4
-EX7	2G M2	1 M2	Gb Mb	 II 2G Ex ia I I CT6 Gb  I M2 Ex ia I Mb	Maximum current (Ii): 2.5 A Maximum voltage (Ui): 30 Vdc Conditional short circuit current: 1000 A acc. to EN 60947-5-1 Protection against short circuits: type gG fuse 4 A 250 V Pollution degree: 3	 This switch type must be used only in intrinsic safety circuits in compliance with standard IEC 60079-11, EN 60079-11
-EX8	2D	21	Db	 II 2D Ex tb II I CT80°C DDb	Thermal current (I _{th}): 6 A Rated insulation voltage (U _i): 250 Vac/Vdc Conditional short circuit current: 1000 A acc. to EN 60947-5-1 Protection against short circuits: type aM fuse 6 A 500 V Pollution degree: 3	Alternating current: AC15 (50±60 Hz) Ue (V) 250 Ie (A) 6 Direct current: DC13 Ue (V) 24 125 250 Ie (A) 6 1.1 0.4

Quality marks of the product


UL approval: E131787
EAC approval: RU C-IT.AJ35.B.00454

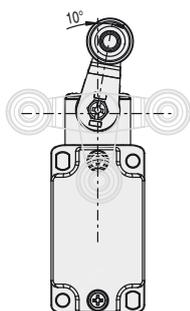
Features approved by UL

Utilization category Q300 (69 VA, 125-250 Vdc)
A600 (720 VA, 120-600 Vac)
Housing features type 1, 4X, 12, 13
For all contact blocks except 2 and 3 use 60 or 75°C copper (Cu) conductors, rigid or flexible, wire size 12, 14 AWG. Tightening torque for terminal screws of 7.1 lb in (0.8 Nm).
For contact blocks 2 and 3 use 60 or 75 °C copper (Cu) conductors, rigid or flexible, wire size 14 AWG. Tightening torque for terminal screws of 12 lb in (1.4 Nm).

In compliance with standard: UL 508, CSA 22.2 No.14
Please contact our technical department for the list of approved products.

Adjustable levers

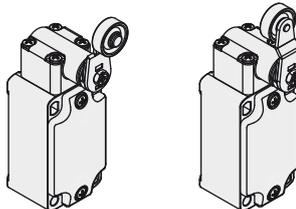
For these switches the lever can be adjusted in 10° steps over the entire 360° range. The positive movement transmission



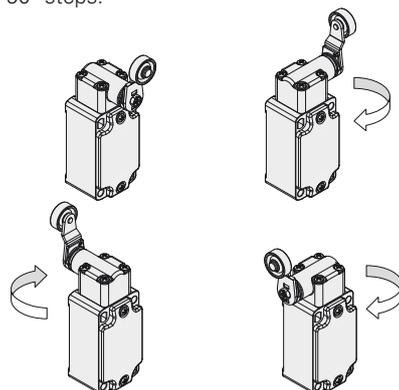
is always guaranteed thanks to the particular geometrical coupling between the lever and the revolving shaft as prescribed for safety applications by the German standard BG-GS-ET-15.

Reversible levers

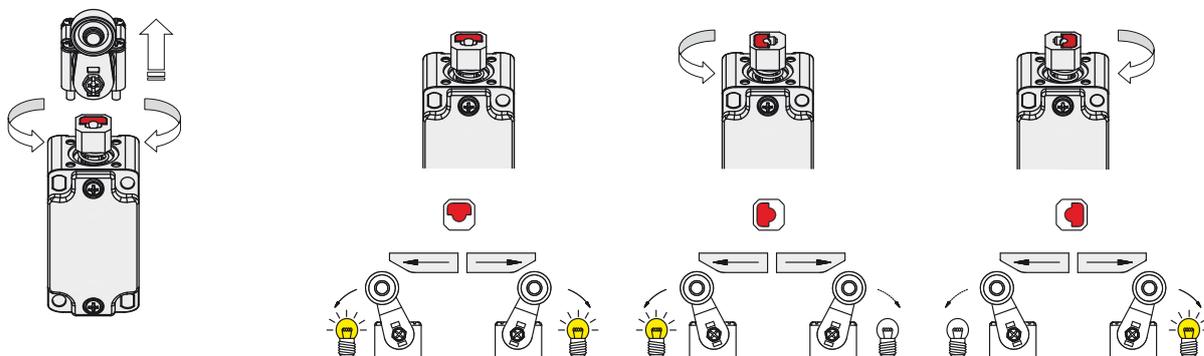
With these switches, the lever can be secured in either the normal or reverse position, whereby positive coupling is retained. In this way two different working planes of the lever are possible.


Head with variable orientation

For all switches the head can be rotated in 90° steps.


Unidirectional heads

For switches with swivelling lever, the unidirectional operation can be set by removing the four head screws and rotating the internal plunger.


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 product code extension
FD 502-GM2-EX7

Housing
FD metal, one conduit entry

Contact block
5 1NO+1NC, snap action
6 2NC, snap action
7 2NO, snap action
... ..

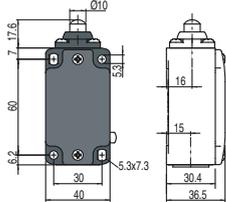
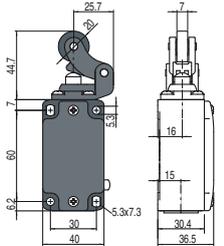
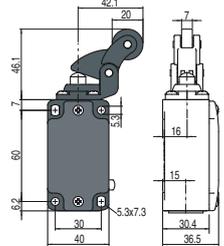
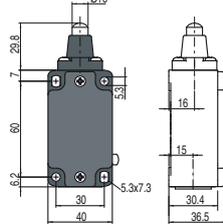
Actuators
01 short plunger
02 roller lever
... ..

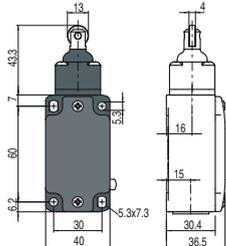
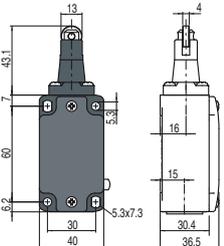
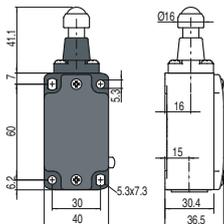
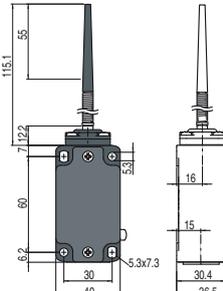
ATEX approval
-EX4 Ex II 3D Ex tc IIIC T80°C Dc
-EX7 Ex II 2G Ex ia IIC T6 Gb
Ex I M2 Ex ia I Mb
-EX8 Ex II 2D Ex tb IIIC T80°C D

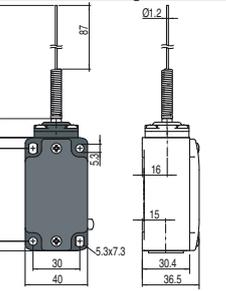
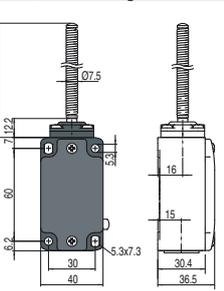
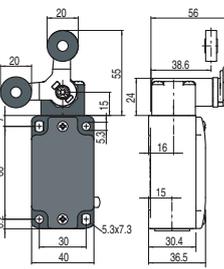
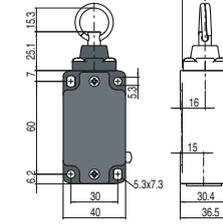
Contact type
silver contacts (standard)
G silver contacts, 1 µm gold coating (not for contact block 2)
G1 silver contacts, 2.5 µm gold coating (not for contact block 20, 21, 22, 28, 29, 30)

Contact type:

R = snap action
L = slow action

Category	Contact block	With stainless steel roller on request		With stainless steel roller on request	
					
3D	5 R	FD 501-M2-EX4  1NO+1NC	FD 502-M2-EX4  1NO+1NC	FD 505-M2-EX4  1NO+1NC	FD 511-M2-EX4  1NO+1NC
	6 L	FD 601-M2-EX4  1NO+1NC	FD 602-M2-EX4  1NO+1NC	FD 605-M2-EX4  1NO+1NC	FD 611-M2-EX4  1NO+1NC
	20 L	FD 2001-M2-EX4  1NO+2NC	FD 2002-M2-EX4  1NO+2NC	FD 2005-M2-EX4  1NO+2NC	FD 2011-M2-EX4  1NO+2NC
	2 R	FD 201-M2-EX4 2x(1NO-1NC)	FD 202-M2-EX4 2x(1NO-1NC)	FD 205-M2-EX4 2x(1NO-1NC)	FD 211-M2-EX4 2x(1NO-1NC)
2G M2	5 R	FD 501-M2-EX7  1NO+1NC	FD 502-M2-EX7  1NO+1NC	FD 505-M2-EX7  1NO+1NC	FD 511-M2-EX7  1NO+1NC
	20 L	FD 2001-M2-EX7  1NO+2NC	FD 2002-M2-EX7  1NO+2NC	FD 2005-M2-EX7  1NO+2NC	FD 2011-M2-EX7  1NO+2NC
2D	5 R	FD 501-M2-EX8  1NO+1NC	FD 502-M2-EX8  1NO+1NC	FD 505-M2-EX8  1NO+1NC	FD 511-M2-EX8  1NO+1NC
	20 L	FD 2001-M2-EX8  1NO+2NC	FD 2002-M2-EX8  1NO+2NC	FD 2005-M2-EX8  1NO+2NC	FD 2011-M2-EX8  1NO+2NC
Max. speed		0.5 m/s		0.5 m/s with cam at 30°	
Actuating force		8 N (25 N )		6 N (25 N )	
Travel diagrams		page 214 - group 1		page 214 - group 2	

Category	Contact block	With external rubber gasket		Ball, Ø 12.7 mm, stainless steel		With external rubber gasket	
							
3D	5 R	FD 515-M2-EX4  1NO+1NC	FD 516-M2-EX4  1NO+1NC	FD 519-M2-EX4  1NO+1NC	FD 520-M2-EX4 1NO+1NC	/	
	6 L	FD 615-M2-EX4  1NO+1NC	FD 616-M2-EX4  1NO+1NC	FD 619-M2-EX4  1NO+1NC	/		
	20 L	FD 2015-M2-EX4  1NO+2NC	FD 2016-M2-EX4  1NO+2NC	FD 2019-M2-EX4  1NO+2NC	FD 2020-M2-EX4 1NO+2NC	/	
	2 R	FD 215-M2-EX4 2x(1NO-1NC)	FD 216-M2-EX4 2x(1NO-1NC)	FD 219-M2-EX4 2x(1NO-1NC)	FD 220-M2-EX4 2x(1NO-1NC)	/	
2G M2	5 R	FD 515-M2-EX7  1NO+1NC	FD 516-M2-EX7  1NO+1NC	FD 519-M2-EX7  1NO+1NC	FD 520-M2-EX7 1NO+1NC	/	
	20 L	FD 2015-M2-EX7  1NO+2NC	FD 2016-M2-EX7  1NO+2NC	FD 2019-M2-EX7  1NO+2NC	FD 2020-M2-EX7 1NO+2NC	/	
2D	5 R	/	FD 516-M2-EX8  1NO+1NC	FD 519-M2-EX8  1NO+1NC	/		
	20 L	/	FD 2016-M2-EX8  1NO+2NC	FD 2019-M2-EX8  1NO+2NC	/		
Max. speed		0.5 m/s with cam at 30°		0.5 m/s		1 m/s	
Actuating force		11 N (25 N )		8 N (25 N )		0.09 Nm	
Travel diagrams		page 214 - group 1		page 214 - group 1		page 214 - group 3	

Category	Contact block	With external rubber gasket		With external rubber gasket		Bistable		Rope switch for signalling	
									
3D	5 R	FD 521-M2-EX4 1NO+1NC	FD 525-M2-EX4 1NO+1NC	FD 541-M2-EX4  1NO+1NC	FD 576-M2-EX4 1NO+1NC	/			
	6 L	/	/	/	FD 676-M2-EX4 1NO+1NC	/			
	20 L	FD 2021-M2-EX4 1NO+2NC	FD 2025-M2-EX4 1NO+2NC	/	FD 2076-M2-EX4 2NO+1NC	/			
	2 R	FD 221-M2-EX4 2x(1NO-1NC)	FD 225-M2-EX4 2x(1NO-1NC)	/	FD 276-M2-EX4 2x(1NO-1NC)	/			
2G M2	5 R	FD 521-M2-EX7 1NO+1NC	FD 525-M2-EX7 1NO+1NC	FD 541-M2-EX7  1NO+1NC	FD 576-M2-EX7 1NO+1NC	/			
	20 L	FD 2021-M2-EX7 1NO+2NC	FD 2025-M2-EX7 1NO+2NC	/	FD 2076-M2-EX7 2NO+1NC	/			
2D	5 R	/	/	FD 541-M2-EX8  1NO+1NC	FD 576-M2-EX8 1NO+1NC	/			
	20 L	/	/	/	FD 2076-M2-EX8 1NO+2NC	/			
Max. speed		1 m/s		0.5 m/s with cam at 30°		0.5 m/s			
Actuating force		0.08 Nm		0.14 Nm		initial 20 N - final 40 N			
Travel diagrams		page 214 - group 3		page 214 - group 3		page 214 - group 4		page 214 - group 6	

Accessories See page 197

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

All values in the drawings are in mm



Position switches with swivelling lever without actuator

All values in the drawings are in mm

Contact type:		Regular head	Compact head
R	= snap action		
L	= slow action		
Category	Contact block		
3D	5 R	FD 538-M2-EX4 → 1NO+1NC	FD 558-M2-EX4 → 1NO+1NC
	6 L	FD 638-M2-EX4 → 1NO+1NC	FD 658-M2-EX4 → 1NO+1NC
	20 L	FD 2038-M2-EX4 → 1NO+2NC	FD 2058-M2-EX4 → 1NO+2NC
	2 R	FD 238-M2-EX4 2x(1NO-1NC)	FD 258-M2-EX4 2x(1NO-1NC)
2G M2	5 R	FD 538-M2-EX7 → 1NO+1NC	FD 558-M2-EX7 → 1NO+1NC
	20 L	FD 2038-M2-EX7 → 1NO+2NC	FD 2058-M2-EX7 → 1NO+2NC
2D	5 R	FD 538-M2-EX8 → 1NO+1NC	FD 558-M2-EX8 → 1NO+1NC
	20 L	FD 2038-M2-EX8 → 1NO+2NC	FD 2058-M2-EX8 → 1NO+2NC
Actuating force		0,1 Nm (0,25 Nm →)	0,06 Nm (0,25 Nm →)
Travel diagrams		page 214 - group 4	page 214 - group 4

IMPORTANT

For safety applications: join only switches and actuators marked with symbol → next to the product code.

For more information about safety applications see details on page 211.

Separate actuators

All values in the drawings are in mm

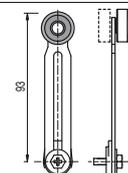
IMPORTANT: These separate actuators can be used only with items of the FD series.

	Technopolymer roller Ø 20 mm	Adjustable round rod Ø 3x125 mm	Adjustable square rod, 3x3x125 mm	Flexible rod with pointed end	Adjustable actuator with technopolymer roller	Adjustable glass fibre rod
Article	VF L31 →	VF L32 (2)	VF L33 (2)	VF L34	VF L35 → (1) (2)	VF L36 (2)
Max. speed	1.5 m/s (cam at 30°)	1.5 m/s	1.5 m/s	1 m/s	1.5 m/s (cam at 30°)	1.5 m/s
	Technopolymer roller Ø 20 mm	Technopolymer roller Ø 20 mm	Porcelain roller	Adjustable safety actuator with technopolymer roller	Technopolymer roller Ø 20 mm	
Article	VF L51 →	VF L52 →	VF L53 →	VF L56 → (2)	VF L57 →	
Max. speed	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	0.5 m/s	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	
Stainless steel rollers, Ø 20 mm						
Article	VF L31-R24 →	VF L35-R24 → (1) (2)	VF L51-R24 →	VF L52-R24 →	VF L56-R24 → (2)	VF L57-R24 →
Max. speed	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)

- (1) Actuator VF L35 can only be used in safety applications if adjusted to its max. length, as shown in the figure to the right.

If an adjustable lever is required for safety applications, use the VF L56 adjustable safety lever.

- (2) If installed with switch FD •58-M2-EX (e.g. FD 558-M2-EX•, FD 658-M2-EX•...) the actuator may hit the housing of the switch upon actuation. This possible interference depends on the fixing position of actuator and switch head.



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

Accessories See page 197

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

Safety rope switches with reset for emergency stops

All values in the drawings are in mm

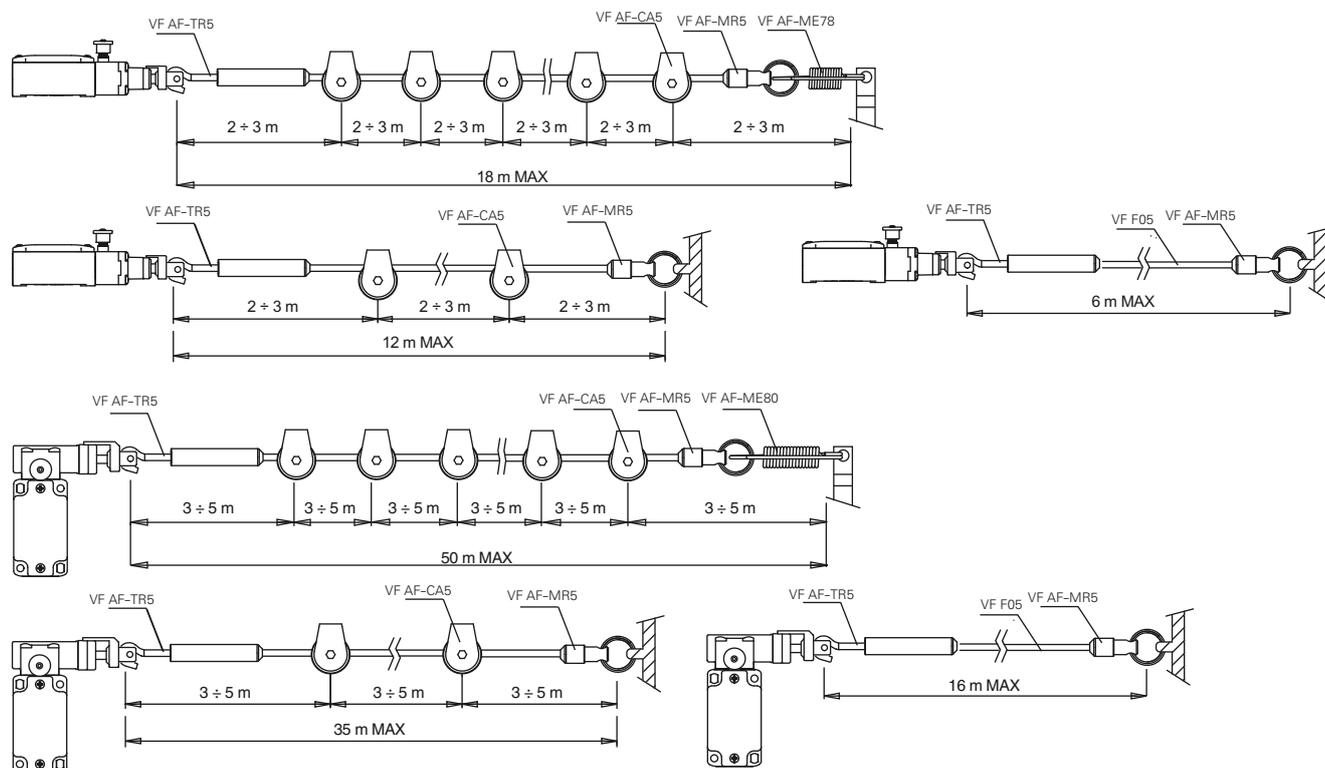
Category		Contact block	FD 1878-M2-EX4		FD 1883-M2-EX4		FD 1884-M2-EX4	
3D		18 L	FD 1878-M2-EX4	1NO+1NC	FD 1883-M2-EX4	1NO+1NC	FD 1884-M2-EX4	1NO+1NC
		20 L	FD 2078-M2-EX4	1NO+2NC	FD 2083-M2-EX4	1NO+2NC	FD 2084-M2-EX4	1NO+2NC
2G		20 L	FD 2078-M2-EX7	1NO+2NC	FD 2083-M2-EX7	1NO+2NC	FD 2084-M2-EX7	1NO+2NC
M2		18 L	FD 1878-M2-EX8	1NO+1NC	FD 1883-M2-EX8	1NO+1NC	FD 1884-M2-EX8	1NO+1NC
		20 L	FD 2078-M2-EX8	1NO+2NC	FD 2083-M2-EX8	1NO+2NC	FD 2084-M2-EX8	1NO+2NC
Actuating force			initial 63 N...final 83 N (90 N)		initial 147 N...final 235 N (250 N)		initial 147 N...final 235 N (250 N)	
Travel diagrams			page 174 - group 1		page 174 - group 2		page 174 - group 2	
Gen. Cat. Safety			page 174 - group 1		page 174 - group 2		page 174 - group 2	

Accessories for rope installation

VF AF-TR5	VF AF-TR8	VF AF-MR5	VF AF-ME78	VF AF-ME80	VF F05-100	VF AF-IF1GR11	VF AF-CA5	VF AF-CA10
Adjustable stay bolt	Stay bolt	End clamp	Safety spring for longitudinal heads	Safety spring for transversal heads	Rope coil Ø 5 mm length 100 m	Rope function indicator.	Stainless steel pulley	Angular pulley, stainless steel

Application examples and max. rope length

All values in the drawings are in mm


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

Accessories See page 197

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



Main features

- ATEX approval
- Metal housing, three conduit entries
- Protection degree IP66
- Versions with gold-plated silver contacts

ATEX markings:

Product code extension	Quality mark	Certificate type and notified body
-EX4		EU declaration of conformity Pizzato Elettrica S.r.l.
-EX7		EC type examination certificate DEKRA EXAM GmbH
-EX8		EC type examination certificate by DEKRA EXAM GmbH

Technical data

Housing

Metal housing, powder-coated	M20x1.5
Three threaded conduit entries:	IP66 acc. to EN 60529 with cable gland presenting same or higher protection degree
Protection degree:	

General data

Ambient temperature (-EX7):	-20°C ... +60°C
Ambient temperature (-EX4/-EX8):	-20°C ... +70°C
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	
FL ●●●●-EX●	10 million operating cycles
FL ●●93-EX●, FL ●●78-EX●, FL ●●8●-EX●, FL ●●95-EX●	500,000 operating cycles
Mounting position:	any
Safety parameters B _{10D} (NC contacts):	
FL ●●●●-EX●	20,000,000
FL ●●93-EX●, FL ●●78-EX●, FL ●●8●-EX●	1,000,000
FL ●●95-EX●	2,500,000
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Tightening torques for installation:	see page 211-222

Cable cross section (flexible copper strands)

Contact blocks 2, 20, 21, 22, 28, 29, 30, 33, 34:	min. 1 x 0.34 mm ²	(1 x AWG 22)
	max. 2 x 1.5 mm ²	(2 x AWG 16)
Contact blocks 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 37, 66, 67:	min. 1 x 0.5 mm ²	(1 x AWG 20)
	max. 2 x 2.5 mm ²	(2 x AWG 14)

In compliance with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, EN 50041, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, UL 508, CSA 22.2 No. 14, IEC 60079-0, EN 60079-0, IEC 60079-11, EN 60079-11.

Compliance with the requirements of:

ATEX Directive 2014/34/EU and EMC Directive 2014/30/EU

Positive contact opening in conformity with standards:

IEC 60947-5-1, EN 60947-5-1.

Installation for safety applications:

Use only switches marked with the symbol  next to the product code. Always connect the safety circuit to the **NC contacts** (normally closed contacts: 11-12, 21-22 or 31-32) as required by **EN ISO 14119, paragraph 5.4** for specific interlock applications and **EN ISO 13849-2 tables D3** (well-tried components) and **D.8** (fault exclusions) for safety applications in general. Actuate the switch **at least up to the positive opening travel** shown in the travel diagrams on page 214. Actuate the switch **at least with the positive opening force**, reported in brackets below each article, next to the actuating force value.

 **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 211 to 222 and in the certificate.**

 **For the correct use of the switch, please use appropriate cable glands suitable for the zone in compliance with the ATEX directive, see Accessories on page 177**

Product code extension	Category	Zone	EPL	Approvals	Electrical data	Utilization category
-EX4	3D	22	Dc	 II 3D Ex tc II ICT80°C Dc	Thermal current (I _{th}): 10 A Rated insulation voltage (U _i): 500 Vac 600 Vdc 400 Vac for contact blocks 20, 28 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	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) 6 1.1 0.4
-EX7	2G M2	1 M2	Gb Mb	 II 2G Ex ia I I CT6 Gb  I M2 Ex ia I Mb	Maximum current (I _i): 2.5 A Maximum voltage (U _i): 30 Vdc Conditional short circuit current: 1000 A acc. to EN 60947-5-1 Protection against short circuits: type gG fuse 4 A 250 V Pollution degree: 3	Alternating current: AC15 (50±60 Hz) U _e (V) 250 I _e (A) 6 Direct current: DC13 U _e (V) 24 125 250 I _e (A) 6 1.1 0.4
-EX8	2D	21	Db	 II 2D Ex tb II CT80°C Db	Thermal current (I _{th}): 6 A Rated insulation voltage (U _i): 250 Vac/Vdc Conditional short circuit current: 1000 A acc. to EN 60947-5-1 Protection against short circuits: type aM fuse 6 A 500 V Pollution degree: 3	Alternating current: AC15 (50±60 Hz) U _e (V) 250 I _e (A) 6 Direct current: DC13 U _e (V) 24 125 250 I _e (A) 6 1.1 0.4

Quality marks of the product


UL approval: E131787
 EAC approval: RU C-IT.A.135.B.00454

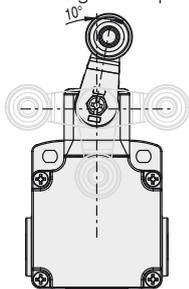
Features approved by UL

Utilization category Q300 (69 VA, 125-250 Vdc)
 A600 (720 VA, 120-600 Vac)
 Housing features type 1, 4X, 12, 13
 For all contact blocks except 2 and 3 use 60 or 75°C copper (Cu) conductors, rigid or flexible, wire size 12, 14 AWG. Tightening torque for terminal screws of 7.1 lb in (0.8 Nm).
 For contact blocks 2 and 3 use 60 or 75 °C copper (Cu) conductors, rigid or flexible, wire size 14 AWG. Tightening torque for terminal screws of 12 lb in (1.4 Nm).

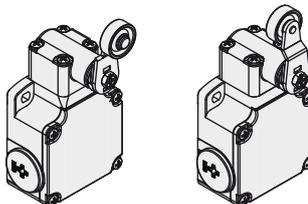
In compliance with standard: UL 508, CSA 22.2 No.14
Please contact our technical department for the list of approved products.

Adjustable levers

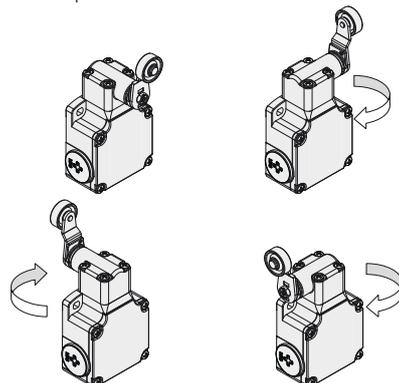
For switches with swivelling lever, the lever can be adjusted in 10° steps over the entire 360° range. The positive movement transmission is always guaranteed thanks to the particular geometrical coupling between the lever and the revolving shaft as prescribed for safety applications by the German standard BG-GS-ET-15.


Reversible levers

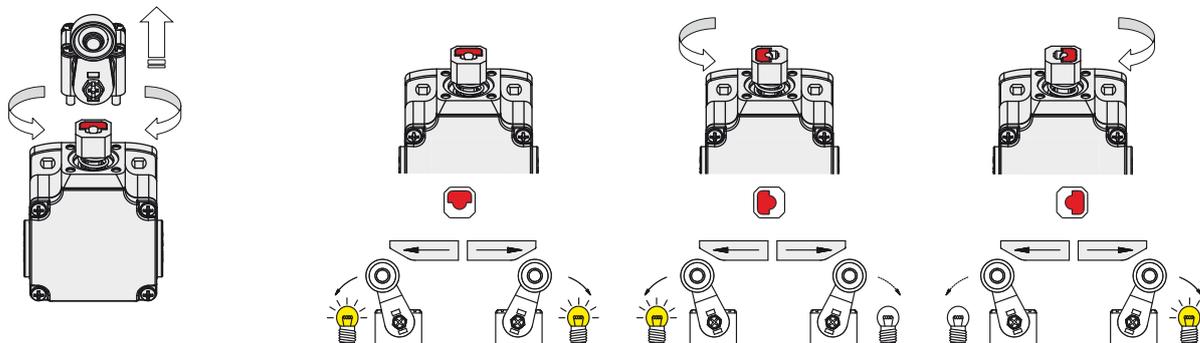
For switches with swivelling lever, the lever can be fastened on straight or reverse side maintaining the positive coupling. In this way two different working planes of the lever are possible.


Head with variable orientation

For all switches the head can be rotated in 90° steps.


Unidirectional heads

For switches with swivelling lever, the unidirectional operation can be set by removing the four head screws and rotating the internal plunger (except contact block 16).


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 product code extension
FL 502-GM2-EX7

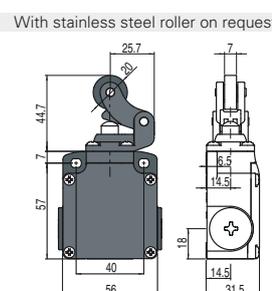
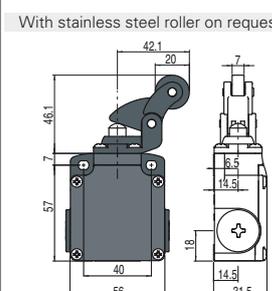
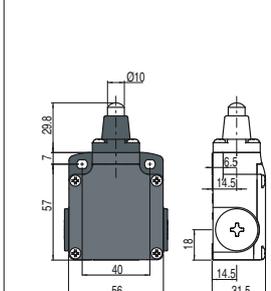
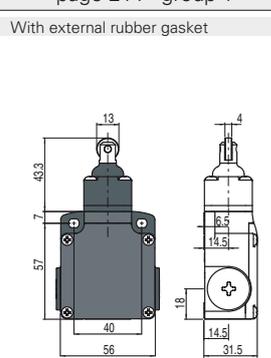
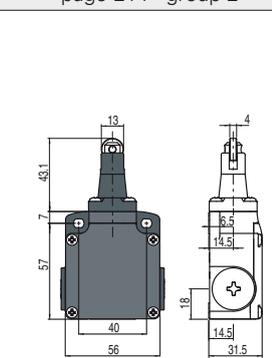
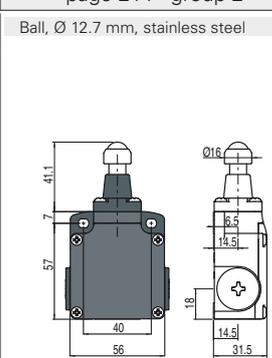
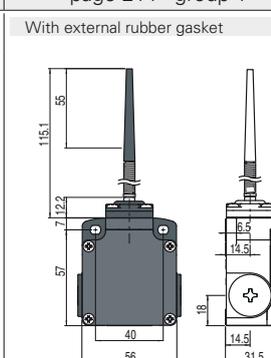
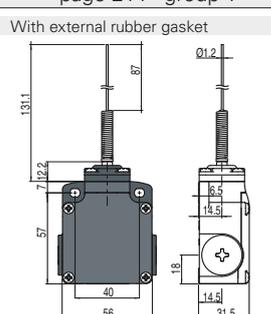
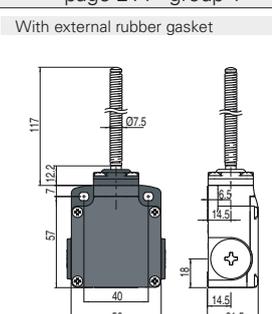
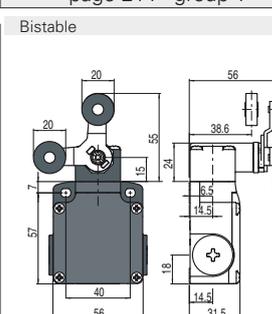
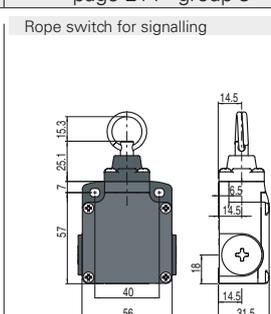
Housing	
FL	metal, three conduit entries

Contact block	
5	1NO+1NC, snap action
6	2NC, snap action
7	2NO, snap action
...

Actuators	
01	short plunger
02	roller lever
...

ATEX approval	
-EX4	II 3D Ex tc IIIC T80°C Dc
-EX7	II 2G Ex ia IIC T6 Gb I M2 Ex ia I Mb
-EX8	II 2D Ex tb IIIC T80°C D

Contact type	
	silver contacts (standard)
G	silver contacts, 1 µm gold coating (not for contact block 2, 3)
G1	silver contacts, 2.5 µm gold coating (not for contact block 20, 21, 22, 28, 29, 30)

Contact type:		With stainless steel roller on request		With stainless steel roller on request					
<p>R = snap action L = slow action</p>									
Category	Contact block								
3D	5 R	FL 501-M2-EX4	1NO+1NC	FL 502-M2-EX4	1NO+1NC	FL 505-M2-EX4	1NO+1NC	FL 511-M2-EX4	1NO+1NC
	6 L	FL 601-M2-EX4	1NO+1NC	FL 602-M2-EX4	1NO+1NC	FL 605-M2-EX4	1NO+1NC	FL 611-M2-EX4	1NO+1NC
	20 L	FL 2001-M2-EX4	1NO+2NC	FL 2002-M2-EX4	1NO+2NC	FL 2005-M2-EX4	1NO+2NC	FL 2011-M2-EX4	1NO+2NC
	2 R	FL 201-M2-EX4	2x(1NO-1NC)	FL 202-M2-EX4	2x(1NO-1NC)	FL 205-M2-EX4	2x(1NO-1NC)	FL 211-M2-EX4	2x(1NO-1NC)
2G M2	5 R	FL 501-M2-EX7	1NO+1NC	FL 502-M2-EX7	1NO+1NC	FL 505-M2-EX7	1NO+1NC	FL 511-M2-EX7	1NO+1NC
	20 L	FL 2001-M2-EX7	1NO+2NC	FL 2002-M2-EX7	1NO+2NC	FL 2005-M2-EX7	1NO+2NC	FL 2011-M2-EX7	1NO+2NC
2D	5 R	FL 501-M2-EX8	1NO+1NC	FL 502-M2-EX8	1NO+1NC	FL 505-M2-EX8	1NO+1NC	FL 511-M2-EX8	1NO+1NC
	20 L	FL 2001-M2-EX8	1NO+2NC	FL 2002-M2-EX8	1NO+2NC	FL 2005-M2-EX8	1NO+2NC	FL 2011-M2-EX8	1NO+2NC
Max. speed		0.5 m/s		0.5 m/s with cam at 30°		0.5 m/s with cam at 30°		0.5 m/s	
Actuating force		8 N (25 N ⊕)		6 N (25 N ⊕)		6 N (25 N ⊕)		8 N (25 N ⊕)	
Travel diagrams		page 214 - group 1		page 214 - group 2		page 214 - group 2		page 214 - group 1	
Category		With external rubber gasket		Ball, Ø 12.7 mm, stainless steel		With external rubber gasket			
									
3D	5 R	FL 515-M2-EX4	1NO+1NC	FL 516-M2-EX4	1NO+1NC	FL 519-M2-EX4	1NO+1NC	FL 520-M2-EX4	1NO+1NC
	6 L	FL 615-M2-EX4	1NO+1NC	FL 616-M2-EX4	1NO+1NC	FL 619-M2-EX4	1NO+1NC	/	
	20 L	FL 2015-M2-EX4	1NO+2NC	FL 2016-M2-EX4	1NO+2NC	FL 2019-M2-EX4	1NO+2NC	FL 2020-M2-EX4	1NO+2NC
	2 R	FL 215-M2-EX4	2x(1NO-1NC)	FL 216-M2-EX4	2x(1NO-1NC)	FL 219-M2-EX4	2x(1NO-1NC)	FL 220-M2-EX4	2x(1NO-1NC)
2G M2	5 R	FL 515-M2-EX7	1NO+1NC	FL 516-M2-EX7	1NO+1NC	FL 519-M2-EX7	1NO+1NC	FL 520-M2-EX7	1NO+1NC
	20 L	FL 2015-M2-EX7	1NO+2NC	FL 2016-M2-EX7	1NO+2NC	FL 2019-M2-EX7	1NO+2NC	FL 2020-M2-EX7	1NO+2NC
2D	5 R	/		FL 516-M2-EX8	1NO+1NC	FL 519-M2-EX8	1NO+1NC	/	
	20 L	/		FL 2016-M2-EX8	1NO+2NC	FL 2019-M2-EX8	1NO+2NC	/	
Max. speed		0.5 m/s with cam at 30°		0.5 m/s with cam at 30°		0.5 m/s		1 m/s	
Actuating force		11 N (25 N ⊕)		8 N (25 N ⊕)		8 N (25 N ⊕)		0.09 Nm	
Travel diagrams		page 214 - group 1		page 214 - group 1		page 214 - group 1		page 214 - group 3	
Category		With external rubber gasket		With external rubber gasket		Bistable		Rope switch for signalling	
									
3D	5 R	FL 521-M2-EX4	1NO+1NC	FL 525-M2-EX4	1NO+1NC	FL 541-M2-EX4	1NO+1NC	FL 576-M2-EX4	1NO+1NC
	6 L	/		/		/		FL 676-M2-EX4	1NO+1NC
	20 L	FL 2021-M2-EX4	1NO+2NC	FL 2025-M2-EX4	1NO+2NC	/		FL 2076-M2-EX4	2NO+1NC
	2 R	FL 221-M2-EX4	2x(1NO-1NC)	FL 225-M2-EX4	2x(1NO-1NC)	/		FL 276-M2-EX4	2x(1NO-1NC)
2G M2	5 R	FL 521-M2-EX7	1NO+1NC	FL 525-M2-EX7	1NO+1NC	FL 541-M2-EX7	1NO+1NC	FL 576-M2-EX7	1NO+1NC
	20 L	FL 2021-M2-EX7	1NO+2NC	FL 2025-M2-EX7	1NO+2NC	/		FL 2076-M2-EX7	2NO+1NC
2D	5 R	/		/		FL 541-M2-EX8	1NO+1NC	FL 576-M2-EX8	1NO+1NC
	20 L	/		/		/		FL 2076-M2-EX8	1NO+2NC
Max. speed		1 m/s		1 m/s		0.5 m/s with cam at 30°		0.5 m/s	
Actuating force		0.08 Nm		0.14 Nm		0.21 Nm (0.36 Nm ⊕)		initial 20 N - final 40 N	
Travel diagrams		page 214 - group 3		page 214 - group 3		page 214 - group 4		page 214 - group 6	

Accessories See page 197

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

All values in the drawings are in mm



Position switches with swivelling lever without actuator

All values in the drawings are in mm

Contact type:		Regular head		Compact head	
R	= snap action				
L	= slow action				
Category	Contact block				
3D	5 R	FL 538-M2-EX4	⊕ 1NO+1NC	FL 558-M2-EX4	⊕ 1NO+1NC
	6 L	FL 638-M2-EX4	⊕ 1NO+1NC	FL 658-M2-EX4	⊕ 1NO+1NC
	20 L	FL 2038-M2-EX4	⊕ 1NO+2NC	FL 2058-M2-EX4	⊕ 1NO+2NC
	2 R	FL 238-M2-EX4	2x(1NO-1NC)	FL 258-M2-EX4	2x(1NO-1NC)
2G M2	5 R	FL 538-M2-EX7	⊕ 1NO+1NC	FL 558-M2-EX7	⊕ 1NO+1NC
	20 L	FL 2038-M2-EX7	⊕ 1NO+2NC	FL 2058-M2-EX7	⊕ 1NO+2NC
2D	5 R	FL 538-M2-EX8	⊕ 1NO+1NC	FL 558-M2-EX8	⊕ 1NO+1NC
	20 L	FL 2038-M2-EX8	⊕ 1NO+2NC	FL 2058-M2-EX8	⊕ 1NO+2NC
Actuating force		0,1 Nm (0,25 Nm ⊕)		0,06 Nm (0,25 Nm ⊕)	
Travel diagrams		page 214 - group 4		page 214 - group 4	

IMPORTANT

For safety applications: join only switches and actuators marked with symbol ⊕ next to the product code. For more information about safety applications see details on page 211.

Separate actuators

All values in the drawings are in mm

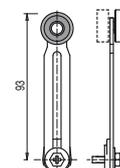
IMPORTANT: These separate actuators can be used only with items of the FL series.

	Technopolymer roller Ø 20 mm	Adjustable round rod Ø 3x125 mm	Adjustable square rod, 3x3x125 mm	Flexible rod with pointed end	Adjustable actuator with technopolymer roller	Adjustable glass fibre rod
Article	VF L31 ⊕	VF L32 ⁽²⁾	VF L33 ⁽²⁾	VF L34	VF L35 ⊕ ^{(1) (2)}	VF L36 ⁽²⁾
Max. speed	1.5 m/s (cam at 30°)	1.5 m/s	1.5 m/s	1 m/s	1.5 m/s (cam at 30°)	1.5 m/s
	Technopolymer roller Ø 20 mm	Technopolymer roller Ø 20 mm	Porcelain roller	Adjustable safety actuator with technopolymer roller	Technopolymer roller Ø 20 mm	
Article	VF L51 ⊕	VF L52 ⊕	VF L53 ⊕	VF L56 ⊕ ⁽²⁾	VF L57 ⊕	
Max. speed	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	0.5 m/s	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	
Stainless steel rollers, Ø 20 mm						
Article	VF L31-R24 ⊕	VF L35-R24 ⊕ ^{(1) (2)}	VF L51-R24 ⊕	VF L52-R24 ⊕	VF L56-R24 ⊕ ⁽²⁾	VF L57-R24 ⊕
Max. speed	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)

- ⁽¹⁾ Actuator VF L35 can only be used in safety applications if adjusted to its max. length, as shown in the figure to the right.

If an adjustable lever is required for safety applications, use the VF L56 adjustable safety lever.

- ⁽²⁾ If installed with switch FL •58-M2-EX (e.g. FL 558-M2-EX•, FL 658-M2-EX•...) the actuator may hit the housing of the switch upon actuation. This possible interference depends on the fixing position of actuator and switch head.



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

Accessories See page 197

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

Safety switches with separate actuator

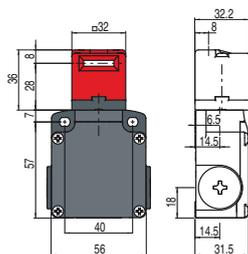
All values in the drawings are in mm

Contact type:

 = slow action

Switches with separate actuator

Switch without actuator



Category	Contact block			
3D	6		FL 693-M2-EX4	 1NO+1NC
	20		FL 2093-M2-EX4	 1NO+2NC
2G M2	20		FL 2093-M2-EX7	 1NO+2NC
2D	20		FL 2093-M2-EX8	 1NO+2NC
Actuating force		10 N (18 N )		
Travel diagrams		page 17		
Gen. Cat. Safety				

Actuators



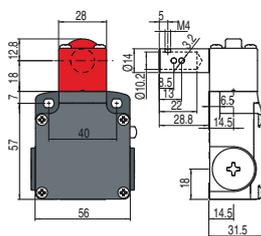
VF KEYF	VF KEYF1	VF KEYF2	VF KEYF3	VF KEYF7	VF KEYF8
Straight actuator	Angled actuator	Swivelling actuator	Actuator adjustable in two directions	Actuator adjustable in one direction	Universal actuator

IMPORTANT: These actuators can be used only with items of the FL series (e.g. FL 2093-M2-EX7).
Actuators with low level of coding acc. to EN ISO 14119.

Safety switches for hinges

All values in the drawings are in mm

Contact type:

 = slow action

Category	Contact block			
3D	18		FL 1895-M2-EX4	 1NO+1NC
	20		FL 2095-M2-EX4	 1NO+2NC
2G M2	20		FL 2095-M2-EX7	 1NO+2NC
2D	20		FL 2095-M2-EX8	 1NO+2NC
Actuating force		0,15 Nm (0,4 Nm )		
Travel diagrams		page 71		
Gen. Cat. Safety				

Items with code on green background are stock items

Accessories See page 197

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

Safety rope switches with reset for emergency stops

All values in the drawings are in mm

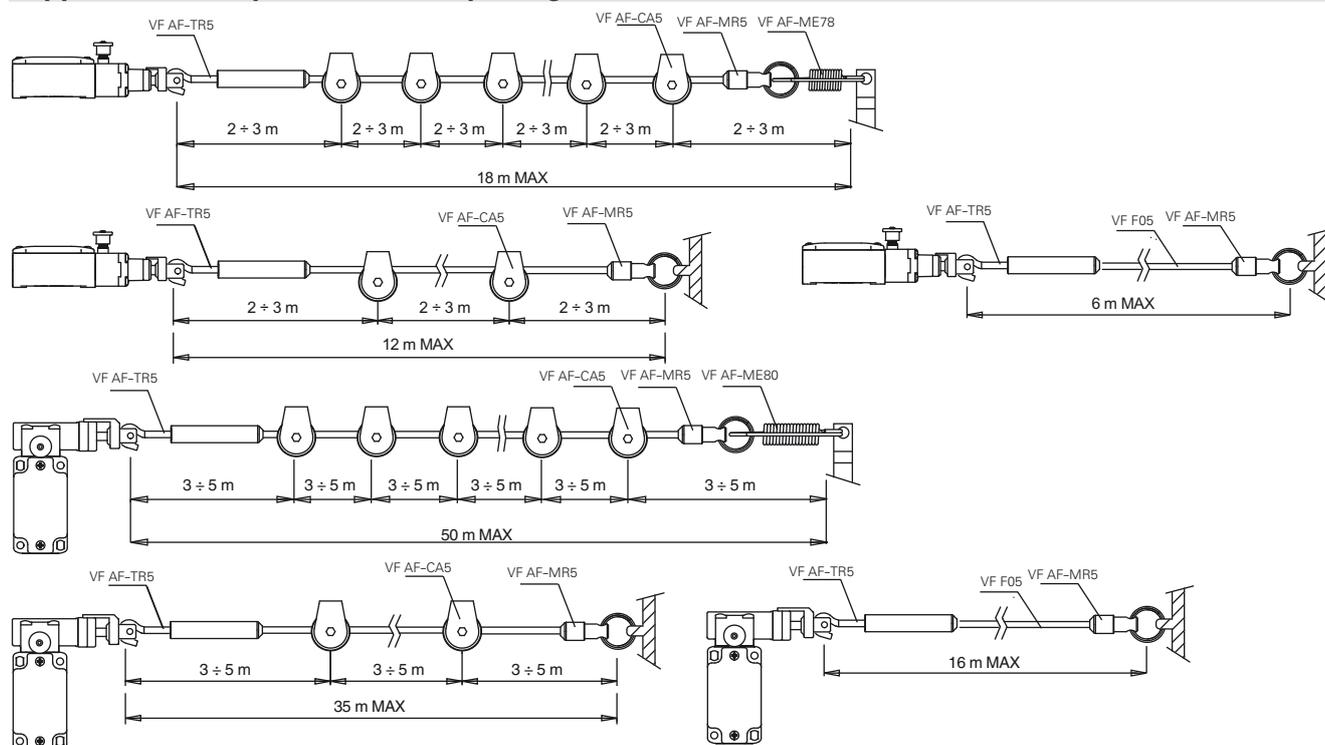
Category		Contact block	FL 1878-M2-EX4		FL 1883-M2-EX4		FL 1884-M2-EX4	
3D		18 L	FL 1878-M2-EX4	1NO+1NC	FL 1883-M2-EX4	1NO+1NC	FL 1884-M2-EX4	1NO+1NC
		20 L	FL 2078-M2-EX4	1NO+2NC	FL 2083-M2-EX4	1NO+2NC	FL 2084-M2-EX4	1NO+2NC
2G M2		20 L	FL 2078-M2-EX7	1NO+2NC	FL 2083-M2-EX7	1NO+2NC	FL 2084-M2-EX7	1NO+2NC
2D		18 L	FL 1878-M2-EX8	1NO+1NC	FL 1883-M2-EX8	1NO+1NC	FL 1884-M2-EX8	1NO+1NC
		20 L	FL 2078-M2-EX8	1NO+2NC	FL 2083-M2-EX8	1NO+2NC	FL 2084-M2-EX8	1NO+2NC
Actuating force			initial 63 N...final 83 N (90 N \rightarrow)		initial 147 N...final 235 N (250 N \rightarrow)		initial 147 N...final 235 N (250 N \rightarrow)	
Travel diagrams			page 174 - group 1		page 174 - group 2		page 174 - group 2	
Gen. Cat. Safety								

Accessories for rope installation

VF AF-TR5	VF AF-TR8	VF AF-MR5	VF AF-ME78	VF AF-ME80	VF F05-100	VF AF-IF1GR11	VF AF-CA5	VF AF-CA10
Adjustable stay bolt	Stay bolt	End clamp	Safety spring for longitudinal heads	Safety spring for transversal heads	Rope coil \varnothing 5 mm length 100 m	Rope function indicator.	Stainless steel pulley	Angular pulley, stainless steel

Application examples and max. rope length

All values in the drawings are in mm


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

Accessories See page 197

 \rightarrow The 2D and 3D files are available at www.pizzato.com



Main features

- ATEX approval
- Metal housing, one conduit entry
- Protection degree IP67
- Versions with gold-plated silver contacts

ATEX markings:

Product code extension

Quality mark

Certificate type and notified body

-EX7EC type examination certificate
DEKRA EXAM GmbH

Technical data

Housing

Metal housing, powder-coated
One threaded conduit entry:
Protection degree:

M20x1.5

IP67 acc. to EN 60529 with cable gland presenting same or higher protection degree

General data

Ambient temperature:

-20°C ... +60°C

Max. actuation frequency:

3600 operating cycles/hour

Mechanical endurance:

FM ●●●●-EX●

10 million operating cycles

FM ●●C●-EX●, FM ●●96-EX●

500,000 operating cycles

Mounting position:

any

Safety parameters B_{10D} (NC contacts):

FM ●●●●-EX●

20,000,000

FM ●●C●-EX●

1,000,000

FM ●●96-EX●

2,500,000

Mechanical interlock, not coded:

type 1 acc. to EN ISO 14119

Tightening torques for installation:

see page 211-222

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 28, 29, 30, 33, 34:

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

Contact blocks 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16,

17, 18, 37, 66, 67:

min. 1 x 0.5 mm² (1 x AWG 20)max. 2 x 2.5 mm² (2 x AWG 14)

In compliance with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, EN 50047, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, UL 508, CSA 22.2 No.14, IEC 60079-0, EN 60079-0, IEC 60079-11, EN 60079-11.

Compliance with the requirements of:

ATEX Directive 2014/34/EU and EMC Directive 2014/30/EU

Positive contact opening in conformity with standards:

IEC 60947-5-1, EN 60947-5-1.

Installation for safety applications:

Use only switches marked with the symbol  next to the product code. Always connect the safety circuit to the **NC contacts** (normally closed contacts: 11-12, 21-22 or 31-32) as required by **EN ISO 14119, paragraph 5.4** for specific interlock applications and **EN ISO 13849-2 tables D3** (well-tried components) and **D.8** (fault exclusions) for safety applications in general. Actuate the switch **at least up to the positive opening travel** shown in the travel diagrams on page 216. Actuate the switch **at least with the positive opening force**, reported in brackets below each article, next to the actuating force value.

 **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 211 to 222 and in the certificate.**

Product code extension	Category	Zone	EPL	Approvals	
-EX7	2G	1	Gb	II 2G Ex ia IIC T6 Gb	 This switch type must be used only in intrinsic safety circuits in compliance with standard IEC 60079-11, EN 60079-11
	M2	M2	Mb	I M2 Ex ia I Mb	
	Electrical data				
	Maximum current (Ii):				2.5 A
	Maximum voltage (Ui):				30 Vdc
	Conditional short circuit current:				1000 A acc. to EN 60947-5-1
	Protection against short circuits:				type gG fuse 4 A 250 V
	Pollution degree:				3

Quality marks of the product


UL approval: E131787
EAC approval: RU C-IT.A.135.B.00454

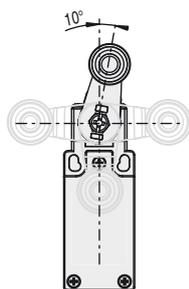
Features approved by UL

Utilization category Q300 (69 VA, 125-250 Vdc)
A600 (720 VA, 120-600 Vac)
Housing features type 1, 4X, 12, 13
For all contact blocks except 2 and 3 use 60 or 75°C copper (Cu) conductors, rigid or flexible, wire size 12, 14 AWG. Tightening torque for terminal screws of 7.1 lb in (0.8 Nm).
For contact blocks 2 and 3 use 60 or 75 °C copper (Cu) conductors, rigid or flexible, wire size 14 AWG. Tightening torque for terminal screws of 12 lb in (1.4 Nm).

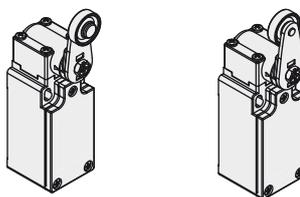
In compliance with standard: UL 508, CSA 22.2 No.14
Please contact our technical department for the list of approved products.

Adjustable levers

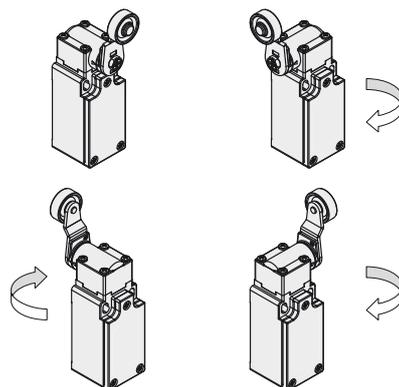
For these switches the lever can be adjusted in 10° steps over the entire 360° range. The positive movement transmission is always guaranteed thanks to the particular geometrical coupling between the lever and the revolving shaft as prescribed for safety applications by the German standard BG-GS-ET-15.


Reversible levers

With these switches, the lever can be secured in either the normal or reverse position, whereby positive coupling is retained. In this way two different working planes of the lever are possible.


Head with variable orientation

For all switches the head can be rotated in 90° steps.


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 product code extension
FM 502-GM2-EX7

Housing	
FM	metal, one conduit entry

Contact block	
5	1NO+1NC, snap action
11	2NC, snap action
12	2NO, snap action
20	1NO+2NC, slow action
21	3NC, slow action
22	2NO+1NC, slow action

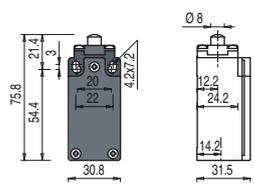
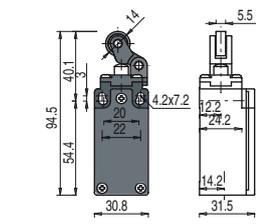
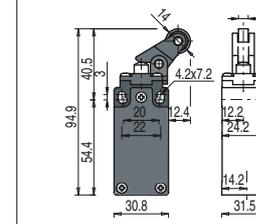
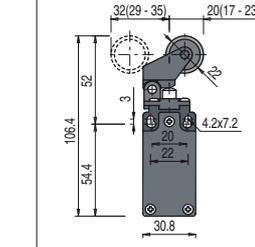
Actuators	
01	short plunger
02	roller lever
...

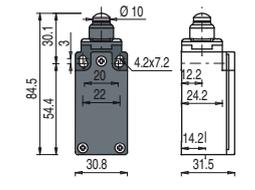
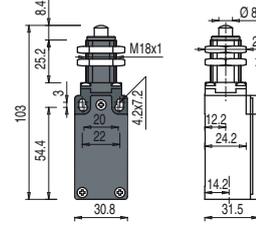
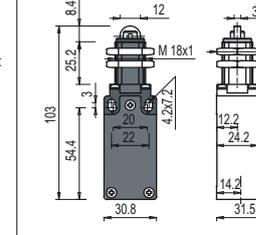
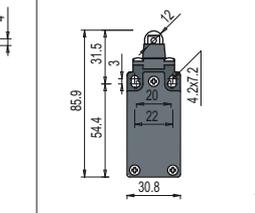
ATEX approval	
-EX7	II 2G Ex ia IIC T6 Gb I M2 Ex ia I Mb

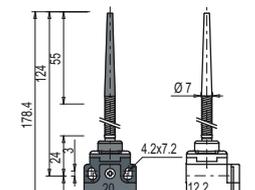
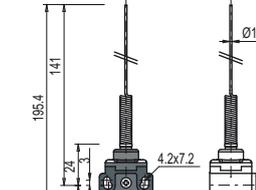
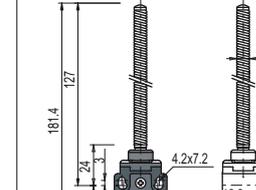
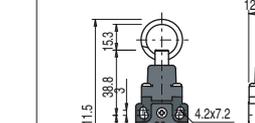
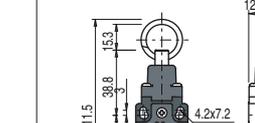
Contact type	
	silver contacts (standard)
G	silver contacts, 1 µm gold coating
G1	silver contacts, 2.5 µm gold coating (not for contact block 20, 21, 22, 28, 29, 30, 33, 34)

Contact type:

- R = snap action
- L = slow action

Category	Contact block	With stainless steel roller on request		With stainless steel roller on request	
		Front view	Side view	Front view	Side view
2G M2	5 R 20 L				
		FM 501-M2-EX7 ➔ 1NO+1NC FM 2001-M2-EX7 ➔ 1NO+2NC	FM 502-M2-EX7 ➔ 1NO+1NC FM 2002-M2-EX7 ➔ 1NO+2NC	FM 505-M2-EX7 ➔ 1NO+1NC FM 2005-M2-EX7 ➔ 1NO+2NC	FM 507-M2-EX7 ➔ 1NO+1NC FM 2007-M2-EX7 ➔ 1NO+2NC
Max. speed		0.5 m/s	0.5 m/s with cam at 30°	0.5 m/s with cam at 30°	0.5 m/s with cam at 30°
Actuating force		8 N (25 N ➔)	6 N (25 N ➔)	6 N (25 N ➔)	4 N (25 N ➔)
Travel diagrams		page 216 - group 1	page 216 - group 2	page 216 - group 2	page 216 - group 3

Category	Contact block	With external rubber gasket		With external rubber gasket		With external rubber gasket	
		Front view	Side view	Front view	Side view	Front view	Side view
2G M2	5 R 20 L						
		FM 508-M2-EX7 ➔ 1NO+1NC FM 2008-M2-EX7 ➔ 1NO+2NC	FM 512-M2-EX7 ➔ 1NO+1NC FM 2012-M2-EX7 ➔ 1NO+2NC	FM 513-M2-EX7 ➔ 1NO+1NC FM 2013-M2-EX7 ➔ 1NO+2NC	FM 515-M2R28-EX7 ➔ 1NO+1NC FM 2015-M2R28-EX7 ➔ 1NO+2NC		
Max. speed		0.5 m/s	0.5 m/s	0.5 m/s with cam at 30°	0.5 m/s with cam at 30°		
Actuating force		8 N (25 N ➔)	8 N (25 N ➔)	8 N (25 N ➔)	8 N (25 N ➔)		
Travel diagrams		page 216 - group 1					

Category	Contact block	With external rubber gasket		With external rubber gasket		With external rubber gasket		Rope switch for signalling
		Front view	Side view	Front view	Side view	Front view	Side view	Front view
2G M2	5 R 20 L							
		FM 520-M2-EX7 1NO+1NC FM 2020-M2-EX7 1NO+2NC	FM 521-M2-EX7 1NO+1NC FM 2021-M2-EX7 1NO+2NC	FM 525-M2-EX7 1NO+1NC FM 2025-M2-EX7 1NO+2NC	FM 576-M2-EX7 1NO+1NC FM 2076-M2-EX7 2NO+1NC			
Max. speed		1 m/s	1 m/s	1 m/s	0.5 m/s			
Actuating force		0.06 Nm	0.04 Nm	0.11 Nm	initial 20 N - final 40 N			
Travel diagrams		page 216 - group 4	page 216 - group 4	page 216 - group 4	page 216 - group 7			

All values in the drawings are in mm



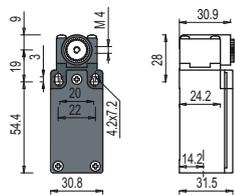
Position switches with swivelling lever without actuator

All values in the drawings are in mm

Contact type:

- R** = snap action
- L** = slow action

Category	Contact block	
2G	5	R FM 538-M2-EX7 → 1NO+1NC
M2	20	L FM 2038-M2-EX7 → 1NO+2NC
Actuating force	0,06 Nm (0,25 Nm →)	
Travel diagrams	page 216 - group 5	



IMPORTANT

For safety applications: join only switches and actuators marked with symbol ⊕ next to the product code.

For more information about safety applications see details on page 211.

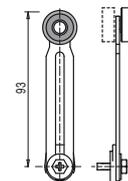
Separate actuators

All values in the drawings are in mm

IMPORTANT: These separate actuators can be used only with items of the FM series.

	Roller Ø 18 mm	Roller Ø 18 mm	Adjustable square rod, 3x3x125 mm	Flexible rod with pointed end	Adjustable round rod Ø 3x125 mm	Technopolymer roller Ø 20 mm	
Article	VF LE30 →	VF LE31 →	VF LE33	VF LE34	VF LE50	VF LE51 →	
Max. speed	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s	1.5 m/s	1.5 m/s	1.5 m/s (cam at 30°)	
	Technopolymer roller Ø 20 mm	Porcelain roller	Technopolymer roller Ø 20 mm	Adjustable actuator with technopolymer roller	Adjustable safety actuator with technopolymer roller	Technopolymer roller Ø 20 mm	Adjustable glass fibre rod
Article	VF LE52 →	VF LE53 →	VF LE54 →	VF LE55 → ⁽¹⁾	VF LE56 →	VF LE57 →	VF LE69
Max. speed	1.5 m/s (cam at 30°)	0.5 ms	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s
Stainless steel rollers, Ø 20 mm							
Article	VF LE31-R24 →	VF LE51-R24 →	VF LE52-R24 →	VF LE54-R24 →	VF LE55-R24 → ⁽¹⁾	VF LE56-R24 →	VF LE57-R24 →
Max. speed	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)	1.5 m/s (cam at 30°)

- ⁽¹⁾ Actuator VF LE55 can only be used in safety applications if adjusted to its max. length, as shown in the figure to the right. If an adjustable lever is required for safety applications, use the VF LE56 adjustable safety lever.



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

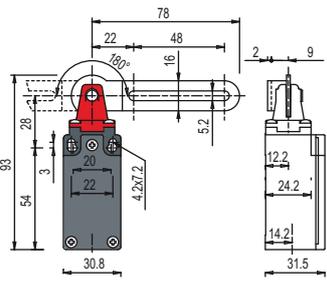
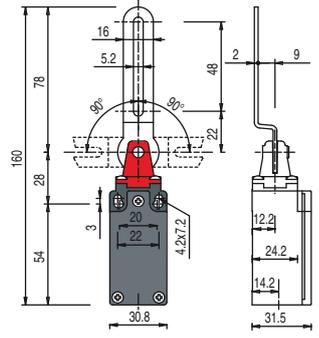
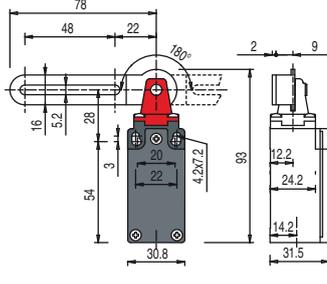
Accessories See page 197

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

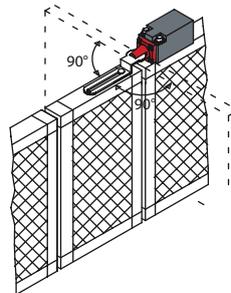
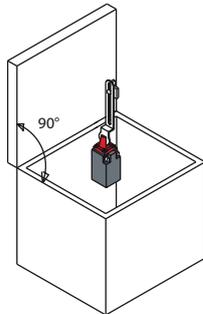
Safety switches with slotted hole lever

All values in the drawings are in mm

Contact type:
 = slow action

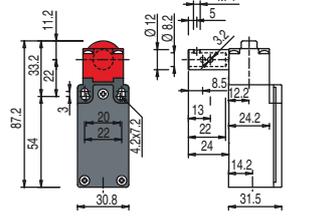
Category	Contact block			
2G M2	20 			
		FM 20C1-M2-EX7  1NO+2NC	FM 20C2-M2-EX7  1NO+2NC	FM 20C3-M2-EX7  1NO+2NC
Actuating force		11 N (15 N )	11 N (15 N )	11 N (15 N )
Travel diagrams		page 218 - group 10	page 218 - group 11	page 218 - group 10

Application examples

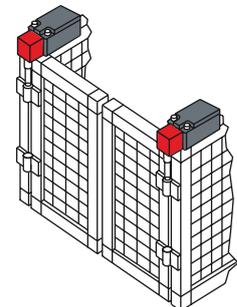
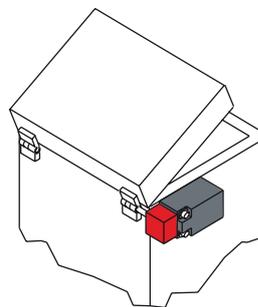


Safety switches for hinges

Contact type:
 = slow action

Category	Contact block	
2G M2	20 	
Actuating force		0,15 Nm (0,4 Nm )
Travel diagrams		page 218 - group 9

Application examples





Technical data

Housing

Metal housing, powder-coated
with cable in halogen-free polyurethane, 2 m, other lengths on request
Protection degree: IP67 acc. to EN 60529

General data

Ambient temperature: -20°C ... +60°C
Max. actuation frequency: 3600 operating cycles/hour
Mechanical endurance: 10 million operating cycles
Mounting position: any
Safety parameters B_{10D} (NC contacts): 20,000,000
Mechanical interlock, not coded: type 1 acc. to EN ISO 14119
Tightening torques for installation: see page 211-222

Main features

- ATEX approval
- Metal housing
- Protection degree IP67
- Cable, halogen-free polyurethane

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, UL 508, CSA 22.2 No.14, IEC 60079-0, EN 60079-0, IEC 60079-31, EN 60079-31, IEC 60079-15, EN 60079-15.

ATEX markings:

Product code extension
Quality mark

Certificate type and notified body

-EX5



EU declaration of conformity
Pizzato Elettrica S.r.l.

Compliance with the requirements of:

ATEX Directive 2014/34/EU and EMC Directive 2014/30/EU

Positive contact opening in conformity with standards:

IEC 60947-5-1, EN 60947-5-1.

Installation for safety applications:

Use only switches marked with the symbol  next to the product code. Always connect the safety circuit to the **NC contacts** (normally closed contacts: see "Internal wiring") as required by **EN ISO 14119, paragraph 5.4** for specific interlock applications and **EN ISO 13849-2 tables D3** (well-tries components) and **D.8** (failure exclusions) for safety applications in general. Actuate the switch **at least up to the positive opening travel** shown in the travel diagrams on page 217. Actuate the switch **at least with the positive opening force**, reported in brackets below each article, next to the actuating force value.

⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 211 to 222 and in the certificate.

Category	Zone	EPL	Approvals
3D	22	Dc	 II 3D Ex tc II I CT 80°C Dc
3G	2	Gc	 II 3G Ex nC I I C T 6 Gc

Product code extension
-EX5

Electrical data

Thermal current (I _{th}):	10 A
Rated insulation voltage (U _i):	400 Vac/dc
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

Utilization category

Alternating current: AC15 (50÷60 Hz)

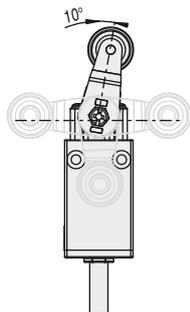
U _e (V)	120	250	400
I _e (A)	6	4	3

Direct current: DC13

U _e (V)	24	125	250
I _e (A)	2.5	0.55	0.27

Adjustable levers

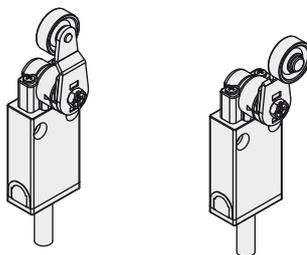
For these switches the lever can be adjusted in 10° steps over the entire 360° range. The positive movement transmission



is always guaranteed thanks to the particular geometrical coupling between the lever and the revolving shaft as prescribed for safety applications by the German standard BG-GS-ET-15.

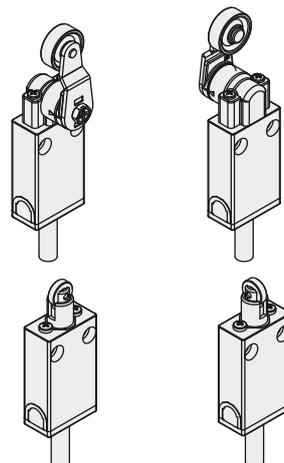
Reversible levers

With these switches, the lever can be secured in either the normal or reverse position, whereby positive coupling is retained. In this way two different working planes of the lever are possible.

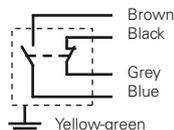


Head with variable orientation

Depending on the model, it is possible to rotate the head in 90° or 180° steps.



Internal wiring



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 product code
extension
FA 4501-2SHG-EX5

Housing

FA metal

Contact block

45 1NO+1NC, snap action

46 1NO+1NC, slow action

Actuators

01 short plunger

02 unidirectional lever

08 plunger

... ..

Connection type

1 cable, length: 1 m

2 cable length: 2 m

... ..

0 cable, length: 10 m

Other lengths on request

ATEX approval

-EX5 II 3D Ex tc IIIC T80°C Dc
 II 3G Ex nC IIC T6 Gc

Contact type

silver contacts (standard)

G silver contacts, 1 µm gold coating

Cable type

H PUR cable, halogen free

Output direction

S bottom output

Category		Contact block		Unidirectional operation	With external rubber gasket	Secured only by means of threaded head	
			Contact type: R = snap action L = slow action				
3D	45	R	FA 4501-2SH-EX5  1NO+1NC	FA 4502-2SH-EX5  1NO+1NC	FA 4508-2SH-EX5  1NO+1NC	FA 4510-2SH-EX5  1NO+1NC	
3G	46	L	FA 4601-2SH-EX5  1NO+1NC	FA 4602-2SH-EX5  1NO+1NC	FA 4608-2SH-EX5  1NO+1NC	FA 4610-2SH-EX5  1NO+1NC	
Max. speed		0.5 m/s		0.5 m/s		0.5 m/s	
Actuating force		10 N (25 N )		5 N (25 N )		10 N (25 N )	
Travel diagrams		page 217 - group 1		page 217 - group 2		page 217 - group 1	

Category		Contact block		Secured only by means of threaded head	Secured only by means of threaded head	With external rubber gasket	Roller, Ø 12 mm, stainless steel
3D	45	R	FA 4511-2SH-EX5  1NO+1NC	FA 4512-2SH-EX5  1NO+1NC	FA 4513-2SH-EX5  1NO+1NC	FA 4515-2SH-EX5  1NO+1NC	
3G	46	L	FA 4611-2SH-EX5  1NO+1NC	FA 4612-2SH-EX5  1NO+1NC	FA 4613-2SH-EX5  1NO+1NC	FA 4615-2SH-EX5  1NO+1NC	
Max. speed		0.1 m/s with cam at 30°		0.1 m/s with cam at 30°		0.5 m/s	
Actuating force		10 N (25 N )		10 N (25 N )		10 N (25 N )	
Travel diagrams		page 217 - group 1		page 217 - group 1		page 217 - group 1	

Category		Contact block		Roller, Ø 12 mm, stainless steel	With external rubber gasket	With external rubber gasket	With Ø 20 mm stainless steel roller on request
3D	45	R	FA 4517-2SH-EX5  1NO+1NC	FA 4520-2SH-EX5 1NO+1NC	FA 4525-2SH-EX5 1NO+1NC	FA 4530-2SH-EX5  1NO+1NC	
3G	46	L	FA 4617-2SH-EX5  1NO+1NC			FA 4630-2SH-EX5  1NO+1NC	
Max. speed		0.1 m/s with cam at 30°		1 m/s		1.5 m/s with cam at 30°	
Actuating force		10 N (25 N )		0.03 Nm		0.03 Nm (0.25 Nm )	
Travel diagrams		page 217 - group 1		page 217 - group 3		page 217 - group 4	



Category		Contact block	With stainless steel roller on request	Square rod, 3x3 mm		With stainless steel roller on request
3D	45	R				
3G	46	L				
			FA 4531-2SH-EX5 (1NO+1NC)	FA 4533-2SH-EX5 (1NO+1NC)	FA 4534-2SH-EX5 (1NO+1NC)	FA 4540-2SH-EX5 (1NO+1NC)
			FA 4631-2SH-EX5 (1NO+1NC)	FA 4633-2SH-EX5 (1NO+1NC)	FA 4634-2SH-EX5 (1NO+1NC)	FA 4640-2SH-EX5 (1NO+1NC)
			Max. speed: 1.5 m/s with cam at 30°	Max. speed: 1.5 m/s	Max. speed: 1.5 m/s	Max. speed: 1.5 m/s with cam at 30°
			Actuating force: 0.03 Nm (0.25 Nm ⊕)	Actuating force: 0.03 Nm	Actuating force: 0.03 Nm	Actuating force: 0.03 Nm (0.25 Nm ⊕)
			Travel diagrams: page 217 - group 4	Travel diagrams: page 217 - group 4	Travel diagrams: page 217 - group 4	Travel diagrams: page 217 - group 4

Category		Contact block	Round rod, Ø 3 mm, stainless steel	With stainless steel roller on request	With stainless steel roller on request	With stainless steel roller on request
3D	45	R				
3G	46	L				
			FA 4550-2SH-EX5 (1NO+1NC)	FA 4551-2SH-EX5 (1NO+1NC)	FA 4552-2SH-EX5 (1NO+1NC)	FA 4554-2SH-EX5 (1NO+1NC)
			FA 4650-2SH-EX5 (1NO+1NC)	FA 4651-2SH-EX5 (1NO+1NC)	FA 4652-2SH-EX5 (1NO+1NC)	FA 4654-2SH-EX5 (1NO+1NC)
			Max. speed: 1.5 m/s	Max. speed: 1.5 m/s with cam at 30°	Max. speed: 1.5 m/s with cam at 30°	Max. speed: 1.5 m/s with cam at 30°
			Actuating force: 0.03 Nm	Actuating force: 0.03 Nm (0.25 Nm ⊕)	Actuating force: 0.03 Nm (0.25 Nm ⊕)	Actuating force: 0.03 Nm (0.25 Nm ⊕)
			Travel diagrams: page 217 - group 4	Travel diagrams: page 217 - group 4	Travel diagrams: page 217 - group 4	Travel diagrams: page 217 - group 4

Category		Contact block	With stainless steel roller on request	With stainless steel roller on request	With stainless steel roller on request	Glass fibre rod
3D	45	R				
3G	46	L				
			FA 4555-2SH-EX5 (1NO+1NC)	FA 4556-2SH-EX5 (1NO+1NC)	FA 4557-2SH-EX5 (1NO+1NC)	FA 4569-2SH-EX5 (1NO+1NC)
			FA 4655-2SH-EX5 (1NO+1NC)	FA 4656-2SH-EX5 (1NO+1NC)	FA 4657-2SH-EX5 (1NO+1NC)	FA 4669-2SH-EX5 (1NO+1NC)
			Max. speed: 1.5 m/s with cam at 30°	Max. speed: 1.5 m/s with cam at 30°	Max. speed: 1.5 m/s with cam at 30°	Max. speed: 1.5 m/s
			Actuating force: 0.03 Nm (0.25 Nm ⊕)	Actuating force: 0.03 Nm (0.25 Nm ⊕)	Actuating force: 0.03 Nm (0.25 Nm ⊕)	Actuating force: 0.03 Nm
			Travel diagrams: page 217 - group 4	Travel diagrams: page 217 - group 4	Travel diagrams: page 217 - group 4	Travel diagrams: page 217 - group 4

(1) Positive opening only with actuator set to max.

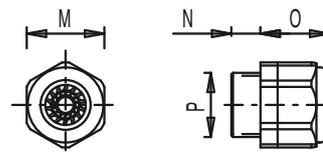
Accessories

All values in the drawings are in mm

ATEX cable gland, technopolymer

**Technical data:**

ATEX marking:  II 2G 1D Ex e II tD A20 IP68
 Body and ring material: Plastic PA V0 acc. to UL 94
 Ambient temperature: -20 ... +95 °C
 Protection degree: IP68 (≤ 10 bar)
 Tightening torque: 3 ... 4 Nm

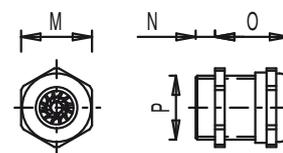


Article	Description	ATEX certificate number	 M	N	O	P
VF PBM20C6P-2GD	M20x1.5 technopolymer cable gland for multipolar cables Ø 6.5 ... 12 mm	DMT 02 ATEX E 047 X	24	9	24	M20x1.5

ATEX cable gland, metal

**Technical data:**

ATEX marking:  II 2G Ex e II
 II 1D Ex tD A20 IP68
 Body and ring material: Nickel-plated brass
 Ambient temperature: -20 ... +95 °C
 Protection degree: IP68 (≤ 10 bar)
 Tightening torque: 3 ... 4 Nm



Article	Description	ATEX certificate number	 M	N	O	P
VF PBM20C6M-2GD	M20x1.5 brass cable gland for multipolar cables Ø 6 ... 12 mm	KEMA 99ATEX6971 X	24	9	24	M20x1.5

