

ATEX







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Category	Zone	Approvals	Article code extension
2G M2	1 M2	Ex II 2G EEX ia IIC T6 Ex I M2 EEX ia I	-EX7

ATEX category				
M2	2G	2D	3G	3D
■	■	-	■	-

Position switches FM series page 2/147



Category	Zone	Approvals	Article code extension
2G M2	1 M2	Ex II 2G EEX ia IIC T6 Ex I M2 EEX ia I	-EX7

ATEX category				
M2	2G	2D	3G	3D
■	■	-	■	-

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Category	Zone	Approvals	Article code extension
2D	21	Ex II 2D IP67 T80°C	-EX8

ATEX category				
M2	2G	2D	3G	3D
-	-	■	-	■

Prewired position switches FA series page 2/159



Category	Zone	Approvals	Article code extension
3D 3G	22 2	Ex II 3D IP67 T80°C Ex II 3G EEX nC II T6	-EX5

ATEX category				
M2	2G	2D	3G	3D
-	-	-	■	■

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Category	Zone	Approvals	Article code extension
3D	22	Ex II 3D IP67 T80°C	-EX4

ATEX category				
M2	2G	2D	3G	3D
-	-	-	-	■

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ATEX Directive

The ATEX mark (**At**mospheres **Ex**plosives) refers to two European directives concerning the risk of deflagration in potentially explosive atmospheres:
- ATEX 94/9/CE: concerns the requirements for electrical and non-electrical equipment used in potentially explosive environments. According to this directive the manufacturer has to comply with the provided requirements and mark the articles in conformity with particular categories.
- ATEX 99/92/CE: regards the minimum safety and sanitary requirements that the user has to satisfy during the activity in potentially explosive environments.

These directives determine the requirements for the safety and health protection of people, animals and property and carry several procedures for the conformity demonstration of equipment to the directive requirements.

Classification of the potentially explosive atmospheres

A potentially explosive atmosphere is an atmosphere that could become explosive according to the local conditions of work. Usually it consists in environments where is present a mixture of air and flammable substances in the form of gas, smog, steams and dusts.
The ATEX 99/92/CE directive defines for two types of explosive atmosphere, depending on the presence in the zone of gases or combustible dusts. Each area exposed to these types of explosive atmospheres is classified in three zones, according to the frequency and duration of the explosive atmosphere. For atmospheres with explosive gas, areas are classified in zones 0, 1 and 2; for atmosphere with explosive dusts in zones 20, 21 and 22:
- **Zone 0/20**: a place where gas or combustible dust are present permanently. Constant danger. Equipment of minimum category 1 are required.
- **Zone 1/21**: a place where gas or combustible dust are likely to occur during normal operation. Potential danger. Equipment of minimum category 2 are required.
- **Zone 2/22**: a place where gas or combustible dust are unlikely to occur or only for a short period. Lower danger. Equipment of minimum category 3 are required.

It's under the responsibility of the final user to choose and classify the different zones and to use suitable equipments.

Equipment categories

ATEX 94/9/CE directive distinguishes equipment between 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 degree:
- **Category M1**: equipment designed to assure a very high protection degree
- **Category M2**: equipment designed to assure a high protection degree

Equipment of the group II is divided in three further categories according to the required protection degree:
- **Category 1**: equipment designed to assure a very high protection degree (use in zones 0 and 20)
- **Category 2**: equipment designed to assure a high protection degree (use in zones 1 and 21)
- **Category 3**: equipment designed to assure a normal protection degree (use in zones 2 and 22)

Environment characteristics				Equipment characteristics		
Environment of application	**Flammable material**	**Potentially explosive atmosphere**	**Classifications of the potentially explosive atmospheres: ZONE**	**Required marking of the applied device: CATEGORY**	**Required marking of the applied device: GROUP**	**Required degree protection**
Mining				**M1**	**I**	very high
				M2		high
Surface	**Gases**	It is present continuously, for long periods or frequently	**0**	**1G**	**II**	very high
		It is likely to occur	**1**	**2G or 1G**		high
		It is unlikely to occur or, if it does, is likely to do infrequently and for a short period only	**2**	**3G, 2G or 1G**		normal
	Dusts	It is present continuously, for long periods or frequently	**20**	**1D**		very high
		It is likely to occur	**21**	**2D or 1D**		high
		It is unlikely to occur or, if it does, is likely to do infrequently and for a short period only	**22**	**3D, 2D or 1D**		normal

Methods of protection

In order to avoid an explosion caused by the electrical ignition of an explosive atmosphere, it is possible to take different type of precautions:
- Isolate the dangerous parts into housing in order to limit the explosion inside itself.
- Avoid contact between ignition sources and the potentially explosive atmosphere interposing solid, liquid or gaseous materials.
- Take measures in order to limit the generation of dangerous ignition sources, eliminating the possibility of faults or limiting the energy so it's not sufficient to cause the ignition.

For each modality have been developed and standardized several methods of protection, as listed in the following table.

Table 2 - Protection methods and reference standards

Protection method	Symbol	Marking	Zone of utilization	CENELEC standard
General requirements	/	/	/	EN 50014
Oil immersion		**EEX o**	1 or 2	EN 50015
Pressurized		**EEX p**	1 or 2	EN 50016
Sand encapsulation		**EEX q**	1 or 2	EN 50017
Explosion-proof enclosure		**EEX d**	1 or 2	EN 50018
Increased safety		**EEX e**	1 or 2	EN 50019
Intrinsic safety		**EEX ia** **EEX ib**	0, 1 or 2	EN 50020
Encapsulation		**EEX m**	1 or 2	EN 50028
Type of protection	/	**EEX n**	2	EN 50021
Protection by housing		**IP**	20/21/22	EN 50281-1-1

Example of marking

Devices for places with gases presence

Ex II 2G EEx ia IIC T6

① ② ③ ④ ⑤ ⑥ ⑦

① Community marking
② Equipment group (see table 1)
③ Protection category (see table 1)
④ Prefix for safety devices according to the CENELEC standard
⑤ Method of protection (see table 2)
⑥ Classification of gases (see table 4)
⑦ Temperature class (see table 3)

Devices for places with dusts presence

Ex II 3D IP67 T80°C

① ② ③ ④ ⑤

① Community marking
② Equipment group (see table 1)
③ Protection category (see table 1)
④ Protection degree (see table 2)
⑤ Maximum surface temperature of the equipment

Temperature classes

Table 3

Classes	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 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		fuel oil, hexane	hydrogen sulphide	
T4		acetaldehyde	ethyl ether	
T5				
T6				carbon bisulphide



Main features

- Approvals:
  2G and **M2** category
- Housing made of metal, one conduit entry
- Protection degree IP67
- Version with silver contacts gold plated

Markings and ATEX approvals:

CE

Ⓔx **II 2G EEX ia IIC T6**
Ⓔx **I M2 EEX ia I**

Certificate n°: BVS 05 ATEX E107

Technical data

Housing
Made of metal, coated with baked epoxy powder
One conduit entry M20
Protection degree: IP67

General data

Ambient temperature:	from -20°C to +60°C
Max operating frequency:	3600 operations cycles[1]/hour
Mechanical endurance:	10 million operations cycles[1]
Assembling position:	anyone

(1) One operation cycle means two movements, one to close and one to open contacts, as foresee by IEC 947-5-1 standard.

Cross section of the conductors (flexible copper wire)

Contact blocks 20,28:	min.	1 x 0,34 mm^2	(1 x AWG 22)
	max.	2 x 1,5 mm^2	(2 x AWG 16)
Contact block 5:	min.	1 x 0,5 mm^2	(1 x AWG 20)
	max.	2 x 2,5 mm^2	(2 x AWG 14)

In conformity with standards:
IEC 60947-5-1, EN 60947-5-1, EN 50041, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, CENELEC EN 50013, EN 50014, EN 50020.

In conformity with requirements requested by:
ATEX directive 94/9/CE
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.
Positive contact opening complying with the standards:
IEC 60947-5-1, EN 60947-5-1, VDE 0660-206.

Installation for safety applications:
Use only switches marked with the symbol ⊖. The safety circuit must always be connected with the **NC contacts** (normally closed contacts: 11-12, 21-22 or 31-32) as stated in the **standard EN 60947-5-1, encl. K, par. 2**. The switch must be actuated with **at least up to the positive opening travel** shown in the travels diagrams on page 6/4. The switch must be actuated **at least with the positive opening force**, shown in brackets, underneath each article, near the value of the min. force.

⚠ **If not expressly indicated in this chapter, for the right installation and the correct utilization of all articles see requirements indicated from page 6/1 to page 6/8.**

Category	Zone	Approvals	Article code extension
2G	**1**	Ⓔx **II 2G EEX ia IIC T6**	**-EX7**
M2	**M2**	Ⓔx **I M2 EEX ia I**	

Electrical data

Max current (Ii):	2,1 A
Max voltage (Ui):	30 VDC
Protection against short circuits:	fuse 4 A 250 V type gG
Pollution degree:	3

⚠ **This type of switches must be used only in intrinsic safety circuits in conformity with standard EN 50020**
⚠ **For the correct utilization of the limit switch please use cable glands suitable for the zone according to the ATEX directive**

Quality marks of the product:

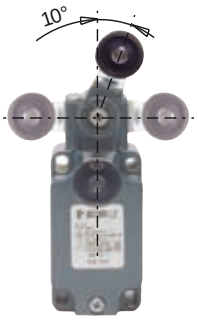
Approvals UL: E131787

Data type approved by UL

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

Adjustable levers

In switches with revolving lever it is possible to adjust the lever with 10° steps for all the 360° range. The positive movement transmission is always guaranteed thanks to the particular geometrical coupling between the lever and the revolving shaft in compliance with German standard BG-GS-ET-15.



Overturning levers

It's possible to fasten the lever on switches in straight or reverse side, maintaining the positive coupling.
In this way it's possible to obtain two different work plans of the lever.



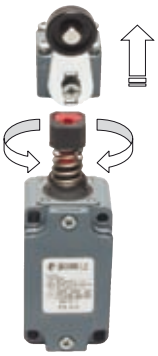
Rotating heads

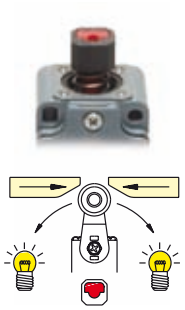
In all switches, it is possible to rotate the head in 90° steps.

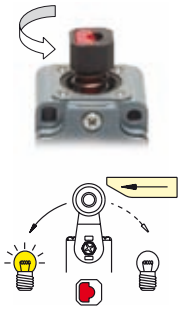


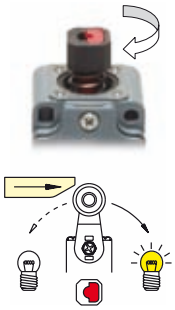
Unidirectional heads

In switches with revolving lever, you can select the directional operation by removing the four screws of the head and revolving the internal piston.









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 article
FD 502-GM2-EX7

Housing
FD metal housing, one conduit entry

ATEX approvals
-EX7 II 2G EEX ia IIC T6
I M2 EEX ia I

Contact blocks
5 1NO+1NC, snap action
20 1NO+2NC, slow action

Threaded conduit entry
M2 M20x1,5

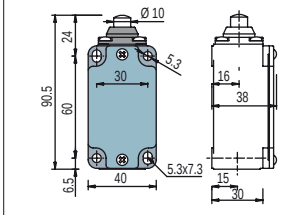
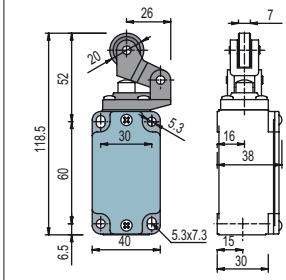
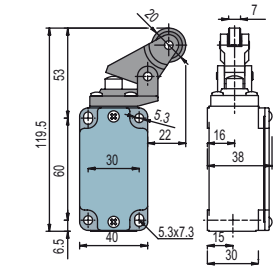
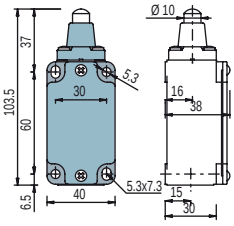
Actuators
01 short plunger
02 roller lever
... .

Type of contacts
silver contacts (standard)
G silver contacts gold plated 1 µm

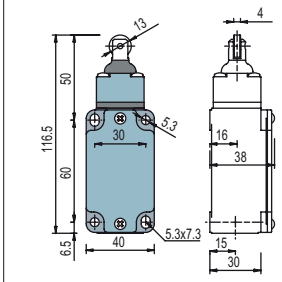
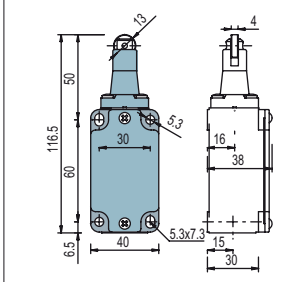
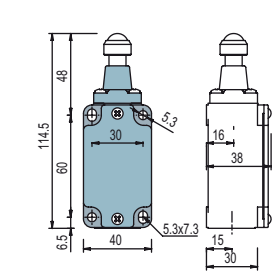
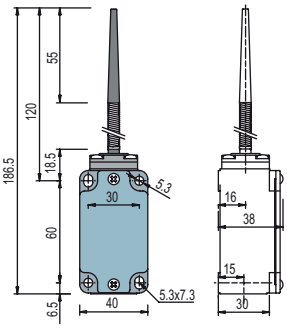
Type of contacts:

R = snap action
L = slow action

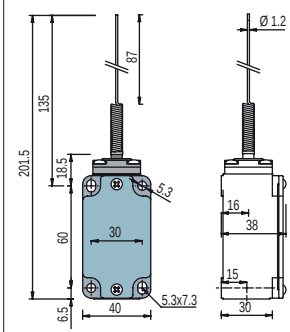
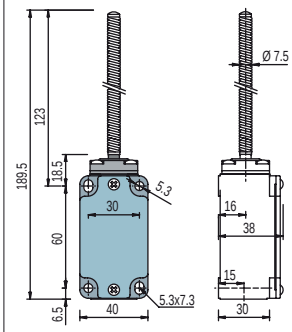
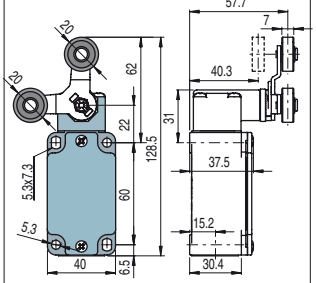
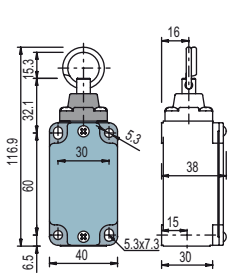
Contact blocks

			On demand with stainless steel roller 	On demand with stainless steel roller 	
5	R	FD 501-M2-EX7 ⟨Ex⟩ 1NO+1NC	FD 502-M2-EX7 ⟨Ex⟩ 1NO+1NC	FD 505-M2-EX7 ⟨Ex⟩ 1NO+1NC	FD 511-M2-EX7 ⟨Ex⟩ 1NO+1NC
20	L	FD 2001-M2-EX7 ⟨Ex⟩ 1NO+2NC	FD 2002-M2-EX7 ⟨Ex⟩ 1NO+2NC	FD 2005-M2-EX7 ⟨Ex⟩ 1NO+2NC	FD 2011-M2-EX7 ⟨Ex⟩ 1NO+2NC
Max speed		0,5 m/s	0,5 m/s with 30° cam	0,5 m/s with 30° cam	0,5 m/s
Min. force		8 N (25 N ⟨Ex⟩)	6 N (25 N ⟨Ex⟩)	6 N (25 N ⟨Ex⟩)	8 N (25 N ⟨Ex⟩)

Contact blocks

		With external rubber gasket 		Ø 12.7 stainless steel sphere 	
5	R	FD 515-M2-EX7 ⟨Ex⟩ 1NO+1NC	FD 516-M2-EX7 ⟨Ex⟩ 1NO+1NC	FD 519-M2-EX7 ⟨Ex⟩ 1NO+1NC	FD 520-M2-EX7 1NO+1NC
20	L	FD 2015-M2-EX7 ⟨Ex⟩ 1NO+2NC	FD 2016-M2-EX7 ⟨Ex⟩ 1NO+2NC	FD 2019-M2-EX7 ⟨Ex⟩ 1NO+2NC	FD 2020-M2-EX7 1NO+2NC
Max speed		0,5 m/s with 30° cam	0,5 m/s with 30° cam	0,5 m/s	1 m/s
Min. force		11 N (25 N ⟨Ex⟩)	8 N (25 N ⟨Ex⟩)	8 N (25 N ⟨Ex⟩)	0,09 Nm

Contact blocks

				With two stable positions 	With rope for signalling 
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
Max speed		1 m/s	1 m/s	0,5 m/s with 30° cam	0,5 m/s
Min. force		0,08 Nm	0,14 Nm	0,21 Nm	initial 20 N - final 40 N

Code	Approvals	Category	Zone
-EX7	⟨Ex⟩ II 2G EEX ia IIC T6	2G	1
	⟨Ex⟩ I M2 EEX ia I	M2	M2

All measures in drawings are in mm

Position switches without actuator

Type of contacts:

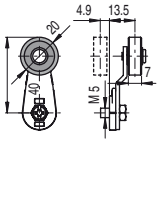
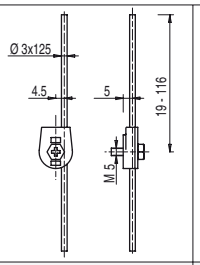
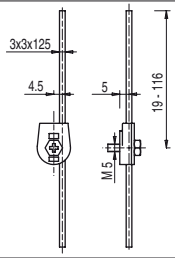
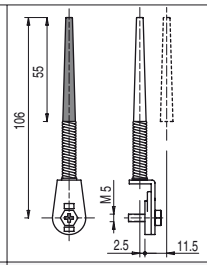
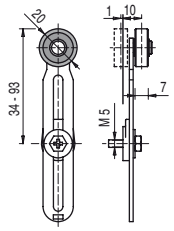
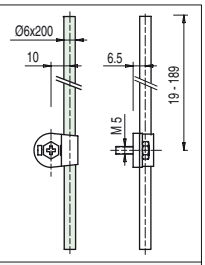
R = snap action
L = slow action

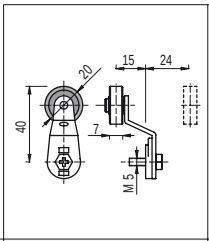
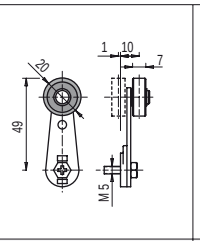
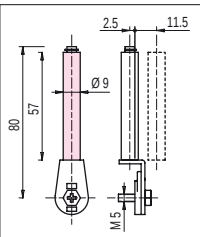
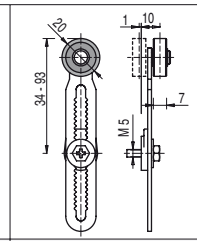
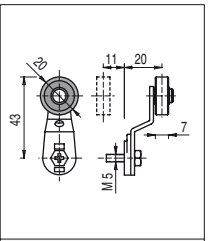
Contact blocks		Regular head	Compact head
5	R	FD 538-M2-EX7 ⟶ 1NO+1NC	FD 558-M2-EX7 ⟶ 1NO+1NC
20	L	FD 2038-M2-EX7 ⟶ 1NO+2NC	FD 2058-M2-EX7 ⟶ 1NO+2NC
Min. force		0,1 Nm (0,25 Nm ⟶)	0,06 Nm (0,25 Nm ⟶)

IMPORTANT
For applications in conformity with Machinery Directive 2006/42/CE : join only switches and actuators marked with symbol ⟶.
For more information about these applications see page 6/1

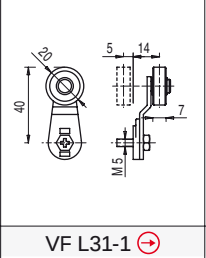
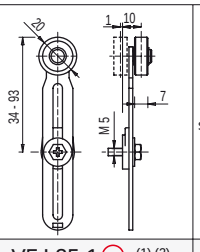
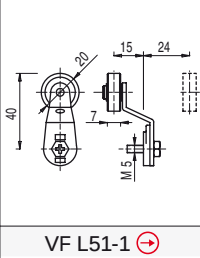
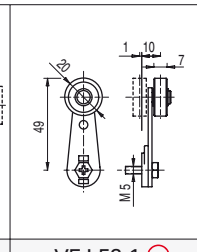
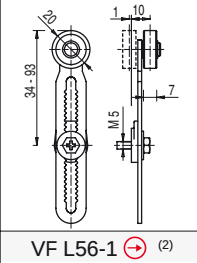
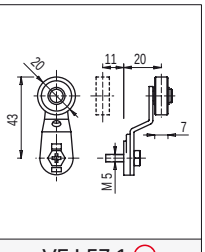
Loose actuators

IMPORTANT: These loose actuators can be used with items of FD series only

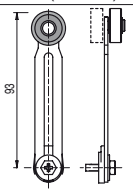
	Ø 20 mm polymer roller	Adjustable round rod Ø 3x125 mm	Adjustable square rod 3x3x125 mm	Flexible rod with push rod	Adjustable actuator with polymer roller	Fibber glass adjustable rod
						
Article	VF L31 ⟶	VF L32 (2)	VF L33 (2)	VF L34	VF L35 ⟶ (1) (2)	VF L36 (2)
Max speed	1,5 m/s (30° cam)	1,5 m/s	1,5 m/s	1 m/s	1,5 m/s (30° cam)	1,5 m/s

	Ø 20 mm polymer roller	Ø 20 mm polymer roller	Porcelain roller	Adjustable safety actuator with polymer roller	Ø 20 mm polymer roller
					
Article	VF L51 ⟶	VF L52 ⟶	VF L53 ⟶	VF L56 ⟶ (2)	VF L57 ⟶
Max speed	1,5 m/s (30° cam)	1,5 m/s (30° cam)	0,5 m/s	1,5 m/s (30° cam)	1,5 m/s (30° cam)

Ø 20 mm stainless steel roller

						
Article	VF L31-1 ⟶	VF L35-1 ⟶ (1) (2)	VF L51-1 ⟶	VF L52-1 ⟶	VF L56-1 ⟶ (2)	VF L57-1 ⟶
Max speed	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)

- (1) Actuator VF L35 suits to safety applications only if adjusted to its max. length, as you can see in the figure beside. If you need an adjustable lever for safety applications, use the adjustable safety lever VF L56.
- (2) If it is installed with switch FD •58 (ex. FD 558, FD 658...) the actuator could mechanically interfere with the housing of the switch. The interference could happen or not according to the actuator fixing position and the head of the switch.



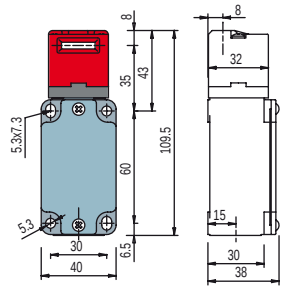
Code	Approvals	Category	Zone
-EX7	⟨Ex⟩ II 2G EEX ia IIC T6	2G	1
	⟨Ex⟩ I M2 EEX ia I	M2	M2

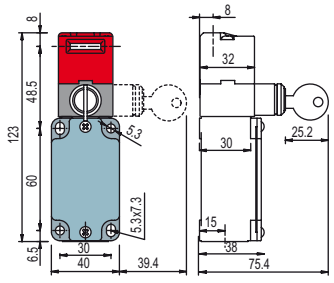
Safety switches with separate actuator

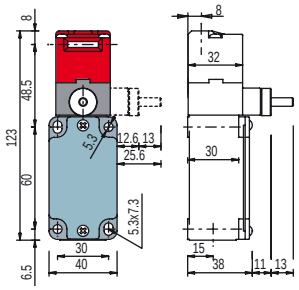
Type of contacts:

L = slow action

Contact blocks		Switches with separate actuator Switches without actuator	Switches with separate actuator with lock Switches without actuator	Switches with manual mechanical delay Switches without actuator
20	L	FD 2093-M2-EX7 → 1NO+2NC	FD 2099-M2-EX7 → 1NO+2NC	FD 20R2-M2-EX7 → 1NO+2NC
28	L		FD 2899-M2-EX7 → 1NO+2NC	
Min. force		10 N (18 N →)	30 N (40 N →)	10 N (18 N →)







Actuators









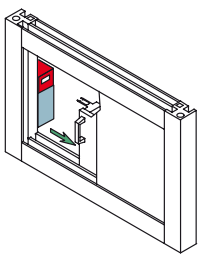


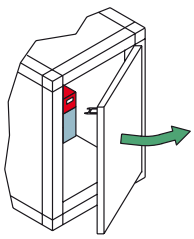


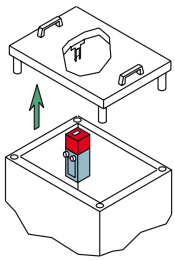
VF KEYF	VF KEYF1	VF KEYF2	VF KEYF3	VF KEYF7	VF KEYF8
Straight actuator	Right-angled actuator	Jointed actuator	Two directions adjustable actuator	One direction adjustable actuator	Universal actuator

IMPORTANT: These actuators must be used with switches of FD series only (e.g. FD 2093-M2-EX7).

Application examples





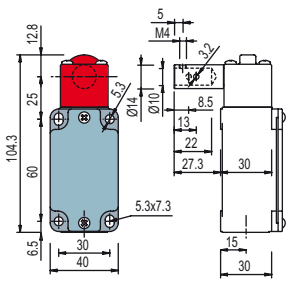


Hinge operating safety switches

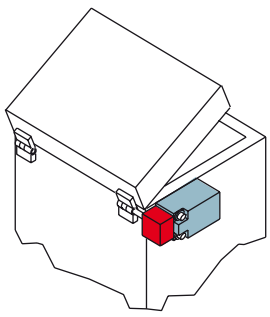
Type of contacts:

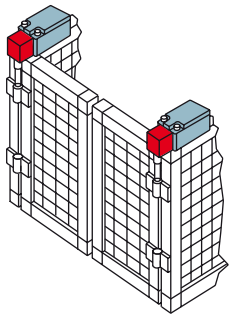
L = slow action

Contact blocks		
20	L	FD 2095-M2-EX7 → 1NO+2NC
Min. force		0,15 Nm (0,4 Nm →)



Application examples





Code	Approvals	Category	Zone
-EX7	Ex II 2G EEX ia IIC T6 Ex I M2 EEX ia I	2G M2	1 M2

Rope safety switches for emergency stop

Type of contacts:

L = slow action

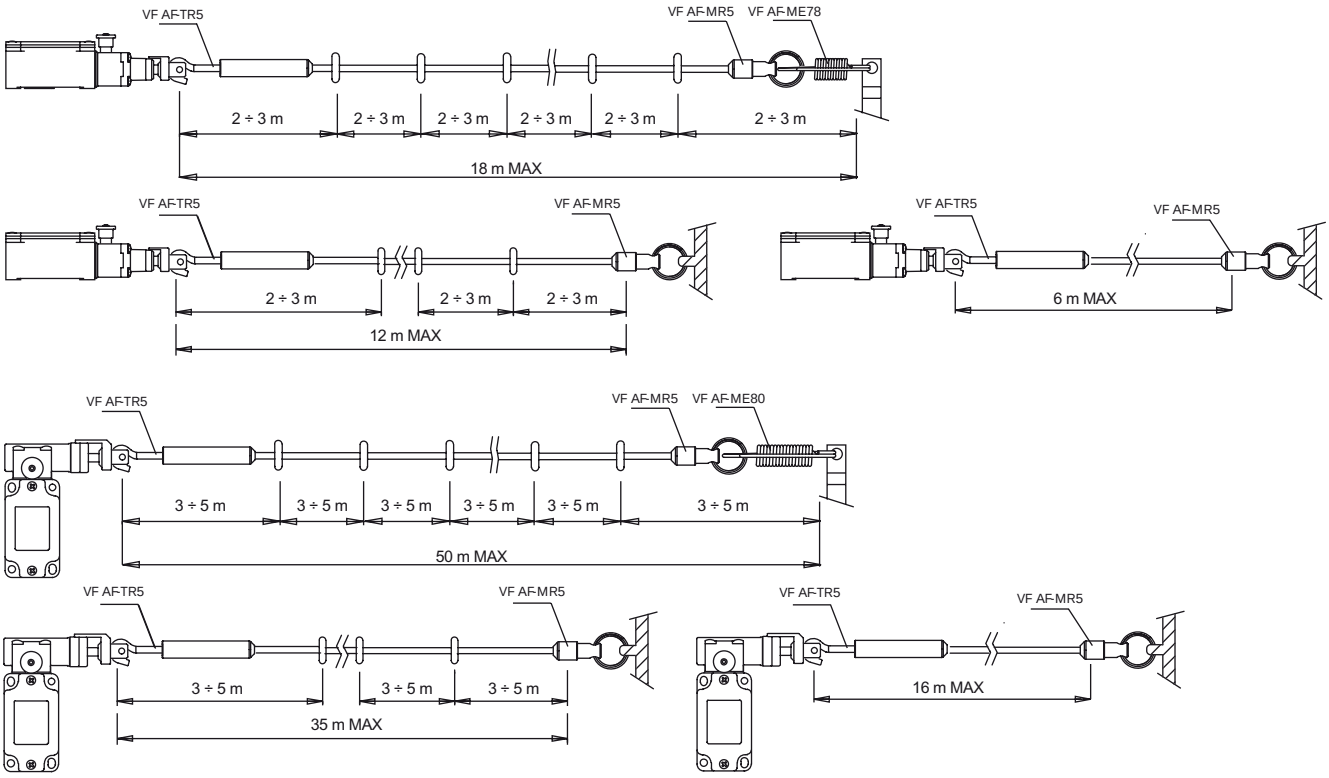
Contact blocks			
20 L	FD 2078-M2-EX7 ⊖ 1NO+2NC	FD 2083-M2-EX7 ⊖ 1NO+2NC	FD 2084-M2-EX7 ⊖ 1NO+2NC
Min. force	initial 63 N...final 83 N (90 N ⊖)	initial 147 N...final 235 N (250 N ⊖)	initial 147 N...final 235 N (250 N ⊖)

Rope installation accessories



VF AF-TR5	VF AF-TR8	VF AF-MR5	VF AF-ME78	VF AF-ME80	VF F05-100	VF AF-IF1GR03	VF AF-CA5	VF AF-CA10
Adjustable stay bolt	Stay bolt	End clamp	Safety spring for longitudinal heads	Safety spring for transversal heads	Ø 5 mm rope 100 m roll	Rope function indicators. Text "STOP"	Pulley	Angular pulley

Application examples and max rope length



Code	Approvals	Category	Zone
-EX7	⟨Ex⟩ II 2G EEX ia IIC T6	2G	1
	⟨Ex⟩ I M2 EEX ia I	M2	M2

Further information on rope switch accessories are available on page 4/95.



Main features

- Approvals:
  2G and **M2** category
- Housing made of metal, one conduit entry
- Protection degree IP67
- Version with silver contacts gold plated

Markings and ATEX approvals:

CE

⟨Ex⟩ **II 2G EEX ia IIC T6**
⟨Ex⟩ **I M2 EEX ia I**

Certificate n°: BVS 05 ATEX E107

Technical data

Housing
Made of metal, coated with baked epoxy powder
One conduit entry M20
Protection degree: IP67

General data

Ambient temperature:	from -20°C to +60°C
Max operating frequency:	3600 operations cycles[1]/hour
Mechanical endurance:	10 million operations cycles[1]
Assembling position:	anyone

(1) One operation cycle means two movements, one to close and one to open contacts, as foresee by IEC 947-5-1 standard.

Cross section of the conductors (flexible copper wire)

Contact blocks 20:	min.	1 x 0,34 mm²	(1 x AWG 22)
	max.	2 x 1,5 mm²	(2 x AWG 16)
Contact blocks 5:	min.	1 x 0,5 mm²	(1 x AWG 20)
	max.	2 x 2,5 mm²	(2 x AWG 14)

In conformity with standards:
IEC 60947-5-1, EN 60947-5-1, EN 50047, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, CENELEC EN 50013, EN 50014, EN 50020.

In conformity with requirements requested by:
ATEX directive 94/9/CE
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.
Positive contact opening complying with the standards:
IEC 60947-5-1, EN 60947-5-1, VDE 0660-206.

Installation for safety applications:
Use only switches marked with the symbol ⊖. The safety circuit must always be connected with the **NC contacts** (normally closed contacts: 11-12, 21-22 or 31-32) as stated in the **standard EN 60947-5-1, encl. K, par. 2**. The switch must be actuated with **at least up to the positive opening travel** shown in the travels diagrams on page 6/6. The switch must be actuated **at least with the positive opening force**, shown in brackets, underneath each article, near the value of the min. force.

⚠ **If not expressly indicated in this chapter, for the right installation and the correct utilization of all articles see requirements indicated from page 6/1 to page 6/8.**

Category	Zone	Approvals	Article code extension
2G	**1**	⟨Ex⟩ **II 2G EEX ia IIC T6**	**-EX7**
M2	**M2**	⟨Ex⟩ **I M2 EEX ia I**	

Electrical data

Max current (Ii):	2,1 A
Max voltage (Ui):	30 VDC
Protection against short circuits:	fuse 4 A 250 V type gG
Pollution degree:	3

⚠ **This type of switches must be used only in intrinsic safety circuits in conformity with standard EN 50020**
⚠ **For the correct utilization of the limit switch please use cable glands suitable for the zone according to the ATEX directive.**

Quality marks of the product:

Approvals UL: E131787

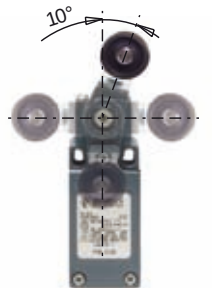
Data type approved by UL

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

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

Adjustable levers

In switches with revolving lever it is possible to adjust the lever with 10° steps for all the 360° range. The positive movement transmission is always guaranteed thanks to the particular geometrical coupling between the lever and the revolving shaft in compliance with German standard BG-GS-ET-15.



Overturning levers

It's possible to fasten the lever on switches in straight or reverse side, maintaining the positive coupling.
In this way it's possible to obtain two different work plans of the lever.



Rotating heads

In all switches, it is possible to rotate the head 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 / article

FM 502-GM2-EX7

Housing

FM	metal housing, one conduit entry

Contact blocks

5	1NO+1NC, snap action
20	1NO+2NC, slow action

Actuators

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

Type of contacts

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

Threaded conduit entry

M2	M20x1,5

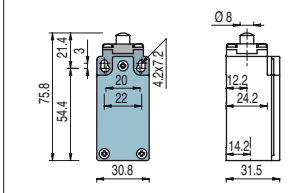
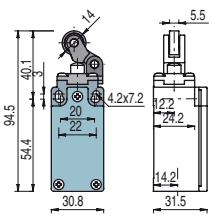
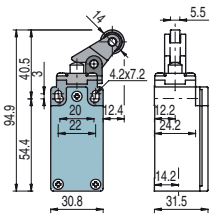
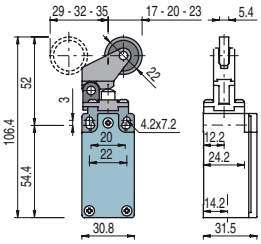
ATEX approvals

-EX7	II 2G EEX ia IIC T6 I M2 EEX ia I

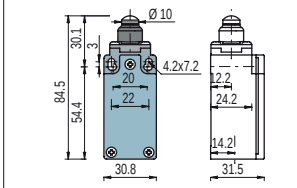
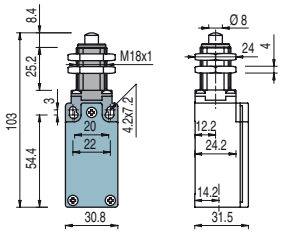
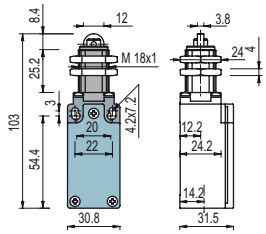
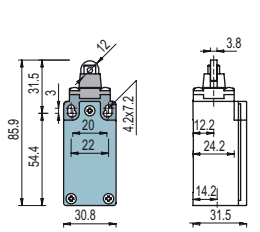
Type of contacts:

R = snap action
L = slow action

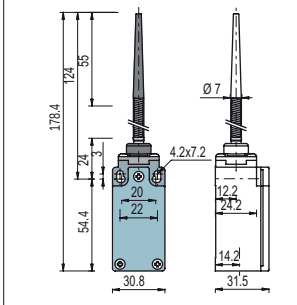
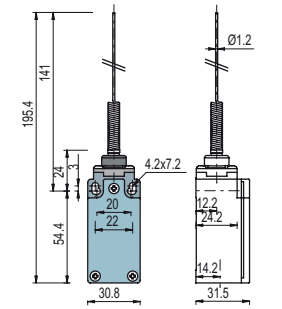
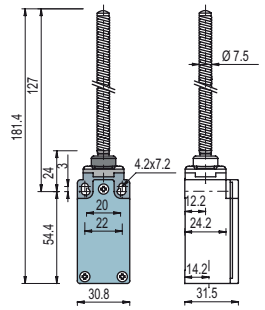
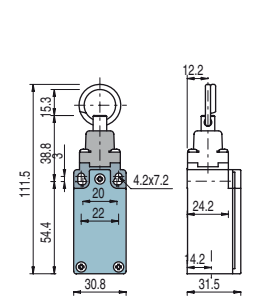
Contact blocks

			On demand with stainless steel roller 	On demand with stainless steel roller 	
5	R	FM 501-M2-EX7 ⟨Ex⟩ 1NO+1NC	FM 502-M2-EX7 ⟨Ex⟩ 1NO+1NC	FM 505-M2-EX7 ⟨Ex⟩ 1NO+1NC	FM 507-M2-EX7 ⟨Ex⟩ 1NO+1NC
20	L	FM 2001-M2-EX7 ⟨Ex⟩ 1NO+2NC	FM 2002-M2-EX7 ⟨Ex⟩ 1NO+2NC	FM 2005-M2-EX7 ⟨Ex⟩ 1NO+2NC	FM 2007-M2-EX7 ⟨Ex⟩ 1NO+2NC
Max speed		0,5 m/s	0,5 m/s with 30° cam	0,5 m/s with 30° cam	0,5 m/s with 30° cam
Min. force		8 N (25 N ⟨Ex⟩)	6 N (25 N ⟨Ex⟩)	6 N (25 N ⟨Ex⟩)	4 N (25 N ⟨Ex⟩)

Contact blocks

		With external rubber gasket 			
5	R	FM 508-M2-EX7 ⟨Ex⟩ 1NO+1NC	FM 512-M2-EX7 ⟨Ex⟩ 1NO+1NC	FM 513-M2-EX7 ⟨Ex⟩ 1NO+1NC	FM 515-M2-EX7 ⟨Ex⟩ 1NO+1NC
20	L	FM 2008-M2-EX7 ⟨Ex⟩ 1NO+2NC	FM 2012-M2-EX7 ⟨Ex⟩ 1NO+2NC	FM 2013-M2-EX7 ⟨Ex⟩ 1NO+2NC	FM 2015-M2-EX7 ⟨Ex⟩ 1NO+2NC
Max speed		0,5 m/s	0,5 m/s	0,5 m/s with 30° cam	0,5 m/s with 30° cam
Min. force		8 N (25 N ⟨Ex⟩)	8 N (25 N ⟨Ex⟩)	8 N (25 N ⟨Ex⟩)	8 N (25 N ⟨Ex⟩)

Contact blocks

					With rope for signalling 
5	R	FM 520-M2-EX7 1NO+1NC	FM 521-M2-EX7 1NO+1NC	FM 525-M2-EX7 1NO+1NC	FM 576-M2-EX7 1NO+1NC
20	L	FM 2020-M2-EX7 1NO+2NC	FM 2021-M2-EX7 1NO+2NC	FM 2025-M2-EX7 1NO+2NC	FM 2076-M2-EX7 2NO+1NC
Max speed		1 m/s	1 m/s	1 m/s	0,5 m/s
Min. force		0,06 Nm	0,04 Nm	0,11 Nm	initial 20 N - final 40 N

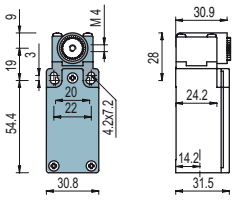
Code	Approvals	Category	Zone
-EX7	⟨Ex⟩ II 2G EEX ia IIC T6	2G	1
	⟨Ex⟩ I M2 EEX ia I	M2	M2

All measures in drawings are in mm

Position switches without actuator

Type of contacts:

R = snap action
L = slow action

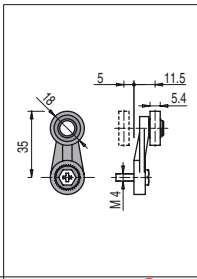
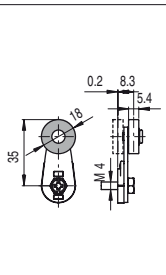
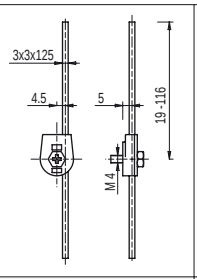
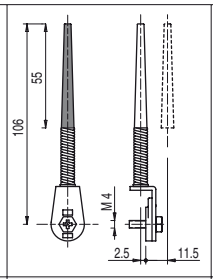
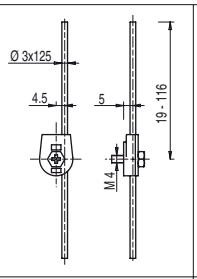
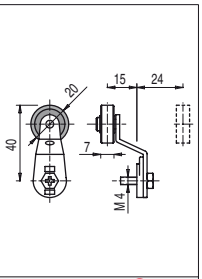


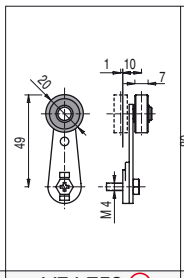
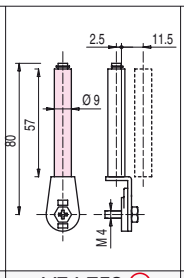
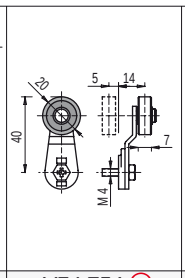
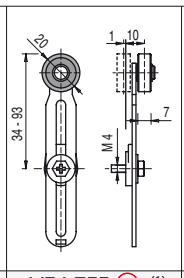
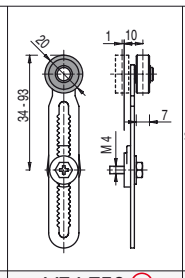
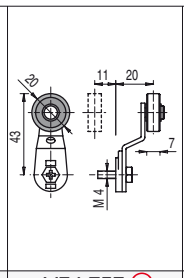
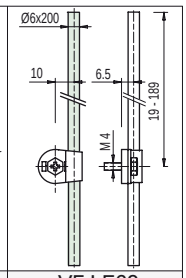
Contact blocks		
5	R	FM 538-M2-EX7 ⟨Ex⟩ 1NO+1NC
20	L	FM 2038-M2-EX7 ⟨Ex⟩ 1NO+2NC
Min. force		0,06 Nm (0,25 Nm ⟨Ex⟩)

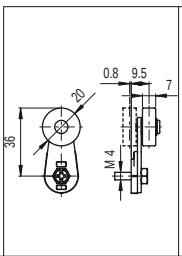
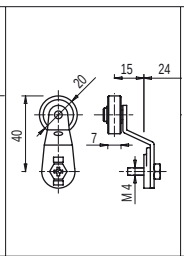
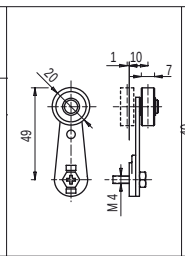
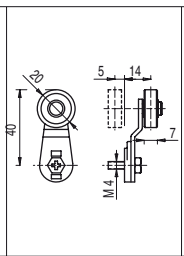
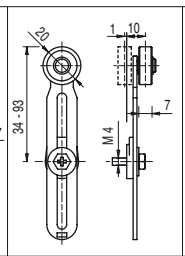
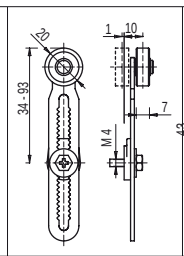
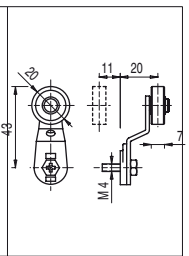
IMPORTANT
For applications in conformity with Machinery Directive 2006/42/CE : join only switches and actuators marked with symbol ⟨Ex⟩.
For more information about these applications see page 6/1

Loose actuators

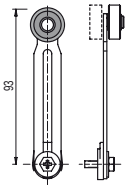
IMPORTANT: These loose actuators can be used with items of FM series only

	Ø 18 mm roller	Ø 18 mm roller	Adjustable square rod 3x3x125 mm	Flexible rod with push rod	Adjustable round rod Ø 3x125 mm	Ø 20 mm polymer roller
						
Article	VF LE30 ⟨Ex⟩	VF LE31 ⟨Ex⟩	VF LE33	VF LE34	VF LE50	VF LE51 ⟨Ex⟩
Max speed	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s	1,5 m/s	1,5 m/s	1,5 m/s (30° cam)

	Ø 20 mm polymer roller	Porcelain roller	Ø 20 mm polymer roller	Adjustable actuator with polymer roller	Adjustable safety actuator with polymer roller	Ø 20 mm polymer roller	Fibber glass adjustable rod
							
Article	VF LE52 ⟨Ex⟩	VF LE53 ⟨Ex⟩	VF LE54 ⟨Ex⟩	VF LE55 ⟨Ex⟩ (1)	VF LE56 ⟨Ex⟩	VF LE57 ⟨Ex⟩	VF LE69
Max speed	1,5 m/s (30° cam)	0,5 ms	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s

	Ø 20 mm stainless steel roller						
							
Article	VF LE31-1 ⟨Ex⟩	VF LE51-1 ⟨Ex⟩	VF LE52-1 ⟨Ex⟩	VF LE54-1 ⟨Ex⟩	VF LE55-1 ⟨Ex⟩ (1)	VF LE56-1 ⟨Ex⟩	VF LE57-1 ⟨Ex⟩
Max speed	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)

- (1) Actuator VF LE55 suits to safety applications only if adjusted to its max. length, as you can see in the figure beside. If you need an adjustable lever for safety applications, use the adjustable safety lever VF LE56.

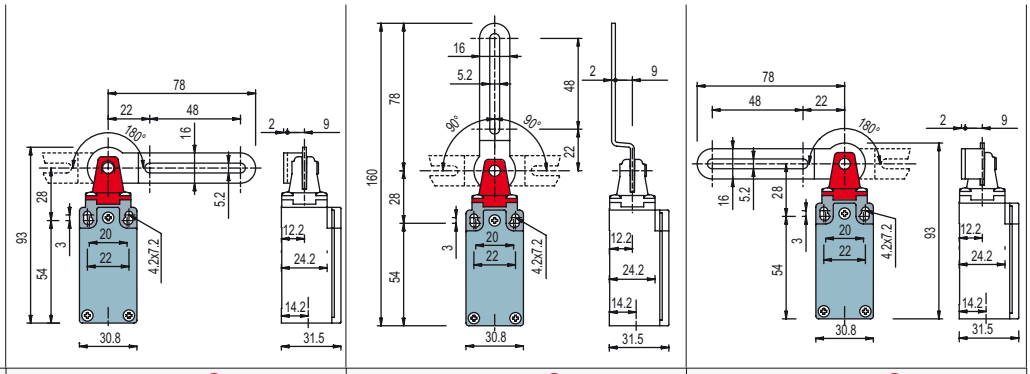


Code	Approvals	Category	Zone
-EX7	⟨Ex⟩ II 2G EEX ia IIC T6	2G	1
	⟨Ex⟩ I M2 EEX ia I	M2	M2

Safety switches with slotted hole lever

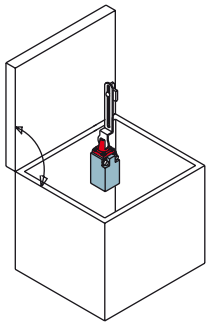
Type of contacts:

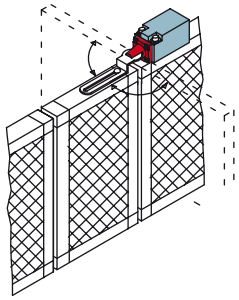
L = slow action



Contact blocks			
20 L	FM 20C1-M2-EX7 → 1NO+2NC	FM 20C2-M2-EX7 → 1NO+2NC	FM 20C3-M2-EX7 → 1NO+2NC
Min. force	11 N (15 N →)	11 N (15 N →)	11 N (15 N →)

Application examples

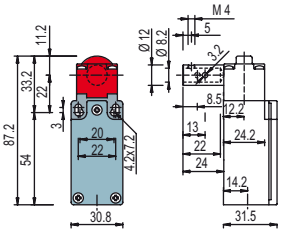




Hinge operating safety switches

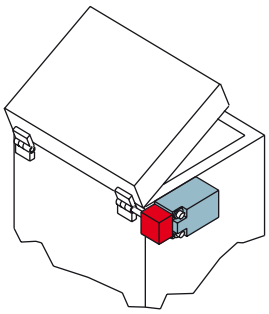
Type of contacts:

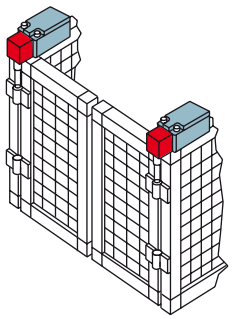
L = slow action



Contact blocks	
20 L	FM 2096-M2-EX7 → 1NO+2NC
Min. force	0,15 Nm (0,4 Nm →)

Application examples





Code	Approvals	Category	Zone
-EX7	Ex II 2G EEX ia IIC T6	2G	1
	Ex I M2 EEX ia I	M2	M2

Notes



Main features

- Approvals:
  2D category
- Housing made of metal, one conduit entry
- Protection degree IP67
- Version with silver contacts gold plated

Markings and ATEX approvals:

CE

Ⓔx **II 2D IP67 T80°C**

Certificate n°: BVS 06 ATEX E156

Technical data

Housing

Made of metal, coated with baked epoxy powder
One conduit entry M20
Protection degree: IP67

General data

Ambient temperature:	from -20°C to +70°C
Max operating frequency:	3600 operations cycles[1]/hour
Mechanical endurance:	10 million operations cycles[1]
Assembling position:	anyone

(1) One operation cycle means two movements, one to close and one to open contacts, as foresee by IEC 947-5-1 standard.

Cross section of the conductors (flexible copper wire)

Contact blocks 20,28:	min.	1 x 0,34 mm^2	(1 x AWG 22)
	max.	2 x 1,5 mm^2	(2 x AWG 16)
Contact block 5:	min.	1 x 0,5 mm^2	(1 x AWG 20)
	max.	2 x 2,5 mm^2	(2 x AWG 14)

In conformity with standards:
IEC 60947-5-1, EN 60947-5-1, EN 50047, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, CENELEC EN 50013, EN 50014, EN 50281-1-1.

In conformity with requirements requested by:
ATEX directive 94/9/CE
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.
Positive contact opening complying with the standards:
IEC 60947-5-1, EN 60947-5-1, VDE 0660-206.

Installation for safety applications:
Use only switches marked with the symbol ⊖. The safety circuit must always be connected with the **NC contacts** (normally closed contacts: 11-12, 21-22 or 31-32) as stated in the **standard EN 60947-5-1, encl. K, par. 2**. The switch must be actuated with **at least up to the positive opening travel** shown in the travels diagrams on page 6/4. The switch must be actuated **at least with the positive opening force**, shown in brackets, underneath each article, near the value of the min. force.

⚠ **If not expressly indicated in this chapter, for the right installation and the correct utilization of all articles see requirements indicated from page 6/1 to page 6/8.**

Category	Zone	Approvals	Article code extension
2D	**21**	Ⓔx **II 2D IP67 T80°C**	**-EX8**

Electrical data

Thermal current (Ith):	10 A
Rated insulation voltage (Ui):	500 VAC 600 VDC
	400 VAC for contact blocks 20, 28
Protection against short circuits:	fuse 10 A 500 V type aM
Pollution degree:	3

Utilization categories

Alternate 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

⚠ **For the correct utilization of the limit switch please use cable glands suitable for the zone according to the ATEX directive**

Quality marks of the product:

Approvals UL: E131787

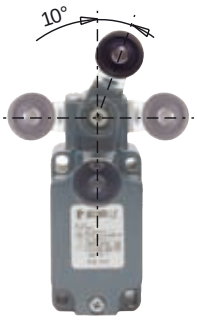
Data type approved by UL

Utilization categories Q300 (69 VA, 125-250 VDC)
A600 (720 VA, 120-600 VAC)
Data of the housing type 1, 4X (indoor use only), 12, 13
In conformity with standard: UL 508
For all contact blocks except 2 use 60° copper (Cu) conductor and wire size No. 12-14 AWG. The terminal tightening torque of 7,1 Lb-In.
For contact blocks 2 use 60° copper (Cu) conductor and wire size No. 14 AWG. The terminal tightening torque of 12 Lb-In.

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

Adjustable levers

In switches with revolving lever it is possible to adjust the lever with 10° steps for all the 360° range. The positive movement transmission is always guaranteed thanks to the particular geometrical coupling between the lever and the revolving shaft in compliance with German standard BG-GS-ET-15.



Overturning levers

It's possible to fasten the lever on switches in straight or reverse side, maintaining the positive coupling.
In this way it's possible to obtain two different work plans of the lever.



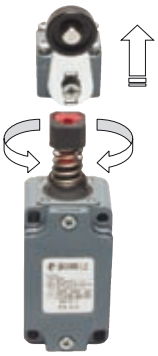
Rotating heads

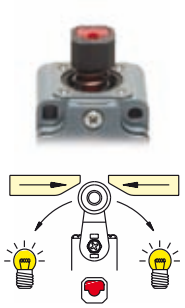
In all switches, it is possible to rotate the head in 90° steps.

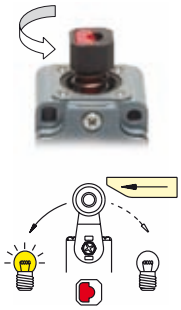


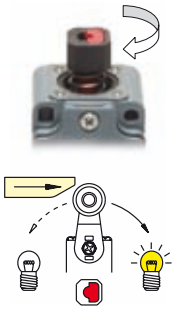
Unidirectional heads

In switches with revolving lever, you can select the directional operation by removing the four screws of the head and revolving the internal piston.









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 article
FD 502-GM2-EX8

Housing

FD	metal housing, one conduit entry

ATEX approvals

-EX8	II 2D IP67 T80°C

Contact blocks

5	1NO+1NC, snap action
20	1NO+2NC, slow action

Threaded conduit entry

M2	M20x1,5

Actuators

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

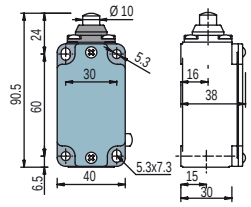
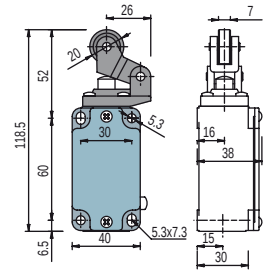
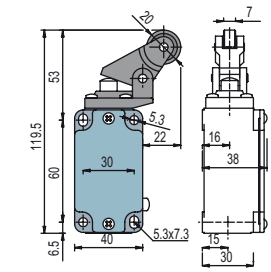
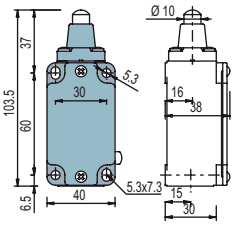
Type of contacts

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

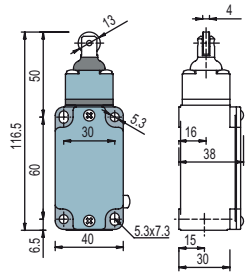
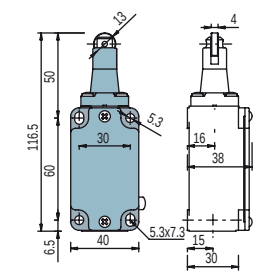
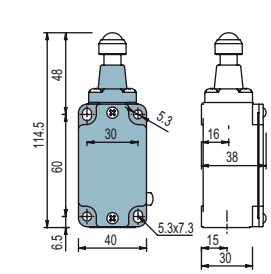
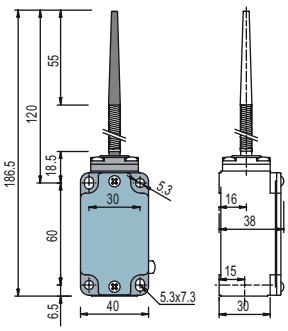
Type of contacts:

R = snap action
L = slow action

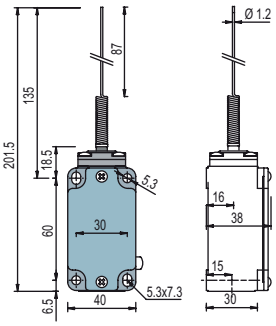
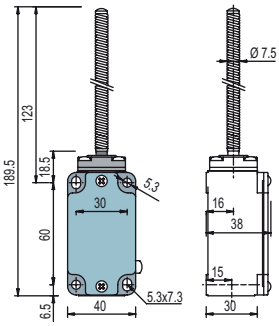
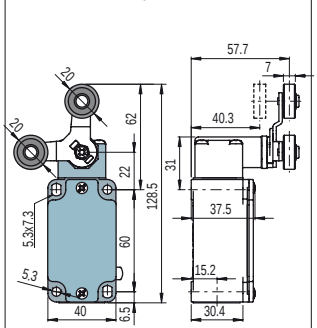
Contact blocks

			On demand with stainless steel roller 	On demand with stainless steel roller 	
5	R	FD 501-M2-EX8 ⟨Ex⟩ 1NO+1NC	FD 502-M2-EX8 ⟨Ex⟩ 1NO+1NC	FD 505-M2-EX8 ⟨Ex⟩ 1NO+1NC	FD 511-M2-EX8 ⟨Ex⟩ 1NO+1NC
20	L	FD 2001-M2-EX8 ⟨Ex⟩ 1NO+2NC	FD 2002-M2-EX8 ⟨Ex⟩ 1NO+2NC	FD 2005-M2-EX8 ⟨Ex⟩ 1NO+2NC	FD 2011-M2-EX8 ⟨Ex⟩ 1NO+2NC
Max speed		0,5 m/s	0,5 m/s with 30° cam	0,5 m/s with 30° cam	0,5 m/s
Min. force		8 N (25 N ⟨Ex⟩)	6 N (25 N ⟨Ex⟩)	6 N (25 N ⟨Ex⟩)	8 N (25 N ⟨Ex⟩)

Contact blocks

		With external rubber gasket 		Ø 12.7 stainless steel sphere 	
5	R	FD 515-M2-EX8 ⟨Ex⟩ 1NO+1NC	FD 516-M2-EX8 ⟨Ex⟩ 1NO+1NC	FD 519-M2-EX8 ⟨Ex⟩ 1NO+1NC	FD 520-M2-EX8 1NO+1NC
20	L	FD 2015-M2-EX8 ⟨Ex⟩ 1NO+2NC	FD 2016-M2-EX8 ⟨Ex⟩ 1NO+2NC	FD 2019-M2-EX8 ⟨Ex⟩ 1NO+2NC	FD 2020-M2-EX8 1NO+2NC
Max speed		0,5 m/s with 30° cam	0,5 m/s with 30° cam	0,5 m/s	1 m/s
Min. force		11 N (25 N ⟨Ex⟩)	8 N (25 N ⟨Ex⟩)	8 N (25 N ⟨Ex⟩)	0,09 Nm

Contact blocks

				With two stable positions 	
5	R	FD 521-M2-EX8 1NO+1NC	FD 525-M2-EX8 1NO+1NC	FD 541-M2-EX8 1NO+1NC	
20	L	FD 2021-M2-EX8 1NO+2NC	FD 2025-M2-EX8 1NO+2NC		
Max speed		1 m/s	1 m/s	0,5 m/s with 30° cam	
Min. force		0,08 Nm	0,14 Nm	0,21 Nm	

Code	Approvals	Category	Zone
-EX8	⟨Ex⟩ II 2D IP67 T80°C	3D	21

All measures in drawings are in mm

Position switches without actuator

Type of contacts:

R = snap action
L = slow action

Contact blocks		Regular head	Compact head
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
Min. force		0,1 Nm (0,25 Nm ⟨→⟩)	0,06 Nm (0,25 Nm ⟨→⟩)

IMPORTANT
For applications in conformity with Machinery Directive 2006/42/CE : join only switches and actuators marked with symbol ⟨→⟩.
For more information about these applications see page 6/1

Loose actuators

IMPORTANT: These loose actuators can be used with items of FD series only

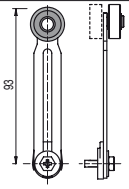
	Ø 20 mm polymer roller	Adjustable round rod Ø 3x125 mm	Adjustable square rod 3x3x125 mm	Flexible rod with push rod	Adjustable actuator with polymer roller	Fibber glass adjustable rod
Article	VF L31 ⟨→⟩	VF L32 (2)	VF L33 (2)	VF L34	VF L35 ⟨→⟩ (1) (2)	VF L36 (2)
Max speed	1,5 m/s (30° cam)	1,5 m/s	1,5 m/s	1 m/s	1,5 m/s (30° cam)	1,5 m/s

	Ø 20 mm polymer roller	Ø 20 mm polymer roller	Porcelain roller	Adjustable safety actuator with polymer roller	Ø 20 mm polymer roller
Article	VF L51 ⟨→⟩	VF L52 ⟨→⟩	VF L53 ⟨→⟩	VF L56 ⟨→⟩ (2)	VF L57 ⟨→⟩
Max speed	1,5 m/s (30° cam)	1,5 m/s (30° cam)	0,5 m/s	1,5 m/s (30° cam)	1,5 m/s (30° cam)

Ø 20 mm stainless steel roller

Article	VF L31-1 ⟨→⟩	VF L35-1 ⟨→⟩ (1) (2)	VF L51-1 ⟨→⟩	VF L52-1 ⟨→⟩	VF L56-1 ⟨→⟩ (2)	VF L57-1 ⟨→⟩
Max speed	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)

- (1) Actuator VF L35 suits to safety applications only if adjusted to its max. length, as you can see in the figure beside. If you need an adjustable lever for safety applications, use the adjustable safety lever VF L56.
- (2) If it is installed with switch FD •58 (ex. FD 558, FD 658...) the actuator could mechanically interfere with the housing of the switch. The interference could happen or not according to the actuator fixing position and the head of the switch.

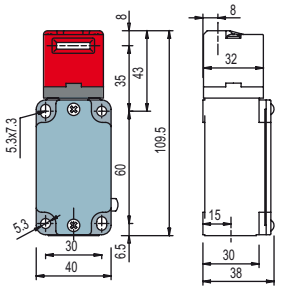
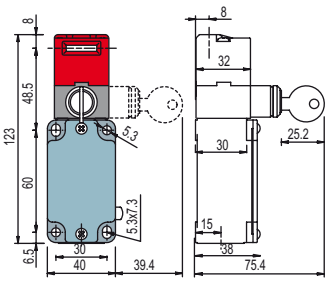
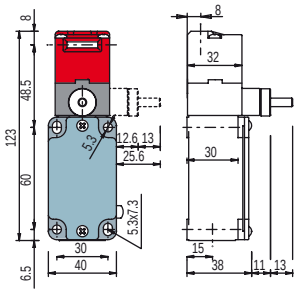


Code	Approvals	Category	Zone
-EX8	⟨Ex⟩ II 2D IP67 T80°C	3D	21

Safety switches with separate actuator

Type of contacts:

L = slow action

Contact blocks	Switches with separate actuator	Switches with separate actuator with lock	Switches with manual mechanical delay
	Switches without actuator	Switches without actuator	Switches without actuator
			
20 L 28 L	FD 2093-M2-EX8 → 1NO+2NC	FD 2099-M2-EX8 → 1NO+2NC FD 2899-M2-EX8 → 1NO+2NC	FD 20R2-M2-EX8 → 1NO+2NC
Min. force	10 N (18 N →)	30 N (40 N →)	10 N (18 N →)

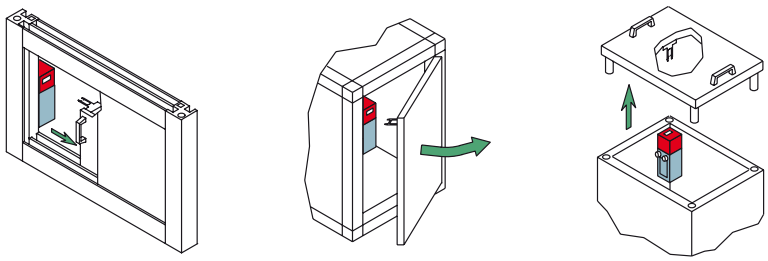
Actuators



VF KEYF	VF KEYF1	VF KEYF2	VF KEYF3	VF KEYF7	VF KEYF8
Straight actuator	Right-angled actuator	Jointed actuator	Two directions adjustable actuator	One direction adjustable actuator	Universal actuator

IMPORTANT: These actuators must be used with switches of FD series only (e.g. FD 2093-M2-EX8).

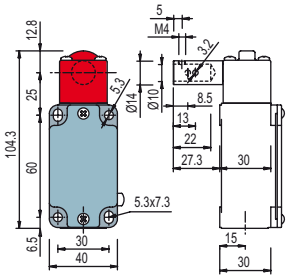
Application examples



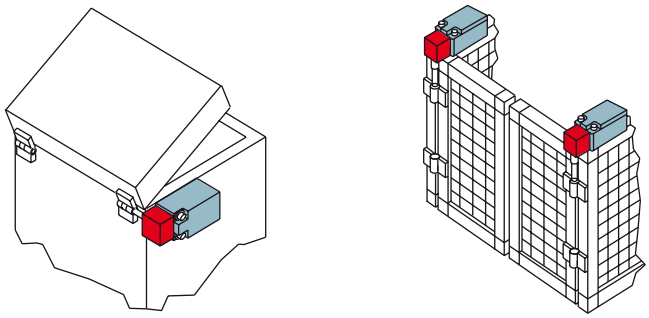
Hinge operating safety switches

Type of contacts:

L = slow action

Contact blocks	
	
20 L	FD 2095-M2-EX8 → 1NO+2NC
	0,15 Nm (0,4 Nm →)

Application examples



Notes



Main features

- Approvals:
  3D and **3G** category
- Housing made of metal
- Protection degree IP67
- Polyurethane cable without halogens

Markings and ATEX approvals:

CE

Ex **II 3D IP67 T80°C**

Ex **II 3G EEX nC II T6**

Technical data

Housing

Made of metal, coated with baked epoxy powder
2 m wire coated polyurethane cable without halogens
Protection degree: IP67

General data

Ambient temperature:	from -20°C to +60°C
Max operating frequency:	3600 operations cycles[1]/hour
Mechanical endurance:	10 million operations cycles[1]
Assembling position:	anyone

(1) One operation cycle means two movements, one to close and one to open contacts, as foresee by IEC 947-5-1 standard.

In conformity with standards:
IEC 60947-5-1, EN 60947-5-1, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, CENELEC EN 50013,EN 50014, EN 50281-1-1, EN 50021.

In conformity with requirements requested by:
ATEX directive 94/9/CE
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.
Positive contact opening complying with the standards:
IEC 60947-5-1, EN 60947-5-1, VDE 0660-206.

Installation for safety applications:
Use only switches marked with the symbol ⊖. The safety circuit must always be connected with the **NC contacts** (normally closed contacts: see "internal connections" on page 2/102) as stated in the **standard EN 60947-5-1, encl. K, par. 2**. The switch must be actuated with **at least up to the positive opening travel** shown in the travels diagrams on page 6/8. The switch must be actuated **at least with the positive opening force**, shown in brackets, underneath each article, near the value of the min. force.

⚠ **If not expressly indicated in this chapter, for the right installation and the correct utilization of all articles see requirements indicated from page 6/1 to page 6/8.**

Category	Zone	Approvals	Article code extension
3D	**22**	Ex **II 3D IP67 T80°C**	**-EX5**
3G	**2**	Ex **II 3G EEX nC II T6**	

Electrical data

Thermal current (Ith):	10 A
Rated insulation voltage (Ui):	400 VAC/DC
Protection against short circuits:	fuse 10 A 500 V type aM
Pollution degree:	3

Utilization categories

Alternate current: AC15 (50÷60 Hz)

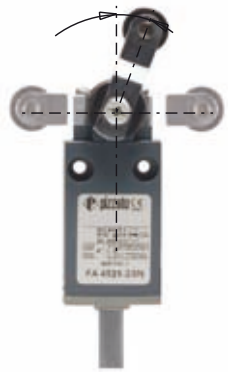
Ue (V)	120	250	400
Ie (A)	6	4	3

Direct current: DC13

Ue (V)	24	125	250
Ie (A)	2,5	0,55	0,27

Adjustable levers

In switches with revolving lever it is possible to adjust the lever with 10° steps for all the 360° range. The positive movement transmission is always guaranteed thanks to the particular geometrical coupling between the lever and the revolving shaft in compliance with German standard BG-GS-ET-15.



Overturning levers

It's possible to fasten the lever on switches in straight or reverse side, maintaining the positive coupling.
In this way it's possible to obtain two different work plans of the lever.

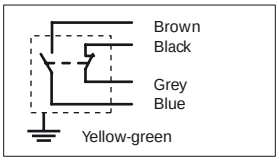


Rotating heads

According to models it is possible to rotate the head in 90° or 180°degree 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.

FA 4501-2SH-EX5

Housing

FA	metal housing

Contact blocks

45	1NO+1NC, snap action
46	1NO+1NC, slow action

Actuators

01	short plunger
02	one-way lever
08	plunger
...	.....

Kind of connection

1	cable length 1 m
2	cable length 2 m
...	.....
0	cable length 10 m

Output direction

S	from bottom

Type of cable

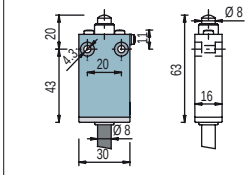
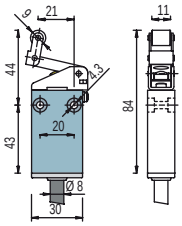
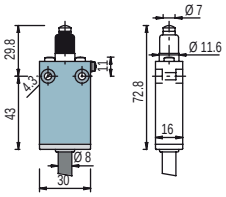
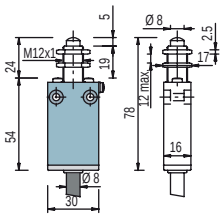
H	polyurethane cable without halogens

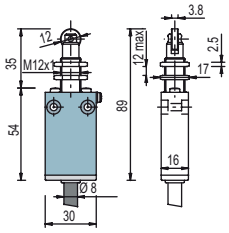
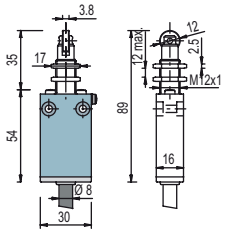
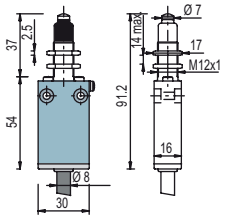
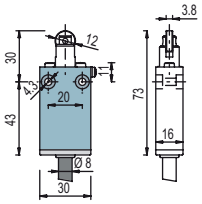
ATEX approvals

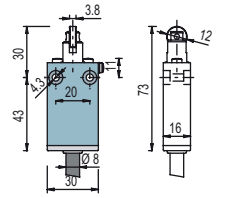
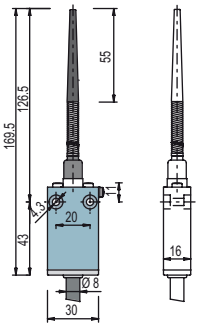
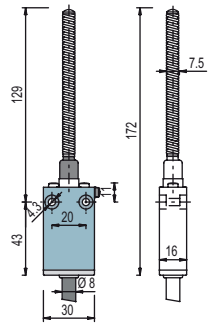
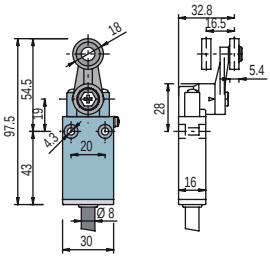
-EX5	Ex II 3D IP67 T80°C Ex II 3G EEx nC II T6

Type of contacts:

R = snap action
L = slow action

Contact blocks					
				With external rubber gasket 	Fixed only by threaded head 
45	R	FA 4501-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4502-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4508-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4510-2SH-EX5 ⟨Ex⟩ 1NO+1NC
46	L	FA 4601-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4602-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4608-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4610-2SH-EX5 ⟨Ex⟩ 1NO+1NC
Max speed		0,5 m/s	0,5 m/s	0,5 m/s	0,5 m/s
Min. force		10 N (25 N ⟨Ex⟩)	5 N (25 N ⟨Ex⟩)	10 N (25 N ⟨Ex⟩)	10 N (25 N ⟨Ex⟩)

Contact blocks					
		Fixed only by threaded head 	Fixed only by threaded head 	With external rubber gasket 	Ø 12 mm stainless steel roller 
45	R	FA 4511-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4512-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4513-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4515-2SH-EX5 ⟨Ex⟩ 1NO+1NC
46	L	FA 4611-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4612-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4613-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4615-2SH-EX5 ⟨Ex⟩ 1NO+1NC
Max speed		0,1 m/s with 30° cam	0,1 m/s with 30° cam	0,5 m/s	0,1 m/s with 30° cam
Min. force		10 N (25 N ⟨Ex⟩)	10 N (25 N ⟨Ex⟩)	10 N (25 N ⟨Ex⟩)	10 N (25 N ⟨Ex⟩)

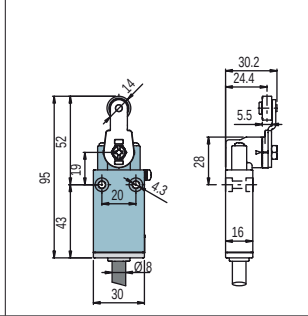
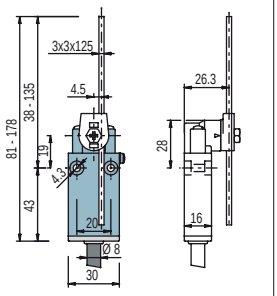
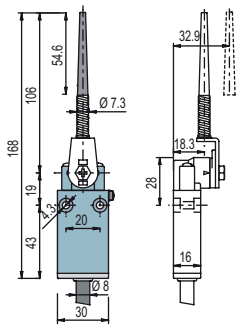
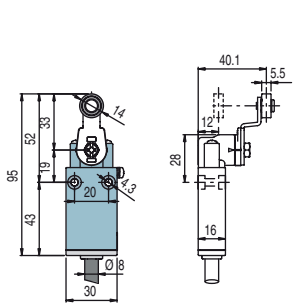
Contact blocks					
		Ø 12 mm stainless steel roller 			
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46	L	FA 4617-2SH-EX5 ⟨Ex⟩ 1NO+1NC			FA 4630-2SH-EX5 ⟨Ex⟩ 1NO+1NC
Max speed		0,1 m/s with 30° cam	1 m/s	1 m/s	1,5 m/s with 30° cam
Min. force		10 N (25 N ⟨Ex⟩)	0,03 Nm	0,06 Nm	0,03 Nm (0,25 Nm ⟨Ex⟩)

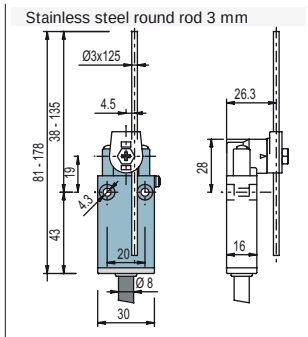
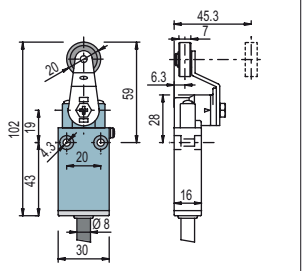
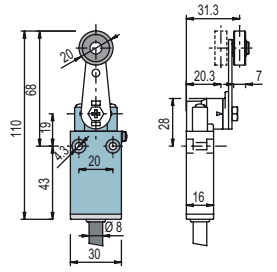
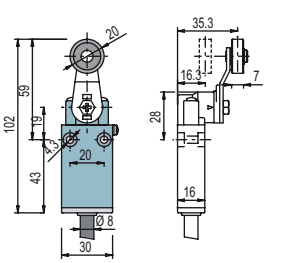
Code	Approvals	Category	Zone
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	⟨Ex⟩ II 3G EEX nC IIT6	3G	2

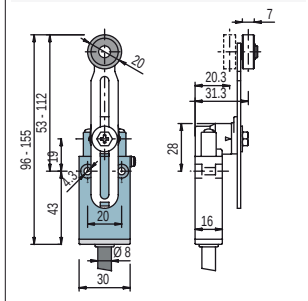
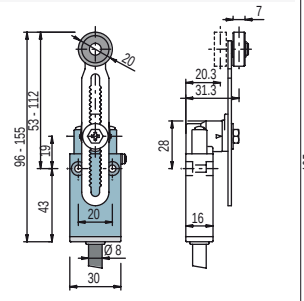
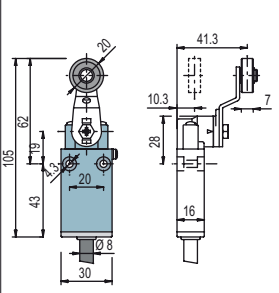
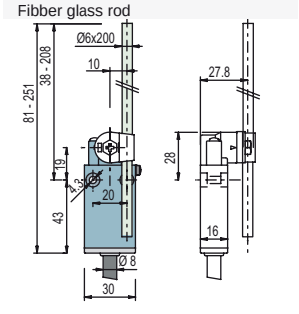
All measures in drawings are in mm

Type of contacts:

R = snap action
L = slow action

Contact blocks		On demand with stainless steel roller	Square rod 3x3 mm		On demand with stainless steel roller
					
45	R	FA 4531-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4533-2SH-EX5 1NO+1NC	FA 4534-2SH-EX5 1NO+1NC	FA 4540-2SH-EX5 ⟨Ex⟩ 1NO+1NC
46	L	FA 4631-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4633-2SH-EX5 1NO+1NC	FA 4634-2SH-EX5 1NO+1NC	FA 4640-2SH-EX5 ⟨Ex⟩ 1NO+1NC
Max speed		1,5 m/s with 30° cam	1,5 m/s	1,5 m/s	1,5 m/s with 30° cam
Min. force		0,03 Nm (0,25 Nm ⟨Ex⟩)	0,03 Nm	0,03 Nm	0,03 Nm (0,25 Nm ⟨Ex⟩)

Contact blocks		Stainless steel round rod 3 mm	On demand with stainless steel roller	On demand with stainless steel roller	On demand with stainless steel roller
					
45	R	FA 4550-2SH-EX5 1NO+1NC	FA 4551-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4552-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4554-2SH-EX5 ⟨Ex⟩ 1NO+1NC
46	L	FA 4650-2SH-EX5 1NO+1NC	FA 4651-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4652-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4654-2SH-EX5 ⟨Ex⟩ 1NO+1NC
Max speed		1,5 m/s	1,5 m/s with 30° cam	1,5 m/s with 30° cam	1,5 m/s with 30° cam
Min. force		0,03 Nm	0,03 Nm (0,25 Nm ⟨Ex⟩)	0,03 Nm (0,25 Nm ⟨Ex⟩)	0,03 Nm (0,25 Nm ⟨Ex⟩)

Contact blocks		On demand with stainless steel roller	On demand with stainless steel roller	On demand with stainless steel roller	Fibber glass rod
					
45	R	FA 4555-2SH-EX5 ⟨Ex⟩(1)1NO+1NC	FA 4556-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4557-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4569-2SH-EX5 1NO+1NC
46	L	FA 4655-2SH-EX5 ⟨Ex⟩(1)1NO+1NC	FA 4656-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4657-2SH-EX5 ⟨Ex⟩ 1NO+1NC	FA 4669-2SH-EX5 1NO+1NC
Max speed		1,5 m/s with 30° cam	1,5 m/s with 30° cam	1,5 m/s with 30° cam	1,5 m/s
Min. force		0,03 Nm (0,25 Nm ⟨Ex⟩)	0,03 Nm (0,25 Nm ⟨Ex⟩)	0,03 Nm (0,25 Nm ⟨Ex⟩)	0,03 Nm

Code	Approvals	Category	Zone
-EX5	⟨Ex⟩ II 3D IP67 T80°C	3D	22
	⟨Ex⟩ II 3G EEX nC IIT6	3G	2

(1) Positive opening with lever adjusted on the max. See general catalogue.



Main features

- Approvals:

3D category

- Housing made of metal, one conduit entry
- Protection degree IP67
- Version with silver contacts gold plated

Markings and ATEX approvals:

CE

Ex **II 3D IP67 T80°C**

Technical data

Housing

Made of metal, coated with baked epoxy powder
One conduit entry M20
Protection degree: IP67

General data

Ambient temperature:	from -20°C to +70°C
Max operating frequency:	3600 operations cycles[1]/hour
Mechanical endurance:	10 million operations cycles[1]
Assembling position:	anyone

(1) One operation cycle means two movements, one to close and one to open contacts, as foresee by IEC 947-5-1 standard.

Cross section of the conductors (flexible copper wire)

Contact blocks 20, 28:	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, 18:	min.	1 x 0,5 mm^2	(1 x AWG 20)
	max.	2 x 2,5 mm^2	(2 x AWG 14)
Contact block 2:	min.	1 x 0,5 mm^2	(1 x AWG 20)
	max.	2 x 1,5 mm^2	(2 x AWG 16)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 50041, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, CENELEC EN 50013, EN 50014, EN 50281-1-1

In conformity with requirements requested by:

ATEX directive 94/9/CE
Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and Electromagnetic Compatibility 2004/108/EC.

Positive contact opening complying with the standards:

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

Installation for safety applications:

Use only switches marked with the symbol ⊖. The safety circuit must always be connected with the **NC contacts** (normally closed contacts: 11-12, 21-22 or 31-32) as stated in the **standard EN 60947-5-1, encl. K, par. 2**. The switch must be actuated with **at least up to the positive opening travel** shown in the travels diagrams on page 6/4. The switch must be actuated **at least with the positive opening force**, shown in brackets, underneath each article, near the value of the min. force.

⚠ **If not expressly indicated in this chapter, for the right installation and the correct utilization of all articles see requirements indicated from page 6/1 to page 6/8.**

Category	Zone	Approvals	Article code extension
3D	**22**	Ex **II 3D IP67 T80°C**	**-EX4**

Electrical data

Thermal current (Ith):	10 A
Rated insulation voltage (Ui):	500 VAC 600 VDC
	400 VAC for contact blocks 20, 28
Protection against short circuits:	fuse 10 A 500 V type aM
Pollution degree:	3

Utilization categories

Alternate 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

⚠ **For the correct utilization of the limit switch please use cable glands suitable for the zone according to the ATEX directive**

Quality marks of the product:

Approvals UL: E131787

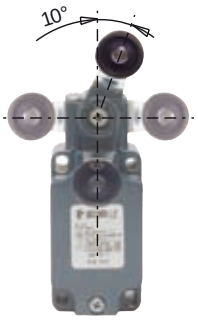
Data type approved by UL

Utilization categories Q300 (69 VA, 125-250 VDC)
A600 (720 VA, 120-600 VAC)
Data of the housing type 1, 4X (indoor use only), 12, 13
In conformity with standard: UL 508
For all contact blocks except 2 use 60° copper (Cu) conductor and wire size No. 12-14 AWG. The terminal tightening torque of 7,1 Lb-In.
For contact blocks 2 use 60° copper (Cu) conductor and wire size No. 14 AWG. The terminal tightening torque of 12 Lb-In.

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

Adjustable levers

In switches with revolving lever it is possible to adjust the lever with 10° steps for all the 360° range. The positive movement transmission is always guaranteed thanks to the particular geometrical coupling between the lever and the revolving shaft in compliance with German standard BG-GS-ET-15.



Overturning levers

It's possible to fasten the lever on switches in straight or reverse side, maintaining the positive coupling.
In this way it's possible to obtain two different work plans of the lever.



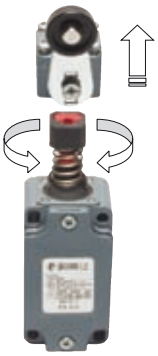
Rotating heads

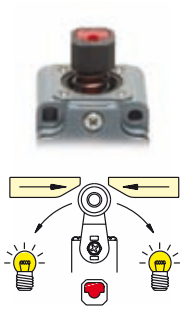
In all switches, it is possible to rotate the head in 90° steps.

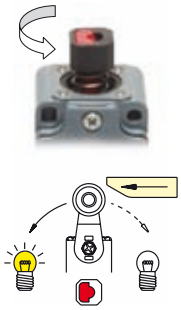


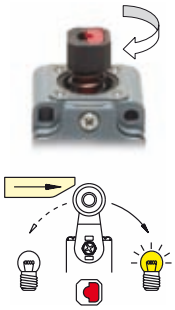
Unidirectional heads

In switches with revolving lever, you can select the directional operation by removing the four screws of the head and revolving the internal piston.









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 article
FD 502-GM2-EX4

Housing

FD	metal housing, one conduit entry

ATEX approvals

-EX4	II 3D IP67 T80°C

Contact blocks

5	1NO+1NC, snap action
6	1NO+1NC, slow action
18	1NO+1NC, slow action
20	1NO+2NC, slow action
2	2x(1NO-1NC) snap action

Threaded conduit entry

M2	M20x1,5

Actuators

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

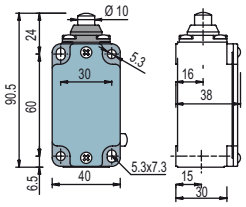
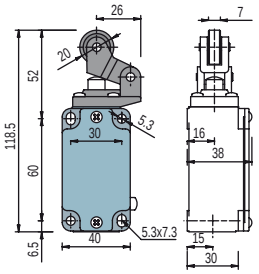
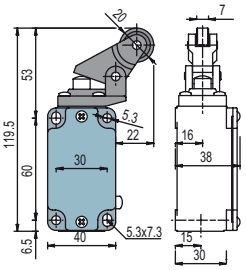
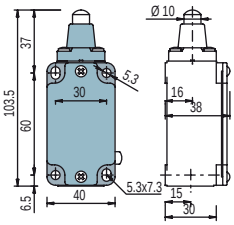
Type of contacts

	silver contacts (standard)
G	silver contacts gold plated 1 µm (except contact blocks 2)

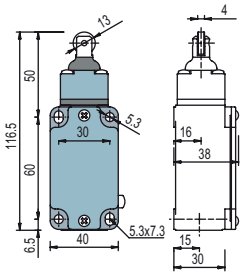
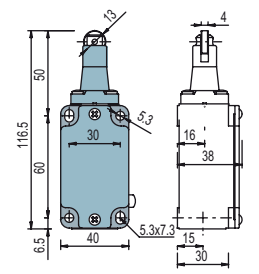
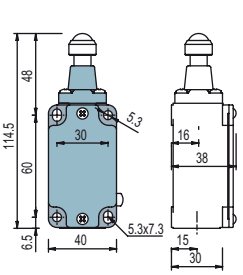
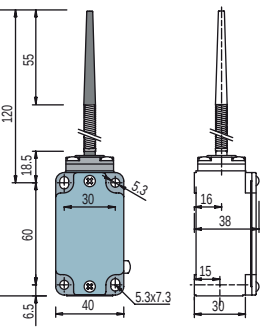
Type of contacts:

R = snap action
L = slow action

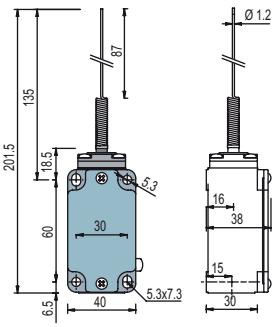
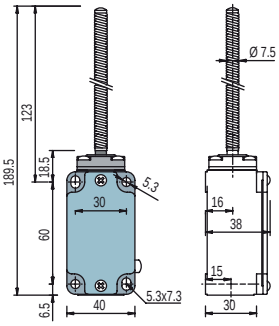
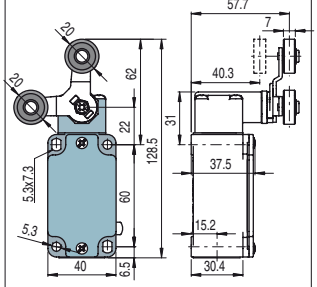
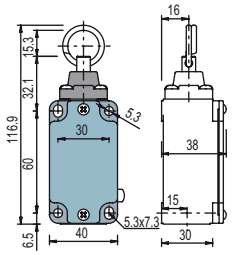
Contact blocks

			On demand with stainless steel roller 	On demand with stainless steel roller 	
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)
Max speed		0,5 m/s	0,5 m/s with 30° cam	0,5 m/s with 30° cam	0,5 m/s
Min. force		8 N (25 N ⟨→⟩)	6 N (25 N ⟨→⟩)	6 N (25 N ⟨→⟩)	8 N (25 N ⟨→⟩)

Contact blocks

		With external rubber gasket 		Ø 12.7 stainless steel sphere 	
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)
Max speed		0,5 m/s with 30° cam	0,5 m/s with 30° cam	0,5 m/s	1 m/s
Min. force		11 N (25 N ⟨→⟩)	8 N (25 N ⟨→⟩)	8 N (25 N ⟨→⟩)	0,09 Nm

Contact blocks

				With two stable positions 	With rope for signalling 
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)
Max speed		1 m/s	1 m/s	0,5 m/s with 30° cam	0,5 m/s
Min. force		0,08 Nm	0,14 Nm	0,21 Nm	initial 20 N - final 40 N

Code	Approvals	Category	Zone
-EX4	⟨Ex⟩ II 3D IP67 T80°C	3D	22

All measure in drawings are in mm

Position switches without actuator

Type of contacts:
R = snap action
L = slow action

Contact blocks		Regular head	Compact head
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)
Min. force		0,1 Nm (0,25 Nm →)	0,06 Nm (0,25 Nm →)

IMPORTANT
For applications in conformity with Machinery Directive 2006/42/CE : join only switches and actuators marked with symbol →.
For more information about these applications see page 6/1

Loose actuators

IMPORTANT: These loose actuators can be used with items of FD series only

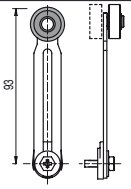
	Ø 20 mm polymer roller	Adjustable round rod Ø 3x125 mm	Adjustable square rod 3x3x125 mm	Flexible rod with push rod	Adjustable actuator with polymer roller	Fibber glass adjustable rod
Article	VF L31 →	VF L32 (2)	VF L33 (2)	VF L34	VF L35 → (1) (2)	VF L36 (2)
Max speed	1,5 m/s (30° cam)	1,5 m/s	1,5 m/s	1 m/s	1,5 m/s (30° cam)	1,5 m/s

	Ø 20 mm polymer roller	Ø 20 mm polymer roller	Porcelain roller	Adjustable safety actuator with polymer roller	Ø 20 mm polymer roller
Article	VF L51 →	VF L52 →	VF L53 →	VF L56 → (2)	VF L57 →
Max speed	1,5 m/s (30° cam)	1,5 m/s (30° cam)	0,5 m/s	1,5 m/s (30° cam)	1,5 m/s (30° cam)

Ø 20 mm stainless steel roller

Article	VF L31-1 →	VF L35-1 → (1) (2)	VF L51-1 →	VF L52-1 →	VF L56-1 → (2)	VF L57-1 →
Max speed	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)	1,5 m/s (30° cam)

- (1) Actuator VF L35 suits to safety applications only if adjusted to its max. length, as you can see in the figure beside. If you need an adjustable lever for safety applications, use the adjustable safety lever VF L56.
- (2) If it is installed with switch FD •58 (ex. FD 558, FD 658...) the actuator could mechanically interfere with the housing of the switch. The interference could happen or not according to the actuator fixing position and the head of the switch.

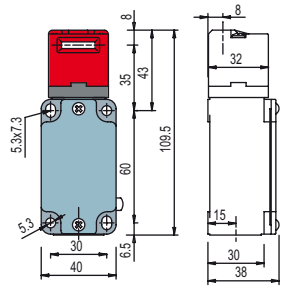
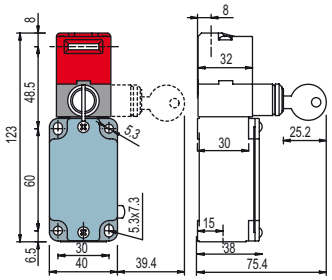
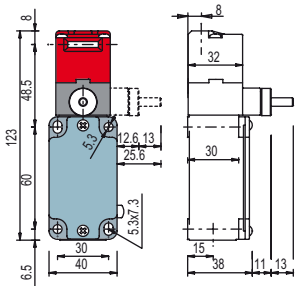


Code	Approvals	Category	Zone
-EX4	⟨Ex⟩ II 3D IP67 T80°C	3D	22

Safety switches with separate actuator

Type of contacts:

L = slow action

Contact blocks		Switches with separate actuator	Switches with separate actuator with lock	Switches with manual mechanical delay
		Switches without actuator	Switches without actuator	Switches without actuator
				
6	L	FD 693-M2-EX4 ⟨Ex⟩ 1NO+1NC		FD 6R2-M2-EX4 ⟨Ex⟩ 1NO+1NC
18	L		FD 1899-M2-EX4 ⟨Ex⟩ 1NO+1NC	
20	L	FD 2093-M2-EX4 ⟨Ex⟩ 1NO+2NC	FD 2099-M2-EX4 ⟨Ex⟩ 1NO+2NC	FD 20R2-M2-EX4 ⟨Ex⟩ 1NO+2NC
28	L		FD 2899-M2-EX4 ⟨Ex⟩ 1NO+2NC	
Min. force		10 N (18 N ⟨Ex⟩)	30 N (40 N ⟨Ex⟩)	10 N (18 N ⟨Ex⟩)

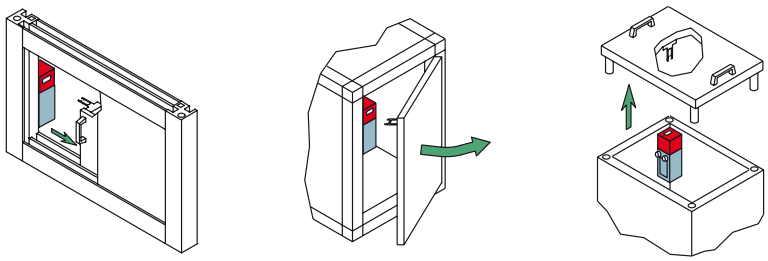
Actuators



VF KEYF	VF KEYF1	VF KEYF2	VF KEYF3	VF KEYF7	VF KEYF8
Straight actuator	Right-angled actuator	Jointed actuator	Two directions adjustable actuator	One direction adjustable actuator	Universal actuator

IMPORTANT: These actuators must be used with switches of FD series only (e.g. FD 2093-M2-EX4).

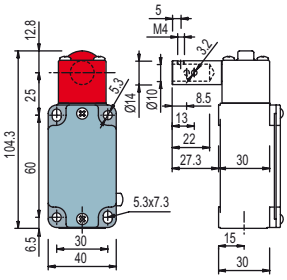
Application examples



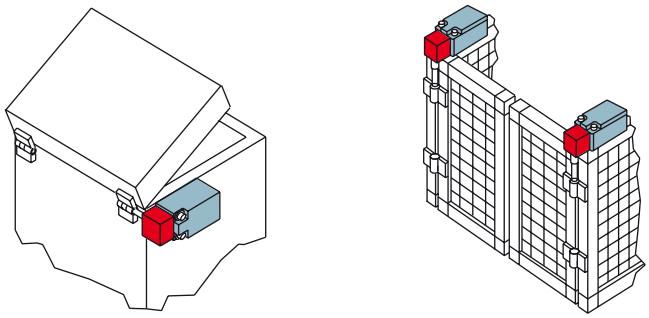
Hinge operating safety switches

Type of contacts:

L = slow action

Contact blocks		
		
18	L	FD 1895-M2-EX4 ⟨Ex⟩ 1NO+1NC
20	L	FD 2095-M2-EX4 ⟨Ex⟩ 1NO+2NC
Min. force		0,15 Nm (0,4 Nm ⟨Ex⟩)

Application examples

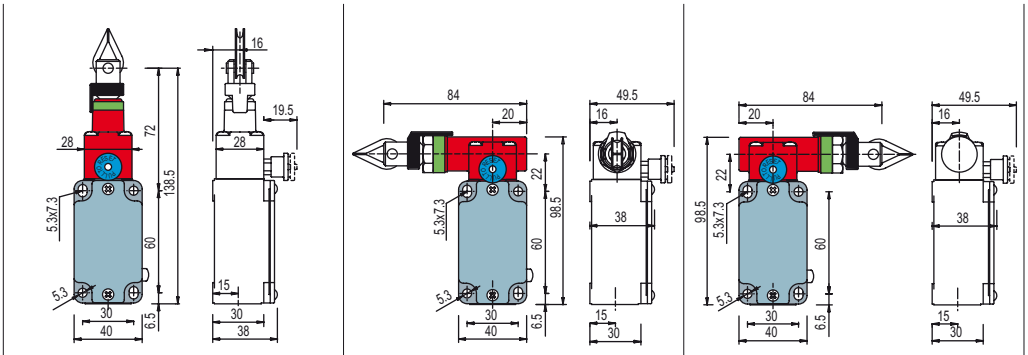


Code	Approvals	Category	Zone
-EX4	⟨Ex⟩ **II 3D IP67 T80°C**	**3D**	**22**

Rope safety switches for emergency stop

Type of contacts:

L = slow action



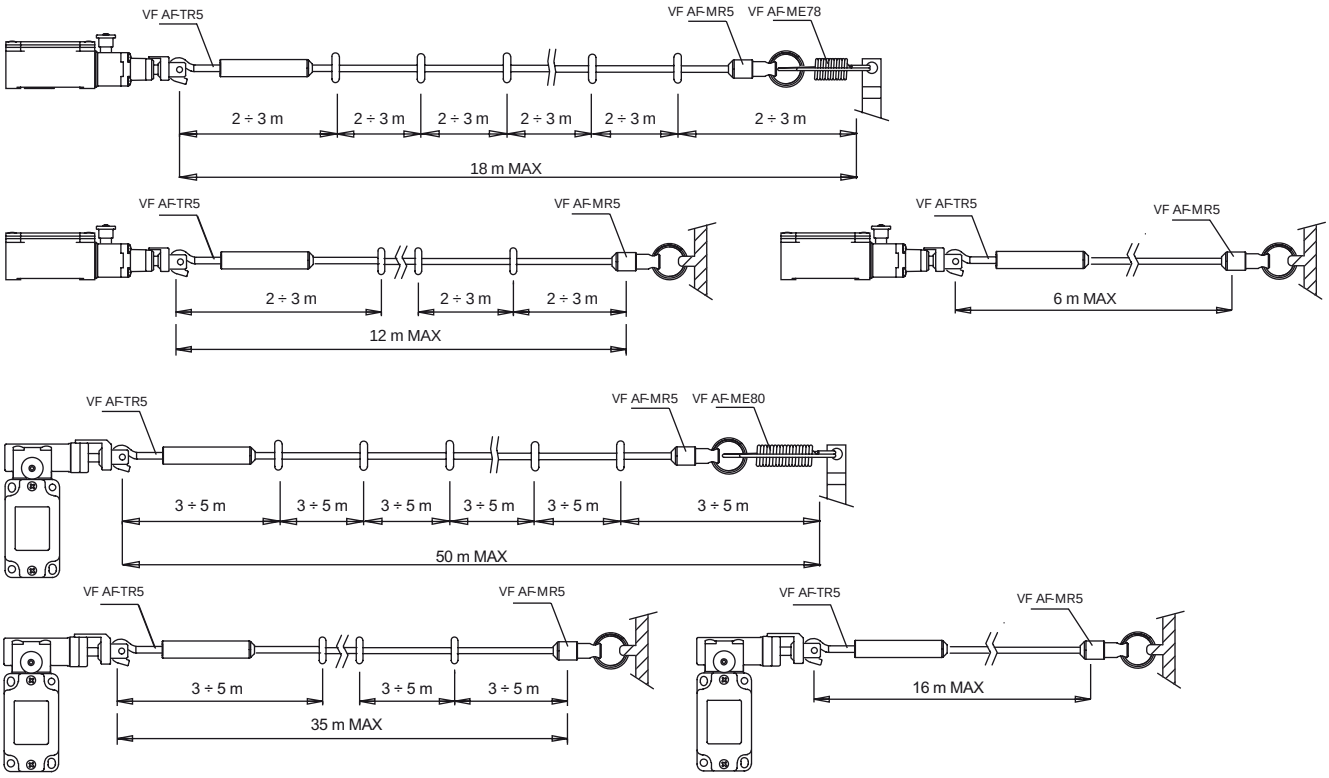
Contact blocks				
18	L	FD 1878-M2-EX4 → 1NO+1NC	FD 1883-M2-EX4 → 1NO+1NC	FD 1884-M2-EX4 → 1NO+1NC
20	L	FD 2078-M2-EX4 → 1NO+2NC	FD 2083-M2-EX4 → 1NO+2NC	FD 2084-M2-EX4 → 1NO+2NC
Min. force		initial 63 N...final 83 N (90 N →)	initial 147 N...final 235 N (250 N →)	initial 147 N...final 235 N (250 N →)

Rope installation accessories



VF AF-TR5	VF AF-TR8	VF AF-MR5	VF AF-ME78	VF AF-ME80	VF F05-100	VF AF-IF1GR03	VF AF-CA5	VF AF-CA10
Adjustable stay bolt	Stay bolt	End clamp	Safety spring for longitudinal heads	Safety spring for transversal heads	Ø 5 mm rope 100 m roll	Rope function indicators. Text "STOP"	Pulley	Angular pulley

Application examples and max rope length



Code	Approvals	Category	Zone
-EX4	Ⓔx II 3D IP67 T80°C	3D	22

Further information on rope switch accessories are available on page 4/95.

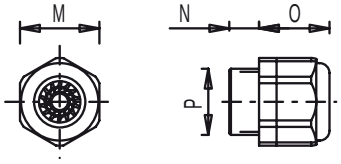
Polymer ATEX cable gland

1 pc packs



Technical data:

ATEX approval:	Ex II 2GD EEx e II IP68
Body and nut material:	Polymer PA V0 according with UL 94
Ambient temperature:	-20 ... +95 °C
Protection degree:	IP68 (≤ 10 bar)
Driving torque:	from 3 to 4 Nm



Article	Description	ATEX certificate number	⬡M	N	O	P
VF PBM20C6P -2GD	Polymer cable gland M20x1,5 for Ø 6,5 to Ø 12 mm cables range	DMT 02 ATEX E 047 X	24	9	24	M20x1,5

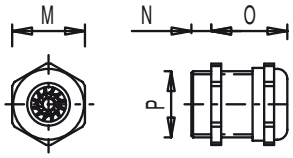
Metal ATEX cable gland

1 pc packs



Technical data:

ATEX approval:	Ex II 2GD EEx e II IP68
Body and nut material:	Nichel plated brass
Ambient temperature:	-20 ... +95 °C
Protection degree:	IP68 (≤ 10 bar)
Driving torque:	from 3 to 4 Nm



Article	Description	ATEX certificate number	⬡M	N	O	P
VF PBM20C6M-2GD	Cable gland M20x1,5 for Ø 6 to Ø 12 mm cables range	DMT 03 ATEX E 051 X	24	9	24	M20x1,5

Notes