



ATEX





Technical concepts

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Position switches FD series

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Category	Zone	EPL	Approvals
<b>2G</b> <b>M2</b>	<b>1</b> <b>M2</b>	<b>Gb</b> <b>Mb</b>	<b>II 2G Ex ia IIC T6 Gb</b> <b>I M2 Ex ia I Mb</b>

Article code extension  
**-EX7**

ATEX category/EPL				
M2/Mb	2G/Gb	2D/Db	3G/Gc	3D/Dc
■	■	-	■	-

Position switches FM series

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Category	Zone	EPL	Approvals
<b>2G</b> <b>M2</b>	<b>1</b> <b>M2</b>	<b>Gb</b> <b>Mb</b>	<b>II 2G Ex ia IIC T6 Gb</b> <b>I M2 Ex ia I Mb</b>

Article code extension  
**-EX7**

ATEX category/EPL				
M2/Mb	2G/Gb	2D/Db	3G/Gc	3D/Dc
■	■	-	■	-

Position switches FD series

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Category	Zone	EPL	Approvals
<b>2D</b>	<b>21</b>	<b>Db</b>	<b>II 2D Ex tb IIIC T80°C Db</b>

Article code extension  
**-EX8**

ATEX category/EPL				
M2/Mb	2G/Gb	2D/Db	3G/Gc	3D/Dc
-	-	■	-	■

Prewired position switches FA series

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Category	Zone	EPL	Approvals
<b>3D</b> <b>3G</b>	<b>22</b> <b>2</b>	<b>Dc</b> <b>Gc</b>	<b>II 3D Ex tc IIIC T80°C Dc</b> <b>II 3G Ex nC IIC T6 Gc</b>

Article code extension  
**-EX5**

ATEX category/EPL				
M2/Mb	2G/Gb	2D/Db	3G/Gc	3D/Dc
-	-	-	■	■

Position switches FD series

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Category	Zone	EPL	Approvals
<b>3D</b>	<b>22</b>	<b>Dc</b>	<b>II 3D Ex tc IIIC T80°C Dc</b>

Article code extension  
**-EX4**

ATEX category/EPL				
M2/Mb	2G/Gb	2D/Db	3G/Gc	3D/Dc
-	-	-	-	■

Accessories

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## ATEX Directive

The ATEX mark (**A**tmospheres **E**xplosives) 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 it 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 is present permanently. Constant danger. Equipment of minimum category 1 is required.
- **Zone 1/21**: a place where gas or combustible dust is likely to occur during normal operation. Potential danger. Equipment of minimum category 2 is required.
- **Zone 2/22**: a place where gas or combustible dust is unlikely to occur or only for a short period. Lower danger. Equipment of minimum category 3 is 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, 1 and 21, 2 and 22)
- **Category 2**: equipment designed to assure a high protection degree (use in zones 1 and 21, 2 and 22)
- **Category 3**: equipment designed to assure a normal protection degree (use in zones 2 and 22)

The relation between the EPL (Equipment Protection Levels) of the IEC 60079-0 standard, and the categories and applications of the ATEX directive are shown in the table below.

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

Environment characteristics				Equipment characteristics			
Environment of application	Flammable material	Potentially explosive atmosphere	Classifications of the potentially explosive atmospheres: ZONE	according to ATEX 94/9/CE		according to IEC 60079-0	
				Required marking of the applied device: CATEGORY	Required marking of the applied device: GROUP	EPL	Required degree protection
Mining				M1	I	Ma	very high
				M2		Mb	high
Surface	Gases	It is present continuously, for long periods or frequently	0	1G	II	Ga	very high
		It is likely to occur	1	2G		Gb	high
		It is unlikely to occur or, if it does, is likely to do infrequently and for a short period only	2	3G		Gc	normal
	Dusts	It is present continuously, for long periods or frequently	20	1D		Da	very high
		It is likely to occur	21	2D		Db	high
		It is unlikely to occur or, if it does, is likely to do infrequently and for a short period only	22	3D		Dc	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 several methods of protection have been developed and standardized, as listed in the following table.

**Table 2 - Protection methods and reference standards**

Protection method	Symbol	Marking	Zone of utilization GAS	Zone of utilization DUST	IEC / EN standards
General requirements	/	/	0, 1, 2	20, 21, 22	IEC 60079-0 EN 60079-0
Oil immersion		Ex o	1,2	/	IEC 60079-6 EN 60079-6
Pressurized		Ex px Ex py Ex pz	1 1 2	21 21 22	IEC 60079-2 EN 60079-2
Sand encapsulation		Ex q	1,2	/	IEC 60079-5 EN 60079-5
Explosion-proof enclosure		Ex d	1,2	/	IEC 60079-1 EN 60079-1
Increased safety		Ex e	1,2	/	IEC 60079-7 EN 60079-7
Intrinsic safety		Ex ia Ex ib Ex ic	0 1 2	20 21 22	IEC 60079-11 EN 60079-11
Encapsulation		Ex ma Ex mb Ex mc	0 1 2	20 21 22	IEC 60079-18 EN 60079-18
Type of protection		Ex nA Ex nC Ex nR	2 2 2	/	IEC 60079-15 EN 60079-15
Protection by housing		Ex ta Ex tb Ex tc	/	20 21 22	IEC 60079-31 EN 60079-31
Optical radiations		Ex op	0,1,2	/	IEC 60079-28 EN 60079-28

## Example of marking

### Devices for places with gases presence

**Ex II 2G Ex ia IIC T6 Gb**

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

### Devices for places with dusts presence

**Ex II 3D Ex tc IIIC T80°C Dc**

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

## 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
<b>T1</b>	methane	propane, methane, ethane, benzene, ammoniac, acetic acid, carbon monoxide, methanol, toluene	acrylonitrile	hydrogen
<b>T2</b>		ethanol, amyl acetate, butane	ethylene	acetylene
<b>T3</b>		fuel oil, hexane	hydrogen sulphide	
<b>T4</b>		acetaldehyde	ethyl ether	
<b>T5</b>				
<b>T6</b>				carbon bisulphide

## Classification of dust

**Table 5**

IIIA	IIB	IIC
combustible particles	non-conductive powder	conductive powder



### 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:



 **II 2G Ex ia IIC T6 Gb**

 **I M2 Ex ia I Mb**

Certificate n°: BVS 05 ATEX E107

### Technical data

#### Housing

Made of metal, coated with baked epoxy powder

One conduit entry M20

Protection degree:

IP67 according to EN 60529 with cable gland having equal or higher protection degree

#### General data

Ambient temperature:

from -20°C to +60°C

Max actuation frequency:

3600 operations cycles<sup>1</sup>/hour

Mechanical endurance F•••••-EX•:

10 million operations cycles<sup>1</sup>

Mechanical endurance F•••93-EX•:

500.000 operations cycles<sup>1</sup>

Mechanical endurance F•••99-EX•, F•••R2-EX•:

250.000 operations cycles<sup>1</sup>

Mechanical endurance F•••95-EX•:

500.000 operations cycles<sup>1</sup>

Mechanical endurance F•••78-EX•, F•••8•-EX•:

500.000 operations cycles<sup>1</sup>

Assembling position:

any

Driving torque for installation:

see pages 7/1-7/12

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

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

Contact blocks 20,28:

min. 1 x 0,34 mm<sup>2</sup> (1 x AWG 22)

max. 2 x 1,5 mm<sup>2</sup> (2 x AWG 16)

Contact block 5:

min. 1 x 0,5 mm<sup>2</sup> (1 x AWG 20)

max. 2 x 2,5 mm<sup>2</sup> (2 x AWG 14)

#### In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, EN 50041, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 60529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, IEC 60079-0, EN 60079-0, IEC 60079-11, EN 60079-11.

#### 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 7/4. 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 7/1 to page 7/12.**

Category	Zone	EPL	Approvals	Article code extension
<b>2G</b>	<b>1</b>	<b>Gb</b>	 <b>II 2G Ex ia IIC T6 Gb</b>	<b>-EX7</b>
<b>M2</b>	<b>M2</b>	<b>Mb</b>	 <b>I M2 Ex ia I Mb</b>	
<b>Electrical data</b>				
Max current (Ii):			2,1 A	
Max voltage (Ui):			30 Vdc	
Conditional short circuit current:			1000 A according to EN 60947-5-1	
Protection against short circuits:			fuse 4 A 250 V type gG	
Pollution degree:			3	
<p> <b>This type of switches must be used only in intrinsic safety circuits in conformity with standard IEC 60079-11, EN 60079-11</b></p> <p> <b>For the correct utilization of the limit switch please use cable glands suitable for the zone according to the ATEX directive</b></p>				



Quality marks of the product:



Approvals UL: E131787

Data type approved by UL

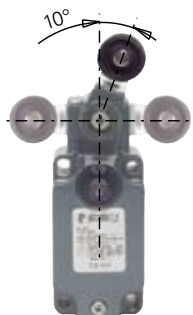
Utilization categories Q300 (69 VA, 125-250 Vdc) A600 (720 VA, 120-600 Vac) Data of the housing type 1, 4X "indoor use only", 12, 13 For all contact blocks except 2 and 3 use 60 or 75 °C copper (Cu) conductor and wire size No. 12-14 AWG. Terminal tightening torque of 7,1 lb in (0,8 Nm). For contact blocks 2 and 3 use 60 or 75 °C copper (Cu) conductor and wire size No. 14 AWG. Terminal tightening torque of 12 lb in (1.4 Nm).

In conformity with standard: UL 508

Please contact our technical service for the list of 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.



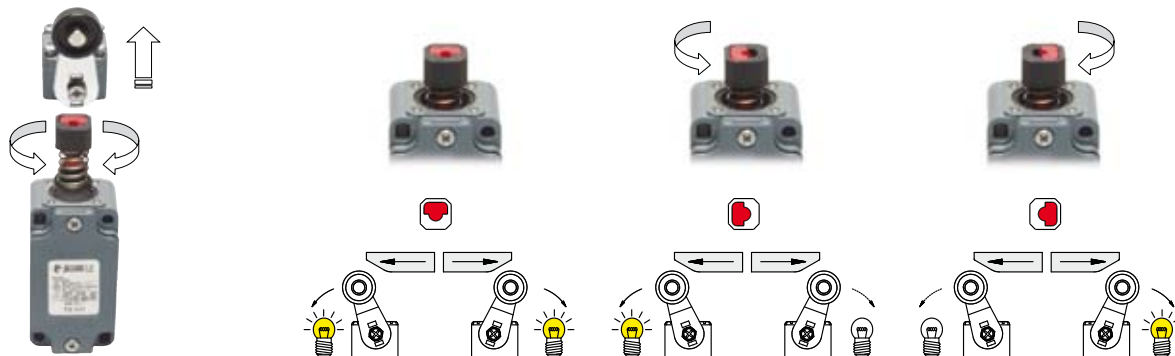
Rotating heads

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-EX7

Housing FD metal housing, one conduit entry

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

Actuators 01 short plunger 02 roller lever ...

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

Threaded conduit entry M2 M20x1,5

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



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

		On demand with stainless steel roller	On demand with stainless steel roller	
5 <b>R</b>	FD 501-M2-EX7	FD 502-M2-EX7	FD 505-M2-EX7	FD 511-M2-EX7
20 <b>L</b>	FD 2001-M2-EX7	FD 2002-M2-EX7	FD 2005-M2-EX7	FD 2011-M2-EX7
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)
Travel diagrams	page 7/4 - group 1	page 7/4 - group 2	page 7/4 - group 2	page 7/4 - group 1

	With external rubber gasket		Ø 12.7 stainless steel sphere	With external rubber gasket
5 <b>R</b>	FD 515-M2-EX7	FD 516-M2-EX7	FD 519-M2-EX7	FD 520-M2-EX7
20 <b>L</b>	FD 2015-M2-EX7	FD 2016-M2-EX7	FD 2019-M2-EX7	FD 2020-M2-EX7
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
Travel diagrams	page 7/4 - group 1	page 7/4 - group 1	page 7/4 - group 1	page 7/4 - group 3

	With external rubber gasket	With external rubber gasket	With two stable positions	With rope for signalling
5 <b>R</b>	FD 521-M2-EX7	FD 525-M2-EX7	FD 541-M2-EX7	FD 576-M2-EX7
20 <b>L</b>	FD 2021-M2-EX7	FD 2025-M2-EX7		FD 2076-M2-EX7
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 (0,36 Nm)	initial 20 N - final 40 N
Travel diagrams	page 7/4 - group 3	page 7/4 - group 3	page 7/4 - group 4	page 7/4 - group 6

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

All measures in drawings are in mm



### Position switches without actuator

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

	Regular head	Compact head
Contact blocks		
5 <b>R</b>	FD 538-M2-EX7 (R) 1NO+1NC	FD 558-M2-EX7 (R) 1NO+1NC
20 <b>L</b>	FD 2038-M2-EX7 (L) 1NO+2NC	FD 2058-M2-EX7 (L) 1NO+2NC
Min. force	0,1 Nm (0,25 Nm (R))	0,06 Nm (0,25 Nm (R))
Travel diagrams	page 7/4 - group 4	page 7/4 - group 4

### IMPORTANT

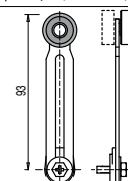
**For safety applications:** join only switches and actuators marked with symbol (R).  
 For more information about safety applications see page 7/1.

### 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	Adjustable fiber glass rod
Article	VF L31 (R)	VF L32 (2)	VF L33 (2)	VF L34	VF L35 (R) (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 (R)	VF L52 (R)	VF L53 (R)	VF L56 (R) (2)	VF L57 (R)	
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 (R)	VF L35-1 (R) (1) (2)	VF L51-1 (R)	VF L52-1 (R)	VF L56-1 (R) (2)	VF L57-1 (R)
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.




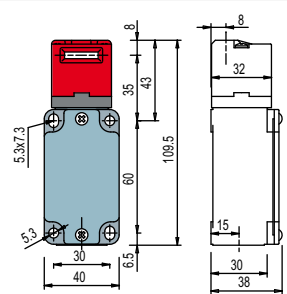
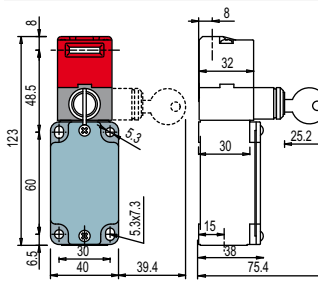
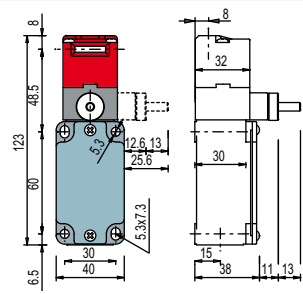









Code	Approvals	Category	Zone	EPL
-EX7	Ex II 2G Ex ia IICT6 Gb	2G	1	Gb
	Ex I M2 Ex ia I Mb	M2	M2	Mb



**Safety switches with separate actuator**

Type of contacts:

 = slow action

	Switches with separate actuator	Switches with separate actuator with lock	Switches with manual mechanical delay
	<p>Switches without actuator</p> 	<p>Switches without actuator</p> 	<p>Switches without actuator</p> 
Contact blocks	20  <b>FD 2093-M2-EX7</b>  1NO+2NC 28 	<b>FD 2099-M2-EX7</b>  1NO+2NC <b>FD 2899-M2-EX7</b>  1NO+2NC	<b>FD 20R2-M2-EX7</b>  1NO+2NC
Min. force	10 N (18 N  )	30 N (40 N  )	10 N (18 N  )
Travel diagrams	page 4/7	page 4/107	page 4/101

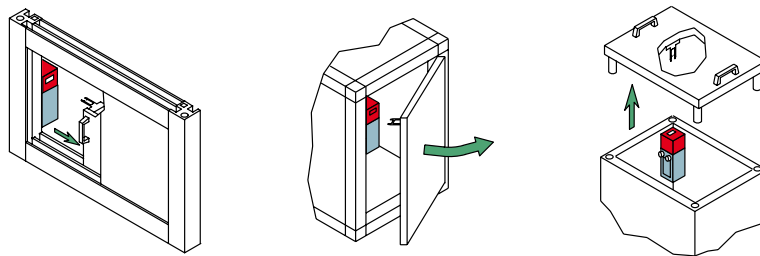
**Actuators**



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).

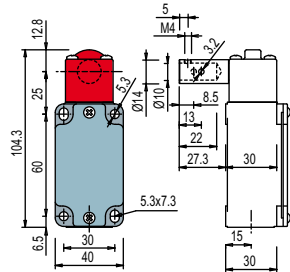
Application examples






**Hinge operating safety switches**

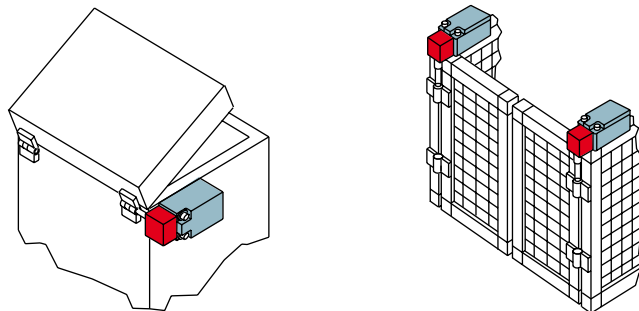
Type of contacts:

 = slow action



Contact blocks	20  <b>FD 2095-M2-EX7</b>  1NO+2NC
Min. force	0,15 Nm (0,4 Nm  )
Travel diagrams	page 4/57

Application examples



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

## Rope safety switches for emergency stop

Type of contacts:

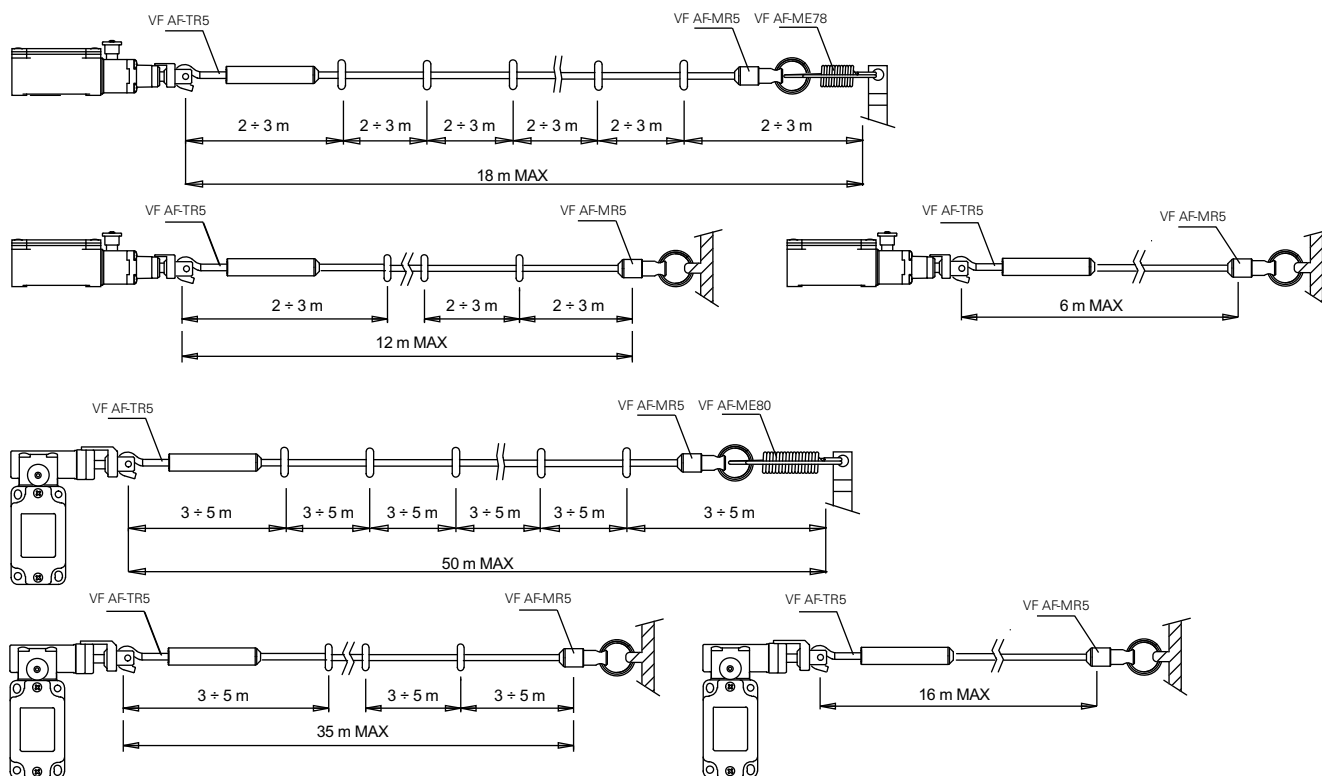
**L** = slow action

Contact blocks			
20 <b>L</b>	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 )
Travel diagrams	page 4/124 - group 1	page 4/124 - group 2	page 4/124 - group 2

## 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 in stainless steel	Angular pulley in stainless steel

## Application examples and max rope length



Code	Approvals	Category	Zone	EPL
-EX7	II 2G Ex ia IICT6 Gb	2G	1	Gb
	I M2 Ex ia I Mb	M2	M2	Mb

Further information on rope switch accessories are available on page 4/135.



### 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:



 II 2G Ex ia IIC T6 Gb

 I M2 Ex ia I Mb

Certificate n°: BVS 05 ATEX E107

### Technical data

#### Housing

Made of metal, coated with baked epoxy powder

One conduit entry M20

Protection degree:

IP67 according to EN 60529 with cable gland having equal or higher protection degree

#### General data

Ambient temperature:

from -20°C to +60°C

Max actuation frequency:

3600 operations cycles<sup>1</sup>/hour

Mechanical endurance F•••••-EX•:

10 million operations cycles<sup>1</sup>

Mechanical endurance F•••C•-EX•:

500.000 operations cycles<sup>1</sup>

Mechanical endurance F•••96-EX•:

500.000 operations cycles<sup>1</sup>

Assembling position:

any

Driving torque for installation:

see pages 7/1-7/12

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

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

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

#### In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, EN 50047, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 60529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, IEC 60079-0, EN 60079-0, IEC 60079-11, EN 60079-11.

#### 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 7/6. 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 7/1 to page 7/12.**

Category	Zone	EPL	Approvals	Article code extension
<b>2G</b>	<b>1</b>	<b>Gb</b>	 II 2G Ex ia IIC T6 Gb	<b>-EX7</b>
<b>M2</b>	<b>M2</b>	<b>Mb</b>	 I M2 Ex ia I Mb	
<b>Electrical data</b>				
Max current (Ii):		2,1 A		
Max voltage (Ui):		30 Vdc		
Conditional short circuit current:		1000 A according to EN 60947-5-1		
Protection against short circuits:		fuse 4 A 250 V type gG		
Pollution degree:		3		
<p> <b>This type of switches must be used only in intrinsic safety circuits in conformity with standard IEC 60079-11, EN 60079-11</b></p> <p> <b>For the correct utilization of the limit switch please use cable glands suitable for the zone according to the ATEX directive</b></p>				



Quality marks of the product:



Approvals UL: E131787

Data type approved by UL

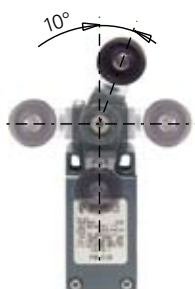
Utilization categories Q300 (69 VA, 125-250 Vdc) A600 (720 VA, 120-600 Vac) Data of the housing type 1, 4X "indoor use only", 12, 13 For all contact blocks except 2 and 3 use 60 or 75 °C copper (Cu) conductor and wire size No. 12-14 AWG. Terminal tightening torque of 7,1 lb in (0,8 Nm). For contact blocks 2 and 3 use 60 or 75 °C copper (Cu) conductor and wire size No. 14 AWG. Terminal tightening torque of 12 lb in (1.4 Nm).

In conformity with standard: UL 508

Please contact our technical service for the list of 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
11 2NC, snap action
12 2NO, snap action
20 1NO+2NC, slow action
21 3NC, slow action
22 2NO+1NC, slow action

Actuators

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

ATEX approvals

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

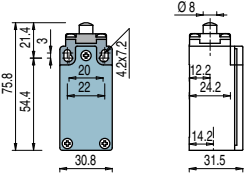
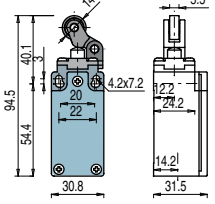
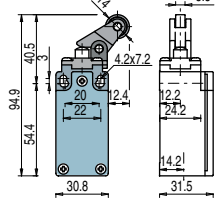
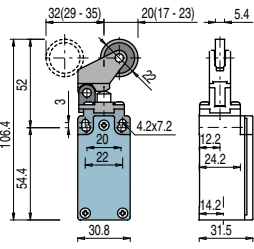











Threaded conduit entry

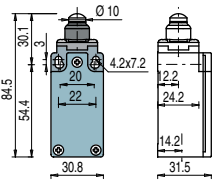
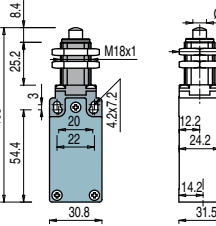
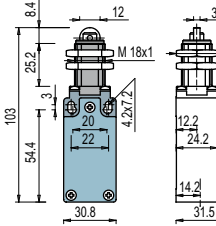
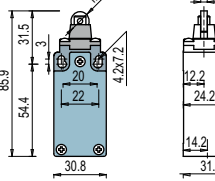












M2 M20x1,5

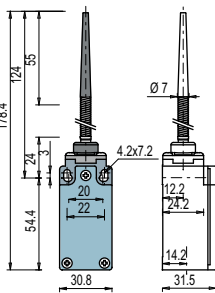
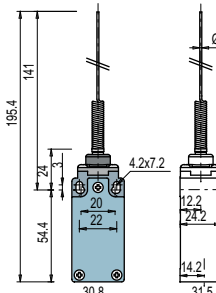
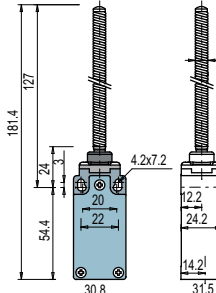
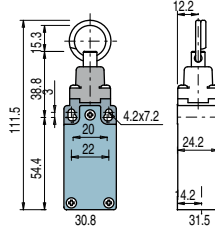
Type of contacts

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

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

	On demand with stainless steel roller	On demand with stainless steel roller	
			
Contact blocks 5 <b>R</b> 20 <b>L</b>	<b>FM 501-M2-EX7</b>  1NO+1NC <b>FM 2001-M2-EX7</b>  1NO+2NC	<b>FM 502-M2-EX7</b>  1NO+1NC <b>FM 2002-M2-EX7</b>  1NO+2NC	<b>FM 505-M2-EX7</b>  1NO+1NC <b>FM 2005-M2-EX7</b>  1NO+2NC <b>FM 507-M2-EX7</b>  1NO+1NC <b>FM 2007-M2-EX7</b>  1NO+2NC
Max speed	0,5 m/s	0,5 m/s with 30° cam	0,5 m/s with 30° cam
Min. force	8 N (25 N  )	6 N (25 N  )	4 N (25 N  )
Travel diagrams	page 7/6 - group 1	page 7/6 - group 2	page 7/6 - group 3

	With external rubber gasket	With external rubber gasket	With external rubber gasket	With external rubber gasket
				
Contact blocks 5 <b>R</b> 20 <b>L</b>	<b>FM 508-M2-EX7</b>  1NO+1NC <b>FM 2008-M2-EX7</b>  1NO+2NC	<b>FM 512-M2-EX7</b>  1NO+1NC <b>FM 2012-M2-EX7</b>  1NO+2NC	<b>FM 513-M2-EX7</b>  1NO+1NC <b>FM 2013-M2-EX7</b>  1NO+2NC	<b>FM 515-M2-EX7</b>  1NO+1NC <b>FM 2015-M2-EX7</b>  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  )	8 N (25 N  )	8 N (25 N  )	8 N (25 N  )
Travel diagrams	page 7/6 - group 1	page 7/6 - group 1	page 7/6 - group 1	page 7/6 - group 1

	With external rubber gasket	With external rubber gasket	With external rubber gasket	With rope for signalling
				
Contact blocks 5 <b>R</b> 20 <b>L</b>	<b>FM 520-M2-EX7</b> 1NO+1NC <b>FM 2020-M2-EX7</b> 1NO+2NC	<b>FM 521-M2-EX7</b> 1NO+1NC <b>FM 2021-M2-EX7</b> 1NO+2NC	<b>FM 525-M2-EX7</b> 1NO+1NC <b>FM 2025-M2-EX7</b> 1NO+2NC	<b>FM 576-M2-EX7</b> 1NO+1NC <b>FM 2076-M2-EX7</b> 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
Travel diagrams	page 7/6 - group 4	page 7/6 - group 4	page 7/6 - group 4	page 7/6 - group 7

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

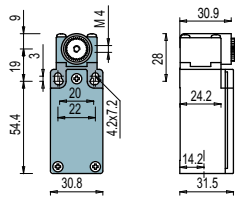
All measures in drawings are in mm



### Position switches without actuator

Type of contacts:

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



#### IMPORTANT

**For safety applications:** join only switches and actuators marked with symbol  $\ominus$ .  
For more information about safety applications see page 7/1.

Contact blocks

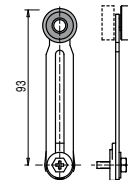
5	<b>R</b>	FM 538-M2-EX7 $\ominus$	1NO+1NC
20	<b>L</b>	FM 2038-M2-EX7 $\ominus$	1NO+2NC
Min. force		0,06 Nm (0,25 Nm $\ominus$ )	
Travel diagrams		page 7/6 - group 5	

### 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 $\ominus$	VF LE31 $\ominus$	VF LE33	VF LE34	VF LE50	VF LE51 $\ominus$	
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	Adjustable fiber glass rod
Article	VF LE52 $\ominus$	VF LE53 $\ominus$	VF LE54 $\ominus$	VF LE55 $\ominus$ <sup>(1)</sup>	VF LE56 $\ominus$	VF LE57 $\ominus$	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 $\ominus$	VF LE51-1 $\ominus$	VF LE52-1 $\ominus$	VF LE54-1 $\ominus$	VF LE55-1 $\ominus$ <sup>(1)</sup>	VF LE56-1 $\ominus$	VF LE57-1 $\ominus$
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)

<sup>(1)</sup> 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.




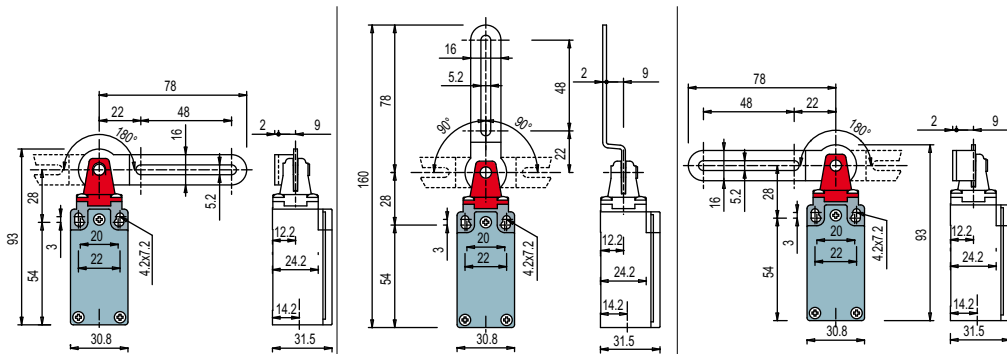
Code	Approvals	Category	Zone	EPL
-EX7	Ex II 2G Ex ia IICT6 Gb	2G	1	Gb
	Ex I M2 Ex ia I Mb	M2	M2	Mb










**Safety switches with slotted hole lever**

Type of contacts:

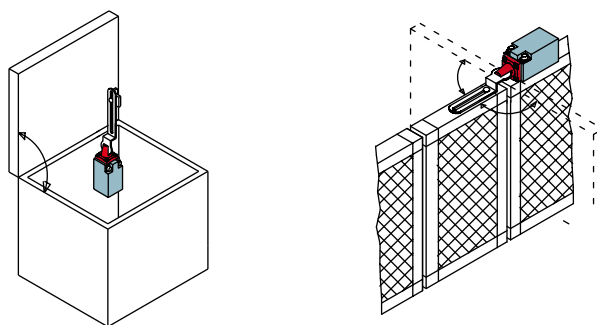
 = slow action



Contact blocks

20 	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  )
Travel diagrams	page 7/8 - group 10	page 7/8 - group 11	page 7/8 - group 10

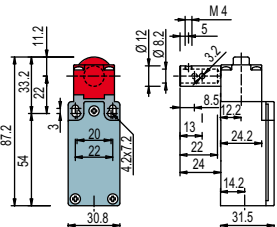
Application examples






**Hinge operating safety switches**

Type of contacts:

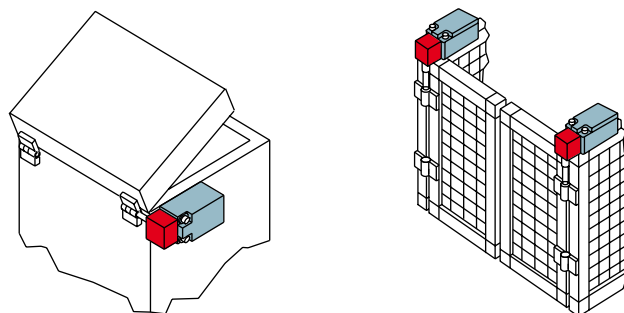
 = slow action



Contact blocks

20 	FM 2096-M2-EX7  1NO+2NC
Min. force	0,15 Nm (0,4 Nm  )
Travel diagrams	page 7/8

Application examples



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





### 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:



 II 2D Ex tb IIIC T80°C Db

Certificate n°: BVS 06 ATEX E156

### Technical data

Housing  
Made of metal, coated with baked epoxy powder  
One conduit entry M20  
Protection degree: IP67 according to EN 60529 with cable gland having equal or higher protection degree

### General data

Ambient temperature: from -20°C to +70°C  
Max actuation frequency: 3600 operations cycles<sup>1</sup>/hour  
Mechanical endurance **F•••••-EX•**: 10 million operations cycles<sup>1</sup>  
Mechanical endurance **F•••93-EX•**: 500.000 operations cycles<sup>1</sup>  
Mechanical endurance **F•••99-EX•**, **F•••R2-EX•**: 250.000 operations cycles<sup>1</sup>  
Mechanical endurance **F•••95-EX•**: 500.000 operations cycles<sup>1</sup>  
Mechanical endurance **F•••78-EX•**, **F•••8•-EX•**: 500.000 operations cycles<sup>1</sup>  
Assembling position: any  
Driving torque for installation: see pages 7/1-7/12  
(1) One operation cycle means two movements, one to close and one to open contacts, as foreseen by EN 60947-5-1 standard.

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

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

### In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, EN 50047, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 60529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, IEC 60079-0, EN 60079-0, IEC 60079-31, EN 60079-31.


### 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 7/4. 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 7/1 to page 7/12.**

Category	Zone	EPL	Approvals	Article code extension	
<b>2D</b>	<b>21</b>	<b>Db</b>	 II 2D Ex tb IIIC T80°C Db	<b>-EX8</b>	
<b>Electrical data</b>					<b>Utilization categories</b>
Thermal current (I <sub>th</sub> ):	10 A				Alternate current: AC15 (50=60 Hz)
Rated insulation voltage (U <sub>i</sub> ):	500 Vac 600 Vdc 400 V <sub>ac</sub> for contact blocks 20, 28				U <sub>e</sub> (V) 250 400 500
Conditional short circuit current:	1000 A according to EN 60947-5-1				I <sub>e</sub> (A) 6 4 1
Protection against short circuits:	fuse 10 A 500 V type aM				Direct current: dc13
Pollution degree:	3				U <sub>e</sub> (V) 24 125 250
					I <sub>e</sub> (A) 6 1,1 0,4
 <b>For the correct utilization of the limit switch please use cable glands suitable for the zone according to the ATEX directive</b>					

**Quality marks of the product:**


Approvals UL: E131787

**Data type approved by UL**

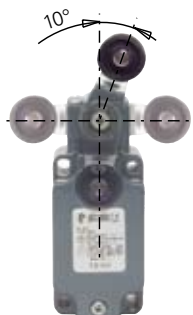
Utilization categories Q300 (69 VA, 125-250 Vdc)  
 A600 (720 VA, 120-600 Vac)  
 Data of the housing type 1, 4X "indoor use only", 12, 13  
 For all contact blocks except 2 and 3 use 60 or 75 °C copper (Cu) conductor and wire size No. 12-14 AWG. Terminal tightening torque of 7,1 lb in (0,8 Nm).  
 For contact blocks 2 and 3 use 60 or 75 °C copper (Cu) conductor and wire size No. 14 AWG. Terminal tightening torque of 12 lb in (1,4 Nm).

In conformity with standard: UL 508

Please contact our technical service for the list of 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**

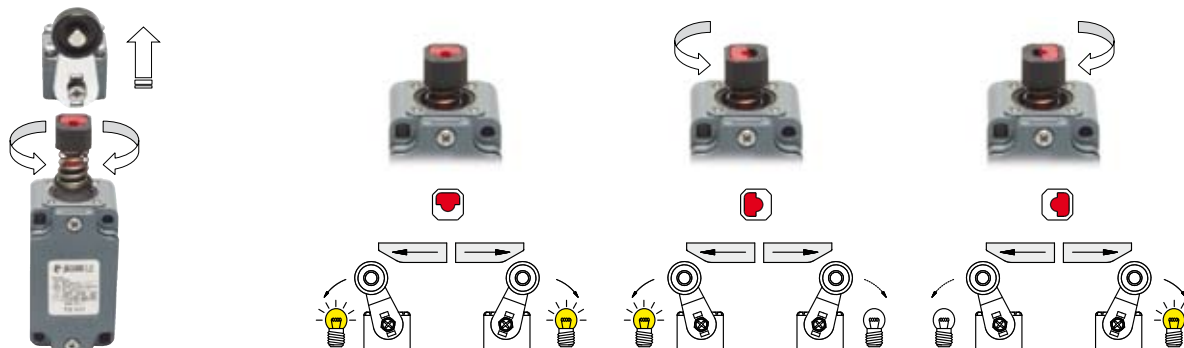
It's possible to fasten the lever on switches in straight or reverse side, maintaining the positive coupling. In this way it's possible to obtain two different work plans of the lever.


**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

**Contact blocks**

<b>5</b>	1NO+1NC, snap action
<b>10</b>	2NO, slow action
<b>11</b>	2NC, snap action
<b>20</b>	1NO+2NC, slow action
<b>21</b>	3NC, slow action
<b>22</b>	2NO+1NC, slow action

**Actuators**

<b>01</b>	short plunger
<b>02</b>	roller lever
...	.....

**ATEX approvals**  
**-EX8** II 2D Ex tb IIIC T80°C Db

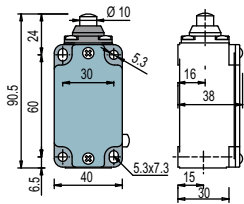
**Threaded conduit entry**  
**M2** M20x1,5

**Type of contacts**

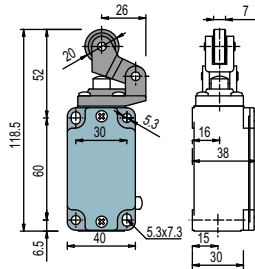
	silver contacts (standard)
<b>G</b>	silver contacts gold plated 1 µm

Type of contacts:

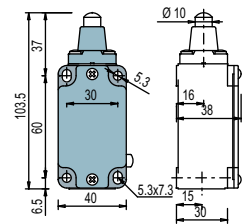
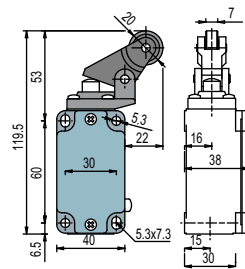
**R** = snap action  
**L** = slow action















On demand with stainless steel roller

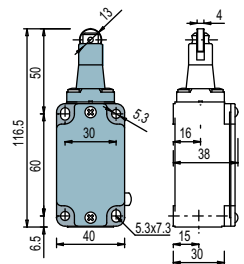


On demand with stainless steel roller

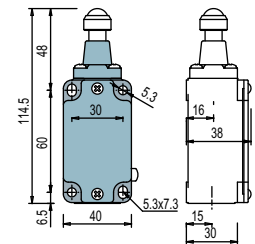


Contact blocks

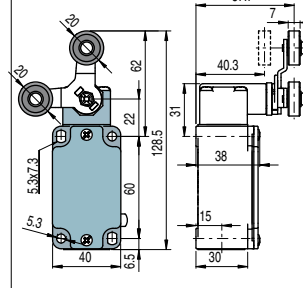
5 <b>R</b>	FD 501-M2-EX8  1NO+1NC	FD 502-M2-EX8  1NO+1NC	FD 505-M2-EX8  1NO+1NC	FD 511-M2-EX8  1NO+1NC
20 <b>L</b>	FD 2001-M2-EX8  1NO+2NC	FD 2002-M2-EX8  1NO+2NC	FD 2005-M2-EX8  1NO+2NC	FD 2011-M2-EX8  1NO+2NC
Max speed	0,5 m/s	0,5 m/s with 30° cam	0,5 m/s with 30° cam	0,5 m/s
Min. force	8 N (25 N  )	6 N (25 N  )	6 N (25 N  )	8 N (25 N  )
Travel diagrams	page 7/4 - group 1	page 7/4 - group 2	page 7/4 - group 2	page 7/4 - group 1



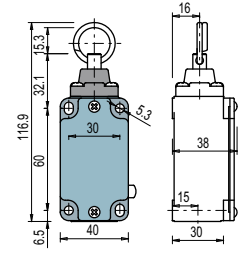
Ø 12.7 stainless steel sphere










With two stable positions



Rope switches for signalling



Contact blocks

5 <b>R</b>	FD 516-M2-EX8  1NO+1NC	FD 519-M2-EX8  1NO+1NC	FD 541-M2-EX8 1NO+1NC	FD 576-M2-EX8 1NO+1NC
20 <b>L</b>	FD 2016-M2-EX8  1NO+2NC	FD 2019-M2-EX8  1NO+2NC		FD 2076-M2-EX8 1NO+2NC
Max speed	0,5 m/s with 30° cam	0,5 m/s	0,5 m/s with 30° cam	0,5 m/s
Min. force	8 N (25 N  )	8 N (25 N  )	0,21 Nm (0,36 Nm  )	initial 20 N - final 40 N
Travel diagrams	page 7/4 - group 1	page 7/4 - group 1	page 7/4 - group 4	page 7/4 - group 6

Code	Approvals	Category	Zone	EPL
-EX8 	II 2D Ex tb IIIC T80°C Db	2D	21	Db

All measures in drawings are in mm

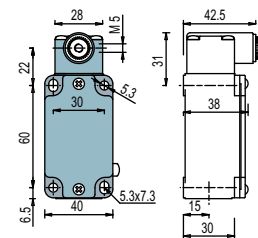


### Position switches without actuator

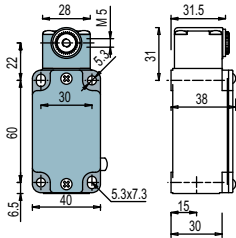
Type of contacts:

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

Regular head



Compact head



### IMPORTANT

**For safety applications:** join only switches and actuators marked with symbol For more information about safety applications see page 7/1.

Contact blocks

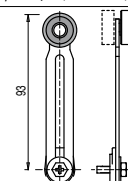
5 <b>R</b>	FD 538-M2-EX8	1NO+1NC
20 <b>L</b>	FD 2038-M2-EX8	1NO+2NC
Min. force	0,1 Nm (0,25 Nm )	0,06 Nm (0,25 Nm )
Travel diagrams	page 7/4 - group 4	page 7/4 - group 4

### 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	Adjustable fiber glass rod
Article	VF L31	VF L32 <sup>(2)</sup>	VF L33 <sup>(2)</sup>	VF L34	VF L35	VF L36 <sup>(2)</sup>
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	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	VF L51-1	VF L52-1	VF L56-1	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)

- <sup>(1)</sup> 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.  
- <sup>(2)</sup> 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.




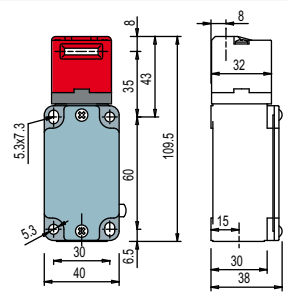
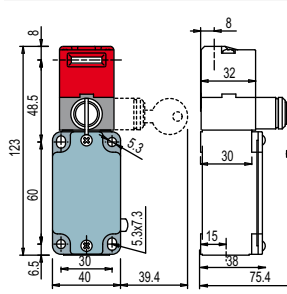
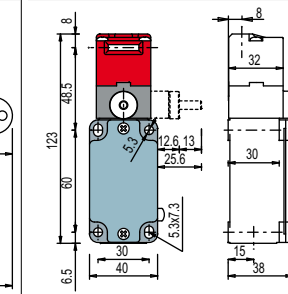







Code	Approvals	Category	Zone	EPL
-EX8	II 2D Ex tb IIIC T80°C Db	2D	21	Db



**Safety switches with separate actuator**

Type of contacts:

 = slow action

	Switches with separate actuator	Switches with separate actuator with lock	Switches with manual mechanical delay
	Switches without actuator	Switches without actuator	Switches without actuator
			
Contact blocks	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  )
Travel diagrams	page 4/7	page 4/107	page 4/101

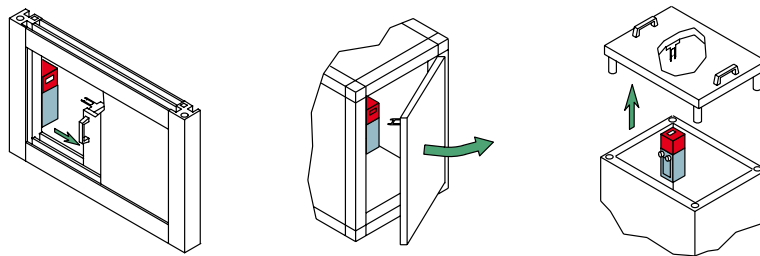
**Actuators**



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).

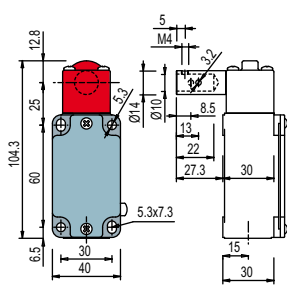


Application examples



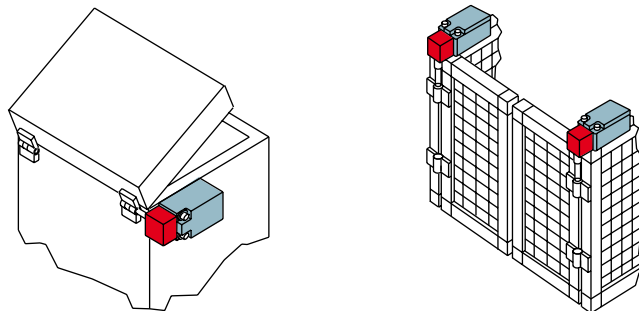
**Hinge operating safety switches**

Type of contacts:

 = slow action

	
Contact blocks	FD 2095-M2-EX8  1NO+2NC
Min. force	0,15 Nm (0,4 Nm  )
Travel diagrams	page 4/57

Application examples



Code	Approvals	Category	Zone	EPL
-EX8  II 2D Ex tb IIIC T80°C Db		2D	21	Db

## Rope safety switches for emergency stop

Type of contacts:

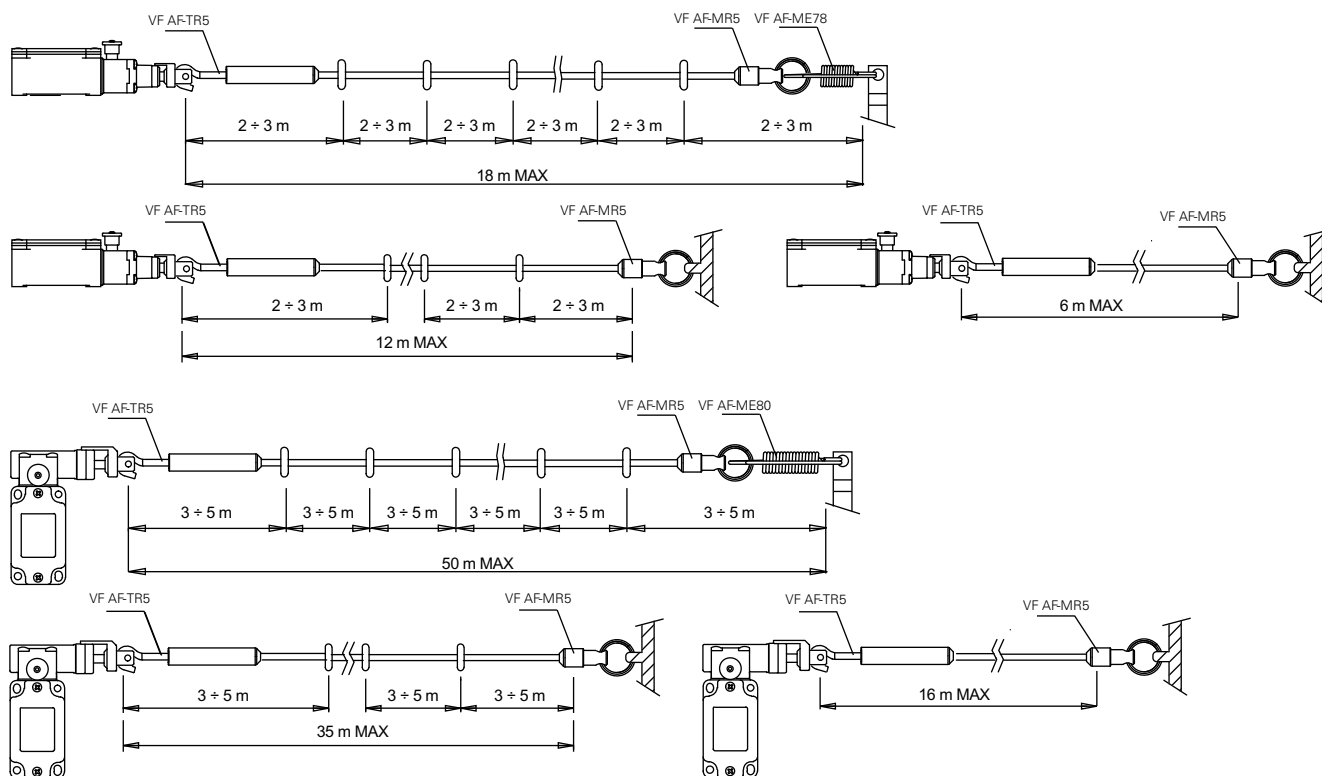
**L** = slow action

Contact blocks			
18 <b>L</b>	<b>FD 1878-M2-EX8</b>	<b>FD 1883-M2-EX8</b>	<b>FD 1884-M2-EX8</b>
20 <b>L</b>	<b>FD 2078-M2-EX8</b>	<b>FD 2083-M2-EX8</b>	<b>FD 2084-M2-EX8</b>
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
Travel diagrams	page 4/124 - group 1	page 4/124 - group 2	page 4/124 - group 2

## 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 in stainless steel	Angular pulley in stainless steel

## Application examples and max rope length



Code	Approvals	Category	Zone	EPL
<b>-EX8</b>	<b>II 2D Ex tb IIICT80°C Db</b>	<b>2D</b>	<b>21</b>	<b>Db</b>

Further information on rope switch accessories are available on page 4/135.



### Technical data

#### Housing

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

Protection degree: IP67 according to EN 60529 with cable gland having equal or higher protection degree

#### General data

Ambient temperature: from -20°C to +60°C  
Max actuation frequency: 3600 operations cycles<sup>1</sup>/hour  
Mechanical endurance: 10 million operations cycles<sup>1</sup>  
Assembling position: any  
Driving torque for installation: see pages 7/1-7/12

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

### Main features

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


### In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 60529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, IEC 60079-0, EN 60079-0, IEC 60079-31, EN 60079-31, IEC 60079-15, EN 60079-15.

### Markings and ATEX approvals:



 II 3D Ex tc IIIC T80°C Dc

 II 3G Ex nC IIC T6 Gc

### 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:

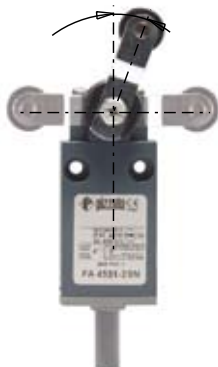
Use only switches marked with the symbol . The safety circuit must always be connected with the **NC contacts** (normally closed contacts: see "internal connections") as stated in the **standard EN 60947-5-1, encl. K, par. 2**. The switch must be actuated with **at least up to the positive opening travel** shown in the travels diagrams on page 7/7. 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 7/1 to page 7/12.**

Category	Zone	Approvals		Article code extension
<b>3D</b>	<b>22</b>	<b>Dc</b>	 II 3D Ex tc IIIC T80°C Dc	<b>-EX5</b>
<b>3G</b>	<b>2</b>	<b>Gc</b>	 II 3G Ex nC IIC T6 Gc	
<b>Electrical data</b>				
Thermal current (I <sub>th</sub> ):	10 A			
Rated insulation voltage (U <sub>i</sub> ):	400 Vac/dc			
Conditional short circuit current:	1000 A according to EN 60947-5-1			
Protection against short circuits:	fuse 10 A 500 V type aM			
Pollution degree:	3			
<b>Utilization categories</b>				
Alternate current: AC15 (50-60 Hz)				
U <sub>e</sub> (V)	120	250	400	
I <sub>e</sub> (A)	6	4	3	
Direct current: dc13				
U <sub>e</sub> (V)	24	125	250	
I <sub>e</sub> (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.

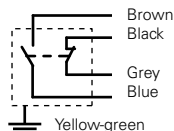


### Rotating heads

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.

article options article  
**FA 4501-2SH-GEX5**

#### 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

#### ATEX approvals

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

#### Contacts type

silver contacts (standard)

**G** silver contacts gold plated 1 μm

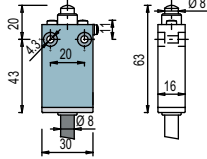
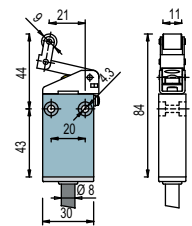
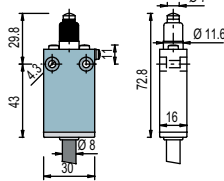
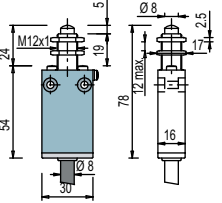












#### Type of cable

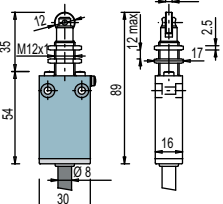
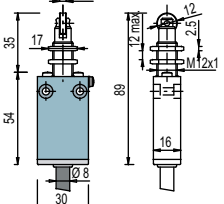
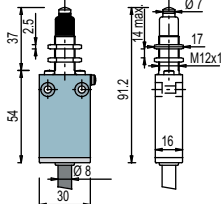
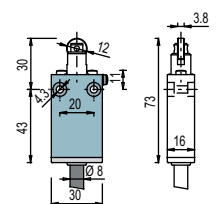












**H** polyurethane cable without halogens

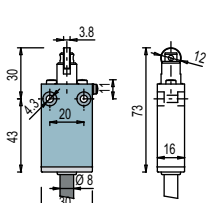
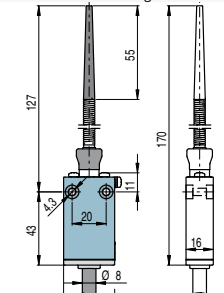
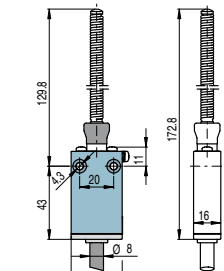
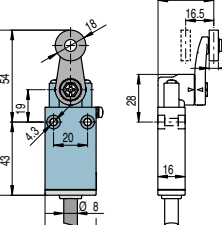






#### Output direction



**S** from bottom

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

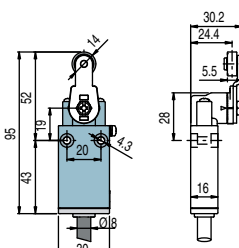
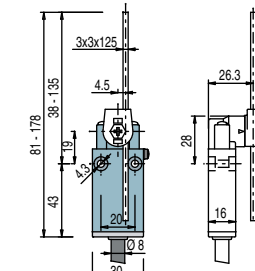
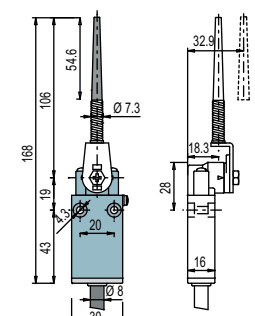
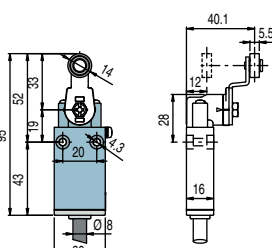
			With external rubber gasket 	Fixed only by threaded head 
Contact blocks	FA 4501-2SH-EX5  1NO+1NC FA 4601-2SH-EX5  1NO+1NC	FA 4502-2SH-EX5  1NO+1NC FA 4602-2SH-EX5  1NO+1NC	FA 4508-2SH-EX5  1NO+1NC FA 4608-2SH-EX5  1NO+1NC	FA 4510-2SH-EX5  1NO+1NC FA 4610-2SH-EX5  1NO+1NC
Max speed	0,5 m/s	0,5 m/s	0,5 m/s	0,5 m/s
Min. force	10 N (25 N  )	5 N (25 N  )	10 N (25 N  )	10 N (25 N  )
Travel diagrams	page 7/7 - group 1	page 7/7 - group 2	page 7/7 - group 1	page 7/7 - group 1

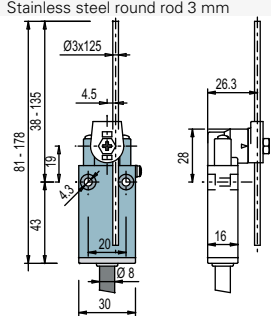
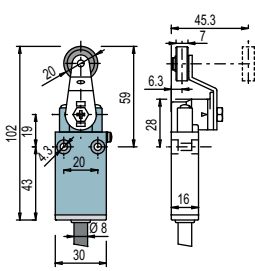
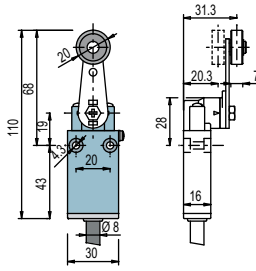
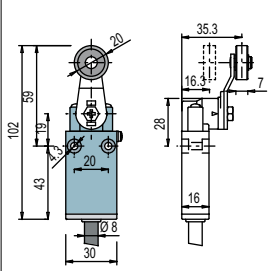
	Fixed only by threaded head 	Fixed only by threaded head 	With external rubber gasket 	Ø 12 mm stainless steel roller 
Contact blocks	FA 4511-2SH-EX5  1NO+1NC FA 4611-2SH-EX5  1NO+1NC	FA 4512-2SH-EX5  1NO+1NC FA 4612-2SH-EX5  1NO+1NC	FA 4513-2SH-EX5  1NO+1NC FA 4613-2SH-EX5  1NO+1NC	FA 4515-2SH-EX5  1NO+1NC FA 4615-2SH-EX5  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  )	10 N (25 N  )	10 N (25 N  )	10 N (25 N  )
Travel diagrams	page 7/7 - group 1	page 7/7 - group 1	page 7/7 - group 1	page 7/7 - group 1

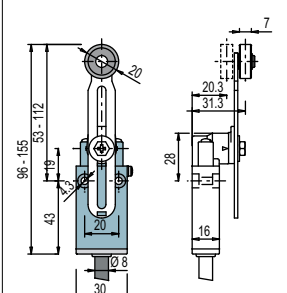
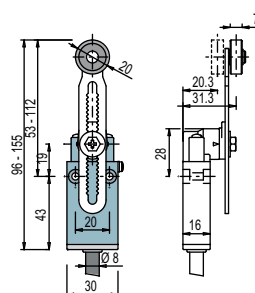
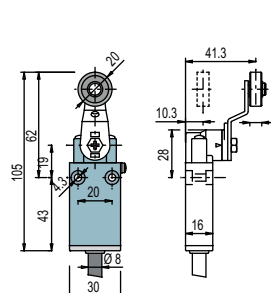
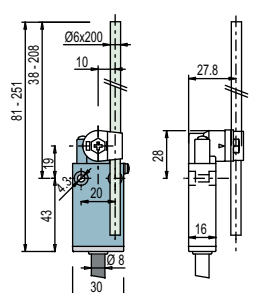
	Ø 12 mm stainless steel roller 	With external rubber gasket 	With external rubber gasket 	With Ø 20 mm stainless steel roller on request 
Contact blocks	FA 4517-2SH-EX5  1NO+1NC FA 4617-2SH-EX5  1NO+1NC	FA 4520-2SH-EX5 1NO+1NC	FA 4525-2SH-EX5 1NO+1NC	FA 4530-2SH-EX5  1NO+1NC FA 4630-2SH-EX5  1NO+1NC
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  )	0,03 Nm	0,06 Nm	0,03 Nm (0,25 Nm  )
Travel diagrams	page 7/7 - group 1	page 7/7 - group 3	page 7/7 - group 3	page 7/7 - group 4

Code	Approvals	Category	Zone	EPL
-EX5	 II 3D Ex tc IIIC T80°C Dc	3D	22	Dc
	 II 3G Ex nC IICT6 Gc	3G	2	Gc

All measures in drawings are in mm

Type of contacts:	On demand with stainless steel roller	Square rod 3x3 mm		On demand with stainless steel roller
<b>R</b> = snap action <b>L</b> = slow action				
Contact blocks 45 <b>R</b> 46 <b>L</b>	<b>FA 4531-2SH-EX5</b> $\ominus$ 1NO+1NC <b>FA 4631-2SH-EX5</b> $\ominus$ 1NO+1NC	<b>FA 4533-2SH-EX5</b> 1NO+1NC <b>FA 4633-2SH-EX5</b> 1NO+1NC	<b>FA 4534-2SH-EX5</b> 1NO+1NC <b>FA 4634-2SH-EX5</b> 1NO+1NC	<b>FA 4540-2SH-EX5</b> $\ominus$ 1NO+1NC <b>FA 4640-2SH-EX5</b> $\ominus$ 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 $\ominus$ )	0,03 Nm	0,03 Nm	0,03 Nm (0,25 Nm $\ominus$ )
Travel diagrams	page 7/7 - group 4	page 7/7 - group 4	page 7/7 - group 4	page 7/7 - group 4

	Stainless steel round rod 3 mm	On demand with stainless steel roller	On demand with stainless steel roller	On demand with stainless steel roller
				
Contact blocks 45 <b>R</b> 46 <b>L</b>	<b>FA 4550-2SH-EX5</b> 1NO+1NC <b>FA 4650-2SH-EX5</b> 1NO+1NC	<b>FA 4551-2SH-EX5</b> $\ominus$ 1NO+1NC <b>FA 4651-2SH-EX5</b> $\ominus$ 1NO+1NC	<b>FA 4552-2SH-EX5</b> $\ominus$ 1NO+1NC <b>FA 4652-2SH-EX5</b> $\ominus$ 1NO+1NC	<b>FA 4554-2SH-EX5</b> $\ominus$ 1NO+1NC <b>FA 4654-2SH-EX5</b> $\ominus$ 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 $\ominus$ )	0,03 Nm (0,25 Nm $\ominus$ )	0,03 Nm (0,25 Nm $\ominus$ )
Travel diagrams	page 7/7 - group 4	page 7/7 - group 4	page 7/7 - group 4	page 7/7 - group 4

	On demand with stainless steel roller	On demand with stainless steel roller	On demand with stainless steel roller	Fiber glass rod
				
Contact blocks 45 <b>R</b> 46 <b>L</b>	<b>FA 4555-2SH-EX5</b> $\ominus$ 1NO+1NC <b>FA 4655-2SH-EX5</b> $\ominus$ 1NO+1NC	<b>FA 4556-2SH-EX5</b> $\ominus$ 1NO+1NC <b>FA 4656-2SH-EX5</b> $\ominus$ 1NO+1NC	<b>FA 4557-2SH-EX5</b> $\ominus$ 1NO+1NC <b>FA 4657-2SH-EX5</b> $\ominus$ 1NO+1NC	<b>FA 4569-2SH-EX5</b> 1NO+1NC <b>FA 4669-2SH-EX5</b> 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 $\ominus$ )	0,03 Nm (0,25 Nm $\ominus$ )	0,03 Nm (0,25 Nm $\ominus$ )	0,03 Nm
Travel diagrams	page 7/7 - group 4	page 7/7 - group 4	page 7/7 - group 4	page 7/7 - group 4

Code	Approvals	Category	Zone	EPL
-EX5		3D	22	Dc
		3G	2	Gc

<sup>(1)</sup> Positive opening with lever adjusted on the max  
 General Catalog 2013-2014





### 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:



 II 3D Ex tc IIIC T80°C Dc

### Technical data

#### Housing

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

IP67 according to EN 60529 with cable gland having equal or higher protection degree

#### General data

Ambient temperature: from -20°C to +70°C  
Max actuation frequency: 3600 operations cycles<sup>1</sup>/hour  
Mechanical endurance F•••••-EX•: 10 million operations cycles<sup>1</sup>  
Mechanical endurance F•••93-EX•: 500.000 operations cycles<sup>1</sup>  
Mechanical endurance F•••99-EX•, F•••R2-EX•: 250.000 operations cycles<sup>1</sup>  
Mechanical endurance F•••95-EX•: 500.000 operations cycles<sup>1</sup>  
Mechanical endurance F•••78-EX•, F•••8•-EX•: 500.000 operations cycles<sup>1</sup>  
Assembling position: any  
Driving torque for installation: see pages 7/1-7/12  
(1) One operation cycle means two movements, one to close and one to open contacts, as foreseen by EN 60947-5-1 standard.

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

Contact blocks 20, 28:	min.	1 x 0,34 mm <sup>2</sup>	(1 x AWG 22)
	max.	2 x 1,5 mm <sup>2</sup>	(2 x AWG 16)
Contact blocks 5, 6, 18:	min.	1 x 0,5 mm <sup>2</sup>	(1 x AWG 20)
	max.	2 x 2,5 mm <sup>2</sup>	(2 x AWG 14)
Contact block 2:	min.	1 x 0,5 mm <sup>2</sup>	(1 x AWG 20)
	max.	2 x 1,5 mm <sup>2</sup>	(2 x AWG 16)

#### In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, EN 50041, IEC 60204-1, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2, IEC 60529, EN 60529, NFC 63-140, VDE 0660-200, VDE 0113, IEC 60079-0, EN 60079-0, IEC 60079-31, EN 60079-31.


#### 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 7/4. 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 7/1 to page 7/12.**

Category	Zone	EPL	Approvals	Article code extension	
<b>3D</b>	<b>22</b>	<b>Dc</b>	 II 3D Ex tc IIIC T80°C Dc	<b>-EX4</b>	
<b>Electrical data</b>					<b>Utilization categories</b>
Thermal current (I <sub>th</sub> ):	10 A				Alternate current: AC15 (50-60 Hz)
Rated insulation voltage (U <sub>i</sub> ):	500 Vac 600 Vdc				U <sub>e</sub> (V) 250 400 500
	400 V <sub>ac</sub> for contact blocks 20, 28				I <sub>e</sub> (A) 6 4 1
Conditional short circuit current:	1000 A according to EN 60947-5-1				Direct current: dc13
Protection against short circuits:	fuse 10 A 500 V type aM				U <sub>e</sub> (V) 24 125 250
Pollution degree:	3				I <sub>e</sub> (A) 6 1,1 0,4
 <b>For the correct utilization of the limit switch please use cable glands suitable for the zone according to the ATEX directive</b>					



Quality marks of the product:



Approvals UL: E131787

Data type approved by UL

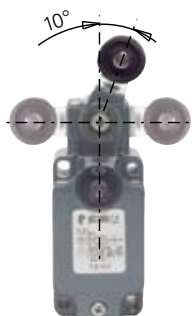
Utilization categories Q300 (69 VA, 125-250 Vdc) A600 (720 VA, 120-600 Vac) Data of the housing type 1, 4X "indoor use only", 12, 13 For all contact blocks except 2 and 3 use 60 or 75 °C copper (Cu) conductor and wire size No. 12-14 AWG. Terminal tightening torque of 7,1 lb in (0,8 Nm). For contact blocks 2 and 3 use 60 or 75 °C copper (Cu) conductor and wire size No. 14 AWG. Terminal tightening torque of 12 lb in (1.4 Nm).

In conformity with standard: UL 508

Please contact our technical service for the list of 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.



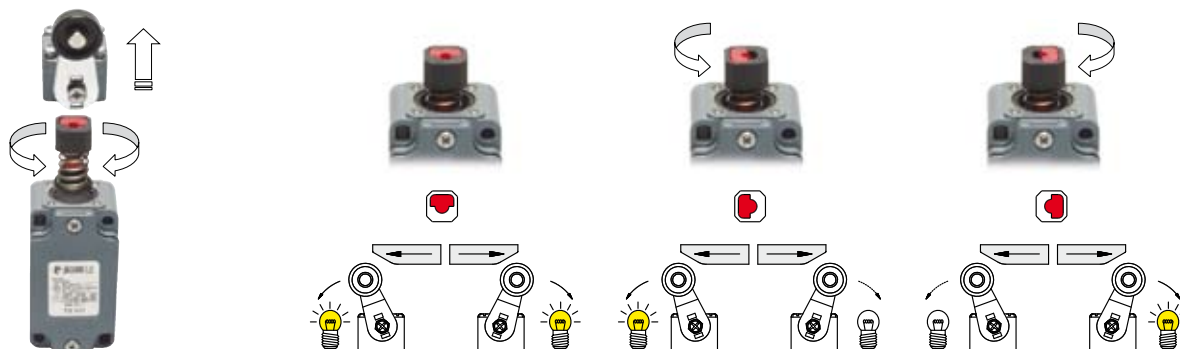
Rotating heads

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

Table with 2 columns: Contact blocks, and 2 rows of specifications (5, 6, 18, 20, 2).

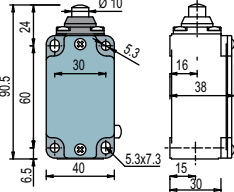
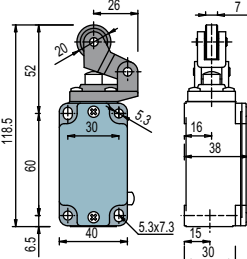
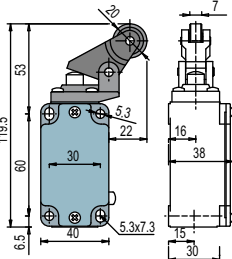
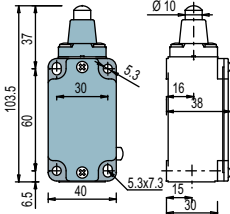
Table with 2 columns: Actuators, and 3 rows of specifications (01, 02, ...).

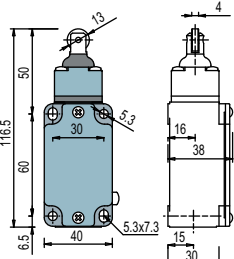
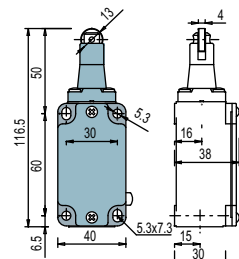
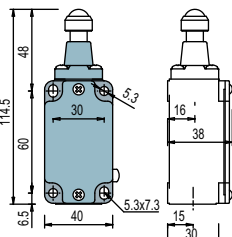
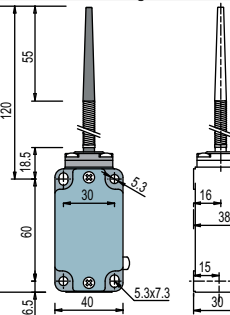
ATEX approvals
-EX4 II 3D Ex tc IIIC T80°C Dc

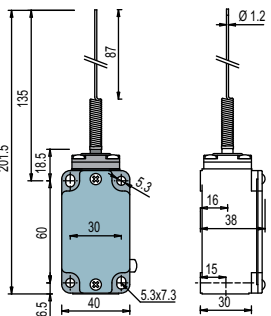
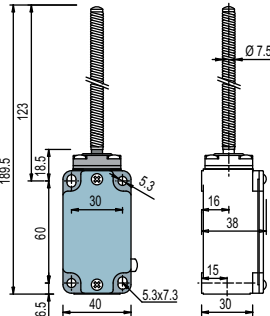
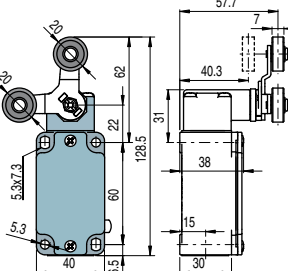
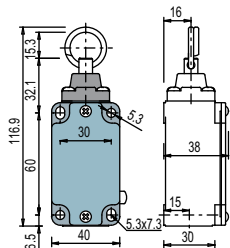
Threaded conduit entry
M2 M20x1,5


Table with 2 columns: Type of contacts, and 2 rows of specifications (silver contacts, G).

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

		On demand with stainless steel roller	On demand with stainless steel roller	
				
				
Contact blocks				
5 <b>R</b>	FD 501-M2-EX4	FD 502-M2-EX4	FD 505-M2-EX4	FD 511-M2-EX4
	1NO+1NC	1NO+1NC	1NO+1NC	1NO+1NC
6 <b>L</b>	FD 601-M2-EX4	FD 602-M2-EX4	FD 605-M2-EX4	FD 611-M2-EX4
	1NO+1NC	1NO+1NC	1NO+1NC	1NO+1NC
20 <b>L</b>	FD 2001-M2-EX4	FD 2002-M2-EX4	FD 2005-M2-EX4	FD 2011-M2-EX4
	1NO+2NC	1NO+2NC	1NO+2NC	1NO+2NC
2 <b>R</b>	FD 201-M2-EX4	FD 202-M2-EX4	FD 205-M2-EX4	FD 211-M2-EX4
	2x(1NO-1NC)	2x(1NO-1NC)	2x(1NO-1NC)	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 $\ominus$ )	6 N (25 N $\ominus$ )	6 N (25 N $\ominus$ )	8 N (25 N $\ominus$ )
Travel diagrams	page 7/4 - group 1	page 7/4 - group 2	page 7/4 - group 2	page 7/4 - group 1

	With external rubber gasket		$\varnothing$ 12.7 stainless steel sphere	With external rubber gasket
				
Contact blocks				
5 <b>R</b>	FD 515-M2-EX4	FD 516-M2-EX4	FD 519-M2-EX4	FD 520-M2-EX4
	1NO+1NC	1NO+1NC	1NO+1NC	1NO+1NC
6 <b>L</b>	FD 615-M2-EX4	FD 616-M2-EX4	FD 619-M2-EX4	
	1NO+1NC	1NO+1NC	1NO+1NC	
20 <b>L</b>	FD 2015-M2-EX4	FD 2016-M2-EX4	FD 2019-M2-EX4	FD 2020-M2-EX4
	1NO+2NC	1NO+2NC	1NO+2NC	1NO+2NC
2 <b>R</b>	FD 215-M2-EX4	FD 216-M2-EX4	FD 219-M2-EX4	FD 220-M2-EX4
	2x(1NO-1NC)	2x(1NO-1NC)	2x(1NO-1NC)	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 $\ominus$ )	8 N (25 N $\ominus$ )	8 N (25 N $\ominus$ )	0,09 Nm
Travel diagrams	page 7/4 - group 1	page 7/4 - group 1	page 7/4 - group 1	page 7/4 - group 3

	With external rubber gasket	With external rubber gasket	With two stable positions	With rope for signalling
				
Contact blocks				
5 <b>R</b>	FD 521-M2-EX4	FD 525-M2-EX4	FD 541-M2-EX4	FD 576-M2-EX4
	1NO+1NC	1NO+1NC	1NO+1NC	1NO+1NC
6 <b>L</b>				FD 676-M2-EX4
				1NO+1NC
20 <b>L</b>	FD 2021-M2-EX4	FD 2025-M2-EX4		FD 2076-M2-EX4
	1NO+2NC	1NO+2NC		2NO+1NC
2 <b>R</b>	FD 221-M2-EX4	FD 225-M2-EX4		FD 276-M2-EX4
	2x(1NO-1NC)	2x(1NO-1NC)		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 (0,36 Nm $\ominus$ )	initial 20 N - final 40 N
Travel diagrams	page 7/4 - group 3	page 7/4 - group 3	page 7/4 - group 4	page 7/4 - group 6

Code	Approvals	Category	Zone	EPL
-EX4 	II 3D Ex tc IIIC T80°C Dc	3D	22	Dc

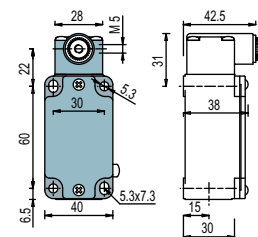


### Position switches without actuator

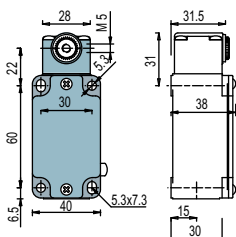
Type of contacts:

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

Regular head



Compact head



### IMPORTANT

**For safety applications:** join only switches and actuators marked with symbol .  
For more information about safety applications see page 7/1.

Contact blocks

5	<b>R</b>	FD 538-M2-EX4	1NO+1NC	FD 558-M2-EX4	1NO+1NC
6	<b>L</b>	FD 638-M2-EX4	1NO+1NC	FD 658-M2-EX4	1NO+1NC
20	<b>L</b>	FD 2038-M2-EX4	1NO+2NC	FD 2058-M2-EX4	1NO+2NC
2	<b>R</b>	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 )	
Travel diagrams		page 7/4 - group 1		page 7/4 - group 1	

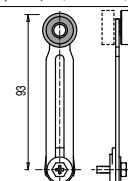
### Loose actuators

**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	Adjustable fiber glass rod
Article	VF L31	VF L32 <sup>(2)</sup>	VF L33 <sup>(2)</sup>	VF L34	VF L35 <sup>(1) (2)</sup>	VF L36 <sup>(2)</sup>
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 <sup>(2)</sup>	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 <sup>(1) (2)</sup>	VF L51-1	VF L52-1	VF L56-1 <sup>(2)</sup>	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)

- <sup>(1)</sup> 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.


- <sup>(2)</sup> 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.

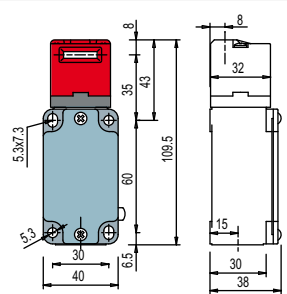
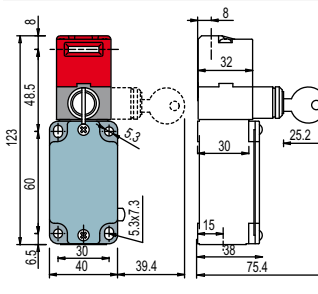
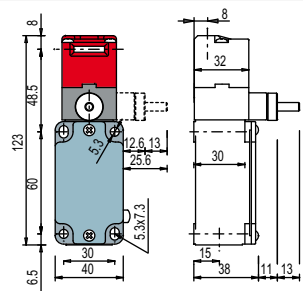
















Code	Approvals	Category	Zone	EPL
-EX4	II 3D Ex tc IICT80°C Dc	3D	22	Dc

**Safety switches with separate actuator**

Type of contacts:

 = slow action

	Switches with separate actuator	Switches with separate actuator with lock	Switches with manual mechanical delay
	Switches without actuator 	Switches without actuator 	Switches without actuator 
Contact blocks			
6 	FD 693-M2-EX4  1NO+1NC	FD 1899-M2-EX4  1NO+1NC	FD 6R2-M2-EX4  1NO+1NC
18 	FD 2093-M2-EX4  1NO+2NC	FD 2099-M2-EX4  1NO+2NC	FD 20R2-M2-EX4  1NO+2NC
20 		FD 2899-M2-EX4  1NO+2NC	
28 			
Min. force	10 N (18 N  )	30 N (40 N  )	10 N (18 N  )
Travel diagrams	page 4/7	page 4/107	page 4/101

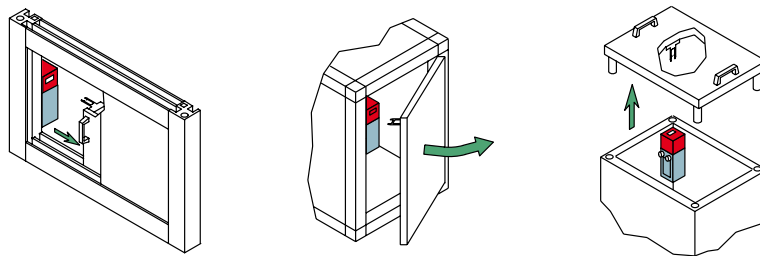
**Actuators**



VF KEY	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 693-M2-EX4).

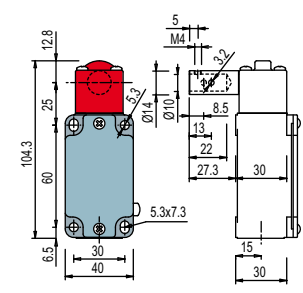





Application examples



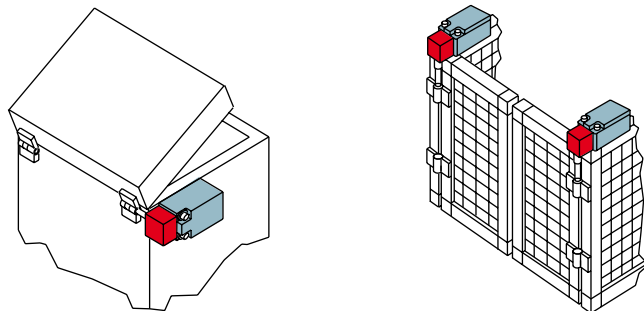
**Hinge operating safety switches**


Type of contacts:

 = slow action

		
Contact blocks		
18 	FD 1895-M2-EX4  1NO+1NC	
20 	FD 2095-M2-EX4  1NO+2NC	
Min. force	0,15 Nm (0,4 Nm  )	
Travel diagrams	page 4/57	

Application examples



Code	Approvals	Category	Zone	EPL
-EX4 	II 3D Ex tc IIIC T80°C Dc	3D	22	Dc

## Rope safety switches for emergency stop

Type of contacts:

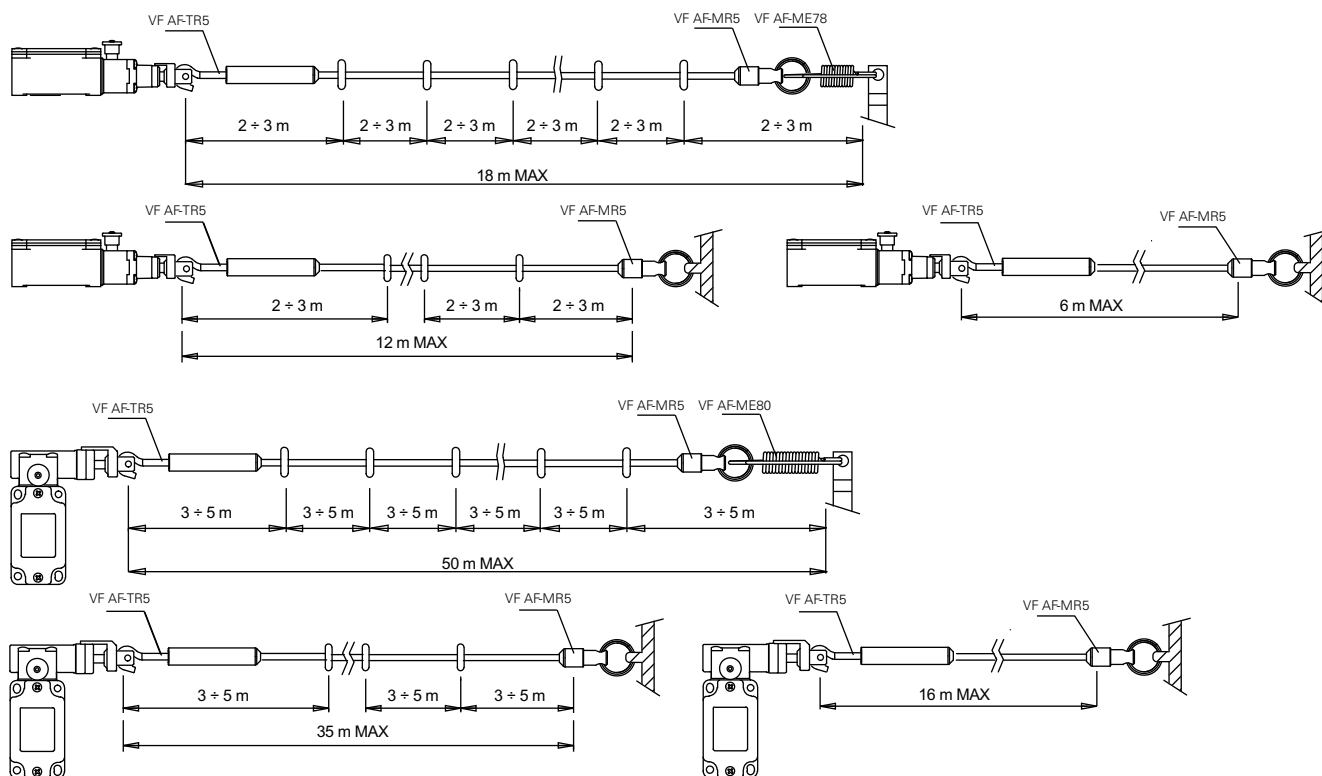
**L** = slow action

Contact blocks			
18 <b>L</b>	FD 1878-M2-EX4	FD 1883-M2-EX4	FD 1884-M2-EX4
20 <b>L</b>	FD 2078-M2-EX4	FD 2083-M2-EX4	FD 2084-M2-EX4
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
Travel diagrams	page 4/124 - group 1	page 4/124 - group 2	page 4/124 - group 2

## 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 in stainless steel	Angular pulley in stainless steel

## Application examples and max rope length



Code	Approvals	Category	Zone	EPL
-EX4	II 3D Ex tc IIICT80°C Dc	3D	22	Dc

Further information on rope switch accessories are available on page 4/135.




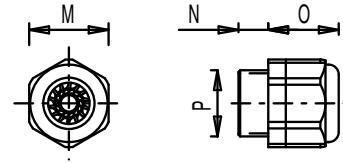
**Polymer ATEX cable gland**


1 pc packs



**Technical data:**

ATEX approval:  II 2G 1D Ex e II tD A20 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

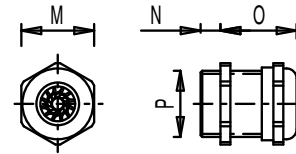
**Metal ATEX cable gland**

1 pc packs



**Technical data:**

ATEX approval:  II 2G Ex e II  
 II 1D Ex tD A20 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	KEMA 99ATEX6971 X	24	9	24	M20x1,5

