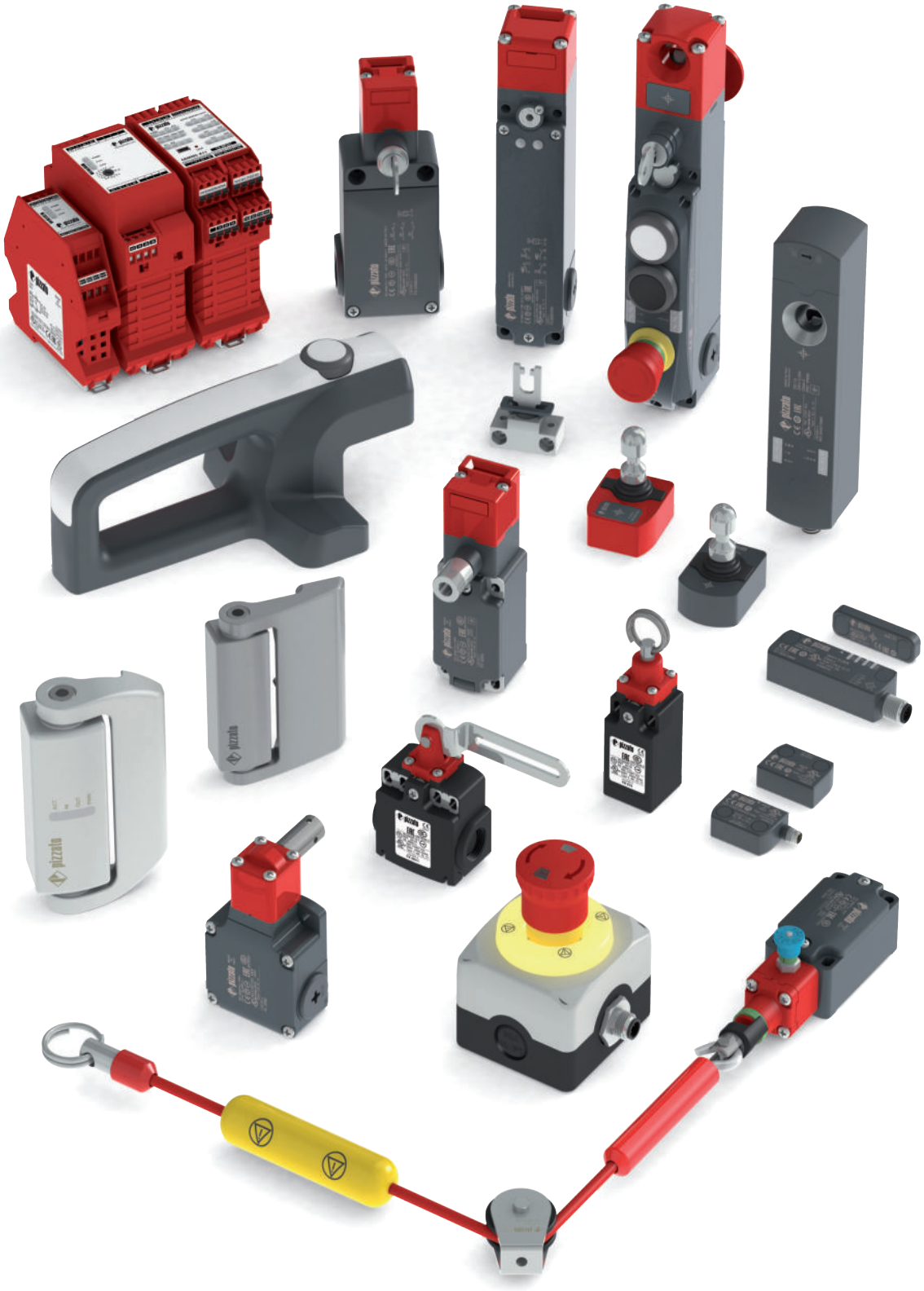
pizzato

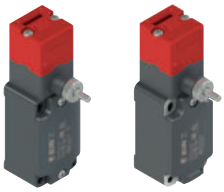
2019-2020

General Catalogue Safety

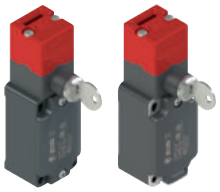


Index General Catalogue Safety

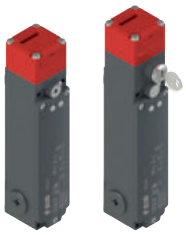
6 Safety switches with separate actuator with lock



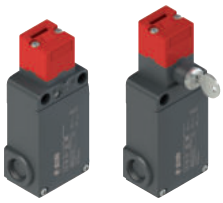
With manual mechanical delay
▶ 91



With key release
▶ 99

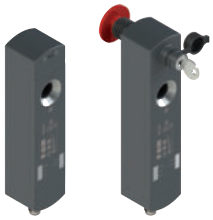


FG series
▶ 107



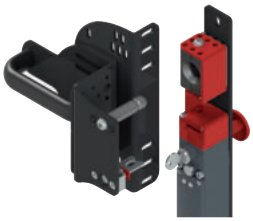
FS series
▶ 121

With RFID technology NG series
▶ 131



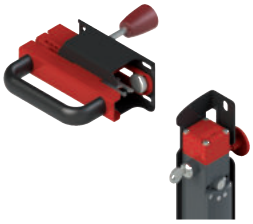
With RFID technology NS series
▶ 145

7 Safety handles P-KUBE

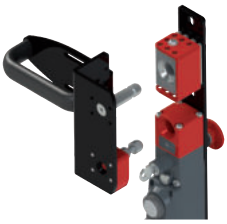


P-KUBE 1 for FD - FG series
▶ 159

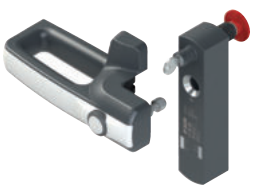
P-KUBE 2 for NG series
▶ 165



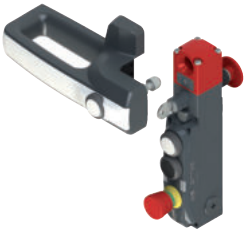
P-KUBE Fast for FD - FG series
▶ 171



P-KUBE Super for NG series
▶ 175



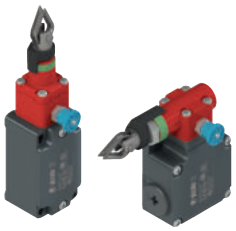
P-KUBE Krome for NS series
▶ 179

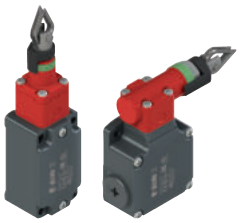


P-KUBE Krome for NG series
▶ 179

Index General Catalogue Safety

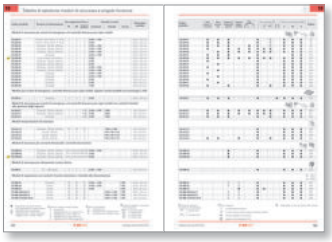
8 Safety rope switches





9 Housings complete with emergency stop buttons

10 Single-function safety modules



10D Safety timers CS FS series

▶ 247

10E For two-hand controls or synchronism monitoring CS DM series

▶ 255

10F For motor standstill monitoring CS AM series

▶ 261

10G Expansion modules with output contacts CS ME series

▶ 263

10 Multifunction safety modules

10H Programmable multifunction modules CS MP series

▶ 277

10I Pre-programmed multifunction modules CS MF series

▶ 305

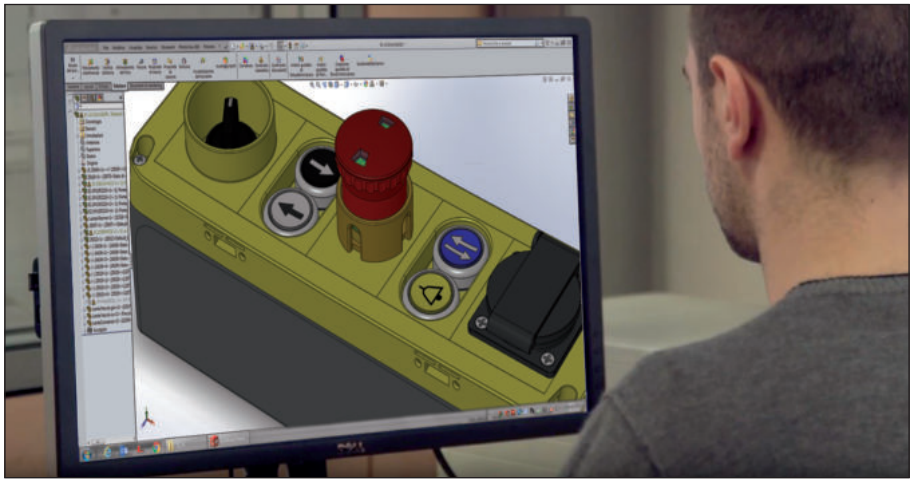
11 Accessories

▶ 321

12 Appendix

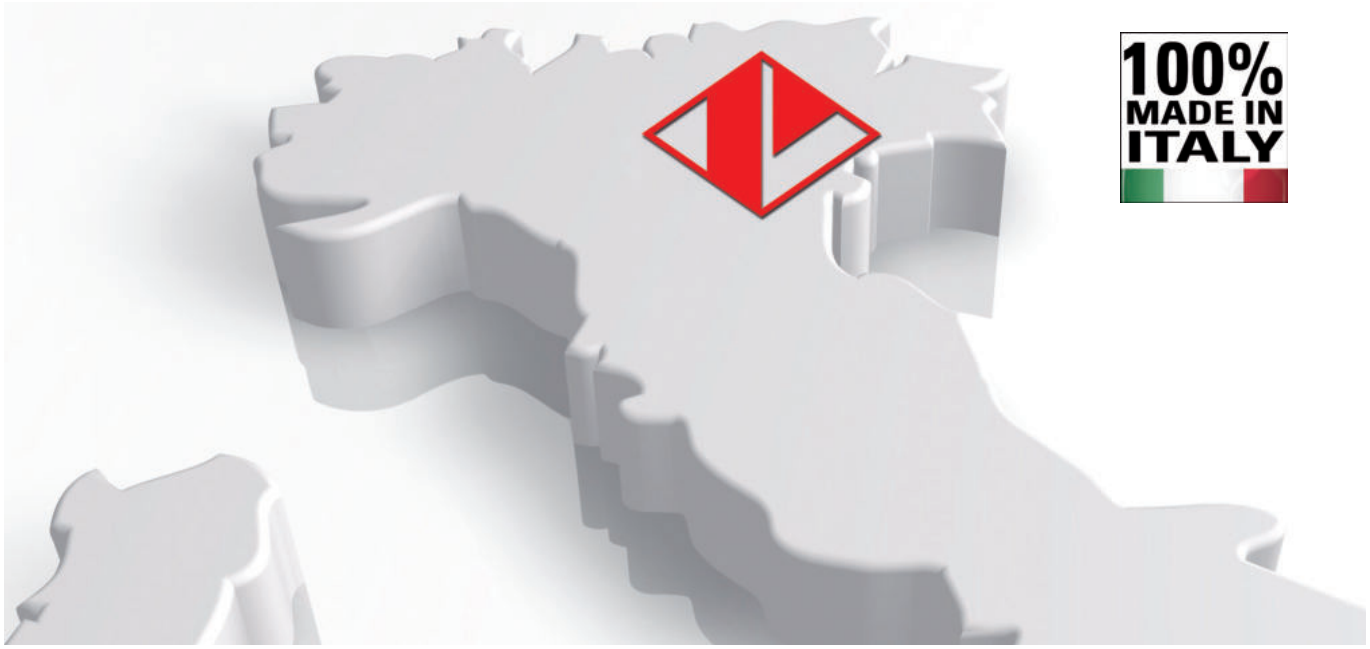
MORE THAN 250 PROFESSIONALS WITH PASSION

It is people, with their professionalism and dedication that make a great company. This profound conviction has always guided Pizzato Elettrica in their choice of employees and partners. Today, Giuseppe and Marco Pizzato lead a tireless team providing the fastest and most efficient response to the demands of the market. This team has grown over the last 10 years and has achieved a considerable increase in sales in all the countries where Pizzato Elettrica is present.



The various strategic sectors of the business are headed by professionals with significant experience and expertise. Many of these people have developed over years with the company. Others are experts in their specific field and have integrated personal experience with the Pizzato Elettrica ethos to extend the company's capability and knowledge.

From the design office to the technical assistance department, from managers to workers, every employee believes in the company and its future. Pizzato Elettrica employees all give the best of themselves secure in the knowledge they are the fundamental elements of a highly valuable enterprise.



100% MADE IN ITALY

Pizzato Elettrica is one of the leading European manufacturers of position switches, microswitches, safety devices, safety modules, foot switches, control and signalling devices, and devices for elevators.
An entrepreneurial company such as Pizzato Elettrica bases its foundations on a solid and widely shared value system. The pillars that form the basis of the company's work have remained constant, and constitute the fundamental guiding principles for all company activities.

PASSION FOR QUALITY

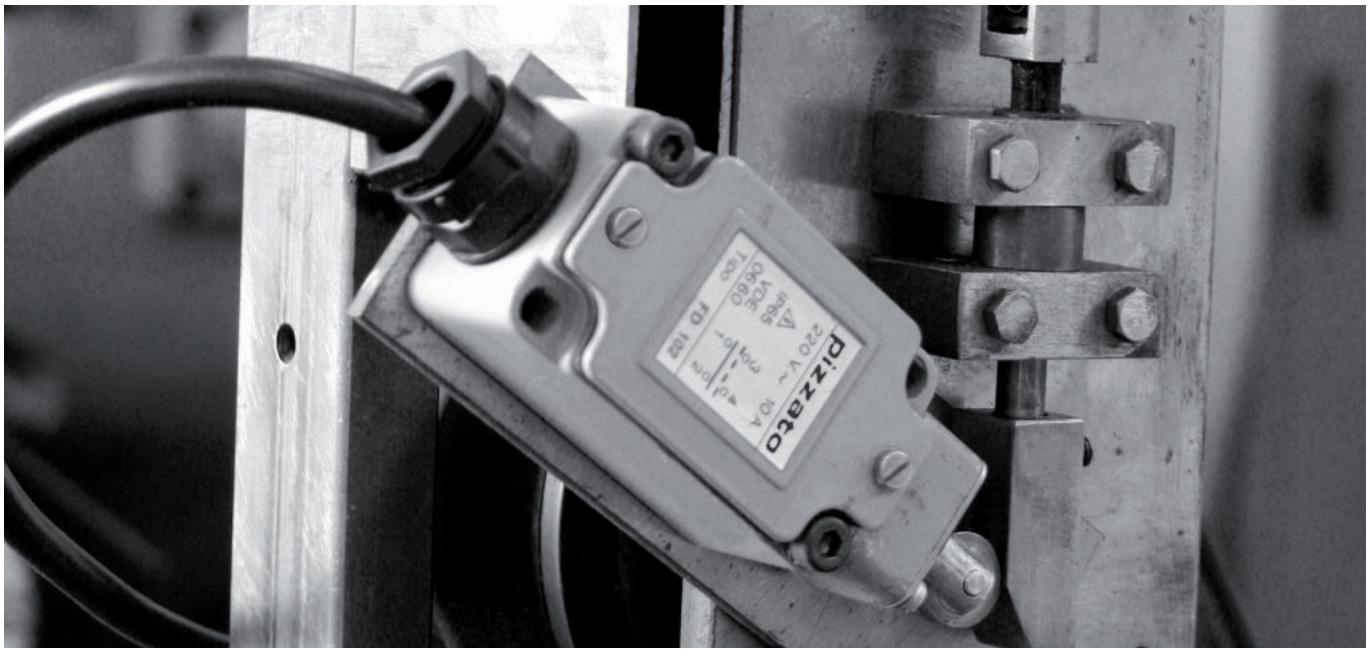
Passion for product quality, orientation towards excellence, innovation, and continuous development, represent the key principles of Pizzato Elettrica's everyday work.
Anyone using Pizzato Elettrica's products does so in the certainty that these devices are of certified quality, since they are the result of a process that is scrupulously controlled at every stage of the production.
The company's goal is to offer the market safe, reliable, and innovative solutions.

CARE FOR THE CUSTOMER

In order to be successful, a product must respond to the specific needs of those who will use it. Market developments must be carefully monitored in order to understand, in advance, which new applications will prove themselves truly useful. This is why Pizzato Elettrica has always cultivated close synergies with the companies that have chosen it as a supplier, using this continuous dialogue to identify the potential developments of the own product range in order to make it highly flexible, complete and capable to respond to the most diverse needs.

100% MADE IN ITALY

All Pizzato Elettrica products are designed, developed, and tested entirely at the company plants in Marostica, in the province of Vicenza in Italy. The company is thus able to meet specific customer requirements at all times, by offering a comprehensive range of products and technologically advanced solutions.



1984: AN ENTREPRENEURIAL STORY BEGINS

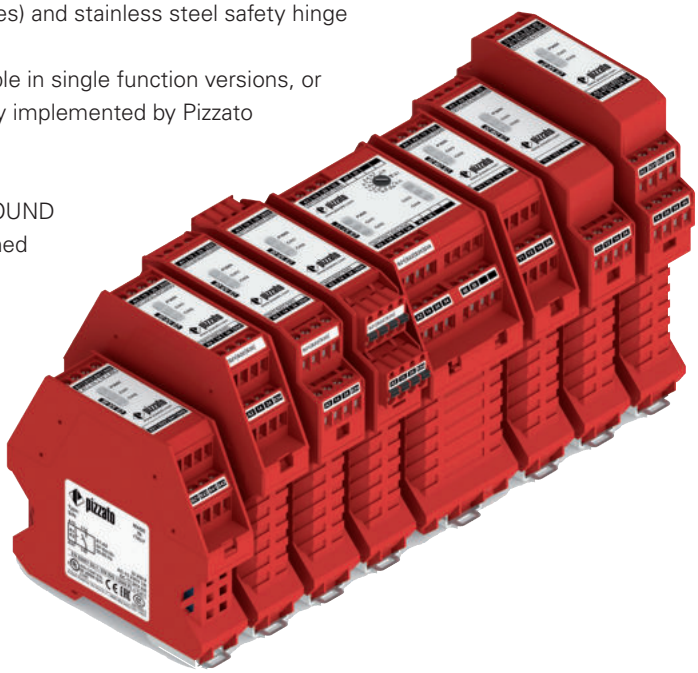
1984
The company Pizzato di Pizzato B. & C. snc. manufacturer of position switches is founded.
1988
The company becomes a limited liability partnership, and is renamed Pizzato Elettrica, a brand shortly destined to become renowned and valued nationwide. Also in the year 1988, the first company-owned plant geared towards mechanical processing was built. By the end of the decade, thanks to the development of quality products and the experience built on the Italian market, Pizzato Elettrica turns to the international market.
1995
Building of the second plant geared towards the moulding of plastic materials. Development of the position switch range continues in parallel. Start of significant years in terms of safety devices planning. The safety sector becomes a key sector to the company.
1998
Construction of the third plant, housing the assembly department.
2002
New millennium starts with quality certifications: achievement of the ISO 9001:2000 certification. Launching of the first safety modules. Construction of the new headquarters and logistics site; currently the company head office. Continued expansion of the industrial safety and automation product range.
2007
Pizzato Elettrica faces its first generational change: Giuseppe and Marco Pizzato take over the company directorship.
2010
Extension of Pizzato Elettrica product portfolio, with the launch of the innovative EROUND line consisting of control and signalling devices. This product range accompanies position switches and safety devices, thus offering complete solutions to customers.
2012
Introduction of Gemnis Studio, the first software produced by Pizzato Elettrica. A graphic development environment for the creation, simulation, and debugging of programs that can be integrated in the Gemnis line modules.
2013
Foundation of first subsidiary of Pizzato Elettrica, Pizzato Deutschland GmbH, in Germany.
2014
A new production facility dedicated to switches and automatic machines is opened, spanning a surface area of 6000 m².
2016
Foundation of second subsidiary of Pizzato Elettrica, Pizzato France SARL, in France.
The new NS series of safety switches with electromagnets and RFID technology is introduced, fruit of the company's experience, spanning more than thirty years in the field of industrial safety. To date it is the state of the art in its industry.
2017
The company continues to expand and now includes an additional production facility, the new location of the offices in the sales network.
The company obtains quality certification in accordance with the most recent version of the ISO 9001 standard of 2015.
In Spain, the third Pizzato Elettrica subsidiary is founded: Pizzato Iberica SL.
2018
Foundation of fourth subsidiary of Pizzato Elettrica, Pizzato USA Inc, in the United States.
Today
Giuseppe and Marco Pizzato lead a company in constant growth in terms of new product launches, number of employees (more than 250 employees at present), turnover, and new markets. Pizzato Elettrica is continuing its new product internationalisation and development process.

86,000,000 PARTS SOLD WORLDWIDE

Pizzato Elettrica's product catalogue contains more than 7,000 articles, with more than 1,500 special codes developed for devices personalised according to clients' specific needs.
Pizzato Elettrica devices can be grouped, according to typology, into three main macro-categories:

• POSITION SWITCHES. Pizzato Elettrica position switches are daily installed in every type of industrial machinery all over the world for applications in the sector of wood, metal, plastic, automotive, packaging, lifting, medicinal, naval, etc.
In order to be used in a such wide variety of sectors and countries, Pizzato Elettrica position switches are made to be assembled in a lot of configurations thanks to the various body shapes, dozens of contact blocks, hundreds of actuators and materials, forces, assembling versions.
Pizzato Elettrica can offer one of the widest product range of position switches in the world. Moreover, the use of high quality materials, high reliability technologies (e.g. twin bridge contact blocks) as well as the IP67 protection degree make this range of position switches one of the most technologically evolved.

• SAFETY DEVICES. The company Pizzato Elettrica has been one of the first Italian companies developing dedicated items for this sector, creating and patenting dozens of innovative products, thus becoming one of the main European manufacturers of safety devices. The vast range of products aimed specifically at the safety of machinery, fully designed and assembled at the Marostica (VI) company premises, ranges from the more traditional safety switches with separate actuator (with or without locking mechanism), hinge switches, and safety handles, to the most modern anti-tampering devices with RFID technology (ST series sensors, NG and NS series locking devices) and stainless steel safety hinge switches with electronic contact block (HX series).
The product range is completed by CS series safety modules, available in single function versions, or user-programmable with the use of the Gemnis Studio software; fully implemented by Pizzato Elettrica and distributed with a free licence.



• MAN-MACHINE INTERFACE. Thanks to the introduction of the EROUND control and signalling devices, Pizzato Elettrica has remarkably widened its offer within the man-machine interface sector.

Thanks to the new design, the care for details and the elegance of the product combined with its maximum safety and reliability, this series is one of the most complete and cutting-edge on the market.

In order to satisfy its customers' needs and requests, Pizzato Elettrica offers a lot of accessories purposely designed not only to complete its wide range of products, but also to help device installation on machineries.

12 MILLION CERTIFIED PRODUCT CODES

A simple brand isn't enough: the company is aiming for the Pizzato Elettrica brand to be widely recognised as a synonym for absolute quality and certainty.

A result that has been reached and consolidated over the years, updating and expanding the series of certifications obtained from the most important Italian and international control organisations. Product quality is assessed by five accredited external bodies: IMQ, UL, CCC, TÜV SÜD, EAC. These bodies lay out high technical and qualitative standards for the company to achieve and maintain, verified yearly with several inspections: these are performed, without prior notice, by qualified inspectors, who extract samples of products and materials destined for sale from plants, or from the market directly, to subject them to apposite tests.

• CE MARK. All Pizzato Elettrica products bear the CE marking in conformity with the European Directives in force.

• ISO 9001 CERTIFICATION. The company's production system is compliant with the international ISO 9001 standard, in its most recent 2015 revision. The certification covers all of the company's plants and their production and managerial activities: entry checks, technical, purchasing and commercial department activities, manufacturing operations assessments, final pre-shipping product tests and checks, equipment reviews and the management of the metrological lab.
The Pizzato Elettrica quality management system ensures that all sensitive company processes – from component design to implementation, from materials provisioning to verification of non-compliant products – are carried out according to the procedures laid down, with the aim of providing our customers with continuously improved and reliable products.

• CERTIFICATION OF COMPANY QUALITY SYSTEMS. Pizzato Elettrica has obtained the certificate of compliance with the UNI EN ISO 9000 regulations in force in Italy and abroad. It is issued by a recognised independent body that guarantees the quality and reliability of the service offered to clients worldwide.

• CSQ, CISQ AND IQNET. The CSQ system is part of the CISQ (Italian Certification of Quality Systems) federation, which consists of the primary certification bodies operating in Italy in the various product sectors. CISQ is the Italian representative body within IQNet, the biggest international Quality Systems and Company Management certification network, which is adhered to by 25 certification organs in as many countries.

GLOBAL SUBSIDIARIES

The two-year period from 2017 - 2018 saw the birth of two new commercial subsidiaries: Pizzato Iberica SL and Pizzato USA Inc. In addition to the Spanish and American subsidiaries, the German subsidiary, Pizzato Deutschland GmbH, was founded in 2013, and the French subsidiary, Pizzato France Sarl, was founded in 2016.

The purpose of these subsidiaries is to coordinate and support the activities of representative agencies, or distributors, active in the various countries, providing the best possible management of marketing and commercial activities, with the ultimate aim of increasing brand visibility, and the penetration ability of Pizzato Elettrica products in markets considered strategic.

Products from Pizzato Elettrica are currently used in over 80 countries: The commercial support network, which is made up of local professional and experienced representatives, combined with the productive capacity of the headquarters in Italy, are the basis for the formation of a group that, together with its partners, has all the necessary requirements to become one of the most important companies in the field of automation and industrial safety.

TECHNICAL AND SALES ASSISTANCE

TECHNICAL DEPARTMENT

The Pizzato Elettrica technical department provides direct technical and qualified assistance in Italian and English, helping in this way the customers to choose the suitable product for their own application explaining the characteristics and the correct installation.

Office hours:	Monday to Friday 08 am - 12 pm / 02 pm - 06 pm CET
Telephone:	+39.0424.470.930
E-mail:	tech@pizzato.com
Spoken languages:	IT | EN

SALES DEPARTMENT

Among the strengths in the company relationship with the commercial network, the direct assistance guaranteed in five languages: Italian, English, French, German and Spanish. A service that confirms Pizzato Elettrica quality and attention to the needs of customers from around the world.

Office hours:	Monday to Friday 08 am - 12 pm / 02 pm - 06 pm CET
Telephone:	+39.0424.470.930
E-mail:	info@pizzato.com
Spoken languages:	IT | EN | DE | FR | ES

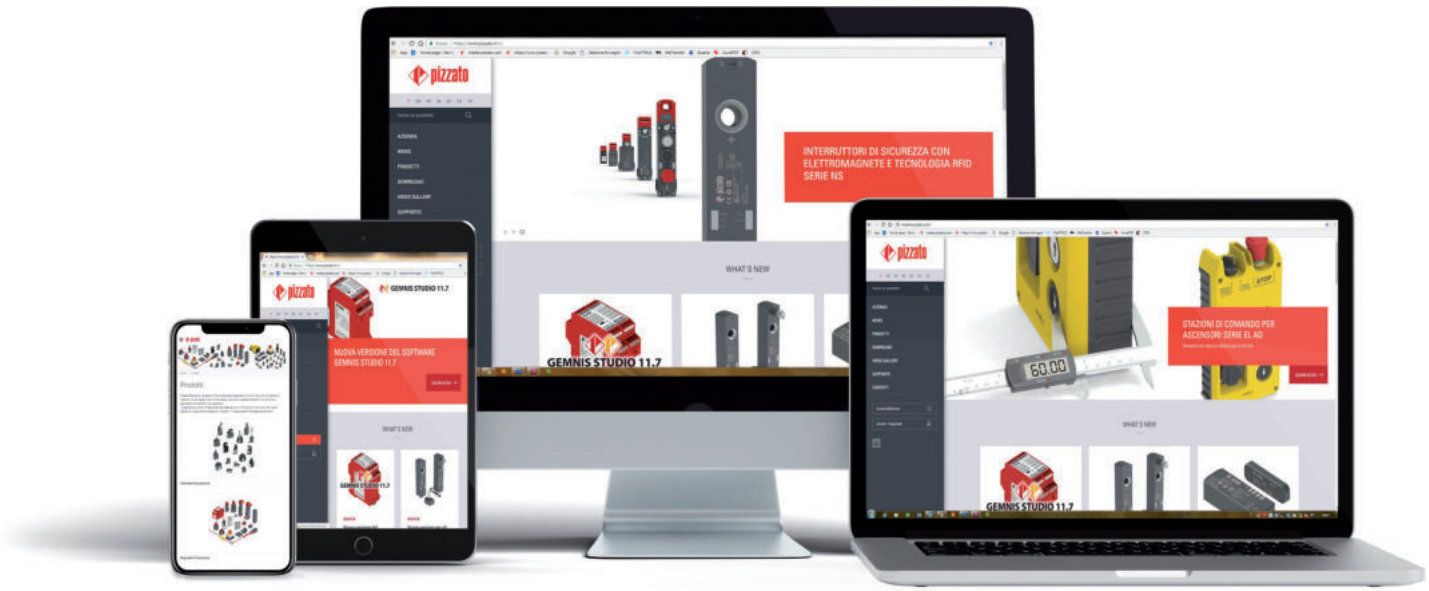
TRADE FAIRS AND EVENTS

TRADE FAIRS

Pizzato Elettrica regularly participate to many trade fairs in Italy and abroad, presenting in this way to the market the products, the latest news, etc.

EVENTS

Besides offering qualified technical assistance, Pizzato Elettrica presents itself as a dynamic partner who is attentive to the needs of its customers. For this reason, the company organises several meetings and training courses with particular attention to the regulatory aspect of machinery safety.



WEBSITE WWW.PIZZATO.COM

PRODUCT NEWS
Visit the website at www.pizzato.com to stay updated on all the news regarding product launches, to view the entire range of products created by Pizzato Elettrica, and to consult all the documentation provided.

SEARCH USING FILTERS
You can find the product you want by entering the relative item code, or use the filters provided to create the item most adapted to your particular requirements, by choosing the features it needs to offer.

BROWSABLE, DOWNLOADABLE CATALOGUE
Users can download the complete catalogue or alternatively browse it directly online, an extremely handy solution for those wishing to consult the range of products simply and rapidly.

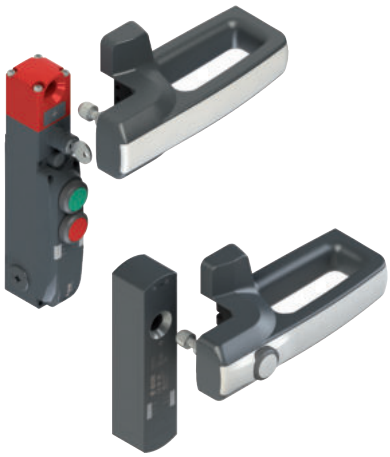
HIGH RESOLUTION IMAGES
The information provided for each product is complete with high resolution images to offer visitors to the website a clear, accurate view of the items in close detail, also offering them the possibility to zoom in and out on the image.

USAGE INSTRUCTIONS
You can download product usage or installation instructions, in PDF format, to your computer.

2D AND 3D FILES
2D and 3D drawings are available for every item; in formats that are compatible with the widest variety of drawing programs.

CERTIFICATES AND EC DECLARATIONS OF CONFORMITY
The latest product type approval certificates, and EC declarations of conformity in accordance with applicable European product directives, are published on the website.

LARGE VIDEO SECTION
The large video section of the website is capable of showcasing the main characteristics, functions and use of the various products.



P-KUBE Krome safety handles

- Compatible with NS and NG series RFID safety switches with lock
- System suitable for use with hinged and sliding doors, either with right or left closing
- Internal steel fixing plate, thickness 5 mm
- Versions with chrome-plated or illuminated grip
- Customizable multicolour lighting with RGB LED technology
- On request with push button or other integrated control device
- Protection caps on the holes of the fixing screws
- Modern and ergonomic design

▸ 179

P-KUBE Super safety handles

- Compatible with NG series RFID safety switches with lock
- Suitable for heavy-duty guards and heavy-duty work environments
- System suitable for use with hinged and sliding doors, either with right or left closing
- Dual centring pin
- Integrated lock out device
- Thanks to the slotted brackets the handle can be adjusted on 3 different axes
- Extremely robust painted metal brackets

▸ 175

LK S lock out device for NS series RFID safety switches with lock

- Made entirely of metal
- Fixing to the holes of the NS switch with only 2 tamper-proof screws
- Dual safety: mechanical closure of the actuator entry hole and shielding of the RFID signal
- Possibility of applying up to 5 padlocks
- Compatible with the new P-KUBE Krome handles

▸ 185

NS and NG series RFID safety switches with lock with mode 3

- 3 different actuation modes for safety outputs
- In mode 3 one safety output is active with inserted and locked actuator, the second safety output is active with inserted actuator
- Alternative solution to electromechanical devices, without the need to change the wiring and operating logic of existing machines
- TÜV and cULus approval

ST series
safety sensors with RFID technology

- SIL 3/PL e/category 4 with a single device
- Maximum PL e/SIL 3 safety level can be maintained with series connection of up to 32 devices
- Protection degrees IP67 and IP69K
- Two actuation distances: 12 mm and 20 mm
- New compact SM L•T actuators
- Version with EDM (External Device Monitoring)
- TÜV and cULus approval

▸ 39

CS MP series
programmable multifunction modules

- New module configurations available
- New models with 8 safety outputs
- New release 11.7.1.0 of the Gemnis Studio software:
  - SERIAL function block for communication with PLC
  - Program migration tool
  - Improved graphics

▸ 277

ECOLAB®

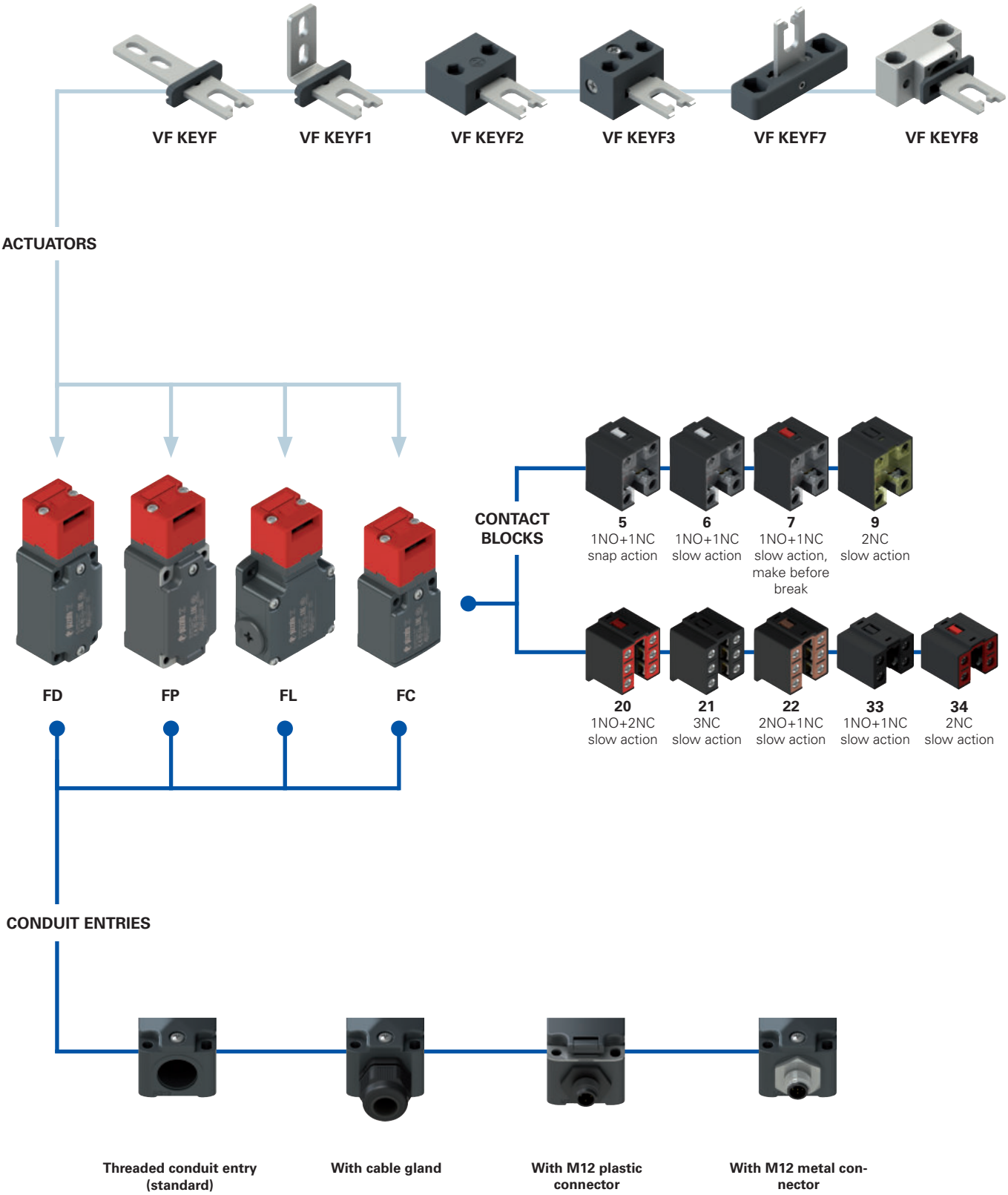
ECOLAB certification

The devices of the NG, NS and ST series are now ECOLAB-certified, i.e. resistant and chemically compatible with the hygiene and cleaning products commonly used in the food & beverage industry.
The results from immersion tests in detergents/disinfectants carried out in ECOLAB laboratories testify to the high quality and versatility of these products.

Stock items

As of the publication of the general catalogue 2019-2020, a list of items in stock will be available at www.pizzato.com

Selection diagram



product option

sold separately as accessory

Code structure

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

article | options | options

FD 693-F1GM2K50T6

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

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

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

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

Threaded conduit entry	
M2	M20x1.5 (standard)
	PG13.5

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

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

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

article | options | options

FC 3393-F1GM2K50T6

Housing	
FC	metal, one conduit entry

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

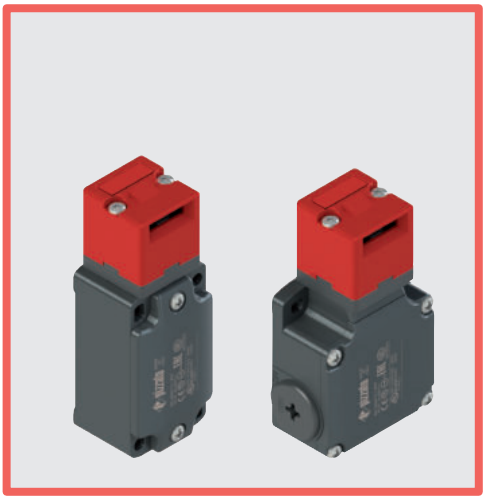
Actuators	
	without actuator (standard)
F	straight actuator VF KEYF
F1	angled actuator VF KEYF1
F2	jointed actuator VF KEYF2
F3	jointed actuator adjustable in two directions VF KEYF3
F7	jointed actuator adjustable in one direction VF KEYF7
F8	universal actuator VF KEYF8

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

Threaded conduit entry	
M2	M20x1.5 (standard)
	PG11

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

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



Main features

- Metal housing or technopolymer housing, from one to three conduit entries
- Protection degree IP67
- 9 contact blocks available
- 6 stainless steel actuators available
- Versions with M12 connector
- Versions with gold-plated silver contacts

Quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, coded:	type 2 acc. to EN ISO 14119
Coding level:	low acc. to EN ISO 14119
Safety parameter B_{10D}:	2,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Tightening torques for installation:	see page 339
Wire cross-sections and wire stripping lengths:	see page 357

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 50581, BG-GS-ET-15, UL 508, CSA 22.2 No.14
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14, GB/T14048.5-2017.

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

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

Electrical data

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

Utilization category

Alternating current: AC15 (50÷60 Hz)

U_e (V)	250	400	500
I_e (A)	6	4	1

Direct current: DC13

U_e (V)	24	125	250
I_e (A)	3	0.55	0.3

Alternating current: AC15 (50÷60 Hz)

U_e (V)	24	120	250
Ie (A)	4	4	4

Direct current: DC13

U_e (V)	24	125	250
I_e (A)	3	0.55	0.3

Alternating current: AC15 (50÷60 Hz)

U_e (V)	24
I_e (A)	2

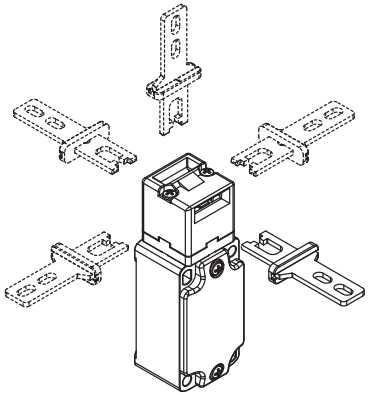
Direct current: DC13

U_e (V)	24
I_e (A)	2

Description

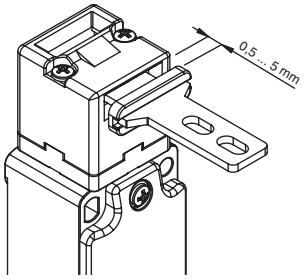
These safety switches are ideal for controlling gates, sliding doors and other guards which protect dangerous parts of machines without inertia.
The stainless steel actuator is fastened to the moving part of the guard in such a way that it is separated from the switch each time the guard is opened. A special mechanism ensures that removing the actuator forces the positive opening of the electrical contacts. Easy to install, these switches can be used with all types of guards (with hinge as well as sliding and removable types). The possibility to actuate the switch only with a specific actuator guarantees that the machine can be restarted only after the guard has been closed. These switches are made of robust materials with larger dimensions and are designed especially for heavy gates and harsh environments.

Head with variable orientation



For all switches, the head can be adjusted in 90° steps after removing the two fastening screws. In this way it is possible to actuate the switch from 5 different directions.

Wide-ranging actuator travel

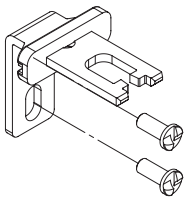


The actuation head of this switch features a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5 mm) without causing unwanted machine shutdowns. This wide range of travel is available in all actuators in order to ensure maximum device reliability.

Protection degree IP67

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

Safety screws for actuators



As required by EN ISO 14119, the actuator must be fixed immovably to the guard frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered by using common tools. See accessories on page 332.

Extended temperature range

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

Laser engraving

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

Features approved by IMQ

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

Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X
Positive opening contacts on contact blocks 5, 6, 7, 9, 20, 21, 22, 33, 34
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

Features approved by UL

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

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

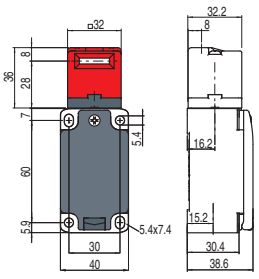
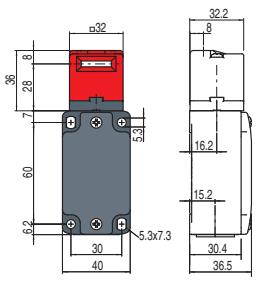
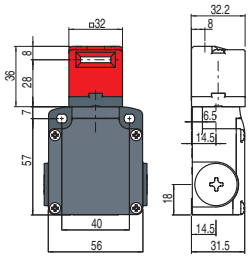
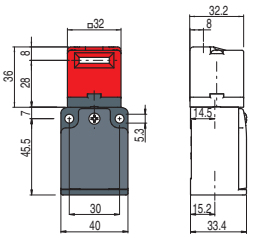
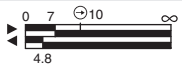
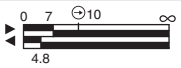
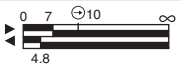
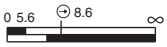
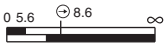
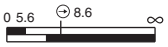
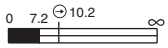
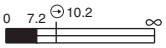
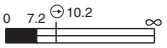
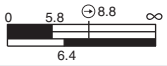
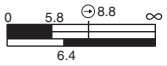
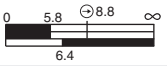
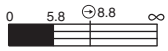
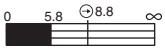
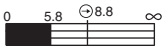
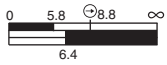
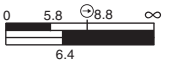
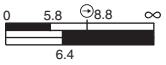
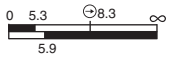
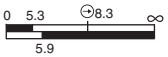
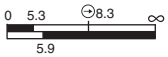
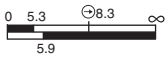
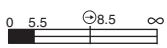
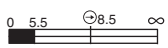
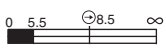
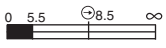
For FP series: the hub is to be connected to the conduit before the hub is connected to the enclosure.

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

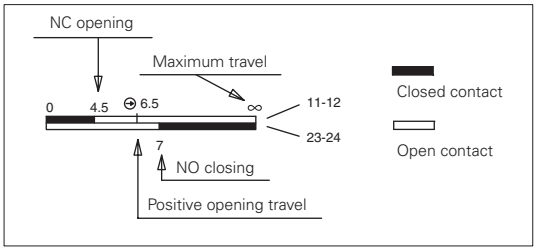
Safety switches **with separate actuator**

Contact type:

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

Contact blocks		Technopolymer housing Without actuator	Metal housing Without actuator	Metal housing Without actuator	Metal housing Without actuator
					
5	R	FP 593-M2 → 1NO+1NC	FD 593-M2 → 1NO+1NC	FL 593-M2 → 1NO+1NC	/
					
6	L	FP 693-M2 → 1NO+1NC	FD 693-M2 → 1NO+1NC	FL 693-M2 → 1NO+1NC	/
					
7	LO	FP 793-M2 → 1NO+1NC	FD 793-M2 → 1NO+1NC	FL 793-M2 → 1NO+1NC	/
					
9	L	FP 993-M2 → 2NC	FD 993-M2 → 2NC	FL 993-M2 → 2NC	/
					
20	L	FP 2093-M2 → 1NO+2NC	FD 2093-M2 → 1NO+2NC	FL 2093-M2 → 1NO+2NC	/
					
21	L	FP 2193-M2 → 3NC	FD 2193-M2 → 3NC	FL 2193-M2 → 3NC	/
					
22	L	FP 2293-M2 → 2NO+1NC	FD 2293-M2 → 2NO+1NC	FL 2293-M2 → 2NO+1NC	/
					
33	L	FP 3393-M2 → 1NO+1NC	FD 3393-M2 → 1NO+1NC	FL 3393-M2 → 1NO+1NC	FC 3393-M2 → 1NO+1NC
					
34	L	FP 3493-M2 → 2NC	FD 3493-M2 → 2NC	FL 3493-M2 → 2NC	FC 3493-M2 → 2NC
					
Actuating force		10 N (18 N →)	10 N (18 N →)	10 N (18 N →)	10 N (18 N →)

How to read travel diagrams



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

Limits of use

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

All values in the drawings are in mm

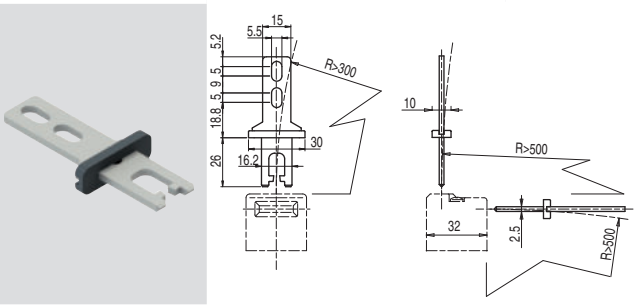
Accessories See page 321

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

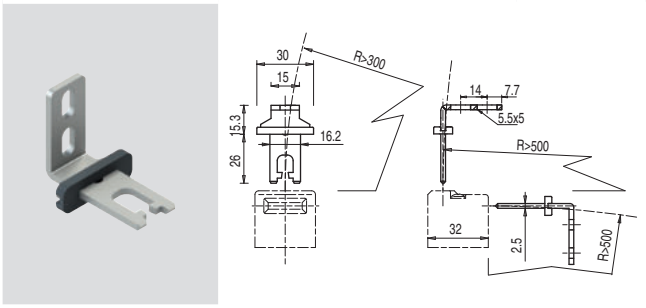
Stainless steel actuators

IMPORTANT: These actuators can be used only with items of the FD, FP, FL, FC and FS series (e.g. FD 693-M2).
Low level of coding acc. to EN ISO 14119.

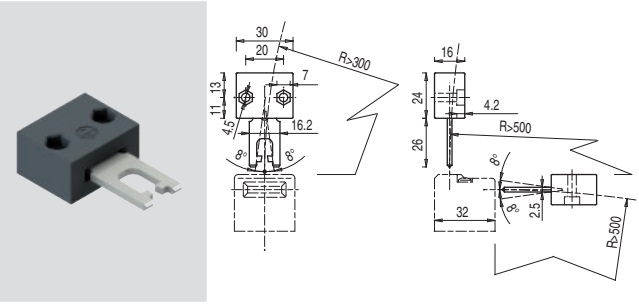
Article	Description
VF KEYF	Straight actuator



Article	Description
VF KEYF1	Angled actuator

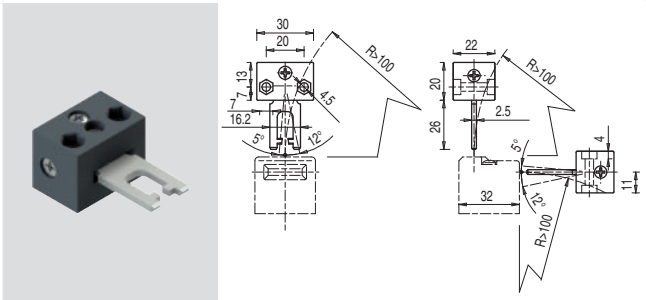


Article	Description
VF KEYF2	Jointed actuator



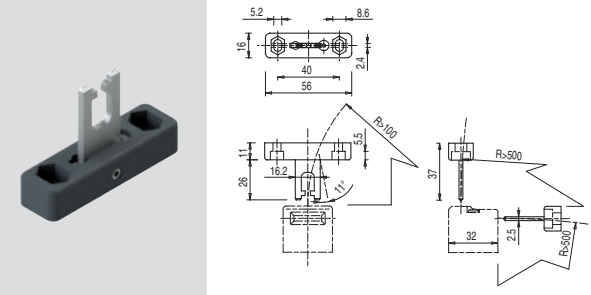
The actuator can flex in four directions for applications where the guard alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions



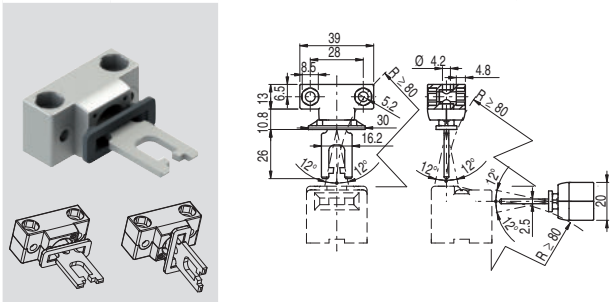
Actuator adjustable in two directions for guards with reduced dimensions.

Article	Description
VF KEYF7	Actuator adjustable in one direction



Actuator adjustable in one direction for guards with reduced dimensions.

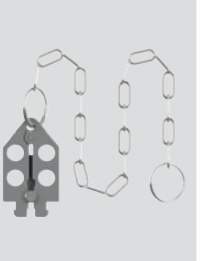
Article	Description
VF KEYF8	Universal actuator



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

Accessories

Article	Description
VF KB1	Lock out device



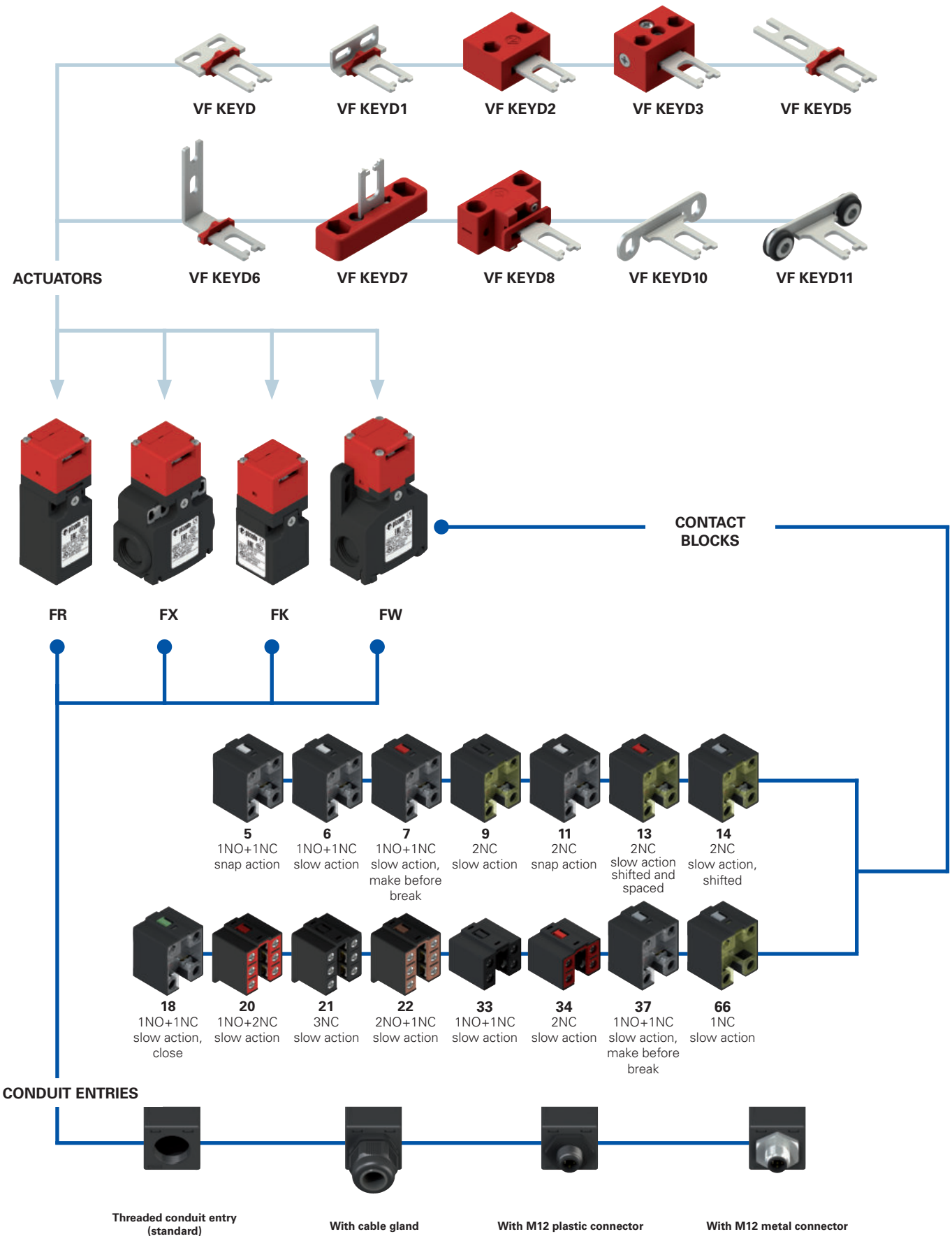
Padlockable lock out device to prevent the actuator entry and the accidental closing of the door behind operators while they are in the danger area.

All values in the drawings are in mm

Accessories See page 321

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

Selection diagram



Code structure

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

article | options | options

FR 693-E3D1XGM2K70T6

Housing

FR	technopolymer, one conduit entry
FX	technopolymer, two conduit entries
FW	technopolymer, three conduit entries

Contact blocks

5	1NO+1NC, snap action
6	1NO+1NC, slow action
7	1NO+1NC, slow action, make before break
9	2NC, slow action
11	2NC, snap action
13	2NC, slow action, shifted and spaced
14	2NC, slow action, shifted
18	1NO+1NC, slow action, close
20	1NO+2NC, slow action
21	3NC, slow action
22	2NO+1NC, slow action
33	1NO+1NC, slow action
34	2NC, slow action
37	1NO+1NC, slow action, make before break
66	1NC, slow action

Head type

92	detachable head (FW housing only)
93	non-detachable head (FR, FX and FK housing only)

Actuator extraction force

	10 N (standard)
E3	30 N

Actuators

	without actuator (standard)
D	straight actuator VF KEYD
D1	angled actuator VF KEYD1
D2	jointed actuator VF KEYD2
...	.....

External metallic parts

	zinc-plated steel (standard)
X	stainless steel

Contact type

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

Threaded conduit entry

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

Pre-installed cable glands or connectors

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

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

Ambient temperature

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

article | options | options

FK 3393-E3D1XGM1K24T6

Housing

FK	technopolymer, one conduit entry

Contact blocks

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

Actuator extraction force

	10 N (standard)
E3	30 N

Actuators

	without actuator (standard)
D	straight actuator VF KEYD
D1	angled actuator VF KEYD1
D2	jointed actuator VF KEYD2
...	.....

External metallic parts

	zinc-plated steel (standard)
X	stainless steel

Contact type

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

Threaded conduit entry

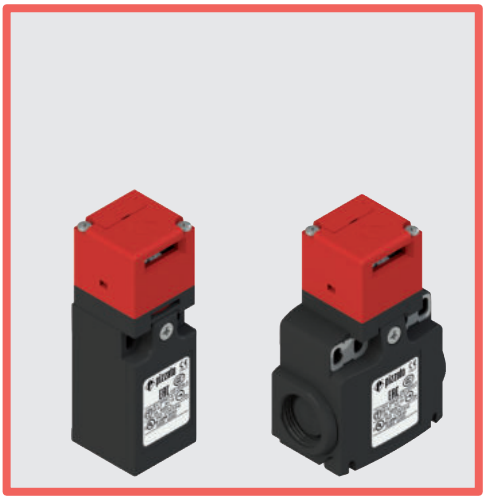
M1	M16x1.5(standard)
	PG 11

Pre-installed cable glands

	no cable gland (standard)
K24	cable gland for cables Ø 10 ... 5 mm
K28	cable gland for cables Ø 3 ... 7°mm

Ambient temperature

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



Main features

- Technopolymer housing, from one to three conduit entries
- Protection degree IP67
- 15 contact blocks available
- 10 stainless steel actuators available
- Versions with M12 connector
- Versions with gold-plated silver contacts

Quality marks:

IMQ approval:	EG610
UL approval:	E131787
CCC approval:	2007010305230013
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

Housing made of glass fibre reinforced technopolymer, self-extinguishing, shock-proof and with double insulation: ⧈

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, coded:	type 2 acc. to EN ISO 14119
Coding level:	low acc. to EN ISO 14119
Safety parameter B_{10D}:	2,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Actuator extraction force	10 N (-E3 versions: 30 N)
Tightening torques for installation:	see page 341
Wire cross-sections and wire stripping lengths:	see page 357

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 50581, BG-GS-ET-15, UL 508, CSA 22.2 No.14

Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14, GB/T14048.5-2017.

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

Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

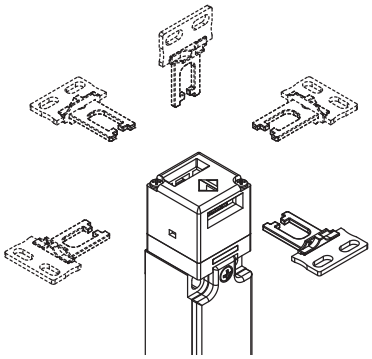
⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

	Electrical data		Utilization category
without connector	Thermal current (I_{th}):	10 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 250 400 500 I_e (A) 6 4 1 Direct current: DC13 U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)	
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	
	Protection against short circuits:	type aM fuse 10 A 500 V	
	Pollution degree:	3	
with M12 connector, 4-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 120 250 I_e (A) 4 4 4 Direct current: DC13 U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	
	Protection against short circuits:	type gG fuse 4 A 500 V	
	Pollution degree:	3	
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 I_e (A) 2 Direct current: DC13 U_e (V) 24 I_e (A) 2
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	
	Protection against short circuits:	type gG fuse 2 A 500 V	
	Pollution degree:	3	

Description

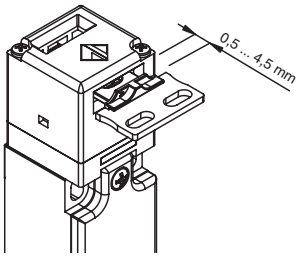
These safety switches are ideal for controlling gates, sliding doors and other guards which protect dangerous parts of machines without inertia. The stainless steel actuator is fastened to the moving part of the guard in such a way that it is separated from the switch each time the guard is opened. A special mechanism ensures that removing the actuator forces the positive opening of the electrical contacts. Easy to install, these switches can be used with all types of guards (with hinge as well as sliding and removable types). The possibility to actuate the switch only with a specific actuator guarantees that the machine can be restarted only after the guard has been closed.

Head with variable orientation



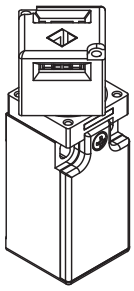
For all switches, the head can be adjusted in 90° steps after removing the two fastening screws. In this way it is possible to actuate the switch from 5 different directions.

Wide-ranging actuator travel



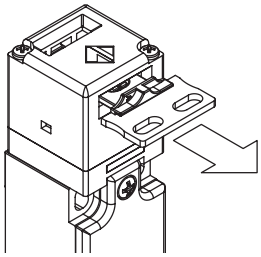
The actuation head of this switch features a wide range of travel. In this way the guard can oscillate along the direction of insertion (4 mm) without causing unwanted machine shutdowns. This wide range of travel is available in all actuators in order to ensure maximum device reliability.

Not detachable head



To make head adjustment safer and smoother, these switches are equipped with a special head to body coupling system. This system makes it impossible to remove the head from the device even during adjustment, thus rendering the use of one-way screws unnecessary for locking the head in position once adjustment is complete. This solution is available for the FR, FX and FK series.

Versions with 30 N actuator extraction force



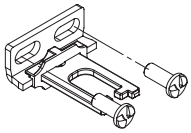
Versions with 30 N actuator holding force instead of the standard 10 N are available.

Protection degree IP67

IP67

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

Safety screws for actuators



As required by EN ISO 14119, the actuator must be fixed immovably to the guard frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered by using common tools. See accessories on page 332.

Extended temperature range

-40°C

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

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

Features approved by IMQ

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

Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X

Positive opening of contacts on contact blocks 5, 6, 7, 9,11, 13, 14, 18, 20, 21, 22, 33, 34, 66

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

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

Features approved by UL

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

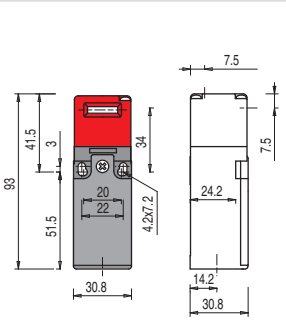
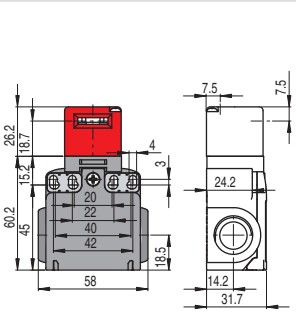
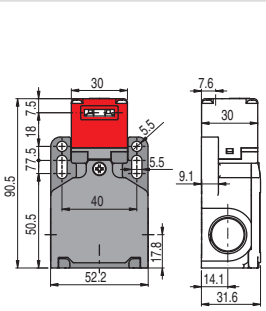
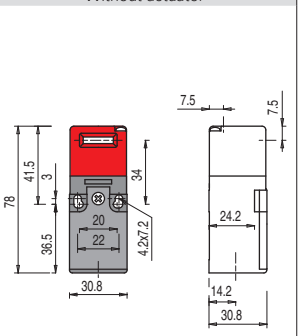
Use 60 or 75 °C copper (Cu) conductor and wire size range 12, 14 AWG, stranded or solid. The terminal tightening torque of 7.1 lb in (0.8 Nm).

The hub is to be connected to the conduit before the hub is connected to the enclosure.

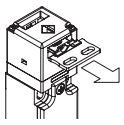
Please contact our technical department for the list of approved products.

Safety switches **with separate actuator**

Contact type:
R = snap action
L = slow action
LO = slow action make before break
LS = slow action shifted
LV = slow action shifted and spaced
LA = slow action close

Contact blocks		Technopolymer housing Without actuator	Technopolymer housing Without actuator	Technopolymer housing Without actuator	Technopolymer housing Without actuator
					
5	R	FR 593-M2 → 1NO+1NC	FX 593-M2 → 1NO+1NC	FW 592-M2 → 1NO+1NC	/
6	L	FR 693-M2 → 1NO+1NC	FX 693-M2 → 1NO+1NC	FW 692-M2 → 1NO+1NC	/
7	LO	FR 793-M2 → 1NO+1NC	FX 793-M2 → 1NO+1NC	FW 792-M2 → 1NO+1NC	/
9	L	FR 993-M2 → 2NC	FX 993-M2 → 2NC	FW 992-M2 → 2NC	/
11	R	FR 1193-M2 → 2NC	FX 1193-M2 → 2NC	FW 1192-M2 → 2NC	/
13	LV	FR 1393-M2 → 2NC	FX 1393-M2 → 2NC	FW 1392-M2 → 2NC	/
14	LS	FR 1493-M2 → 2NC	FX 1493-M2 → 2NC	FW 1492-M2 → 2NC	/
18	LA	FR 1893-M2 → 1NO+1NC	FX 1893-M2 → 1NO+1NC	FW 1892-M2 → 1NO+1NC	/
20	L	FR 2093-M2 → 1NO+2NC	FX 2093-M2 → 1NO+2NC	FW 2092-M2 → 1NO+2NC	/
21	L	FR 2193-M2 → 3NC	FX 2193-M2 → 3NC	FW 2192-M2 → 3NC	/
22	L	FR 2293-M2 → 2NO+1NC	FX 2293-M2 → 2NO+1NC	FW 2292-M2 → 2NO+1NC	/
33	L	FR 3393-M2 → 1NO+1NC	FX 3393-M2 → 1NO+1NC	FW 3392-M2 → 1NO+1NC	FK 3393-M1 → 1NO+1NC
34	L	FR 3493-M2 → 2NC	FX 3493-M2 → 2NC	FW 3492-M2 → 2NC	FK 3493-M1 → 2NC
37	LO	FR 3793-M2 → 1NO+1NC	FX 3793-M2 → 1NO+1NC	FW 3792-M2 → 1NO+1NC	/
66	L	FR 6693-M2 → 1NC	FX 6693-M2 → 1NC	FW 6692-M2 → 1NC	/
Actuating force		10 N (18 N →)	10 N (18 N →)	10 N (18 N →)	10 N (18 N →)
Travel diagrams		page 344 - group 8	page 344 - group 8	page 344 - group 8	page 344 - group 8

All switches listed above are available in a version with 30 N actuator extraction force.
To obtain these products, the order code must be changed by adding the extension "E3", for example FR 693-M2E3.



Actuator extraction force: 30 N	30 N (38 N →)	30 N (38 N →)	30 N (38 N →)	30 N (38 N →)

Limits of use

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

All values in the drawings are in mm

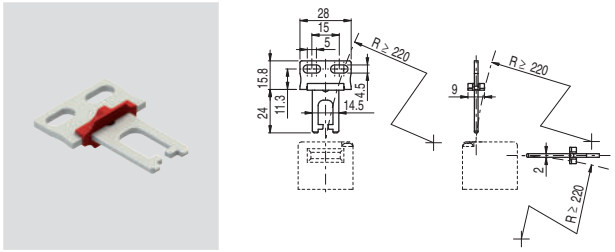
Accessories See page 321

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

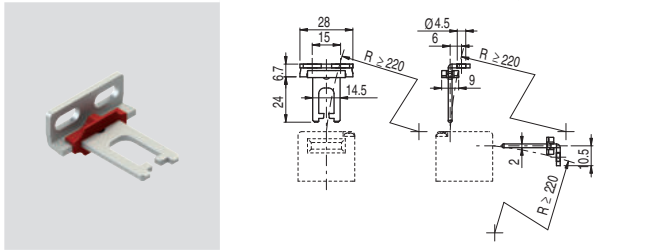
Stainless steel actuators

IMPORTANT: These actuators can only be used with items of the FR, FX, FK and FW series (e.g. FR 693-M2).
Low level of coding acc. to EN ISO 14119.

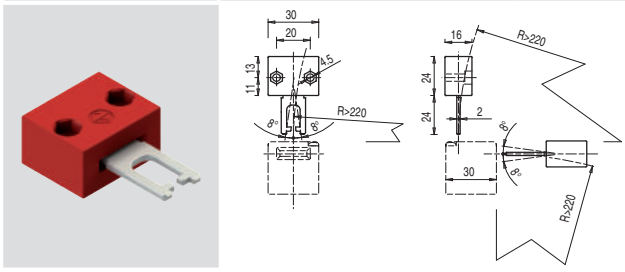
Article	Description
VF KEYD	Straight actuator



Article	Description
VF KEYD1	Angled actuator

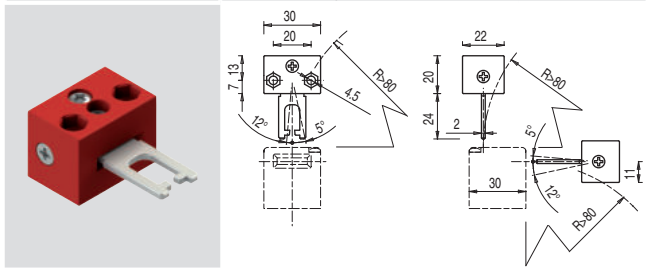


Article	Description
VF KEYD2	Jointed actuator



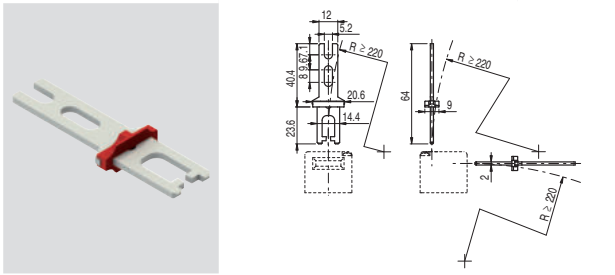
The actuator can flex in four directions for applications where the guard alignment is not precise.

Article	Description
VF KEYD3	Actuator adjustable in two directions

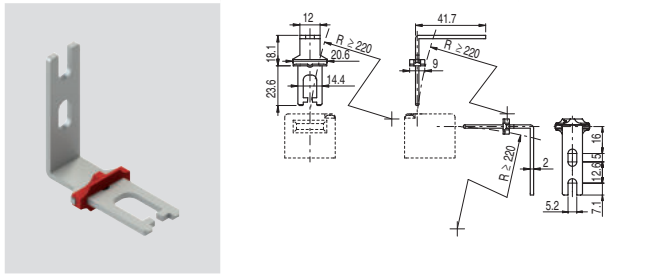


Actuator adjustable in two directions for guards with reduced dimensions.

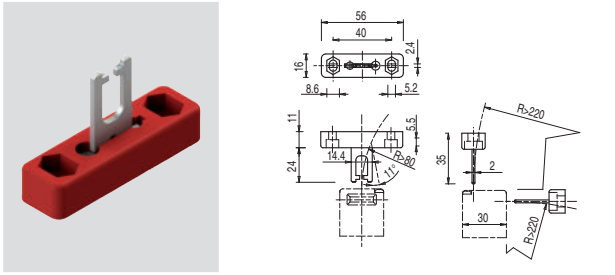
Article	Description
VF KEYD5	Extended actuator



Article	Description
VF KEYD6	Extended actuator, angled

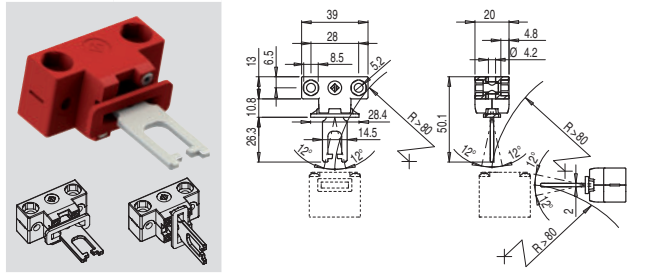


Article	Description
VF KEYD7	Actuator adjustable in one direction



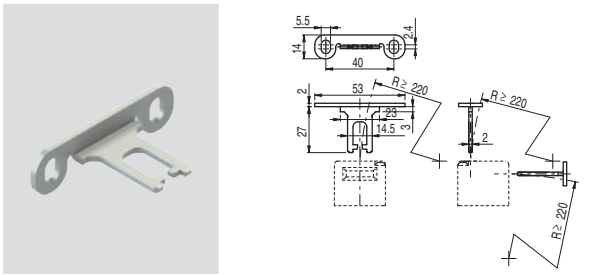
Actuator adjustable in one direction for guards with reduced dimensions.

Article	Description
VF KEYD8	Universal actuator

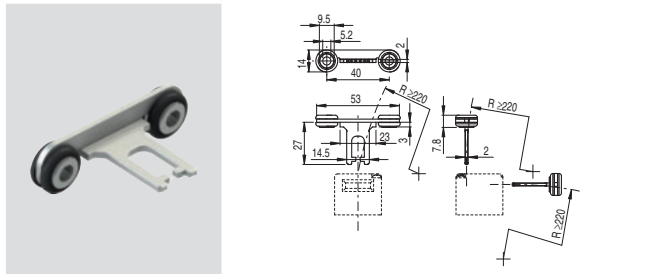


Jointed actuator for guards with poor alignment, adjustable in two dimensions for small doors; can be mounted in various positions.
The fixing body has two pairs of bore holes; it is provided for rotating the working plane of the actuator by 90°.

Article	Description
VF KEYD10	Profiled actuator



Article	Description
VF KEYD11	Profiled actuator

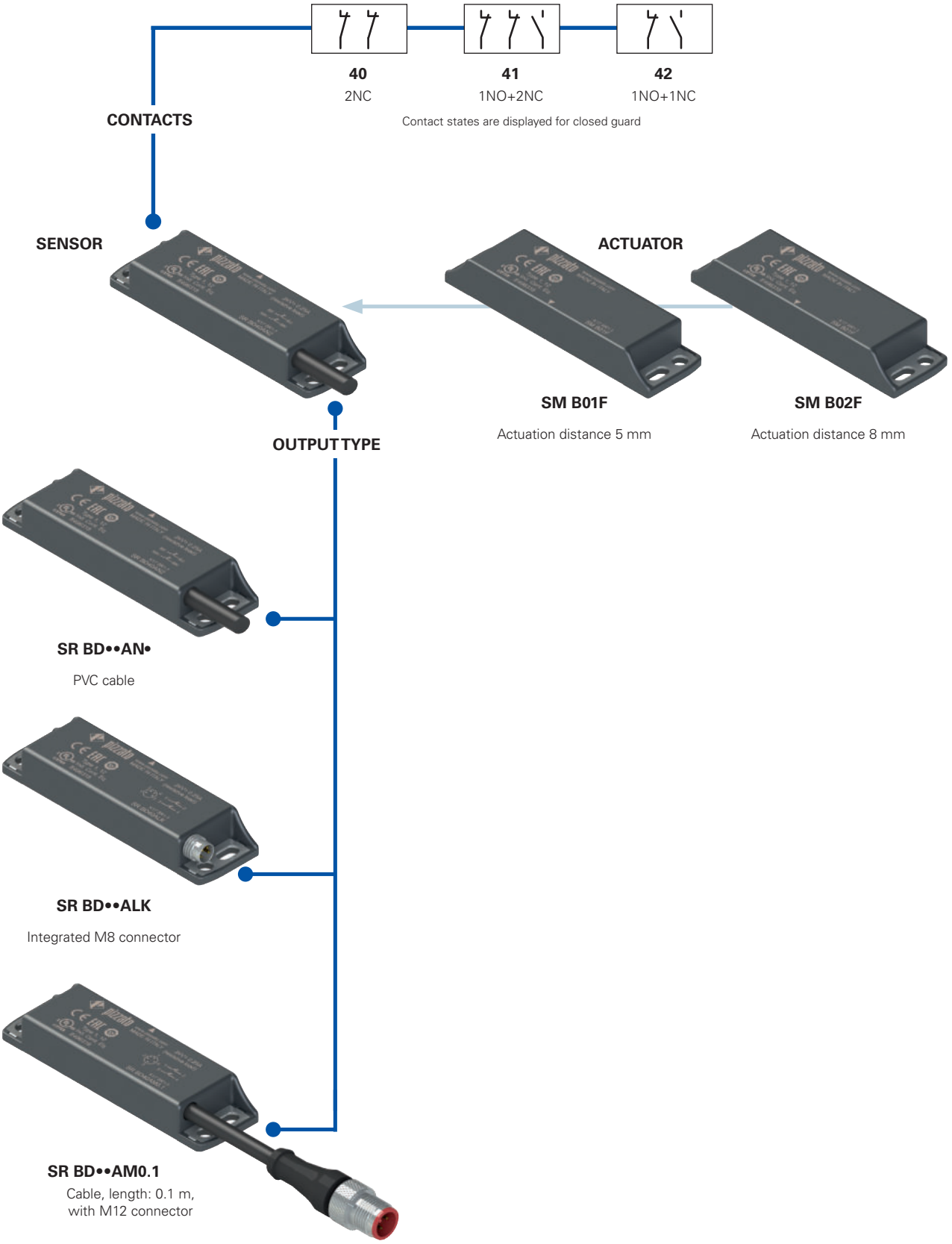


All values in the drawings are in mm

Accessories See page 321

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

Selection diagram



product option

sold separately as accessory

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

Code structure for sensor with actuator

article | options

SR BD40AN2-B01F-X

Sensor housing	
SR	technopolymer

External metallic parts	
	stainless steel fixing plates (standard)
X	fixing plates and connector body in stainless steel (LK connector available only)

Contacts (with closed guard)	
40	2NC (standard)
41	1NO+2NC (standard)
42	1NO+1NC

Actuator	
B01F	complete with actuator SM B01F, actuation distance 5 mm
B02F	complete with actuator SM B02F, actuation distance 8 mm

Cable or connector type	
N1	PVC cable, IEC 60332-1-2 oil resistant, length 1 m
N2	PVC cable, IEC 60332-1-2 oil resistant, length 2 m (standard)
...	.....
N10	PVC cable, IEC 60332-1-2 oil resistant, length 10 m
M0.1	cable, length: 0.1 m, with M12 connector
LK	integrated M8 connector (available only with contacts 40 and 42)

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

Code structure for single sensor

article | options

SR BD40AN2-X

Sensor housing	
SR	technopolymer

External metallic parts	
	stainless steel fixing plates (standard)
X	fixing plates and connector body in stainless steel (LK connector available only)

Contacts (with closed guard)	
40	2NC (standard)
41	1NO+2NC (standard)
42	1NO+1NC

Cable or connector type	
N1	PVC cable, IEC 60332-1-2 oil resistant, length 1 m
N2	PVC cable, IEC 60332-1-2 oil resistant, length 2 m (standard)
...	.....
N10	PVC cable, IEC 60332-1-2 oil resistant, length 10 m
M0.1	cable, length: 0.1 m, with M12 connector
LK	integrated M8 connector (available only with contacts 40 and 42)

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

Code structure for single actuator

SM B01F

Actuator	
B01F	actuation distance 5 mm
B02F	actuation distance 8 mm

SR B series coded magnetic safety sensors

Main features
- Actuation without mechanical contact
- Stainless steel fixing plates
- Output contacts: 2NC, 1NO+2NC or 1NO+1NC
- Insensitive to dirt
- Protection degrees IP67 and IP69K
- Coded actuator
- Technopolymer housing
- Versions with M8 or M12 connector

Quality marks:

UL approval: E496318
TÜV SÜD approval: Z10 18 05 75157 024
EAC approval: RU C-IT.УТ03.B.00035/19

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

Technical data

Housing
Housing made of glass fibre reinforced technopolymer, self-extinguishing.
Versions with integrated cable 4 x 0.34 mm² or 6 x 0.25 mm², length 2 m, other lengths from 0.5 m … 10 m on request.
Versions with integrated M8 connector
Versions with 0.1 m cable length and M12 connector, other lengths from 0.1 … 3 m on request

Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Interlock, no contact, coded:	type 4 acc. to EN ISO 14119
Coding level:	low acc. to EN ISO 14119
Safety parameter B_{10D}:	20,000,000 (with compatible Pizzato Elettrica safety modules) 400,000 (at max. load: DC12 24 V 250 mA)
Mission time:	20 years
Ambient temperature:	-25°C … +80°C
Ambient temp. with flexible installation cable:	-5°C … +80°C
Vibration resistance:	10 gn (10 … 150 Hz) acc. to IEC 60068-2-6
Shock resistance:	30 gn; 11 ms acc. to EN 60068-2-27
Pollution degree	3
Screw tightening torque:	0.8 … 2 Nm

In compliance with standards:
IEC 60947-1, IEC 60947-5-1, IEC 60947-5-2, IEC 60947-5-3 (in connection with safety module), EN ISO 14119, EN ISO 12100, EN ISO 13849-1, EN ISO 13849-2, IEC 62061:2005, IEC 60204-1, IEC 60529, IEC 61508-1, IEC 61508-2, IEC 61508-4, EN 50581, ISO 20653, UL 508, CSA 22.2 No.14.

Approvals:
UL 508, CSA 22.2 No.14 , EN ISO 13849-1, EN 60947-5-3, EN 50178, EN 61508-1, EN 61508-2, EN 61508-4, EN 62061, EN 60947-1.

Actuation data

Assured operating distance S_{ao}:	5 mm with actuator SM B01F 8 mm with actuator SM B02F
Assured release distance S_{ar}:	15 mm with actuator SM B01F 20 mm with actuator SM B02F
Repeat accuracy:	≤ 10%
Switching frequency:	up to 1 Hz
Distance between two sensors:	min. 50 mm

Electrical data

Rated operating voltage U_e:	24 Vac/dc
Rated operating current I_e:	0.25 A (resistive load)
Rated insulation voltage U_i:	120 Vac (with cable) 60 Vac / 75 Vdc (with M8 connector) 120 Vac (with M12 connector, 4-pole) 30 Vac / 36 Vdc (with M12 connector, 8-pole)
Rated impulse withstand voltage (U_{imp}):	6 kV 1.5 kV (with connector)
Thermal current I_{th}:	0.25 A
Maximum switching load:	6 W (resistive load)
Protection fuse:	0.25 A type F
Electrical endurance:	1 million operating cycles

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

Connection with safety modules for safety applications:
Connection with safety modules CS AR-01••••; CS AR-02••••; CS AR-04••••; CS AR-05••••; CS AR-06••••; CS AR-08••••; CS AR-46•024; CS AR-91••••; CS AT-0•••••; CS AT-1•••••; CS AT-3•••••; CS FS-5•••••; CS MF•••••-••; CS MP•••••-••.
When connected to the safety module, the sensor can be classified as a control circuit device up to PDF-M (EN 60947-5-3).
The system can be used in safety circuits up to PL e/SIL 3/category 4 in accordance with EN ISO 13849-1.

Features approved by UL

Electrical Ratings: 24 Vdc, 0,25 A (resistive load)
Environmental Ratings: Types 1, 4X, 6, 12, 13
Accessory for series SR for actuator switch series SM B.

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

Features approved by TÜV SÜD

Supply voltage: 24 Vac/dc
Rated operating current (max.): 0.25 A
Ambient temperature: -25°C … +80°C
Protection degree: IP67
PL, category: PL e, cat. 4. with CS AR-08

In compliance with standards: 2006/42/EC Machinery Directive, EN ISO 13849-1:2015 (Cat. 4, PL e), EN 60947-5-3:2013, EN ISO 14119:2013, EN 61508-1:2010 (SIL 3), EN 61508-2:2010 (SIL 3), EN 61508-4:2010 (SIL 3), EN 62061:2005/A2:2015 (SIL CL 3)

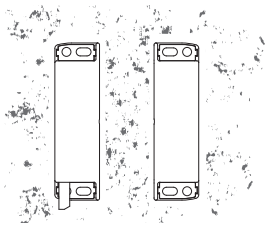
Please contact our technical department for the list of approved products.

Description

Coded magnetic sensors are devices suitable for monitoring protections and guards of machines without inertia which, when linked to a safety module, can create a system with safety category up to SIL 3 according to EN 62061, up to PL e according to EN ISO 13849-1 and up to category 4 according to EN ISO 13849-1.

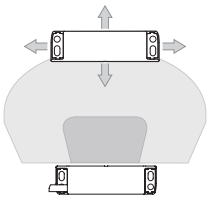
These products consist of a sensor that detects the magnetic field and which is connected to the machine structure and of a coded magnetic actuator, which is connected to the movable guard. When the sensor and actuator are approached (closed guard), the sensor detects the actuator and actuates the electrical contacts. The sensor is designed to be activated only by the correct coded actuator and not through a common magnet.

Insensitivity to dirt



Magnetic sensors are totally sealed and retain their safety characteristics also where dirt and dust are present (not ferromagnetic material). This characteristic, combined with the design without recesses, makes them particularly suitable for use in the food industry.

Wide actuation range

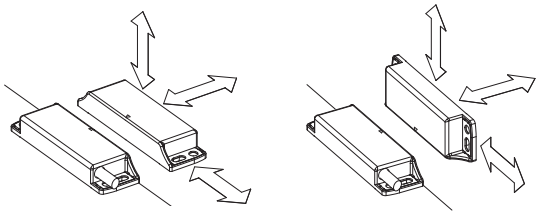


With their built-in features, magnetic sensors have a wide actuation range, making them very well suited for applications with large tolerances or where mechanical properties change over time.

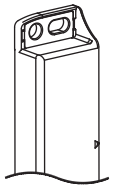
In this type of sensor, the actuation distances may vary depending on the shift direction of the actuator in relation to the sensor.

Actuation from many directions

The coded magnetic sensors were designed to be activated by the respective actuator from various directions. The customer therefore enjoys maximum flexibility when positioning devices along the perimeter of the guards.

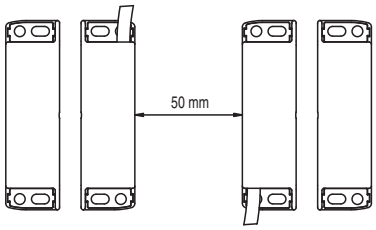


Stainless steel fixing plates



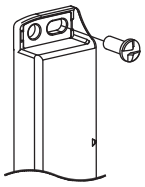
To prevent damage to the fixing slots when fastening on non-perfectly flat surfaces, coded magnetic sensors are equipped with stainless steel fixing plates. Even in the presence of suitable fixing surfaces, this solution makes the sensor more robust against mechanical stresses.

Assembly of multiple sensor-actuator systems



It is possible to install more than one device on the same machine. The minimum mounting distance between sensor-actuator systems is only 50 mm.

Safety screws for actuators



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

See accessories on page 332.

Laser engraving

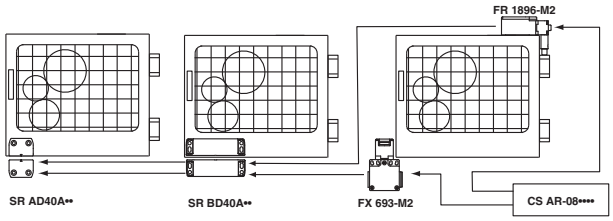
All devices are marked using a dedicated indelible laser system. These engravings are therefore suitable for extreme environments too. Thanks to this system that does not use labels, the loss of plate data is prevented and a greater resistance of the marking is achieved over time.

Series connection of multiple sensors

The coded magnetic sensors can be connected in series with the only limitation that the overall resistance, of sensors and the related wiring, has to be not higher than the admitted max. value of the module, which typically is equal to 50 ohm (see module features). This is a very high value that, with normal wiring, allows the use of dozens of sensors without problems. It is also possible to realise mixed circuit solutions by connecting coded magnetic sensors in series to safety switches, with the only limitation being the above-mentioned maximum electrical resistance.

It should be noted that the series connection of two or more coded sensors reduces the self-monitoring capacity of the system, see ISO/TR 24119.

The use of Pizzato Elettrica safety modules is recommended.



Protection degrees IP67 and IP69K

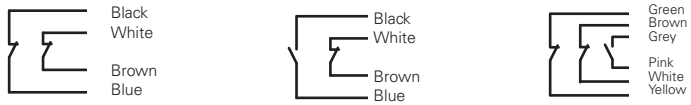
IP69K
IP67

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

Internal connections with cable

Contact states are displayed for closed guard

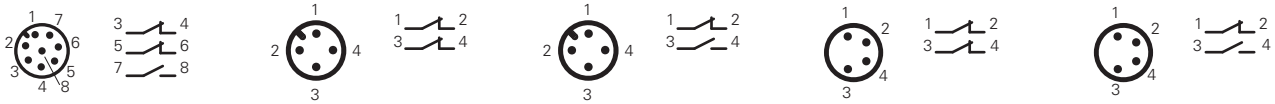
With cable (2NC)	With cable (1NO+1NC)	With cable (1NO+2NC)



Internal connections with connector

Contact states are displayed for closed guard

With M12 connector (1NO+2NC)	With M12 connector (2NC)	With M12 connector (1NO+1NC)	With M8 connector (2NC)	With M8 connector (1NO+1NC)



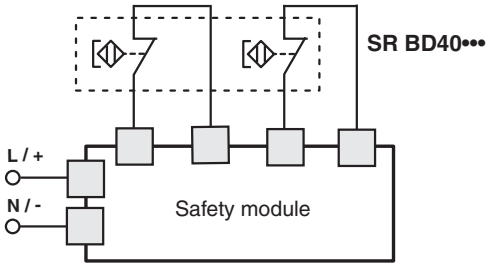
For female connectors, see page 321

Connection with safety modules

A coded magnetic sensor alone cannot be used for safety functions because its operating principles are not considered safe by the standards (e.g. positive opening on mechanical switches). For this reason, a magnetic sensor coded for use in safety applications must always be connected to a safety module that monitors its proper operation through a circuit with at least two channels.

Compatible safety modules

These magnetic sensors have been checked and tested for operation with suitable safety modules (see list).
The use of complete and tested solutions guarantees the electrical compatibility between the sensor and safety module, as well as high reliability.

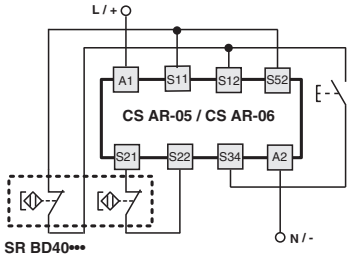


Sensors	Compatible safety modules	Safety module output contacts	
		Instantaneous contacts	Delayed contacts
SR BD40A•• SR BD41A•• SR BD42A••[a]	CS AR-01••••[b]	2NO+1NC	/
	CS AR-02••••[b]	3NO	/
	CS AR-04••••[b]	3NO+1NC	/
	CS AR-05••••	3NO+1NC	/
	CS AR-06••••	3NO+1NC	/
	CS AR-08••••	2NO	/
	CS AR-46•024	1NO	/
	CS AR-91••••	2NO+1PNP	/
	CS AR-94••••	2NO	/
	CS AR-95••••	2NO	/
	CS AT-0•••••	2NO+1NO	2NO
	CS AT-1•••••	3NO	2NO
	CS AT-3•••••	2NO	1NO
	CS FS-5•••••	1NO+1NC+1CO	/
	CS MP•••••-••	see page 277	see page 277
	CS MF•••••-••	see page 305	see page 305

[a] Compatible with CS MF202••-P4 and CS MP•••••-•• only.
[b] Compatible with modules with production batch later than 06/2014 only.
For features of the safety modules see page 213.

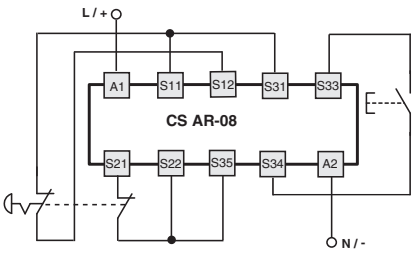
Connection with safety modules CS AR-05 or CS AR-06

Input configuration with manual start (CS AR-05) and monitored start (CS AR-06)
2 channels



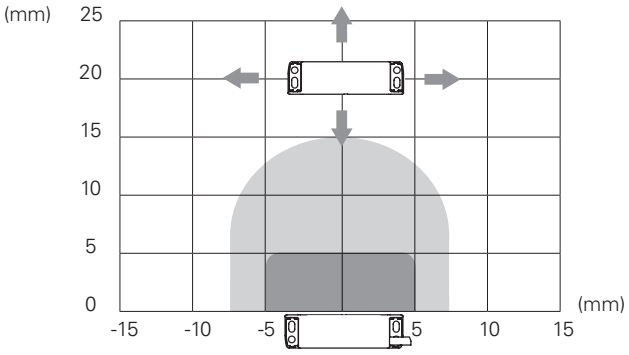
Connection with safety modules CS AR-08 or CS AT

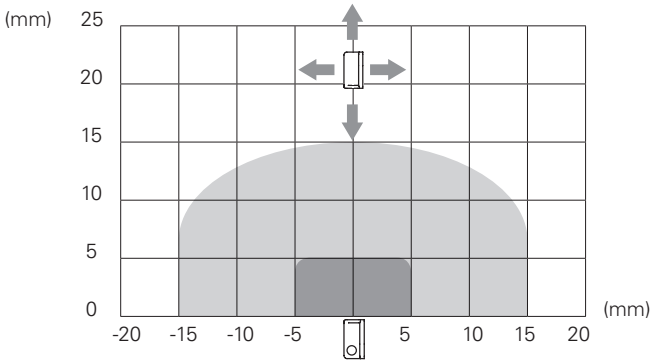
Input configuration with manual start
2 channels



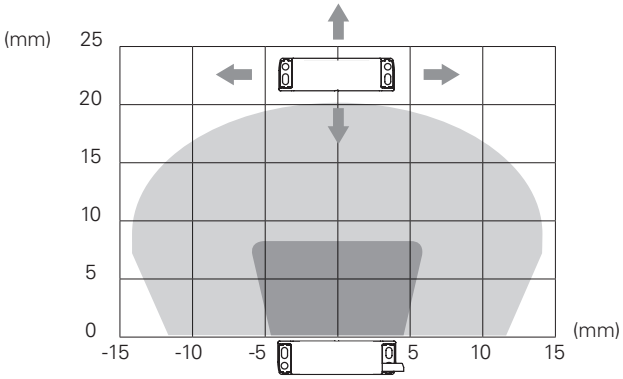
For features of the safety modules see page 213.

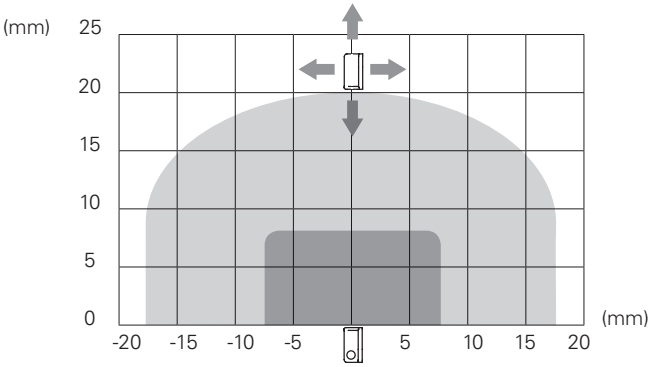
Operating distances SR BD•••••-B01F





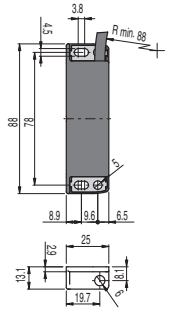
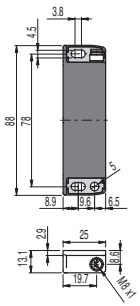
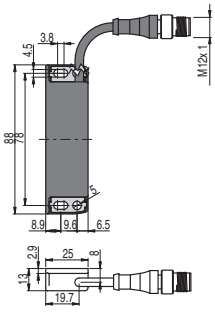
Operating distances SR BD•••••-B02F



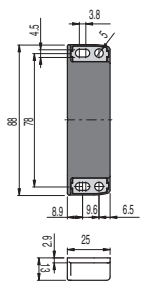


Legend:
Assured operating distance S_{ao} Assured release distance S_{ar}
Note: The progress of the activation areas is for reference only

Dimensional drawings

Integrated cable, length: 2 m		M8 connector		Cable, length: 0.1 m, with M12 connector	
					
SR BD40AN2	2NC	SR BD40ALK	2NC	SR BD40AM0.1	2NC
SR BD41AN2	1NO+2NC	/		SR BD41AM0.1	1NO+2NC
SR BD42AN2	1NO+1NC	SR BD42ALK	1NO+1NC	SR BD42AM0.1	1NO+1NC

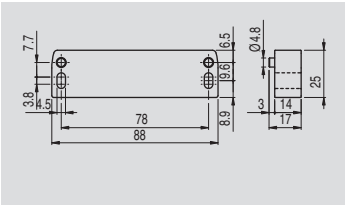
coded actuator
Low level of coding acc. to EN ISO 14119



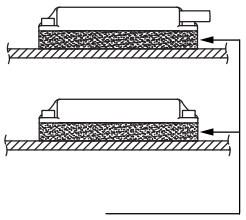
SM B01F	Actuation distance 5 mm
SM B02F	Actuation distance 8 mm

Accessories

Spacer



If possible do not mount the sensor and the actuator on ferromagnetic materials.
This spacer is placed between the magnetic safety sensors and metal surfaces that can deflect the magnetic field: as a result, the activation and deactivation distances of the sensor remain the same.
Because it is made out of a single block of material, it is especially well suited for applications where a high level of cleanness is required, as any material present in the installation area cannot penetrate and accumulate.



Spacer

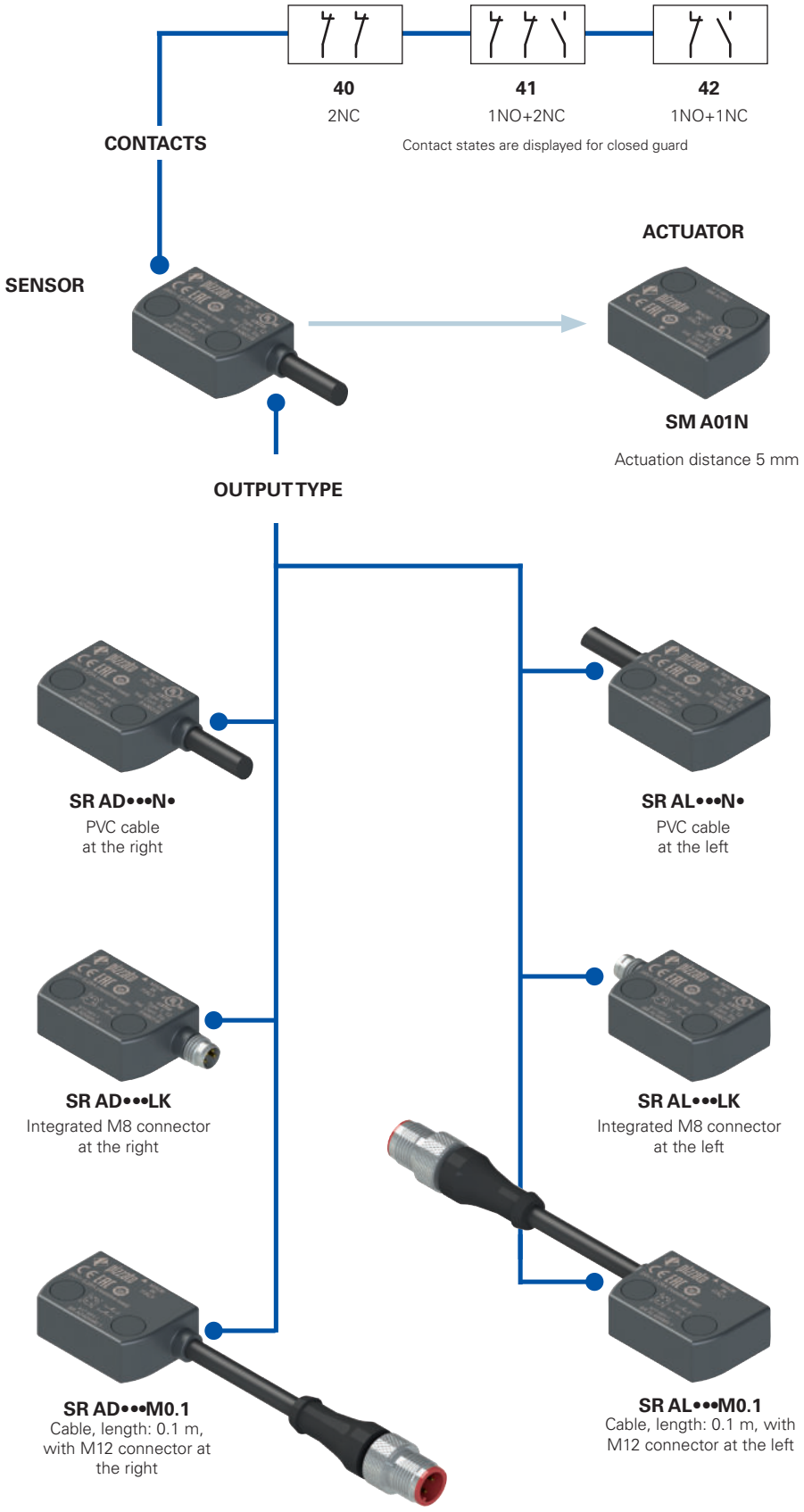
Article	Description
VS SP1BA1	Spacer for SR B series sensors

All values in the drawings are in mm

Accessories See page 321

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

Selection diagram



product option

sold separately as accessory

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

Code structure for sensor with actuator

article | options

SR AD40AN2-A01N-X

Sensor housing

SR	technopolymer

Output direction, connections

D	output at the right
L	output at the left

Contacts (with closed guard)

40	2NC (standard)
41	1NO+2NC (standard)
42	1NO+1NC

Actuator

A01N	complete with actuator SM A01N, actuation distance 5 mm

Cable or connector type

N1	PVC cable, IEC 60332-1-2 oil resistant, length 1 m
N2	PVC cable, IEC 60332-1-2 oil resistant, length 2 m (standard)
...	.....
N10	PVC cable, IEC 60332-1-2 oil resistant, length 10 m
M0.1	cable, length: 0.1 m, with M12 connector
LK	integrated M8 connector (available only with contacts 40 and 42)

External metallic parts

	brass, nickel-plated, where present (standard)
X	connector body in stainless steel (only LK connector available)

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

Code structure for single sensor

article | options

SR AD40AN2-X

Sensor housing

SR	technopolymer

Output direction, connections

D	output at the right
L	output at the left

Contacts (with closed guard)

40	2NC (standard)
41	1NO+2NC (standard)
42	1NO+1NC

Cable or connector type

N1	PVC cable, IEC 60332-1-2 oil resistant, length 1 m
N2	PVC cable, IEC 60332-1-2 oil resistant, length 2 m (standard)
...	.....
N10	PVC cable, IEC 60332-1-2 oil resistant, length 10 m
M0.1	cable, length: 0.1 m, with M12 connector
LK	integrated M8 connector (available only with contacts 40 and 42)

External metallic parts

	brass, nickel-plated, where present (standard)
X	connector body in stainless steel (only LK connector available)

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

Code structure for single actuator

SM A01N

Actuator

A01N	actuation distance 5 mm

SR A series coded magnetic safety sensors

Main features
- Actuation without mechanical contact
- Output contacts: 2NC, 1NO+2NC or 1NO+1NC
- Insensitive to dirt
- Protection degrees IP67 and IP69K
- Coded actuator
- Technopolymer housing
- Versions with M8 or M12 connector

Quality marks:

UL approval: E496318
TÜV SÜD approval: Z10 18 05 75157 024
EAC approval: RU C-IT.УТ03.B.00035/19

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

Technical data

Housing
Housing made of glass fibre reinforced technopolymer, self-extinguishing.
Versions with integrated cable 4 x 0.34 mm² or 6 x 0.25 mm², length 2 m, other lengths from 0.5 m … 10 m on request.
Versions with integrated M8 connector.
Versions with 0.1 m cable length and M12 connector, other lengths from 0.1 … 3 m on request

Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Interlock, no contact, coded:	type 4 acc. to EN ISO 14119
Coding level:	low acc. to EN ISO 14119
Safety parameter B_{10d}:	20,000,000 (used with Pizzato safety modules) 400,000 (used with max load: DC12 24 V 0.25 A)
Mission time:	20 years
Ambient temperature:	-25°C … +80°C
Ambient temperature with flexible installation cable:	-5°C … +80°C
Vibration resistance:	10 gn (10 … 150 Hz) acc. to IEC 60068-2-6
Shock resistance:	30 gn; 11 ms acc. to EN 60068-2-27
Pollution degree	3
Screw tightening torque:	0.8 … 2 Nm

In compliance with standards:
IEC 60947-1:2007, IEC 60947-5-1, IEC 60947-5-2, IEC 60947-5-3 (in connection with safety module), EN ISO 14119, EN ISO 12100, EN ISO 13849-1, EN ISO 13849-2, IEC 62061, IEC 60204-1, IEC 60529, IEC 61508-1, EN 61508-2:2010, IEC 61508-4, EN 50581, ISO 20653, UL 508, CSA 22.2 No.14
Approvals:
UL 508, CSA 22.2 No.14 , EN ISO 13849-1, EN 60947-5-3, EN 50178, EN 61508-1, EN 61508-2, EN 61508-4, EN 62061, EN 60947-1.

Actuation data

Assured operating distance S_{ao}:	5 mm with actuator SM A01N
Assured release distance S_{ar}:	15 mm with actuator SM A01N
Repeat accuracy:	≤ 10%
Switching frequency:	up to 1 Hz
Distance between two sensors:	minimum 50 mm

Electrical data

Rated operating voltage U_e:	24 Vac/dc
Rated operating current I_e:	0.25 A (resistive load)
Rated insulation voltage U_i:	120 Vac (with cable) 60 Vac / 75 Vdc (with M8 connector) 120 Vac (with M12 connector, 4-pole) 30 Vac / 36 Vdc (with M12 connector, 8-pole)
Rated impulse withstand voltage (U_{imp}):	6 kV / 1.5 kV (with connector)
Thermal current I_{th}:	0.25 A
Maximum switching load:	6 W (resistive load)
Protection fuse:	0.25 A type F
Electrical endurance:	1 million operating cycles

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

Connection with safety modules for safety applications:
Connection with safety modules CS AR-01••••; CS AR-02••••; CS AR-04••••; CS AR-05••••; CS AR-06••••; CS AR-08••••; CS AR-46•024; CS AR-91••••; CS AT-0•••••; CS AT-1•••••; CS AT-3•••••; CS FS-5•••••; CS MF•••••-••; CS MP•••••-••.
When connected to the safety module, the sensor can be classified as a control circuit device up to PDF-M (EN 60947-5-3).
The system can be used in safety circuits up to PL e/SIL 3/category 4 in accordance with EN ISO 13849-1.

Features approved by UL

Electrical Ratings: 24 Vdc, 0,25 A (resistive load)
Environmental Ratings: Types 1, 4X, 6, 12, 13
Accessory for series SR for actuator switch series SM A.

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

Features approved by TÜV SÜD

Supply voltage: 24 Vac/dc
Rated operating current (max.): 0.25 A
Ambient temperature: -25°C … +80°C
Protection degree: IP67
PL, category: PL e, cat. 4. with CS AR-08

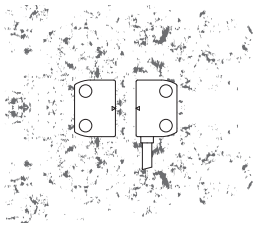
In compliance with standards: 2006/42/EC Machinery Directive,
EN ISO 13849-1:2015 (Cat. 4, PL e), EN 60947-5-3:2013,
EN ISO 14119:2013, EN 61508-1:2010 (SIL 3), EN 61508-2:2010 (SIL 3),
EN 61508-4:2010 (SIL 3), EN 62061:2005/A2:2015 (SIL CL 3)

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

Description

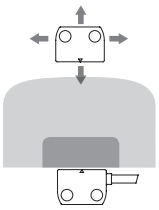
Coded magnetic sensors are devices suitable for monitoring protections and guards of machines without inertia which, when linked to a safety module, can create a system with safety category up to SIL 3 according to EN 62061, up to PL e according to EN ISO 13849-1 and up to category 4 according to EN ISO 13849-1.
These products consist of a sensor that detects the magnetic field and which is connected to the machine structure and of a coded magnetic actuator, which is connected to the movable guard. When the sensor and actuator are approached (closed guard), the sensor detects the actuator and actuates the electrical contacts. The sensor is designed to be activated only by the correct coded actuator and not through a common magnet.

Insensitivity to dirt



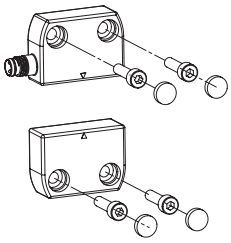
Magnetic sensors are totally sealed and retain their safety characteristics also where dirt and dust are present (not ferromagnetic material).
This characteristic, combined with the design without recesses, makes them particularly suitable for use in the food industry.

Wide actuation range



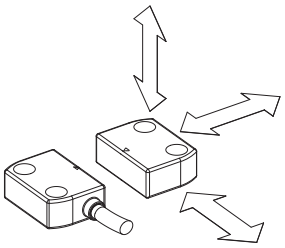
With their built-in features, magnetic sensors have a wide actuation range, making them very well suited for applications with large tolerances or where mechanical properties change over time.
In this type of sensor, the actuation distances may vary depending on the shift direction of the actuator in relation to the sensor.

Protection against tampering



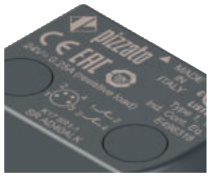
Each sensor and actuator of the SR A series is supplied complete with snap-on protection caps to be applied on the holes of the fixing screws. Not only do the caps prevent dirt from accumulating and simplify cleaning, they also block access to the fastening screws of the actuator. As a result, standard screws can be used instead of tamper-proof screws.

Actuation from many directions



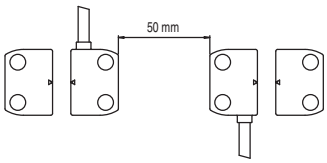
The coded magnetic sensors were designed to be activated by the respective actuator from various directions.
The customer therefore enjoys maximum flexibility when positioning devices along the perimeter of the guards.

Laser engraving



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

Assembly of multiple sensor-actuator systems



It is possible to install more than one device on the same machine. The minimum mounting distance between sensor-actuator systems is only 50 mm.

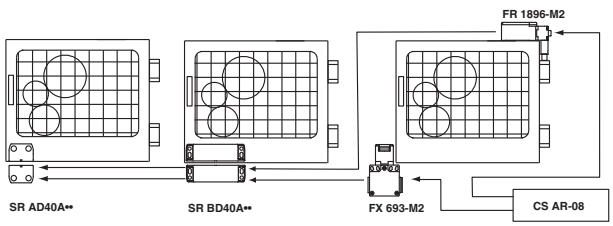
Protection degrees IP67 and IP69K

IP69K
IP67

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

Series connection of multiple sensors

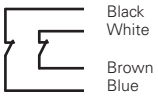
The coded magnetic sensors can be connected in series with the only limitation that the overall resistance, of sensors and the related wiring, has to be not higher than the admitted max. value of the module, which typically is equal to 50 Ω (see module features). This is a very high value that, with normal wiring, allows the use of dozens of sensors without problems. It is also possible to realise mixed circuit solutions by connecting coded magnetic sensors in series to safety switches, with the only limitation being the above-mentioned maximum electrical resistance.
It should be noted that the series connection of two or more coded sensors reduces the self-monitoring capacity of the system, see ISO/TR 24119. The use of Pizzato Elettrica safety modules is recommended.



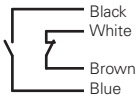
Internal connections with cable

Contact states are displayed for closed guard

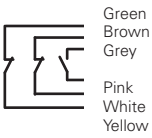
With cable (2NC)



With cable (1NO+1NC)



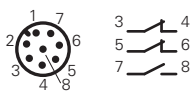
With cable (1NO+2NC)



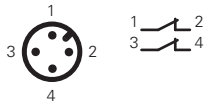
Internal connections with connector

Contact states are displayed for closed guard

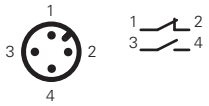
With M12 connector (1NO+2NC)



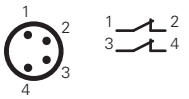
With M12 connector (2NC)



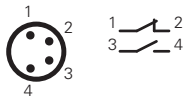
With M12 connector (1NO+1NC)



With M8 connector (2NC)



With M8 connector (1NO+1NC)



For female connectors, see page 321

Connection with safety modules

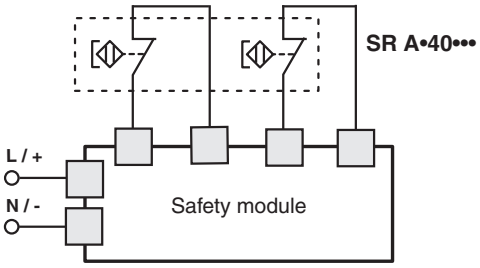
A coded magnetic sensor alone cannot be used for safety functions because its operating principles are not considered safe by the standards (e.g. the positive opening on mechanical switches).

For this reason, a magnetic sensor coded for use in safety applications must always be connected to a safety module with at least two channels that monitors the proper function.

Compatible safety modules

These magnetic sensors have been checked and tested for operation with suitable safety modules (see list).

The use of complete and tested solutions guarantees the electrical compatibility between the sensor and safety module, as well as high reliability.



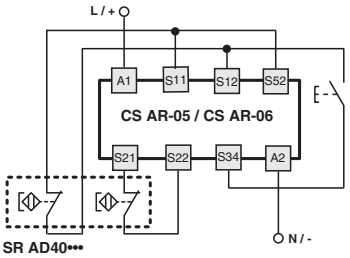
Sensors	Compatible safety modules	Safety module output contacts	
		Instantaneous contacts	Delayed contacts
SR AD40A•• SR AD41A•• SR AD42A••[a]	CS AR-01••••[b]	2NO+1NC	/
	CS AR-02••••[b]	3NO	/
	CS AR-04••••[b]	3NO+1NC	/
	CS AR-05••••	3NO+1NC	/
	CS AR-06••••	3NO+1NC	/
	CS AR-08••••	2NO	/
	CS AR-46•024	1NO	/
	CS AR-91••••	2NO+1PNP	/
	CS AR-94••••	2NO	/
	CS AR-95••••	2NO	/
	CS AT-0•••••	2NO+1NO	2NO
	CS AT-1•••••	3NO	2NO
	CS AT-3•••••	2NO	1NO
	CS FS-5•••••	1NO+1NC+1CO	/
	CS MP•••••-••	see page 277	see page 277
	CS MF•••••-••	see page 305	see page 305

[a] Compatible with CS MF202••-P4 and CS MP•••••-•• only.
[b] Compatible with modules with production batch later than 06/2014 only.
For features of the safety modules see page 213.

Connection with safety modules CS AR-05 or CS AR-06

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

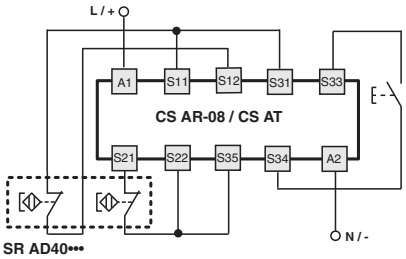
2 channels



Connection with safety modules CS AR-08 or CS AT

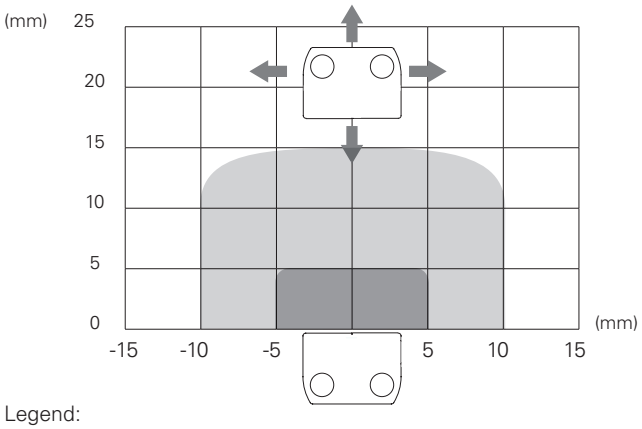
Input configuration with manual start

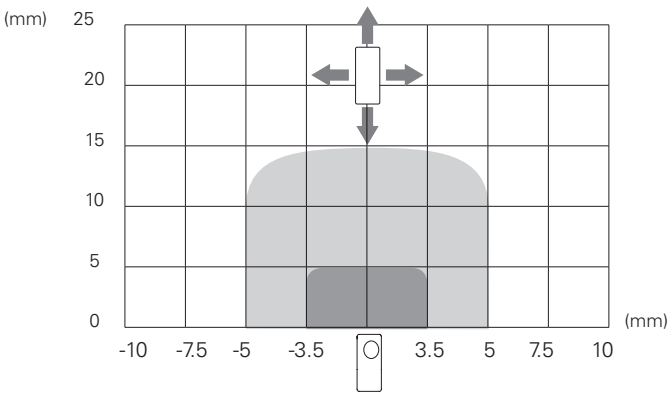
2 channels



For features of the safety modules see page 213.

Operating distances SR AD•••••-A01N





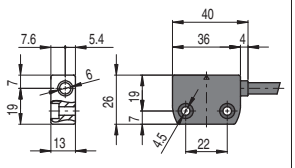
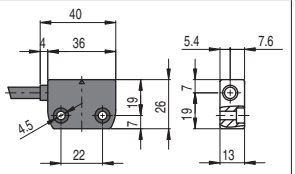
Legend:

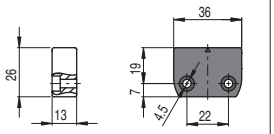
Assured operating distance S_{ao}

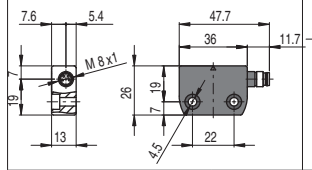
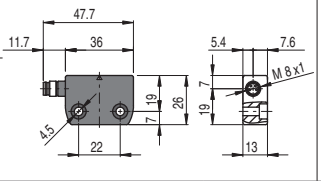
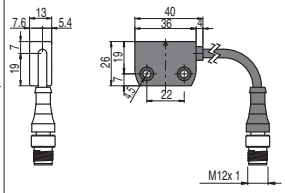
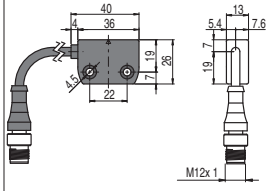
Assured release distance S_{ar}

Note: The progress of the activation areas is for reference only

Dimensional drawings

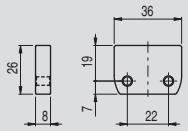
Integrated cable, length: 2 m, at the right		Integrated cable, length: 2 m, at the left	
			
SR AD40AN2	2NC	SR AL40AN2	2NC
SR AD41AN2	1NO+2NC	SR AL41AN2	1NO+2NC
SR AD42AN2	1NO+1NC	SR AL42AN2	1NO+1NC

coded actuator Low level of coding acc. to EN ISO 14119	
	
SM A01N	Actuation distance 5 mm

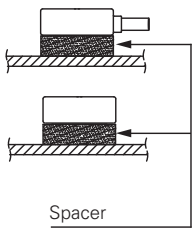
M8 connector, at the right		M8 connector, at the left		Cable, length: 0.1 m, with M12 connector at the right		Cable, length: 0.1 m, with M12 connector at the left	
							
SR AD40ALK	2NC	SR AL40ALK	2NC	SR AD40AM0.1	2NC	SR AL40AM0.1	2NC
/		/		SR AD41AM0.1	1NO+2NC	SR AL41AM0.1	1NO+2NC
SR AD42ALK	1NO+1NC	SR AL42ALK	1NO+1NC	SR AD42AM0.1	1NO+1NC	SR AL42AM0.1	1NO+1NC

Accessories

Spacer



If possible do not mount the sensor and the actuator on ferromagnetic materials. This spacer is placed between the magnetic safety sensors and metal surfaces that can deflect the magnetic field: as a result, the activation and deactivation distances of the sensor remain the same. Because it is made out of a single block of material, it is especially well suited for applications where a high level of cleanness is required, as any material present in the installation area cannot penetrate and accumulate.



Article	Description
VS SP1AA1	Spacer for SR A series sensors

All values in the drawings are in mm

Accessories See page 321

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

ST series safety sensors with RFID technology

Introduction

In combination with the corresponding safety modules, the sensors of the ST series are suitable for the monitoring of protective devices on machines without inertia and allow the system in which they are used to reach a safety category up to SIL 3 acc. to EN 62061 as well as up to PL e and Category 4 acc. to EN ISO 13849-1.
These sensors use RFID (Radio Frequency IDentification) technology and provide high protection against possible manipulation thanks to the uniqueness of the codes transmitted by the actuator. Because they have no mechanical elements, they guarantee a long service life even in applications with frequent operating cycles and under harsh environmental conditions.

Maximum safety with a single device

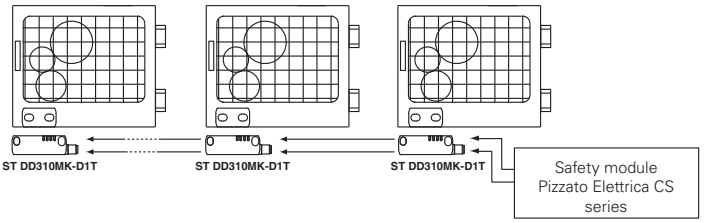
PL e + SIL 3

The sensors of the ST series are constructed with redundant electronics. As a result, the maximum PL e and SIL 3 safety levels can still be achieved through the use of a single device on a guard. This avoids expensive wiring in the field and allows faster installation. Inside the control cabinet, the two electronic safety outputs must be connected to a safety module with OSSD inputs or to a safety PLC.

Series connection of multiple sensors

PL e + SIL 3

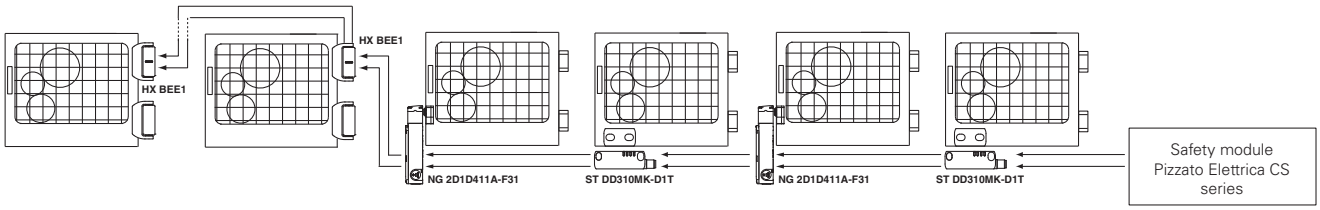
One of the most important features of the ST series from Pizzato Elettrica is the possibility of connecting up to 32 sensors in series, while still maintaining the maximum safety level (PL e) laid down in EN 13849-1.
This connection type is permissible in safety systems which have a safety module at the end of the chain that monitors the outputs of the last ST sensor.
The fact that the PL e safety level can be maintained even with 32 sensors connected in series demonstrates the extremely secure structure of each sensor of the ST series.



Series connection with other devices

PL e + SIL 3

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



High level coded actuators

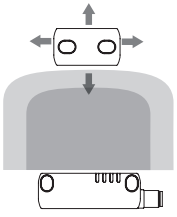
The ST series is provided with an electronic system based on RFID technology to detect the actuator. This allows to provide each actuator with different coding and makes it impossible to tamper with a device by using another actuator of the same series. Millions of different coding combinations are possible for the actuators. They are therefore classified as high level coded actuators, according to EN ISO 14119.

Protection degrees IP67 and IP69K

IP69K
IP67

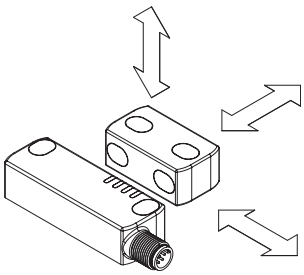
These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where maximum protection degree of the housing is required. Due to their special design, these devices are suitable for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

Wide actuation range



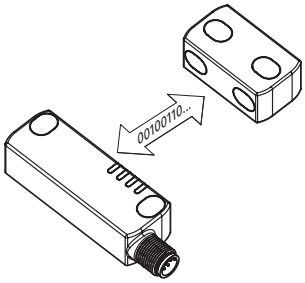
By utilising the properties of RFID technology, the sensors of the ST series have a wide actuation range, making them very well suited for applications with large tolerances or where mechanical properties change over time.

Actuation from many directions



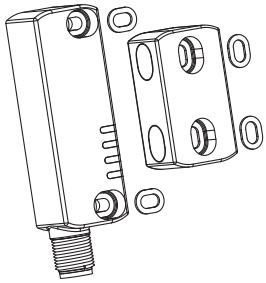
The sensors of the ST series from Pizzato Elettrica were designed to be activated from various directions, thereby providing the customer with maximum flexibility when positioning the sensors on the guards. Furthermore, the SM D•T actuator can be secured in two mutually orthogonal directions.

Programmability



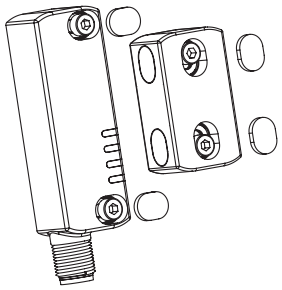
Pizzato Elettrica supplies a programmable version of the ST series sensors. With a simple and brief operation, the sensor can be programmed to recognise the code of a new actuator.
By activating a special input, the sensor is switched to a safe state, during which it waits for a new code to be accepted. As the actuator approaches, the ST sensor performs a number of checks on the code being received, whereby the code must adhere to certain parameters of RFID technology.
If the checks are successful, the sensor uses LEDs to signal the successful completion of the procedure.
After programming has been completed, the sensor only recognises the code of the last programmed actuator, thereby preserving the safety level and the reliability of the system in which it is installed.

Stainless steel fixing plates



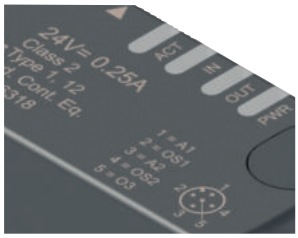
The stainless-steel fixing plates for the ST sensors not only protect the mounting eyes during installation on surfaces that are not perfectly flat, they also help the sensor better withstand mechanical loads. As a result, the system is safer and more reliable.

Protection against tampering



Each sensor and actuator of the ST series is supplied complete with snap-on protection caps to be applied on the holes of the fixing screws. Not only do the caps prevent dirt from accumulating and simplify cleaning, they also block access to the fastening screws of the actuator. As a result, standard screws can be used instead of tamper-proof screws.

Four LEDs for immediate diagnosis



As the LEDs have been designed for quick immediate diagnosis, the status of each input and output is highlighted by one specific LED. By knowing which device is active and which door is open, it is possible to quickly identify an interruption in the safety chain as well as any internal device errors. All of this at a glance, without needing to decode complex flashing sequences.

External device monitoring

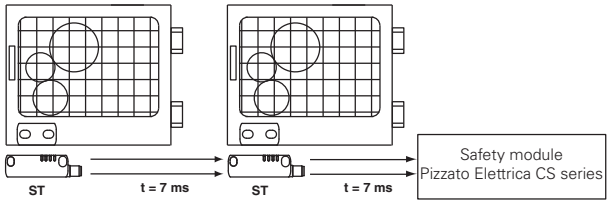
EDM On request, the switch can be supplied with EDM function (External Device Monitoring). In this case, the switch itself checks the proper function of the devices connected to the safety outputs. These devices (usually relays or safety contactors) must send a feedback signal to the EDM input, which checks that the received signal is consistent with the state of the safety outputs.

Laser engraving

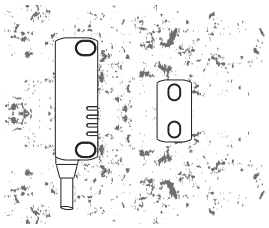
All devices are marked using a dedicated indelible laser system. These engravings are therefore suitable for extreme environments too. Thanks to this system that does not use labels, the loss of plate data is prevented and a greater resistance of the marking is achieved over time.

Short signal propagation delay

One of the main features of the ST sensors is the short signal propagation time of approx. 7 ms after deactivation of the inputs.
This short signal propagation time is particularly advantageous for sensors connected in series.

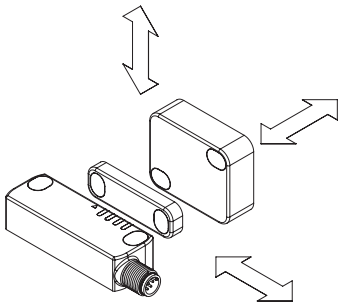


Insensitivity to dirt



The sensors are completely sealed and retain their safety characteristics even in the presence of dirt or deposits (not ferromagnetic material). This characteristic, combined with the design without recesses, makes them particularly suitable for use in the food industry.

Versions with increased actuation distance



In addition to the standard actuation distance of 12 mm, sensors with an actuation distance of 20 mm are also available. The increased actuation distance of the sensors is ideal for installation situations in which it is not possible to ensure that the actuator approaches the sensor in a precise and stable manner.

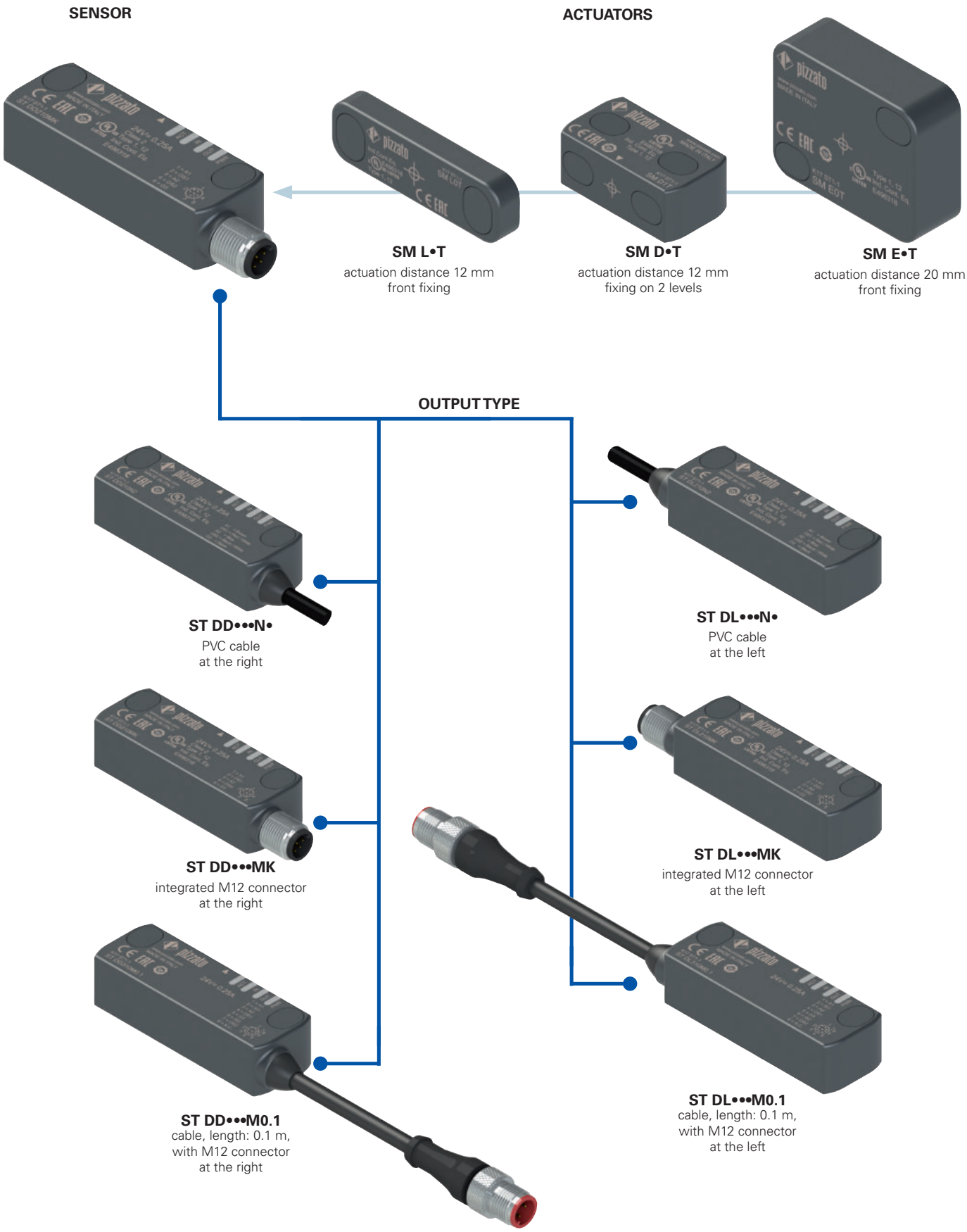
New compact actuators

In addition to the standard actuators, the new compact actuators SM L•T are now available to order; these actuators have a single mounting direction (frontal) and maintain the same actuation distance of 12 mm as the actuator SM D•T.
Due to the reduced thickness (just 7 mm), they can be installed in all applications with restricted space conditions and thereby enable use of RFID technology, even with guards of small dimensions.

Extended supply voltage range

In addition to the standard 24 Vdc supply voltage, the ST series sensors are available with an extended supply voltage of 12 … 24 Vdc (articles ST D•••1••). This characteristic makes them particularly suitable for use in the automotive sector, in machines powered by common battery systems, and both in light and heavy vehicles.

Selection diagram



product option

sold separately as accessory

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

Code structure for sensor with actuator

ST DD420N2-D1T

Output direction, connections	
D	output at the right
L	output at the left

Inputs and outputs					
	OS safety outputs	O signalling outputs	IS safety inputs	I programming inputs	EDM inputs
21	2	1	-	-	-
31	2	1	2	-	-
42	2	1	2	1	-
51	2	1	2	-	1
61	2	1 (inverted)	-	-	-
71	2	1 (inverted)	2	-	-
82	2	1 (inverted)	2	1	-

Note: versions 21, 31, 51, 61, 71 are only supplied together with an actuator

Actuator	
D0T	standard actuator low level of coding the sensor recognises any type D0T actuator
D1T	standard actuator high level of coding the sensor recognises one single type D1T actuator
E0T	Large actuator low level of coding the sensor recognises any type E0T actuator
E1T	Large actuator high level of coding the sensor recognises one single type E1T actuator
L0T	miniaturized actuator low level of coding the sensor recognises any type L0T actuator
L1T	miniaturized actuator high level of coding the sensor recognises one single type L1T actuator

Supply voltage	
0	24 Vdc
1	12 … 24 Vdc

Connection type	
0.1	cable, length: 0.1 m, with M12 connector
0.5	cable, length: 0.5 m
...	....
2	cable, length: 2 m (standard)
...	....
10	cable, length: 10 m
K	integrated M12 connector

Cable or connector type	
N	PVC cable, IEC 60332-1-2 oil resistant (standard)
H	PUR cable, halogen free (not available with versions ST D•2•••• and ST D•6••••)
M	M12 connector

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

Code structure for single sensor

ST DD420N2

Output direction, connections	
D	output at the right
L	output at the left

Inputs and outputs				
	OS safety outputs	O signalling outputs	IS safety inputs	I programming inputs
42	2	1	2	1
82	2	1 (inverted)	2	1

Connection type	
0.1	cable, length: 0.1 m, with M12 connector
0.5	cable, length: 0.5 m
...	....
2	cable, length: 2 m (standard)
...	....
10	cable, length: 10 m
K	integrated M12 connector

Supply voltage	
0	24 Vdc
1	12 … 24 Vdc

Cable or connector type	
N	PVC cable, IEC 60332-1-2 oil resistant (standard)
H	PUR cable, halogen free (not available with version ST D•2••••)
M	M12 connector

Attention! Individual sensors are initially programmed with the code of the actuators with low coding level •0T.
Attention! The feasibility of a code number does not mean the effective availability of a product. Please contact our sales office.

Code structure for actuator

SM D1T

Design and actuation distance	
D	standard actuator actuation distance 12 mm
E	large actuator actuation distance 20 mm
L	miniaturized actuator actuation distance 12 mm

Actuator	
0T	low level coded actuator the sensor recognises any type •0T actuator
1T	high level coded actuator the sensor recognises one single type •1T actuator

Main features

- Actuation without contact, using RFID technology
- Digitally coded actuator
- Protection degrees IP67 and IP69K
- 4 LEDs for status display of the sensor
- Actuators with various actuation distances

Quality marks:

UL approval:	E496318
EC type examination certificate:	M6A 18 01 75157 021
TÜV SÜD approval:	Z10 18 01 75157 011
EAC approval:	RU C-IT.УТ03.B.00035/19

In compliance with standards:
IEC 61508-1, IEC 61508-2, IEC 61508-3, IEC 61508-4, EN ISO 13849-1, EN ISO 13849-2, EN ISO 14119, EN 62061, EN 60947-5-3, EN 60947-5-2, EN 60947-1, EN 61326-1, EN 61326-3-1, EN 61326-3-2, EN 50581, ETSI 301 489-1, ETSI 301 489-3, ETSI 300 330-2, UL 508, CSA 22.2 No.14

Compliance with the requirements of:
Machinery Directive 2006/42/EC, EMC Directive 2014/30/EC, Directive 2014/53/EU - RED, RoHS Directive 2011/65/EU, FCC Part 15.

Connection with safety modules for safety applications:
Connection with safety modules CS AR-05••••; CS AR-06••••; CS AR-08••••; CS AT-0•••••; CS AT-1•••••; CS MP•••••.
When connected to the safety module, the sensor can be classified as a control circuit device up to PDDB (EN 60947-5-3).
The system can be used in safety circuits up to PL e/SIL 3/category 4 in accordance with EN ISO 13849-1.

Technical data

Housing

Housing made of glass fibre reinforced technopolymer, self-extinguishing.
Versions with integrated cable 6 x 0.5 mm² or 8 x 0.34 mm², length 2 m, other lengths 0.5 m … 10 m on request
Versions with M12 stainless steel connector
Versions with 0.1 m cable length and integrated M12 connector, other lengths 0.1 … 3 m on request

Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Interlock, no contact, coded:	type 4 acc. to EN ISO 14119
Level of coding acc. to EN ISO 14119:	high with SM •1T actuators low with SM •0T actuators
Safety parameters:	
$MTTF_D$:	4077 years
PFH_D:	1.20E-11
DC:	High
Mission time:	20 years
Ambient temperature for sensors without cable:	-25 … +70 °C
Ambient temperature for sensors with cable:	see table page 44
Storage and transport temperature:	-25 … +85 °C
Vibration resistance:	10 gn (10 … 150 Hz) acc. to IEC 60068-2-6
Shock resistance:	30 gn; 11 ms acc. to EN 60068-2-27
Pollution degree	3
Screw tightening torque:	0.8 … 2 Nm

Electrical data of IS1/IS2/I3/EDM inputs

Rated operating voltage U_{e1}:	24 Vdc or 12 … 24 Vdc
Rated current consumption I_{e1}:	5 mA

Electrical data of OS1/OS2 safety outputs

Rated operating voltage U_{e2}:	24 Vdc or 12 … 24 Vdc
Output type:	PNP type OSSD
Maximum current per output I_{e2}:	0.25 A
Minimum current per output I_{m2}:	0.5 mA
Thermal current I_{th2}:	0.25 A
Utilization category:	DC13; U_{e2}=24 Vdc, I_{e2}=0.25 A
Short circuit detection:	Yes
Overcurrent protection:	Yes
Internal self-resettable protection fuse:	0.75 A
Duration of the deactivation impulses at the safety outputs:	< 300 µs
Permissible maximum capacitance between outputs:	< 200 nF
Permissible maximum capacitance between output and ground:	< 200 nF

Electrical data of O3 signalling output

Rated operating voltage U_{e3}:	24 Vdc or 12 … 24 Vdc
Output type:	PNP
Maximum current per output I_{e3}:	0.1 A
Utilization category:	DC12; U_{e3}=24 Vdc; I_{e3}=0.1 A
Short circuit detection:	No
Overcurrent protection:	Yes
Internal self-resettable protection fuse:	0.75 A

Actuation data

	SM D•T	SM E•T	SM L•T
Assured operating distance S_{ao}:	10 mm	16 mm	10 mm
Assured release distance S_{ar}:	16 mm	27 mm	16 mm
Rated operating distance S_n:	12 mm	20 mm	12 mm
Rated release distance S_{nr}:	14 mm	23 mm	14 mm
Repeat accuracy:	≤ 10 % s_n		
Differential travel:	≤ 20 % s_n		
RFID transponder frequency:	125 kHz		
Max. switching frequency:	1 Hz		
Distance between two sensors:	min. 50 mm		
Response time upon deactivation of input IS1 or IS2:	typically 7 ms, max. 12 ms		
Response time upon actuator removal:	typically 80 ms, max. 150 ms		

Power supply electrical data

Rated operating voltage U_e SELV:	
- 24 Vdc versions	24 Vdc -15% … +10%
- 12 … 24 Vdc versions	12 … 24 Vdc -30% … +25%
Operating current at U_e voltage:	
- minimum:	40 mA
- with all outputs at maximum power:	0.7 A
Rated insulation voltage U_i:	32 Vdc
Rated impulse withstand voltage U_{imp}:	1.5 kV
External protection fuse:	1 A type Gg or equivalent device
Overvoltage category:	III

Features approved by UL

Electrical Ratings: 24 Vdc Class 2, 0,25 A (resistive load)

Environmental Ratings: Types 1, 4X, 6, 12, 13

Accessory for series ST for actuator switch series SM D, SM E, SM G, SM L.

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

Features approved by TÜV SÜD

Supply voltage: 24 Vdc
12 … 24 Vdc

Rated operating current (max.): 0.25 A

Ambient temperature: -25 °C … + 70°C

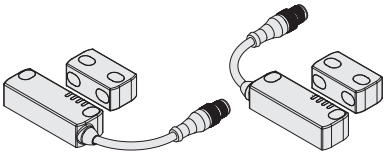
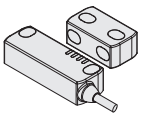
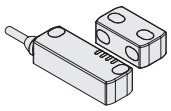
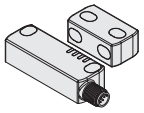
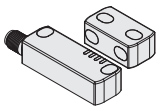
Protection degree: IP67 and IP69K

PL, category: PL e, category 4

In compliance with standards: Machine Directive 2006/42/EEC
EN ISO 13849-1:2015, EN 60947-5-3:2013, EN 50178:1997,
EN 61508-1:2010 (SIL 3), EN 61508-2:2010 (SIL 3), EN 61508-3:2010 (SIL 3),EN 61508-4:2010 (SIL 3), IEC 62061:2005/A2:2015 (SIL CL 3)

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

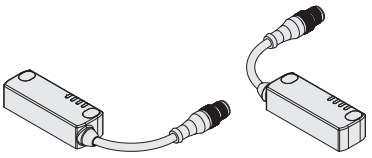
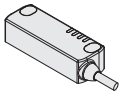
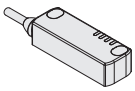
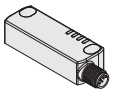
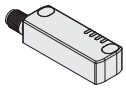
Selection table for sensors with high level coded actuators

OS safety outputs	O signalling outputs	IS safety inputs	I programming inputs	EDM inputs	Programmable	cable, length: 0.1 m, with M12 connector at the right	cable, length: 0.1 m, with M12 connector at the left	integrated cable, at the right	integrated cable, at the left	M12 connector, at the right	M12 connector, at the left
2	1	-	-	-	-	/	/	ST DD210N•-D1T	ST DL210N•-D1T	ST DD210MK-D1T	ST DL210MK-D1T
2	1	2	-	-	-	ST DD310M0.1-D1T	ST DL310M0.1-D1T	ST DD310N•-D1T	ST DL310N•-D1T	ST DD310MK-D1T	ST DL310MK-D1T
2	1	2	1	-	•	ST DD420M0.1-D1T	ST DL420M0.1-D1T	ST DD420N•-D1T	ST DL420N•-D1T	ST DD420MK-D1T	ST DL420MK-D1T
2	1	2	-	1	-	ST DD510M0.1-D1T	ST DL510M0.1-D1T	ST DD510N•-D1T	ST DL510N•-D1T	ST DD510MK-D1T	ST DL510MK-D1T

To order a product with E•T or L•T actuator replace D with E or L in the codes shown above.
For example: ST DD310M0.1-D•T → ST DD310M0.1-E•T or ST DD310M0.1-L•T

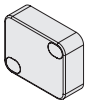
Selection table for sensors

OS safety outputs	O signalling outputs	IS safety inputs	I programming inputs	EDM inputs	Programmable	cable, length: 0.1 m, with M12 connector at the right	cable, length: 0.1 m, with M12 connector at the left	integrated cable, at the right	integrated cable, at the left	M12 connector, at the right	M12 connector, at the left
2	1	2	1	-	•	ST DD420M0.1	ST DL420M0.1	ST DD420N•	ST DL420N•	ST DD420MK	ST DL420MK

Selection table for actuators





Level of coding acc. to ISO 14119	actuation distance 12 mm	actuation distance 12 mm	actuation distance 20 mm
low	SM L0T	SM D0T	SM E0T
high	SM L1T	SM D1T	SM E1T

The use of RFID technology in ST series sensors makes them suitable for several applications. Pizzato Elettrica offers two different versions of actuators, in order to best suit customers' specific needs.

Type •0T actuators are all encoded with the same code. This implies that a sensor associated with an actuator type •0T can be activated by other actuators type •0T.

Type •1T actuators are always encoded with different codes. This implies that a sensor associated with an actuator type •1T can be activated only by a specific actuator. Another •1T type actuator will not be recognised by the sensor until a new association procedure is carried out (reprogramming). After reprogramming, the old actuator type •1T will no longer be recognized.

Reprogramming of the actuator can be performed repeatedly.

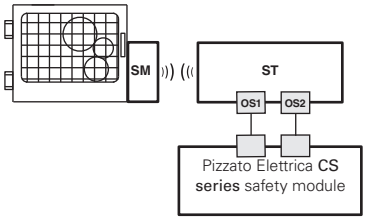
Ambient temperature for sensors with cable

	Connection type	Output with cable		Output with cable and M12 connector
Cable features	Cable type	N	H	
	Conductors	8x0.34 mm²	8x0.34 mm²	8x0.25 mm²
	Application field	General	General, mobile installation	General
	In compliance with standards	03VV-F	03E7Q-H	03VV-H
	Sheath	PVC OIL RESISTANT	PUR Halogen Free	PVC OIL RESISTANT
	Self-extinguishing	IEC 60332-1-2 UL 758:FT1 CEI 20-22 II	IEC 60332-1-2 UL 758:FT1	IEC 60332-1-2 UL 758:FT1 CEI 20-22 II
	Oil resistant	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210
	Max. speed	/	300 m/min.	50 m/min
	Max. acceleration	/	30 m/s²	5 m/s²
	Minimum bending radius	108 mm	70 mm	90 mm
	Outer diameter	7 mm	7 mm	6 mm
	End stripped	80 mm	80 mm	/
	Copper conductors	Class 5 IEC 60228	Class 6 IEC 60228	Class 6 IEC 60228
	Engraving	6276	6283	6275
Ambient temperature	Cable, fixed installation	-25°C +70°C	-25°C +70°C	-25°C +70°C
	Cable, flexible installation	-5°C +70°C	-25°C +70°C	-15°C +70°C
	Cable, mobile installation	/	-25°C +70°C	-15°C +70°C
	Approvals	CE cULus TÜV EAC	CE cULus TÜV EAC	CE cULus TÜV EAC

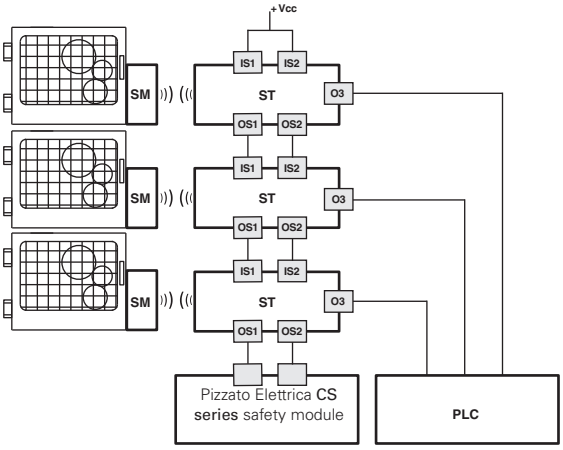
→ The 2D and 3D files are available at **www.pizzato.com**

Complete safety system

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



ST sensors can be used as individual devices provided that the outputs be evaluated by a Pizzato Elettrica safety module (see table for combinable safety modules).

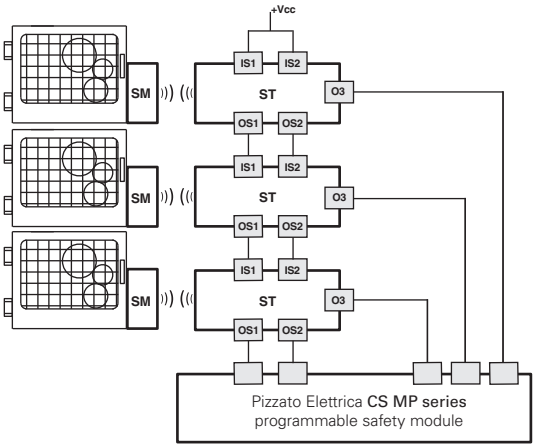


Possibility of series connection of multiple sensors for simplifying the wiring of the safety system, whereby only the outputs of the last sensor are evaluated by a Pizzato Elettrica safety module (see table with compatible safety modules). Each ST sensor is equipped with a signalling output, which – depending on the version – is activated or deactivated when the respective guard is closed. Depending on the specific requirements of the application, this information can be evaluated by a PLC.

Compatible safety modules

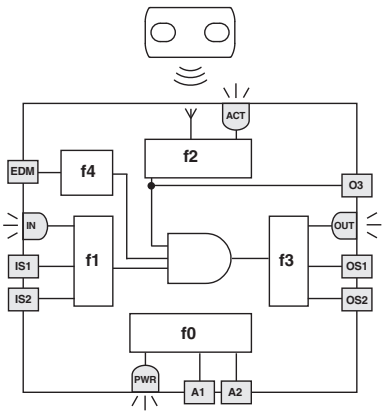
Sensors	Safety modules	Safety module output contacts		
		Instantaneous safety contacts	Delayed safety contacts	Signalling contacts
ST D••••••	CS AR-05••••	3NO	/	1NC
	CS AR-06••••	3NO	/	1NC
	CS AR-08••••	2NO	/	/
	CS AT-0•••••	2NO	2NO	1NC
	CS AT-1•••••	3NO	2NO	/
	CS MP••••••	see p. 277		
	CS MF••••••	see p. 305		

All ST series sensors can be connected, provided that compatibility is checked, to safety modules or safety PLCs with OSSD inputs.



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

Internal block diagram (ST D•5••••)



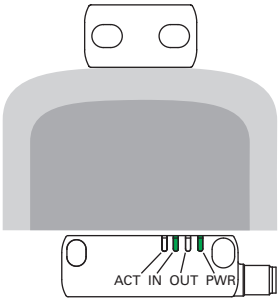
The adjacent diagram illustrates five logical, linked sub-functions of the sensor.
Function f0 is a basic function and includes the monitoring of the power supply as well as internal, cyclical tests.
Function f1 monitors the status of the inputs, whereas function f2 monitors the position of the actuator in the detection area.
Function f3 is intended to activate or deactivate the safety outputs and check for any faults or short circuits in the outputs.
In the EDM versions, function f4 checks the EDM signal on state changes of the safety outputs.

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

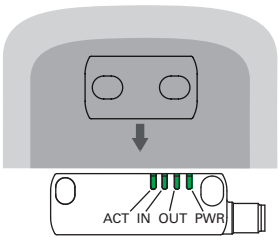
The safety-related function, which combines the sub-functions mentioned above, only activates the safety outputs if the input signals are correctly applied and the actuator is located within the safe zone.
The status of each sub-function is displayed by corresponding LEDs (PWR, IN, ACT, OUT), thereby providing a quick overview of the operating status of the sensor.

Limit activation zone and safe activation zone (ST D•4••••)

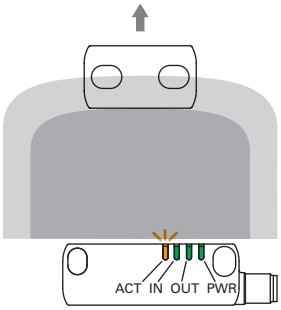
When aligning the sensor with the actuator, the status LEDs use various colours to indicate whether the actuator is in the limit activation zone or in the safe activation zone. The following figures use the ST DD420MK-D1T sensor as an example.



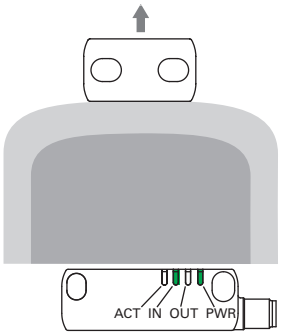
Operating voltage is applied to the sensor, (LED PWR on, green), the inputs are enabled (LED IN on, green), the outputs are deactivated (LED OUT off). The actuator is outside of the actuation zone (LED ACT off).



If the actuator is moved inside the safe activation zone (dark grey area), the ACT LED on the sensor illuminates (green) and it activates the outputs (LED OUT on, green).



When the actuator leaves the safe zone, the sensor keeps the safety outputs enabled. Entry into the limit activation zone (light grey area) is, however, indicated by the ACT LED (orange/green, flashing).



As soon as the actuator exits the limit activation zone, the sensor deactivates the outputs and switches off the OUT and ACT LEDs.

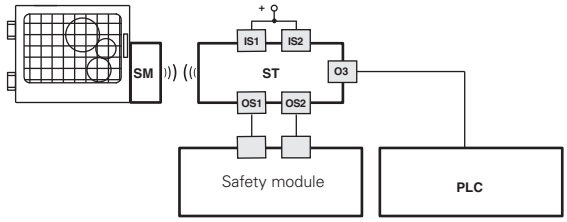
Operating states (ST D•4••••)

PWR LED	OUT LED	IN LED	ACT LED	Sensor state	Description
○	○	○	○	OFF	Sensor off.
●	○	○	○	POWER ON	Internal tests upon activation.
●	✳	○	✳	RUN	Sensor with inactive inputs.
●	✳	●	✳	RUN	Activation of the inputs.
●	✳	◐	✳	RUN	Input incoherence. Recommended action: check for presence and/or wiring of inputs.
●	✳	✳	●	RUN	Actuator in safe area. O3 signalling output active.
●	✳	✳	◐	RUN	Actuator in limit activation zone, O3 active. Recommended action: bring the sensor back to the safe area.
●	●	●	●	RUN	Activation of the inputs. Actuator in safe area and safety outputs active.
●	◐	✳	✳	ERROR	Error on outputs. Recommended action: check for any short circuits between the outputs, outputs and ground or outputs and power supply, then restart the sensor.
●	✳	✳	✳	ERROR	Internal error. Recommended action: restart the sensor. If the failure persists, replace the sensor.

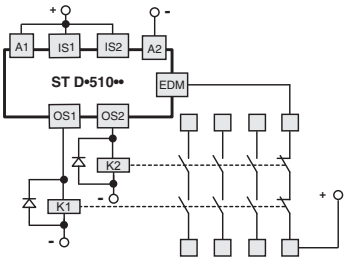
Legend: ○ = off ● = on ◐ = flashing ◑ = alternating colours
✳ = indifferent

O3 output inverted (ST D•6••••, ST D•7••••, ST D•8••••)

The version with inverted O3 signalling output allows checking of the actual electrical connection of the sensor by an external PLC. The O3 output will be activated when the actuator is removed and the OS safety outputs are switched off.

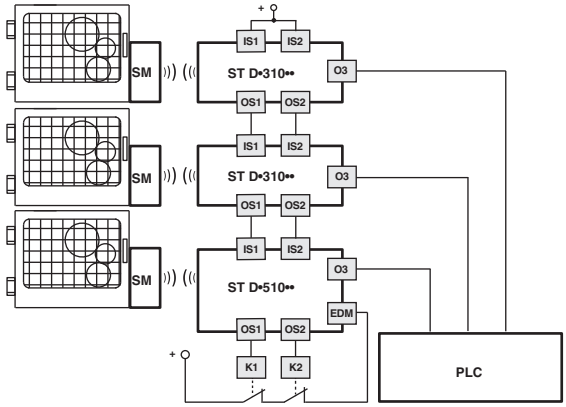


External device monitoring (EDM)



The ST D•51••• version, in addition to maintaining the operating and safety characteristics of the ST series, allows control of **forcibly guided NC contacts of contactors or relays** controlled by the safety outputs of the sensor itself. As an alternative to the relays or contactors you can use Pizzato Elettrica expansion modules CS ME-03. See page 263.

This check is carried out by monitoring the EDM input (External Device Monitoring as defined in EN 61496-1) of the sensor.



This version, with the IS safety inputs, **can be used at the end of a series** of ST sensors, **up to a maximum number of 32 devices**, while maintaining the maximum PL e safety level according to EN ISO 13849-1.

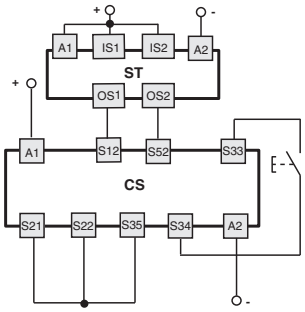
For specific applications, this solution allows you to dispense with the safety module connected to the last device in the chain.

Connection with safety modules

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

Input configuration with monitored start

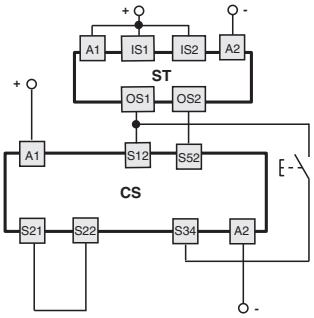
2 channels / Category 4 / up to SIL 3 / PL e



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

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

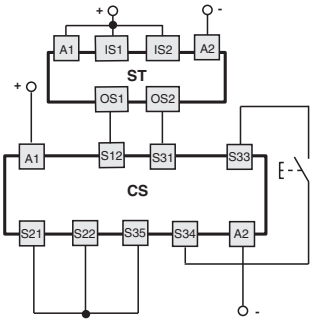
2 channels / Category 4 / up to SIL 3 / PL e



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

Input configuration with monitored start

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

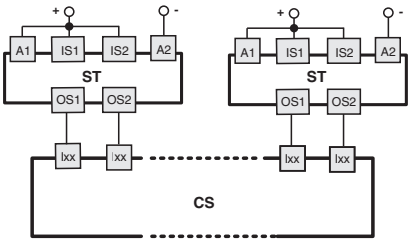


For features of the safety modules see page 213.

Connection with safety module CS MP••••0

The connections vary according to the program of the module

Category 4/ up to SIL 3 / PL e

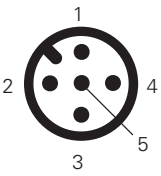


For application examples, see page 276.

Internal device connections

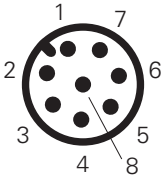
5-pole versions
ST D•2••••, ST D•6••••

M12 connector	Cable	Connection
1	brown	A1 (+)
2	red/white	OS1
3	blue	A2 (-)
4	black/white	OS2
5	black	O3
/	red	not connected



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

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



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

Legend

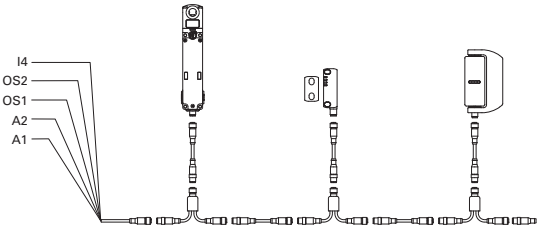
A1-A2: supply
IS1-IS2 Safety inputs
OS1-OS2: safety outputs
O3: signalling output
I3: programming input
EDM: input for monitoring of NC contacts of the contactors

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

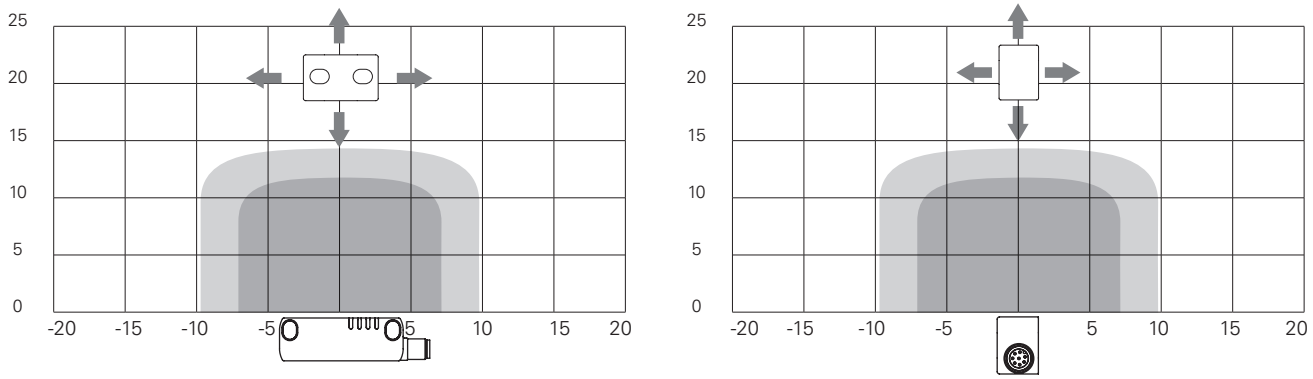
For female connectors, see page 321.

Series connection

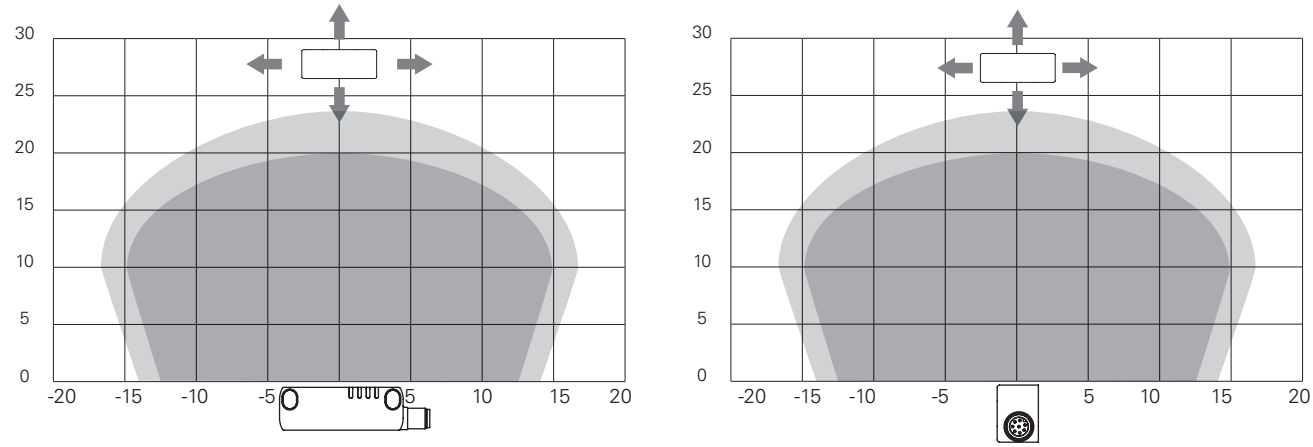
To simplify series connections of the devices, various M12 connectors are available that allow complete wiring.
This solution significantly reduces installation times while at the same time maintaining the maximum safety levels PL e and SIL 3.
For further information see page 326.



Operating distances SM D•T/SM L•T actuators



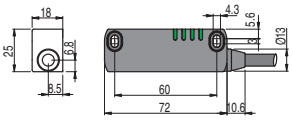
Operating distances SM E•T actuator



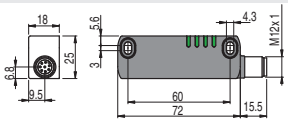
Legend:
Rated operating distance s_n (mm)
Rated release distance s_{nr} (mm)
Note: The progress of the activation areas is for reference only; the possible application on ferromagnetic surfaces can reduce the operating distances.

Dimensional drawings

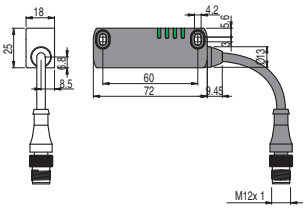
ST DD•••N• sensor with cable at the right



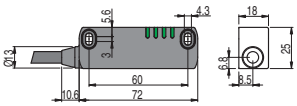
ST DD•••MK sensor with M12 connector at the right



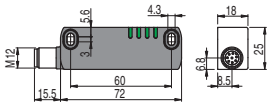
ST DD•••M0.1 sensor with cable and M12 connector at the right



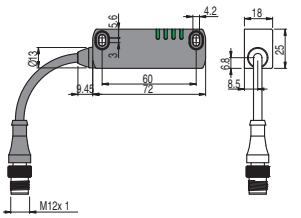
ST DL•••N• sensor with cable at the left



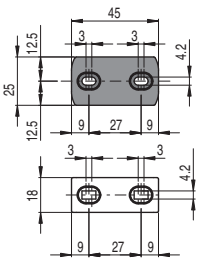
ST DL•••MK sensor with M12 connector at the left



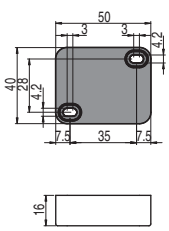
ST DL•••M0.1 sensor with cable and M12 connector at the left



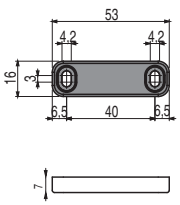
SM D•T actuator



SM E•T actuator



SM L•T actuator



All values in the drawings are in mm

Accessories See page 321

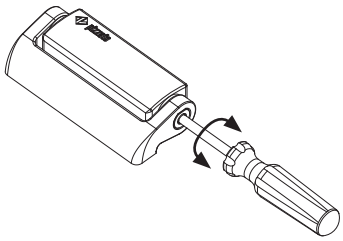
➔ The 2D and 3D files are available at **www.pizzato.com**

HP-HC series safety hinge switches

Description

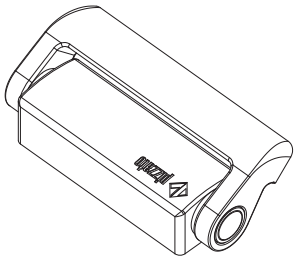
The HP - HC series hinge switches from Pizzato Elettrica combine safety and style in a single product. The electric switch is fully integrated into the mechanical hinge so that it is virtually invisible to an inexpert eye. This, asides from being an aesthetic advantage, guarantees greater safety as a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

Adjustment of the switching point



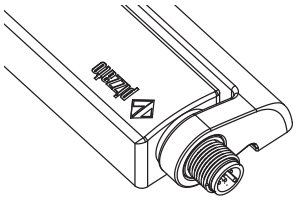
The switching point of the switches can be set with a Phillips head screwdriver.
Adjusting the switching point allows for any calibration for large size guards. After calibrating the switch, it is always necessary to close the hole using the safety cap supplied.

Basic activation angle variants



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

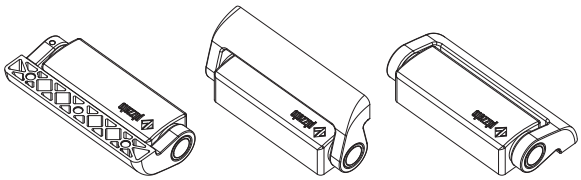
Integrated M12 connector



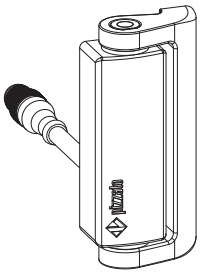
Versions with connection from the top or the bottom are available with integrated M12 connector.
The use of versions with connectors permits faster wiring if guards need to be moved from the test location to the installation site.

Opening angle up to 180°

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



Cable with connector at the back



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

Versions for glass or polycarbonate doors

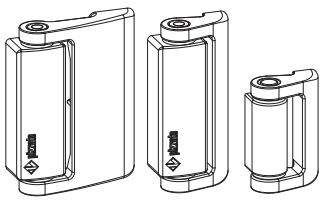
A version of the switch developed exclusively for glass and polycarbonate doors without frame is available.
Installation is facilitated by the larger supporting arm and the spaced fixing points; these also prevent the formation of cracks caused by holes located too close to the edge of the guard.
It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

Protection degrees IP67 and IP69K

IP69K
IP67

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

Additional hinges

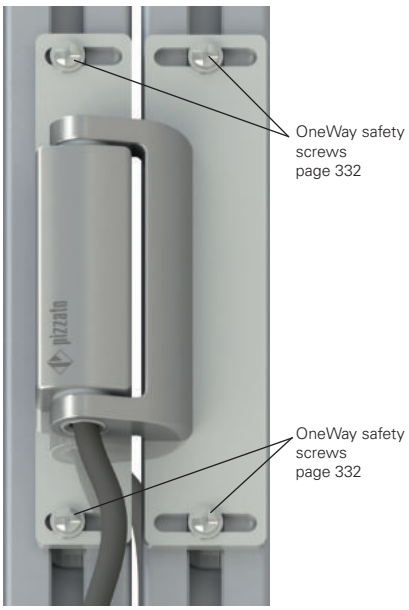


To complete the installation, various types of additional hinges are available to be used in a variable number depending on the weight of the guard.
These hinges have the same aesthetic but cost less as they contain no electrical parts.

Application examples

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

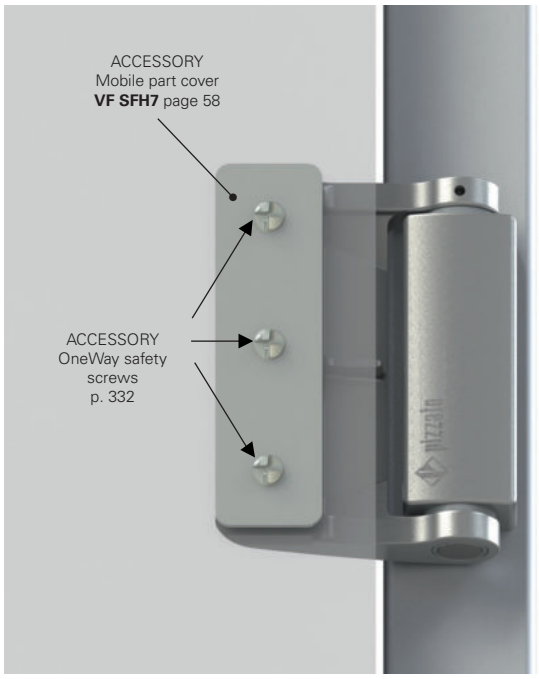
- Switch with angular mounting plate for slotted profile.
- Fixing with internal screws.
- Output with M12 connector at the bottom.



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

Closed door

Open door



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

Selection diagram

DESIGNS

A

100x50 mm movable part, metal

B

100x75 mm movable part, metal

CABLES AND CONNECTORS

S

Cable output, bottom (standard)

A

Cable output, top

P

Cable output, back

KSM

M12 connector, bottom

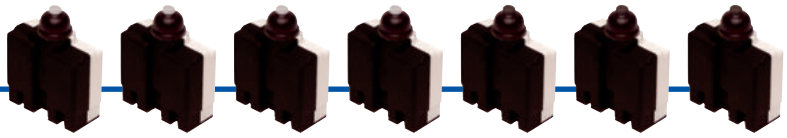
KAM

M12 connector, top

0.2PM

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

CONTACT BLOCKS



52C

1NO+1NC slow action

52D

2NC slow action

52F

1NO+2NC slow action

52M

2NO+2NC slow action

53C

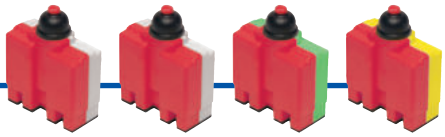
1NO+1NC slow action, make before break

53F

1NO+2NC slow action, make before break

53M

2NO+2NC slow action, make before break



50C

1NO+1NC snap action

50D

2NC snap action

50F

1NO+2NC snap action

50M

2NO+2NC snap action

ADDITIONAL HINGES

HC LL

HC AA

HC AB

product option

Code structure

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

article | options

HP AA052C-2SNGH15

Movable part	
A	100x50 mm movable part, metal
B	100x75 mm movable part, metal

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

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

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

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

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

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

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

Code structure for additional hinges

HC AA

Additional hinges (H x L)	
HC AA	100.6 x 49 mm
HC AB	100.6 x 79 mm
HC LL	65 x 44.5 mm

HP-HC series safety hinge switches

Main features

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

Quality marks:

IMQ approval:	CA02.03746
UL approval:	E131787
CCC approval:	2013010305647255
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	5,000,000 for NC contacts
Mission time	20 years
Ambient temperature for hinges without cable:	-25C° … +80C° (standard) -40C° … +80C° (T6 option)
Ambient temperature for hinges with cable:	See table on page 54
Max. actuation frequency:	1200 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	90°/s
Min. actuation speed:	2°/s
Mounting position:	any
Tightening torque, M5 screws:	3 … 5 Nm

Electrical data

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

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 50581, ISO 20653, UL 508, CSA 22.2 No.14.
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14, GB/T14048.5-2017.

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

⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.

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

Features approved by IMQ

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

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

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

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

Features approved by UL

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

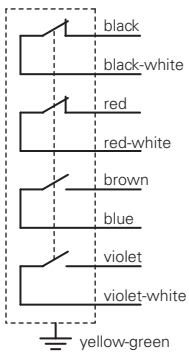
Please contact our technical department for the list of approved products.

Ambient temperatures for hinges with cable and electrical data

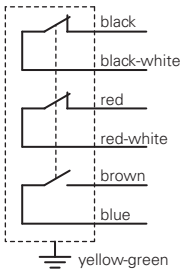
	Connection type	Output with cable								Output with M12 connector	
	Contact blocks	2 contacts				3 contacts		4 contacts		2 contacts	3 or 4 contacts
	Cable or connector type	E	N	H	R	N	H	N	R	M12 connector, 5-pole	M12 connector, 8-pole
Cable features	Conductors	5x0.75 mm²	5x0.75 mm²	5x0.75 mm²	5x0.5mm²	7x0.5 mm²	7x0.5 mm²	9x0.34 mm²	9x0.5 mm²	5x0.25 mm²	8x0.25 mm²
	Application field	General	General	General, mobile installation	Rail	General	General, mobile installation	General	Rail	General	General
	In compliance with standards	H05VV-F	H05VV5-F	05EQ-H	EN50306-4 1E-300V 5G0.5 mm² MM-90 EN 50306-4 EN 45545	03VV-F	03E7Q-H	03VV-F	EN50306-4 1P-300V- 9G0.5 mm² MM-90 EN 50306-4 EN 45545	03VV-H	03VV-H
	Sheath	PVC	PVC OIL RESISTANT	PUR HALOGEN FREE	/	PVC OIL RESISTANT	PUR HALOGEN FREE	PVC OIL RESISTANT	/	PVC OIL RESISTANT	PVC OIL RESISTANT
	Self-extinguishing	IEC 60332-1-2	IEC 60332-1-2 UL 758:FT1 CEI 20-22 II	IEC 60332-1-2 UL 758:FT1	IEC 60332-1 EN 50305 EN 50306-1	IEC 60332-1-2 UL 758:FT1 CEI 20-22 II	IEC 60332-1-2 UL 758:FT1	IEC 60332-1-2 UL 758:FT1 CEI 20-22 II	IEC 60332-1 EN 50305 EN 50306-1	IEC 60332-1-2 CEI 20-22 II UL 758:FT1	IEC 60332-1-2 CEI 20-22 II UL 758:FT1
	Oil resistant	/	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210	/	UL 758 CSA 22.2 N°210	UL 758	UL 758 CSA 22.2 N°210	/	UL 758 CSA 22.2 N°210	UL 758 CSA 22.2 N°210
	Max. speed	/	/	300 m/min	/	/	300 m/min	/	/	50 m/min	50m/min
	Max. acceleration	/	/	30 m/s²	/	/	30 m/s²	/	/	5 m/s²	5m/s²
	Minimum bending radius	80 mm	80 mm	80 mm	60 mm	108 mm	80 mm	108 mm	65 mm	75 mm	90 mm
	Outer diameter	8 mm	8 mm	8 mm	6 mm	7 mm	7 mm	7 mm	6.5 mm	6 mm	6 mm
	End stripped	80 mm	80 mm	80 mm	80 mm	80 mm	80 mm	80 mm	80 mm	/	/
	Copper conductors IEC 60228	Class 5	Class 5	Class 6	Class 5	Class 5	Class 6	Class 5	Class 5	Class 6	Class 6
	Engraving	Standard	6268	6280	Standard	6274	6282	6278	Standard	6267	6275
Ambient temperature with cable standard	Cable, fixed installation	-15°C +60°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C	-25°C +80°C
	Cable, flexible installation	+5°C +60°C	-5°C +80°C	-25°C +80°C	-25°C +80°C	-5°C +80°C	-25°C +80°C	-5°C +80°C	-25°C +80°C	-15°C +80°C	-15°C +80°C
	Cable, mobile installation	/	/	-25°C +80°C	/	/	-25°C +80°C	/	/	-15°C +80°C	-15°C +80°C
Ambient temperature with cable extended (T6)	Cable, fixed installation	/	/	-40°C +80°C	-40°C +80°C	/	-40°C +80°C	/	-40°C +80°C	/	/
	Cable, flexible installation	/	/	-40°C +80°C	-40°C +80°C	/	-40°C +80°C	/	-40°C +80°C	/	/
	Cable, mobile installation	/	/	-40°C +80°C	/	/	-40°C +80°C	/	/	/	/
Electrical data	Thermal current Ith	10 A	10 A	10 A	6 A	6 A	6 A	3 A	4 A	4 A	2 A
	Rated insulation voltage Ui	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac 300 Vdc	30 Vac 36 Vdc
	Protection against short circuits (fuse)	10 A 500 V type gG	10 A 500 V type gG	10 A 500 V type gG	6 A 500 V type gG	6 A 500 V type gG	6 A 500 V type gG	3 A 500 V type gG	4 A 500 V type gG	4 A 500 V type gG	2 A 500V type gG
	Utilization category DC13 24 V	2 A	2 A	2 A	2 A	2 A	2 A	2 A	2 A	2 A	2 A
	Utilization category DC13 125 V	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	0.4 A	/
	Utilization category DC13 250 V	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	0.3 A	/
	Utilization category AC15 24 V	4 A	4 A	4 A	4 A	4 A	4 A	3 A	4 A	4 A	2 A
	Utilization category AC15 120 V	4 A	4 A	4 A	4 A	4 A	4 A	3 A	4 A	4 A	/
	Utilization category AC15 250 V	4 A	4 A	4 A	4 A	4 A	4 A	3 A	4 A	4 A	/
	Approvals	CE cULus IMQ EAC CCC	CE cULus IMQ EAC CCC	CE cULus IMQ EAC CCC	CE IMQ EAC CCC	CE cULus IMQ EAC CCC	CE cULus IMQ EAC CCC	CE cULus IMQ EAC CCC	CE IMQ EAC CCC	CE cULus IMQ EAC CCC	CE cULus EAC

Internal cable wiring

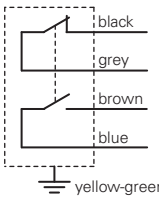
2NO+2NC



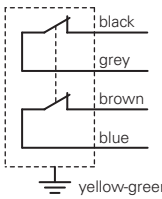
1NO+2NC



1NO+1NC



2NC



Connector pin assignment

2NO+2NC

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

1NO+2NC

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

1NO+1NC

1-2 NC
3-4 NO
5

2NC

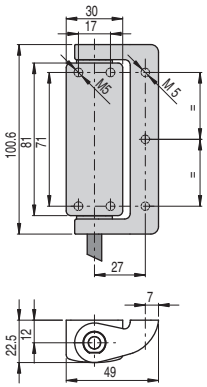
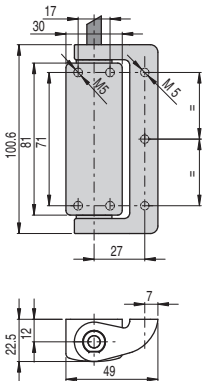
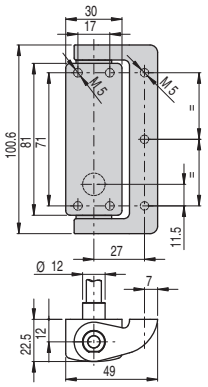
1-2 NC
3-4 NC
5

Female connectors See page 321

Contact type

L = slow action

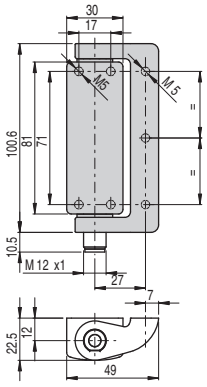
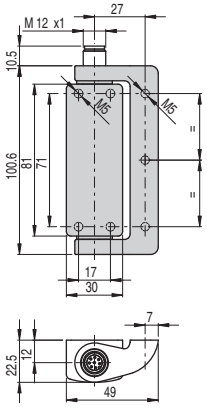
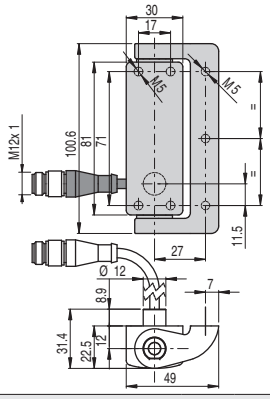
LO = slow action, make before break

Contact blocks		2 m cable, bottom		2 m cable, top		2 m cable, back	
							
52C	L	HP AA052C-2SN	1NO+1NC	HP AA052C-2AN	1NO+1NC	HP AA052C-2PN	1NO+1NC
52D	L	HP AA052D-2SN	2NC	HP AA052D-2AN	2NC	HP AA052D-2PN	2NC
52F	L	HP AA052F-2SN	1NO+2NC	HP AA052F-2AN	1NO+2NC	HP AA052F-2PN	1NO+2NC
52M	L	HP AA052M-2SN	2NO+2NC	HP AA052M-2AN	2NO+2NC	HP AA052M-2PN	2NO+2NC
53C	LO	HP AA053C-2SN	1NO+1NC	HP AA053C-2AN	1NO+1NC	HP AA053C-2PN	1NO+1NC
53F	LO	HP AA053F-2SN	1NO+2NC	HP AA053F-2AN	1NO+2NC	HP AA053F-2PN	1NO+2NC
53M	LO	HP AA053M-2SN	2NO+2NC	HP AA053M-2AN	2NO+2NC	HP AA053M-2PN	2NO+2NC
Actuating force		0.3 Nm (0.65 Nm →)		0.3 Nm (0.65 Nm →)		0.3 Nm (0.65 Nm →)	
Travel diagrams		page 58 - group 1		page 58 - group 1		page 58 - group 1	

Contact type

L = slow action

LO = slow action, make before break

Contact blocks		M12 connector, bottom		M12 connector, top		cable (0.2 m) with M12 connector, back	
							
52C	L	HP AA052C-KSM	1NO+1NC	HP AA052C-KAM	1NO+1NC	HP AA052C-0.2PM	1NO+1NC
52D	L	HP AA052D-KSM	2NC	HP AA052D-KAM	2NC	HP AA052D-0.2PM	2NC
52F	L	HP AA052F-KSM	1NO+2NC	HP AA052F-KAM	1NO+2NC	HP AA052F-0.2PM	1NO+2NC
52M	L	HP AA052M-KSM	2NO+2NC	HP AA052M-KAM	2NO+2NC	HP AA052M-0.2PM	2NO+2NC
53C	LO	HP AA053C-KSM	1NO+1NC	HP AA053C-KAM	1NO+1NC	HP AA053C-0.2PM	1NO+1NC
53F	LO	HP AA053F-KSM	1NO+2NC	HP AA053F-KAM	1NO+2NC	HP AA053F-0.2PM	1NO+2NC
53M	LO	HP AA053M-KSM	2NO+2NC	HP AA053M-KAM	2NO+2NC	HP AA053M-0.2PM	2NO+2NC
Actuating force		0.3 Nm (0.65 Nm →)		0.3 Nm (0.65 Nm →)		0.3 Nm (0.65 Nm →)	
Travel diagrams		page 58 - group 1		page 58 - group 1		page 58 - group 1	

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

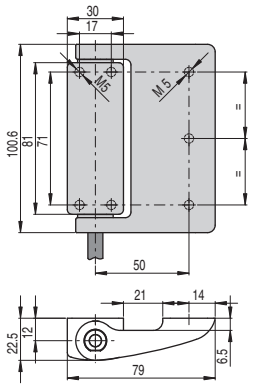
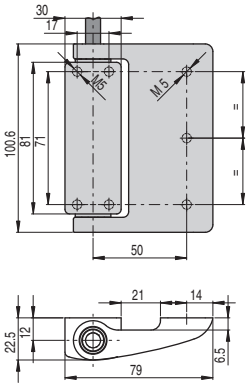
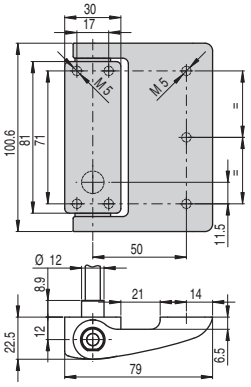
All values in the drawings are in mm

Accessories See page 321

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

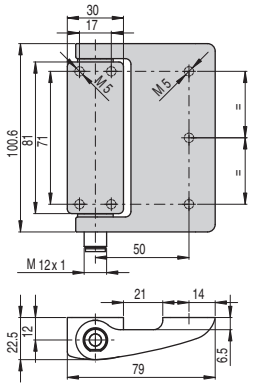
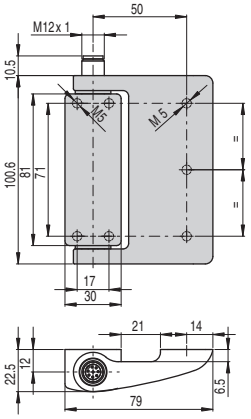
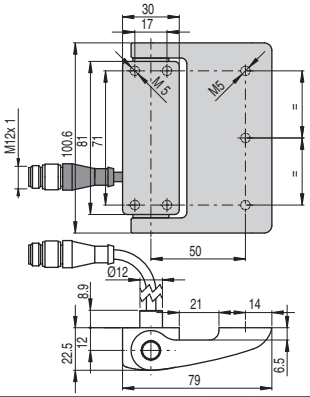
Contact type

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

Contact blocks		2 m cable, bottom	2 m cable, top	2 m cable, back
				
52C	L	HP AB052C-2SN → 1NO+1NC	HP AB052C-2AN → 1NO+1NC	HP AB052C-2PN → 1NO+1NC
52D	L	HP AB052D-2SN → 2NC	HP AB052D-2AN → 2NC	HP AB052D-2PN → 2NC
52F	L	HP AB052F-2SN → 1NO+2NC	HP AB052F-2AN → 1NO+2NC	HP AB052F-2PN → 1NO+2NC
52M	L	HP AB052M-2SN → 2NO+2NC	HP AB052M-2AN → 2NO+2NC	HP AB052M-2PN → 2NO+2NC
53C	LO	HP AB053C-2SN → 1NO+1NC	HP AB053C-2AN → 1NO+1NC	HP AB053C-2PN → 1NO+1NC
53F	LO	HP AB053F-2SN → 1NO+2NC	HP AB053F-2AN → 1NO+2NC	HP AB053F-2PN → 1NO+2NC
53M	LO	HP AB053M-2SN → 2NO+2NC	HP AB053M-2AN → 2NO+2NC	HP AB053M-2PN → 2NO+2NC
Actuating force		0.3 Nm (0.65 Nm →)	0.3 Nm (0.65 Nm →)	0.3 Nm (0.65 Nm →)
Travel diagrams		page 58 - group 1	page 58 - group 1	page 58 - group 1

Contact type

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

Contact blocks		M12 connector, bottom	M12 connector, top	cable (0.2 m) with M12 connector, back
				
52C	L	HP AB052C-KSM → 1NO+1NC	HP AB052C-KAM → 1NO+1NC	HP AB052C-0.2PM → 1NO+1NC
52D	L	HP AB052D-KSM → 2NC	HP AB052D-KAM → 2NC	HP AB052D-0.2PM → 2NC
52F	L	HP AB052F-KSM → 1NO+2NC	HP AB052F-KAM → 1NO+2NC	HP AB052F-0.2PM → 1NO+2NC
52M	L	HP AB052M-KSM → 2NO+2NC	HP AB052M-KAM → 2NO+2NC	HP AB052M-0.2PM → 2NO+2NC
53C	LO	HP AB053C-KSM → 1NO+1NC	HP AB053C-KAM → 1NO+1NC	HP AB053C-0.2PM → 1NO+1NC
53F	LO	HP AB053F-KSM → 1NO+2NC	HP AB053F-KAM → 1NO+2NC	HP AB053F-0.2PM → 1NO+2NC
53M	LO	HP AB053M-KSM → 2NO+2NC	HP AB053M-KAM → 2NO+2NC	HP AB053M-0.2PM → 2NO+2NC
Actuating force		0.3 Nm (0.65 Nm →)	0.3 Nm (0.65 Nm →)	0.3 Nm (0.65 Nm →)
Travel diagrams		page 58 - group 1	page 58 - group 1	page 58 - group 1

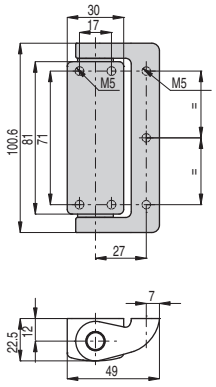
Attention! The safety hinge switch can be combined together exclusively with one or more Pizzato Elettrica hinges (HP or HC series). The use of whichever other hinge does not guarantee the correct operation of the safety device.

All values in the drawings are in mm

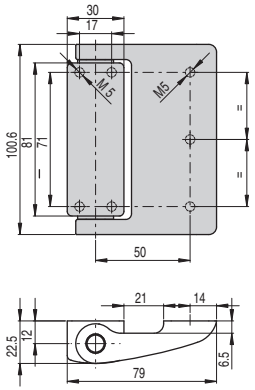
Accessories See page 321

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

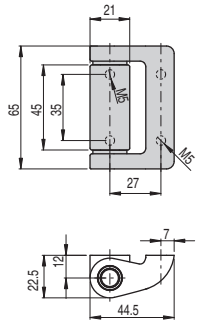
Additional hinges



HC AA



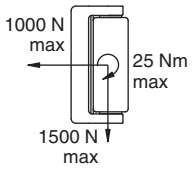
HC AB



HC LL

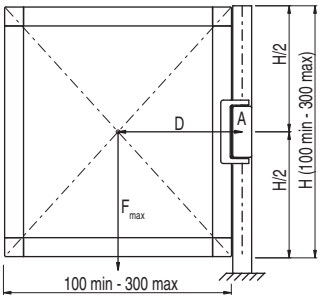
Maximum forces and loads HP AA••••-•••, HC AA, HC LL

Admitted max. loads, independent of utilization conditions.

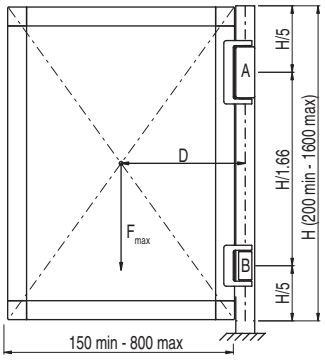


Attention: Never exceed the loads listed above under any circumstances.
The loads have been verified by a fatigue test of one million operating cycles with a 90° opening angle.

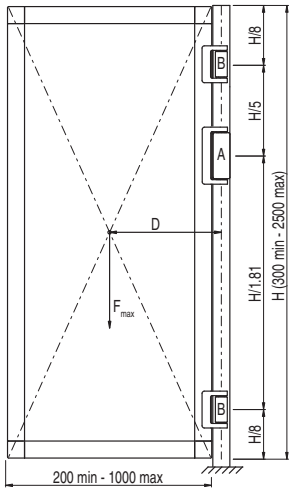
Doors with one safety hinge
F_{max} (N)=25,000/D (mm)



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



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

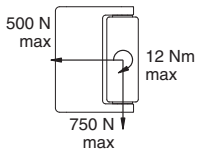


Legend

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

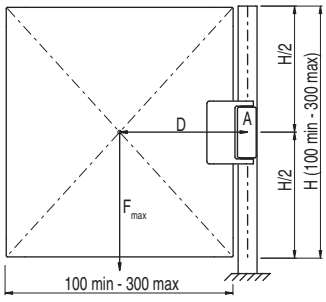
Maximum forces and loads HP AB••••-•••, HC AB

Admitted max. loads, independent of utilization conditions.

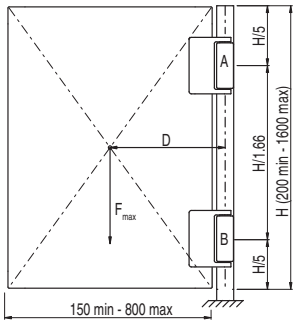


Attention: Never exceed the loads listed above under any circumstances.
The loads have been verified by a fatigue test of one million operating cycles with a 90° opening angle.

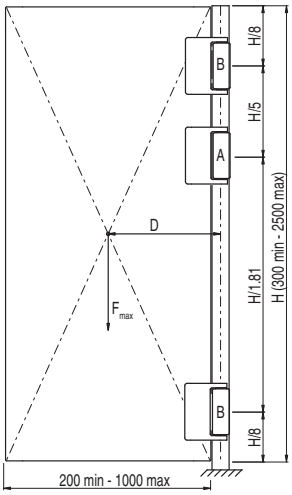
Doors with one safety hinge
F_{max} (N)=12,500/D (mm)



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



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



Legend

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

Accessories

Article	Description
VF AC7032	Protection cap for adjustment screw

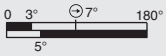
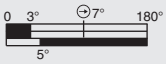
The cap is supplied with every hinge and must always be inserted after the adjustment of the switching point.
In case of loss or damage, the cap can be ordered separately.

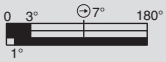
All values in the drawings are in mm

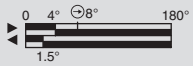
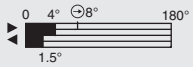
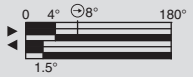
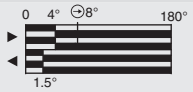
Accessories See page 321

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

Travel diagrams

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

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

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

Legend

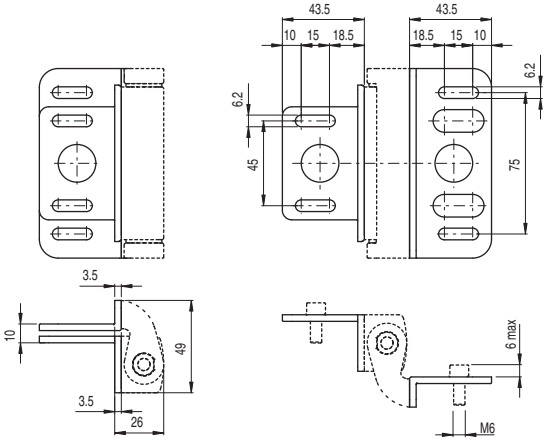
- Closed contact
- Open contact
- Positive opening travel
- Switch pressed / Switch released

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

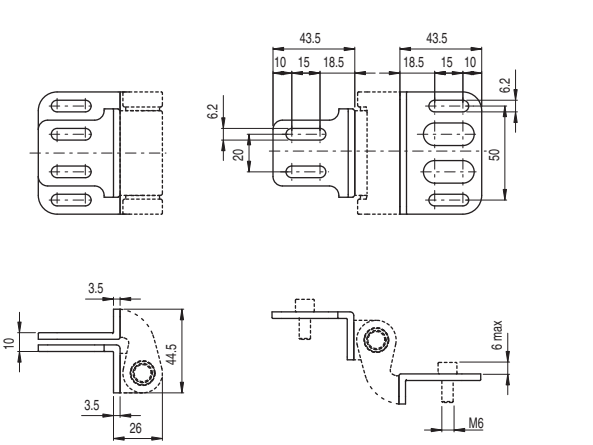
Fixing plates

Fastening screws for profile not supplied.

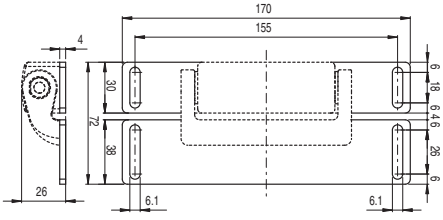
Article	Description
VF SFH1-C	Couple of angular plates for HP AA and HC AA supplied with fastening screws for attachment of the switch



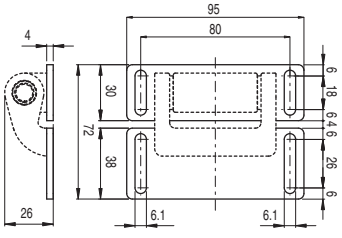
Article	Description
VF SFH2-C	Couple of angular plates for HC LL supplied with fastening screws for attachment of the switch



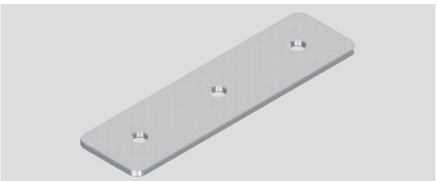
Article	Description
VF SFH3-C	Couple of plane plates for HP AA and HC AA supplied with fastening screws for attachment of the switch

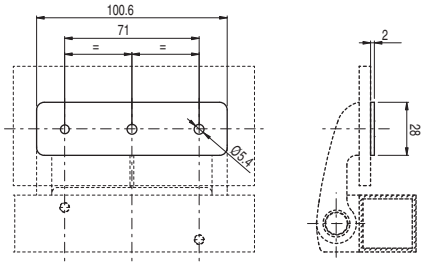


Article	Description
VF SFH4-C	Couple of plane plates for HC LL supplied with fastening screws for attachment of the switch



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





All values in the drawings are in mm

Accessories See page 321

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

HX series safety hinge switches

Description

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

Maximum safety with a single device

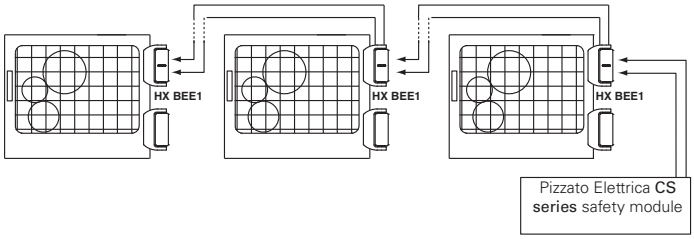
PL e + SIL 3

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

Series connection of several switches

PL e + SIL 3

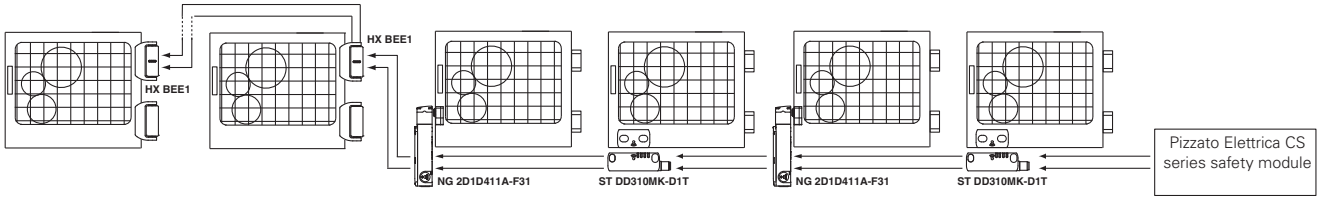
One of the most important features of the HX series is the possibility of connecting up to 32 sensors in series, while still maintaining the maximum safety levels PL e laid down in EN 13849-1 and SIL 3 acc. to EN 62061.
This connection type is permissible in safety systems which have a safety module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



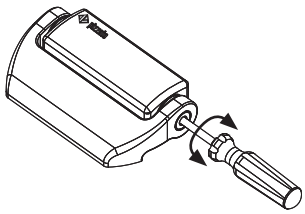
Series connection with other devices

PL e + SIL 3

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



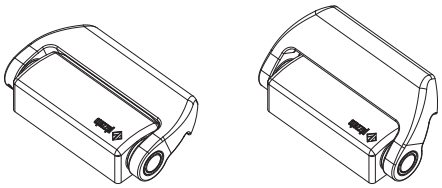
Adjustment of the switching point



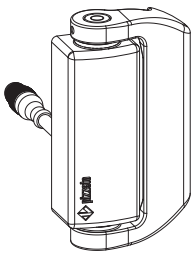
The switching point of the switches can be set with a flat-blade screwdriver.
Adjusting the switching point allows for any calibration for large size guards. After calibrating the switch, it is always necessary to close the hole using the safety cap supplied.

Basic activation angle variants

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



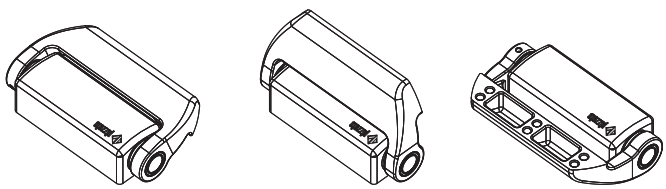
Cable with connector at the back



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

Opening angle up to 180°

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

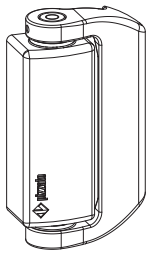


Protection degrees IP67 and IP69K

IP69K
IP67

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

Additional hinges



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

Materials

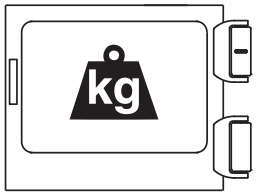
AISI
316L

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

Laser engraving

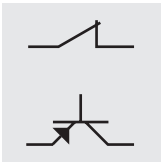
Pizzato Elettrica has introduced a new laser engraving system for stainless steel switches of the HX series.
Thanks to this new system, engravings on the products are indelible.

For heavy duty applications



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

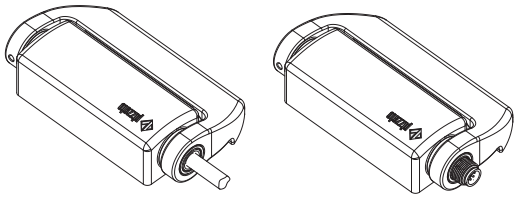
Mechanical or electronic contact blocks



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

With cable or connector

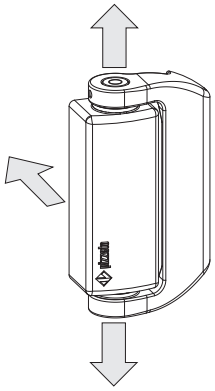
The electrical connection via integrated cable or M12 connector option makes the device suitable for the most diverse applications. The connector versions allow faster device replacement and installation, by making incorrect wiring connection impossible. The cable versions, on the other hand, offer the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



Four LEDs for immediate diagnosis

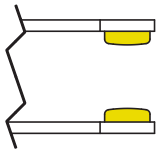
The versions with electronic contact block are equipped with four signalling LEDs. Each LED represents a specific hinge function, this greatly facilitates switching point adjustment via the immediate visual indication for the installer during the adjustment phase. There are also three separate LEDs available: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

Three different output directions



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

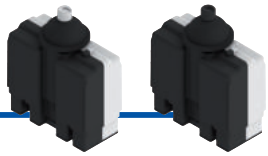
Gold-plated contacts



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

Selection diagram

MECHANICAL CONTACT BLOCKS



L22
2NO+2NC slow action, close

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

CABLES AND CONNECTORS

•SN
Cable output, bottom (standard)

•AN
Cable output, top

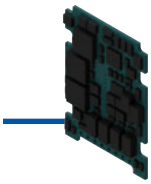
•PN
Cable output, back

KSM
M12 connector, bottom

KAM
M12 connector, top

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

ELECTRONIC CONTACT BLOCK



EE1
Electronic contact block with LED

CABLES AND CONNECTORS

•SN
Cable output, bottom (standard)

•AN
Cable output, top

•PN
Cable output, back

KSM
M12 connector, bottom

KAM
M12 connector, top

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

ADDITIONAL HINGES

HX CB **HX CD**

product option

Code structure

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

article | options

HX BL22-2PNGH15

Body and movable part dimensions	
B	126x76x31 mm

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

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

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

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

Other cable lengths on request.

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

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

Code structure for additional hinges

HX CB

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

HX series safety hinge switches

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

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

In compliance with standards:
IEC 60947-5-1, EN 60947-5-1, EN 60947-1,
IEC 60204-1, EN 60204-1, EN ISO 14119,
EN ISO 12100, IEC 60529, EN 60529,
ISO 20653, IEC 61508-1, IEC 61508-2,
IEC 61508-3, EN ISO 13849-1, EN ISO 13849-2,
EN 62061 , EN 61326-1, EN 61326-3-1,
EN 61326-3-2, EN 50581, UL 508,
CSA 22.2 No.14

Quality marks:

UL approval:	E131787
TÜV SÜD approval:	Z10 14 03 75157 007
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

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

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

General data

SIL (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters HX B•22-•••	
B_{10D}:	5,000,000 for NC contacts
Safety parameters HX BEE1-•••	
$MTTF_D$:	2413 years
PFH_D:	1.24E-09
DC:	High
Mission time:	20 years
Ambient temperature:	see table on page 64
Max. actuation frequency:	600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	90°/s
Min. actuation speed:	2°/s
Mounting position:	any
Tightening torque, M6 screws:	10 … 12 Nm

Electrical data (L22 - H22 mechanical contact blocks)

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

Electrical data (EE1 electronic contact block)

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

⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.

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

Features approved by UL

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

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

Features approved by TÜV SÜD

Supply voltage: 24 Vdc
Rated operating current (max.): 0.25 A
Ambient temperature: -25°C … +70°C
Protection degree: IP67 and IP69K
PL, category: PL e, category 4

In compliance with standards: IEC 61508-1:2010 (SIL 3), IEC 61508-2:2010 (SIL 3), IEC 61508-3:2010 (SIL 3), IEC 61508-4:2010 (SIL 3), IEC 62061:2005/A2:2015 (SIL CL 3), EN ISO 13849-1:2015 (PL e, Cat. 4), EN 60947-5-1:2017, ISO 14119:2013

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

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

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

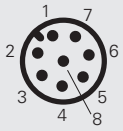
Utilization temperatures and electrical data for EE1 electronic contact block

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

Internal device connections

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

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



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

Electronic contact blocks (HX BEE1-•••)

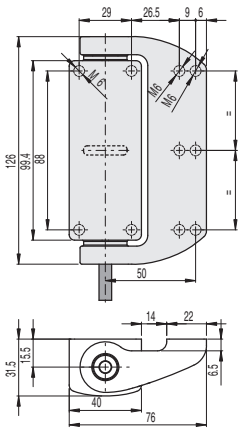
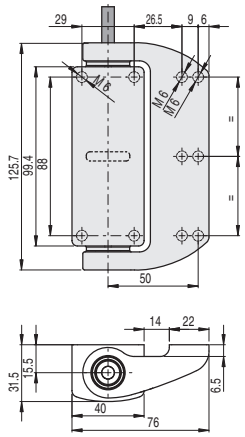
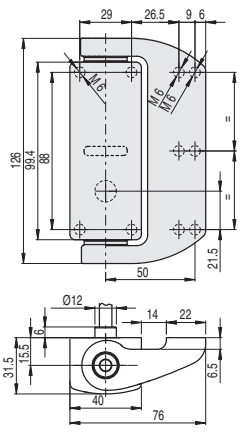
Connection	Versions with cable	Versions with M12 connector
A1	brown	1
IS1	red	2
A2	blue	3
OS1	red-white	4
O3	black	5
IS2	purple	6
OS2	black-white	7
not connected	purple-white	8

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

HX series safety hinge switches

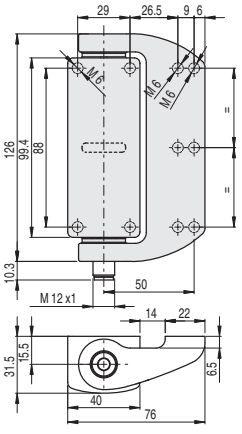
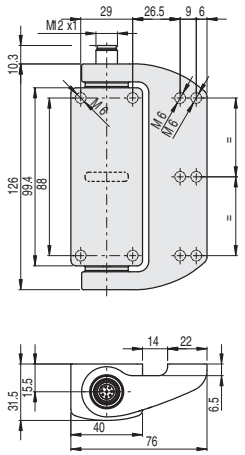
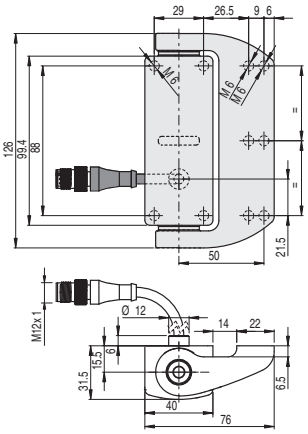
Contact type

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

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

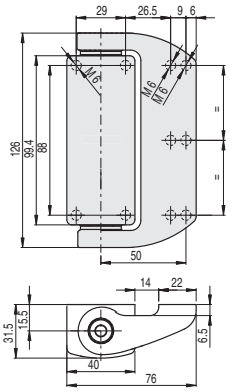
Contact type

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

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

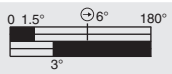
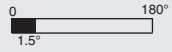
To order a product with a movable part at the left replace P with Q in the codes shown above.
Example: HX BL22-2**P**N → HX BL22-2**Q**N

Additional hinges



HX CB

Travel diagrams

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

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

Legend

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

All values in the drawings are in mm

Accessories See page 321

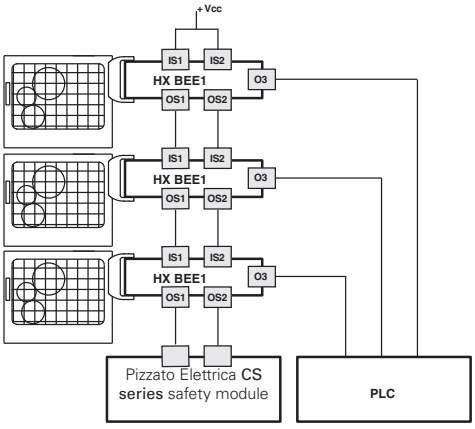
→ The 2D and 3D files are available at **www.pizzato.com**

Complete safety system

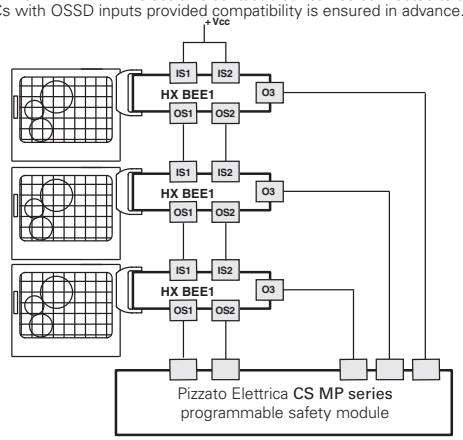
The use of complete and tested solutions guarantees the electrical compatibility between the hinge of the HX series and the safety modules from Pizzato Elettrica, as well as high reliability. The sensors have been tested with the modules listed in the adjacent table.

Switch	Compatible safety modules	Safety module output contacts		
		Instantaneous safety contacts	Delayed safety contacts	Signalling contacts
HX BEE1-•••	CS AR-05••••	3NO	/	1NC
	CS AR-06••••	3NO	/	1NC
	CS AR-08••••	2NO	/	/
	CS AT-0•••••	2NO	2NO	1NC
	CS AT-1•••••	3NO	2NO	/
	CS MP••••••	see page 277		
	CS MF••••••	see page 305		

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

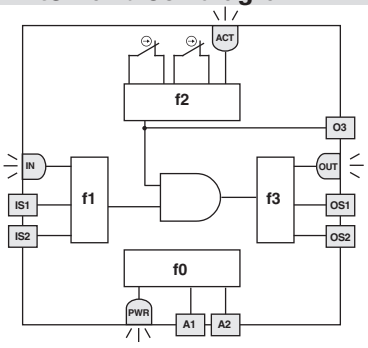


Possibility of series connection of multiple hinges for simplifying the wiring of the safety system, whereby only the outputs of the last hinge are evaluated by a Pizzato Elettrica safety module (see table with compatible safety modules). Each HX switch is provided with a signalling output, which is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



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

Internal block diagram



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

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

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

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

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

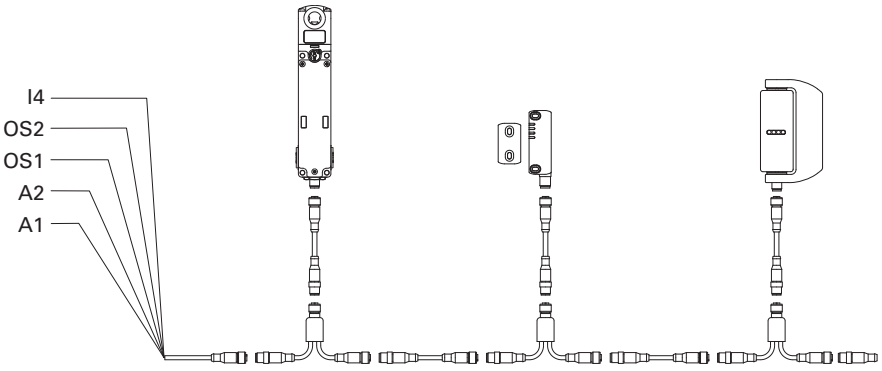
LED	Function
ACT	state of actuator / O3 output
IN	status of safety inputs
OUT	status of safety outputs
PWR	Power supply / self-diagnosis

Series connection

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

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

For further information see page 326.



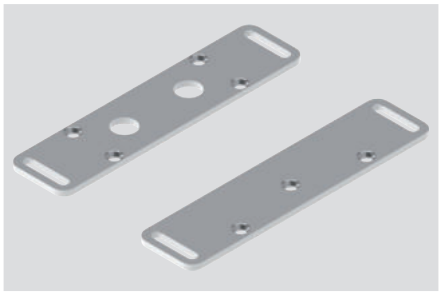
Accessories

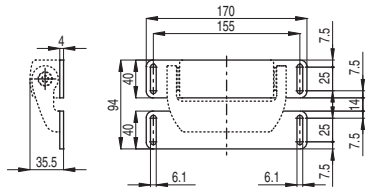
Article	Description
VF AC7032	Protection cap of adjustment screw

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

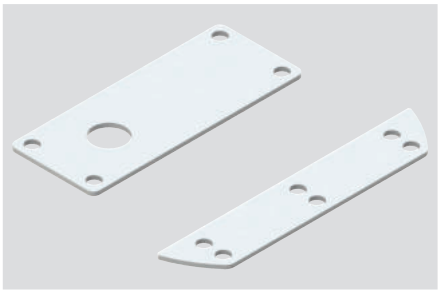
Fixing plates

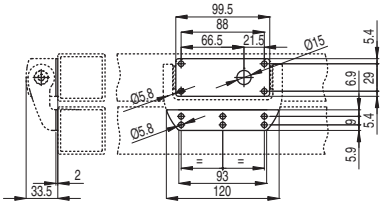
Article	Description
VF SFH10-TX	Couple of stainless steel plane plates supplied with fastening screws for attachment of the switch



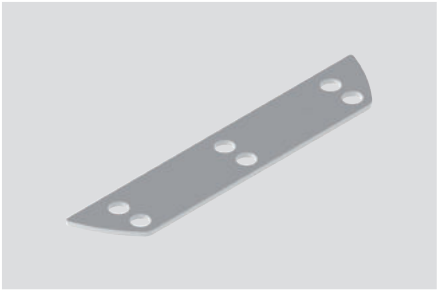


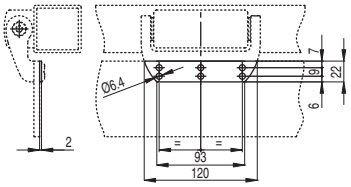
Article	Description
VF SFH9	Polyethylene gaskets for the food industry. Seals the contact surface between the hinge and the frame.





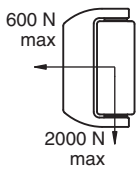
Article	Description
VF SFH8	Mobile part cover in stainless steel. Ideal for fixing the mobile part with polycarbonate guards.





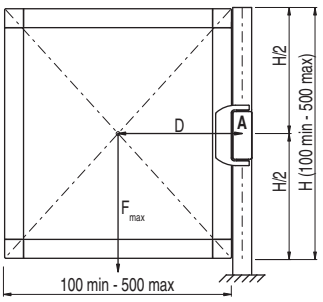
Max. forces and loads HX

Admitted max. loads, independent of utilization conditions.

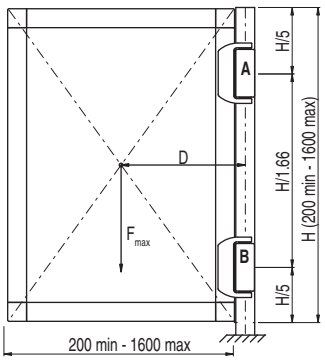


Attention: Never exceed the loads listed above under any circumstances.
The loads have been verified by a fatigue test of one million operating cycles with a 90° opening angle.

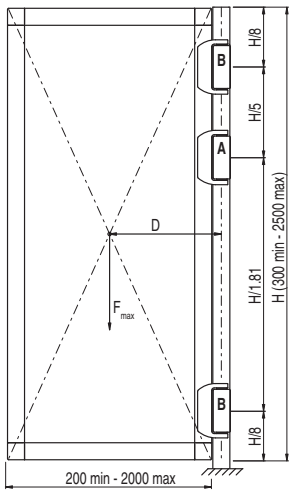
Doors with one safety hinge
F_{max} (N)=50,000/D (mm)



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



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



Legend

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

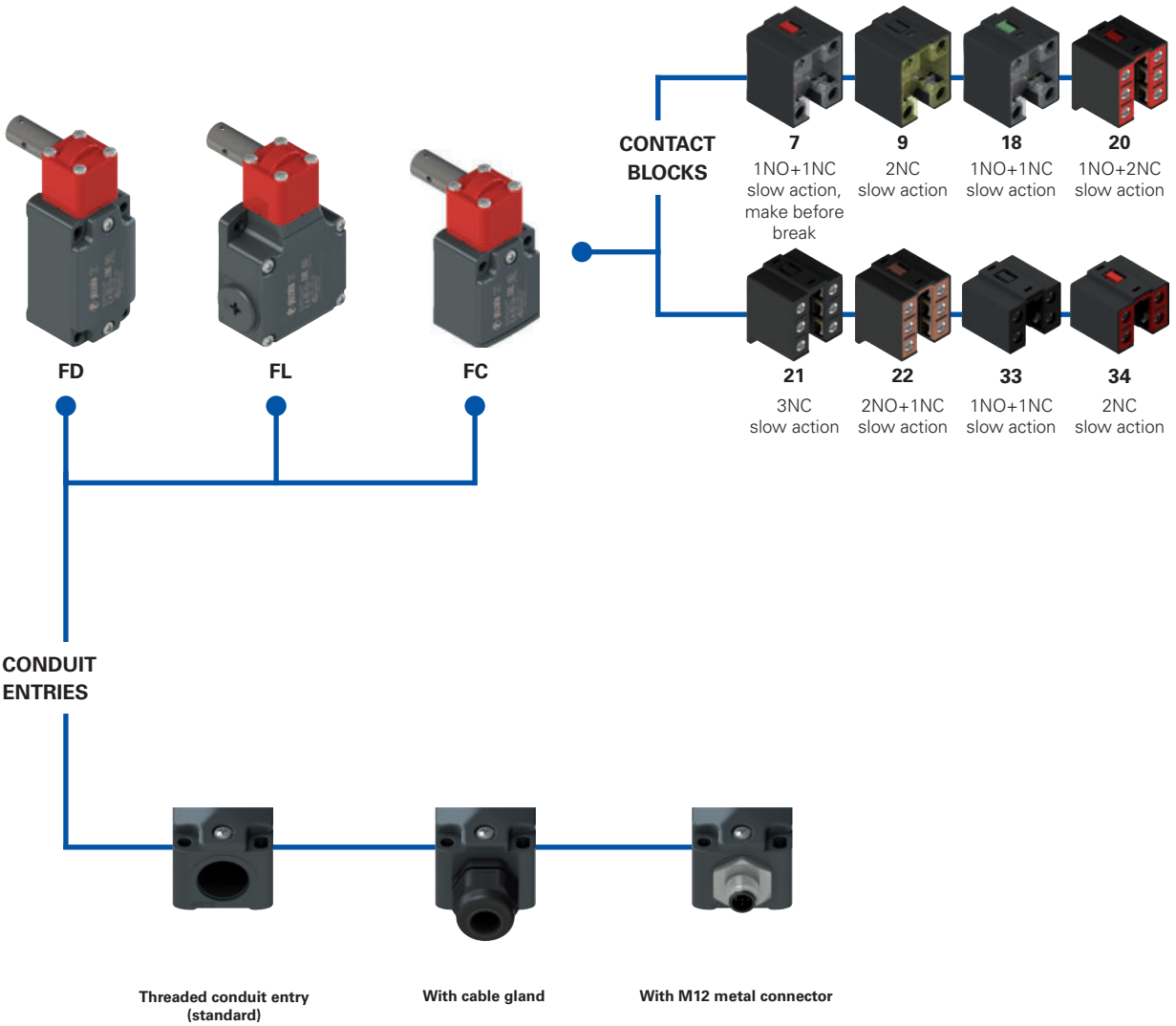
All values in the drawings are in mm

Accessories See page 321

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

Notes

Selection diagram



product options

Code structure

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

article | options | options

FD 1895-GM2K50T6

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

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

Contact blocks	
7	1NO+1NC, slow action, make before break
9	2NC, slow action
18	1NO+1NC, slow action
20	1NO+2NC, slow action
21	3NC, slow action
22	2NO+1NC, slow action
33	1NO+1NC, slow action
34	2NC, slow action

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

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

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

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

article | options | options

FC 3395-GM2K50T6

Housing	
FC	metal, one conduit entry

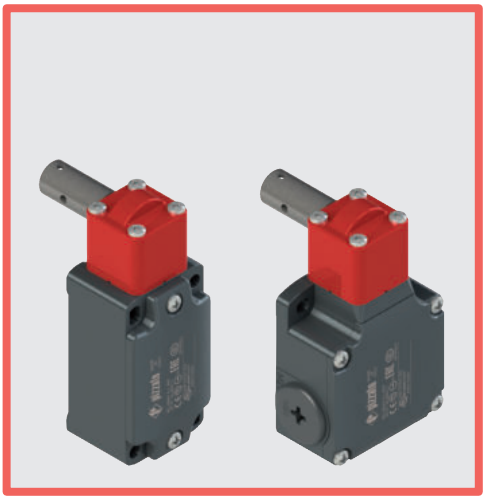
Ambient temperature	
	-25°C … +80°C (standard)
T6	-40°C … +80°C

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

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

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

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



Main features

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

Quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	5,000,00 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	180°/s
Min. actuation speed:	2°/s
Tightening torques for installation:	see page 339
Wire cross-sections and wire stripping lengths:	see page 357

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 50581, UL 508, CSA 22.2 No.14.
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14, GB/T14048.5-2017.

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

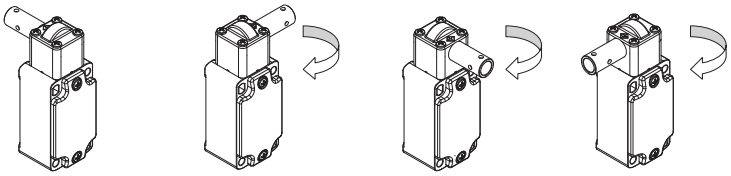
⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.

Electrical data			Utilization category
without connector	Thermal current (I_{th}):	10 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	U_e (V) 250 400 500 I_e (A) 6 4 1
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)	Direct current: DC13
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	U_e (V) 24 125 250
	Protection against short circuits:	type aM fuse 10 A 500 V	I_e (A) 3 0.55 0.3
	Pollution degree:	3	
with M12 connector, 4 or 5-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	U_e (V) 24 120 250 I_e (A) 4 4 4
	Protection against short circuits:	type gG fuse 4 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	U_e (V) 24 I_e (A) 2
	Protection against short circuits:	type gG fuse 2 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 I_e (A) 2

Description

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

Head with variable orientation



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

Protection degree IP67

IP67

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

Extended temperature range

-40°C

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

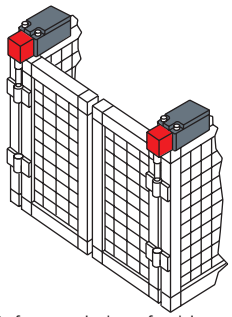
Laser engraving

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

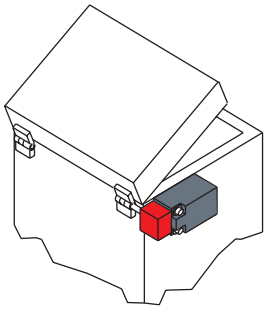
Adjustable switching point

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

Application examples



Safety switches for hinges, mounting on double door



Safety switch for hinges, mounting outside the safety guard

Features approved by IMQ

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

Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X
Positive opening contacts on contact blocks 7, 9, 18, 20, 21, 22, 33, 34
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

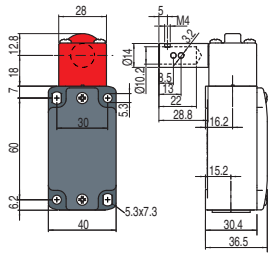
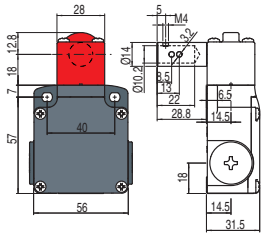
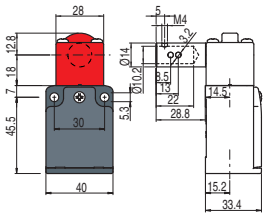
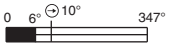
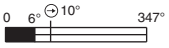
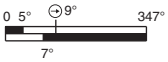
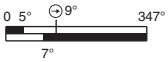
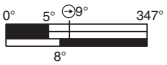
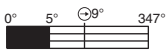
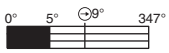
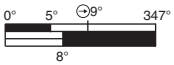
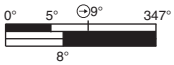
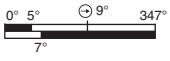
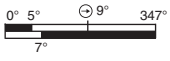
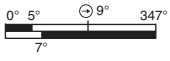
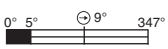
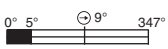
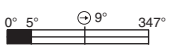
Features approved by UL

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

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

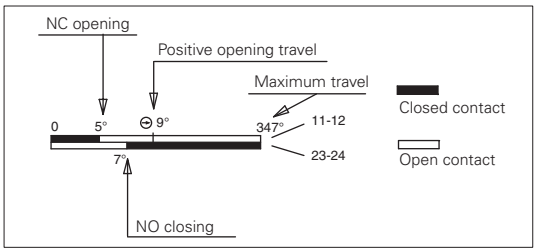
Please contact our technical department for the list of approved products.

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

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

How to read travel diagrams

All values in the diagrams are in degrees



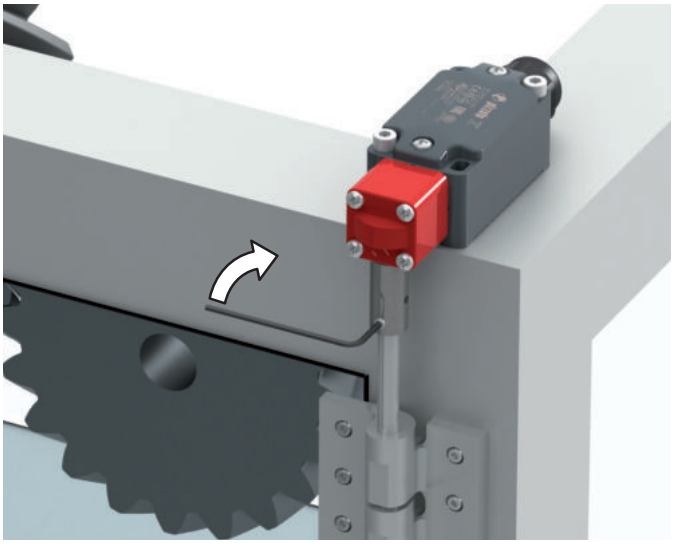
IMPORTANT:
In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol →. Actuate the switch **at least with the positive opening force**, reported in brackets below each article, next to the actuating force value.

All values in the drawings are in mm

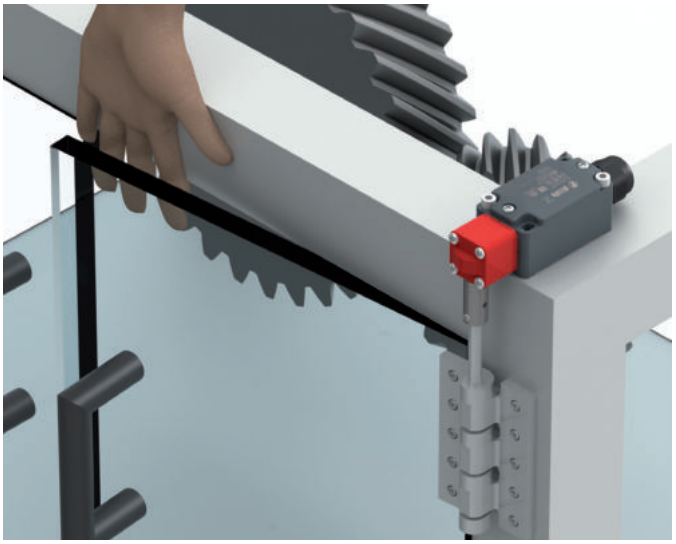
Accessories See page 321

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

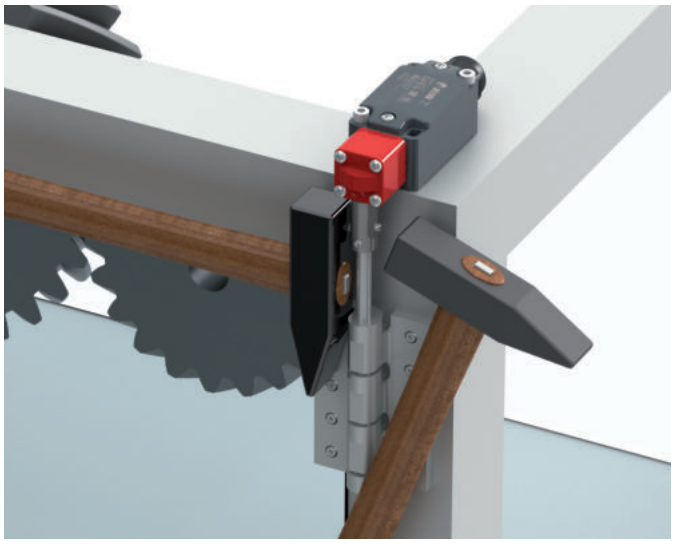
Adjustment of the switching point



Temporary locking of the actuator
(stud screw provided).

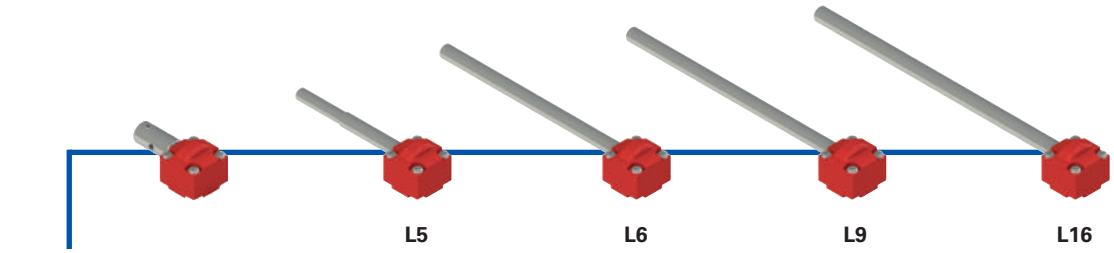


Verify the switching point according to EN ISO 13857
and recalibrate if necessary.

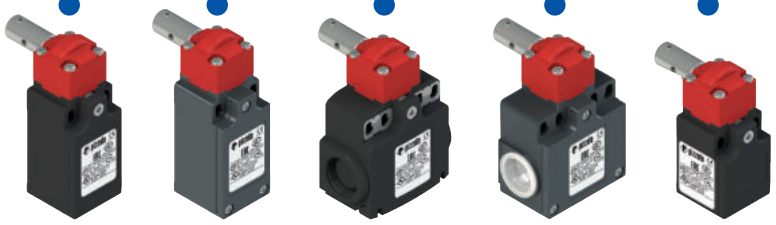


Pin the switch (pin is provided).

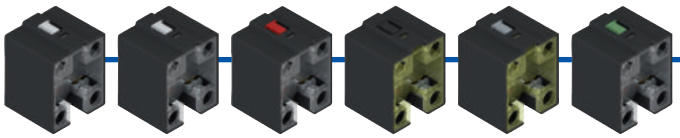
Selection diagram



ACTUATORS



CONTACT BLOCKS



5 1NO+1NC snap action

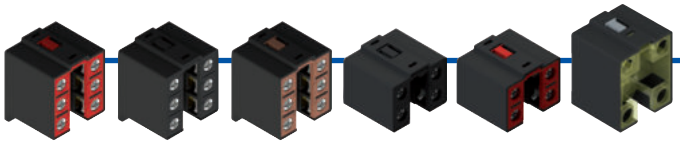
6 1NO+1NC slow action

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

9 2NC slow action

14 2NC slow action, shifted

18 1NO+1NC slow action, close



20 1NO+2NC slow action

21 3NC slow action

22 2NO+1NC slow action

33 1NO+1NC slow action

34 2NC slow action

66 1NC slow action

CONDUIT ENTRIES

Threaded conduit entry (standard)

With cable gland

With M12 plastic connector

With M12 metal connector

product options

Code structure

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

article | options | options

FR 1896-XGL16M2K70T6

Housing

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

Contact blocks

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

External metallic parts

	zinc-plated steel (standard)
X	stainless steel

Contact type

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

Actuator design

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

Threaded conduit entry

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

Ambient temperature

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

Pre-installed cable glands or connectors

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

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

article | options | options

FK 3396-XGL16M1K24T6

Housing

FK	technopolymer, one conduit entry

Contact blocks

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

External metallic parts

	zinc-plated steel (standard)
X	stainless steel

Contact type

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

Actuator design

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

Threaded conduit entry

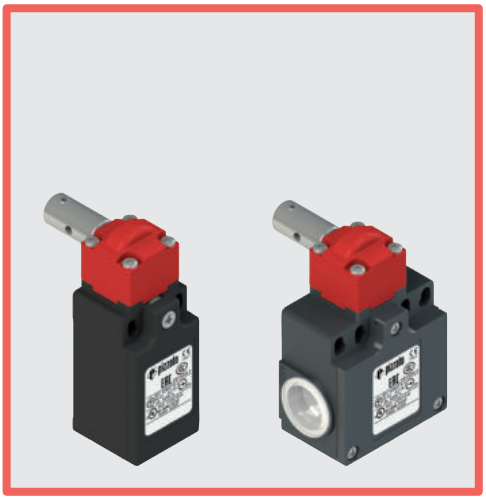
M1	M16x1.5 (standard)
	PG11

Ambient temperature

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

Pre-installed cable glands

	no cable gland (standard)
K24	cable gland for cables Ø 5 … 10°mm
K28	cable gland for cables Ø 3 … 7°mm



Main features

- Metal housing or technopolymer housing, from one to two conduit entries
- Protection degree IP67
- 12 contact blocks available
- Versions with M12 connector
- Versions with gold-plated silver contacts
- Versions with stainless steel external metallic parts

Technical data

Housing

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	5,000,00 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	180°/s
Min. actuation speed:	2°/s
Tightening torques for installation:	see page 341
Wire cross-sections and wire stripping lengths:	see page 357

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 50581, UL 508, CSA 22.2 No.14.
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14, GB/T14048.5-2017.

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

Quality marks:

IMQ approval:	EG610
UL approval:	E131787
CCC approval:	2007010305230013
EAC approval:	RU C-IT.УТ03.B.00035/19

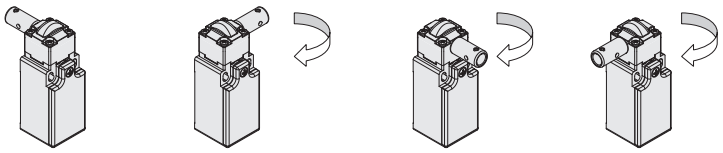
⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.

	Electrical data		Utilization category
without connector	Thermal current (I_{th}):	10 A	
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	Alternating current: AC15 (50÷60 Hz) U_e (V) 250 400 500 I_e (A) 6 4 1
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)	Direct current: DC13 U_e (V) 24 125 250
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	I_e (A) 3 0.55 0.3
	Protection against short circuits:	type aM fuse 10 A 500 V	
	Pollution degree:	3	
with M12 connector, 4 and 5-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 120 250 I_e (A) 4 4 4
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	Direct current: DC13 U_e (V) 24 125 250
	Protection against short circuits:	type gG fuse 4 A 500 V	I_e (A) 3 0.55 0.3
	Pollution degree:	3	
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	I_e (A) 2
	Protection against short circuits:	type gG fuse 2 A 500 V	Direct current: DC13 U_e (V) 24
	Pollution degree:	3	I_e (A) 2

Description

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

Head with variable orientation



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

Protection degree IP67

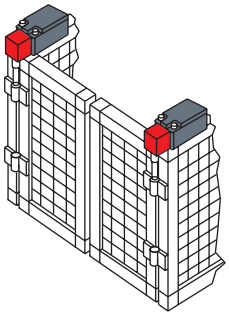
IP67 These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where maximum protection degree of the housing is required.

Extended temperature range

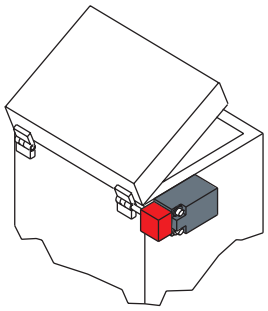
-40°C These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +80°C.

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

Application examples



Safety switches for hinges, mounting on double door



Safety switch for hinges, mounting outside the safety guard

Adjustable switching point

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

Features approved by IMQ

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

Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X

Positive opening contacts on contact blocks 5, 6, 7, 9, 14, 18, 20, 21, 22, 33, 34, 66.

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

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

Features approved by UL

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

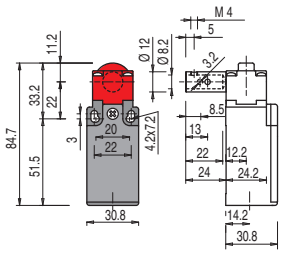
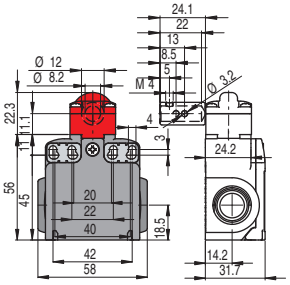
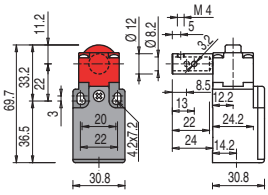
Use 60 or 75 °C copper (Cu) conductor and wire size range 12, 14 AWG, stranded or solid. The terminal tightening torque of 7.1 lb in (0.8 Nm).

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

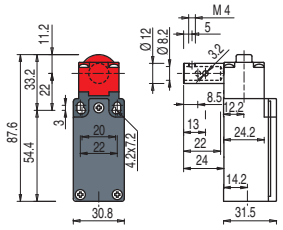
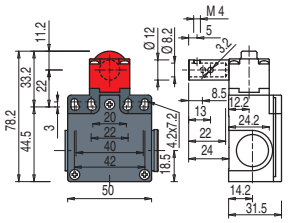
Please contact our technical department for the list of approved products.

Safety switches **for hinges**

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

Contact blocks		Technopolymer housing		Technopolymer housing		Technopolymer housing	
							
5	R	FR 596-M2	1NO+1NC	FX 596-M2	1NO+1NC	/	
6	L	FR 696-M2	1NO+1NC	FX 696-M2	1NO+1NC	/	
7	LO	FR 796-M2	1NO+1NC	FX 796-M2	1NO+1NC	/	
9	L	FR 996-M2	2NC	FX 996-M2	2NC	/	
14	LS	FR 1496-M2	2NC	FX 1496-M2	2NC	/	
18	L	FR 1896-M2	1NO+1NC	FX 1896-M2	1NO+1NC	/	
20	L	FR 2096-M2	1NO+2NC	FX 2096-M2	1NO+2NC	/	
21	L	FR 2196-M2	3NC	FX 2196-M2	3NC	/	
22	L	FR 2296-M2	2NO+1NC	FX 2296-M2	2NO+1NC	/	
33	L	FR 3396-M2	1NO+1NC	FX 3396-M2	1NO+1NC	FK 3396-M1	1NO+1NC
34	L	FR 3496-M2	2NC	FX 3496-M2	2NC	FK 3496-M1	2NC
66	L	FR 6696-M2	1NC	FX 6696-M2	1NC	/	
Actuating force		0.15 Nm (0.4 Nm →)		0.15 Nm (0.4 Nm →)		0.15 Nm (0.4 Nm →)	
Travel diagrams		page 344 - group 9		page 344 - group 9		page 344 - group 9	

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

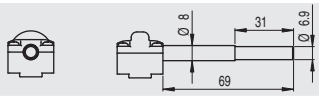
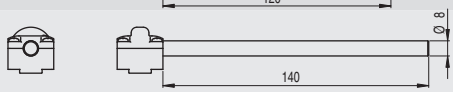
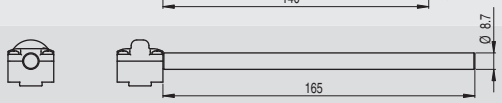
Contact blocks		Metal housing		Metal housing	
					
5	R	FM 596-M2	1NO+1NC	FZ 596-M2	1NO+1NC
6	L	FM 696-M2	1NO+1NC	FZ 696-M2	1NO+1NC
7	LO	FM 796-M2	1NO+1NC	FZ 796-M2	1NO+1NC
9	L	FM 996-M2	2NC	FZ 996-M2	2NC
14	LS	FM 1496-M2	2NC	FZ 1496-M2	2NC
18	L	FM 1896-M2	1NO+1NC	FZ 1896-M2	1NO+1NC
20	L	FM 2096-M2	1NO+2NC	FZ 2096-M2	1NO+2NC
21	L	FM 2196-M2	3NC	FZ 2196-M2	3NC
22	L	FM 2296-M2	2NO+1NC	FZ 2296-M2	2NO+1NC
33	L	FM 3396-M2	1NO+1NC	FZ 3396-M2	1NO+1NC
34	L	FM 3496-M2	2NC	FZ 3496-M2	2NC
66	L	FM 6696-M2	1NC	FZ 6696-M2	1NC
Actuating force		0.15 Nm (0.4 Nm →)		0.15 Nm (0.4 Nm →)	
Travel diagrams		page 344 - group 9		page 344 - group 9	

All values in the drawings are in mm

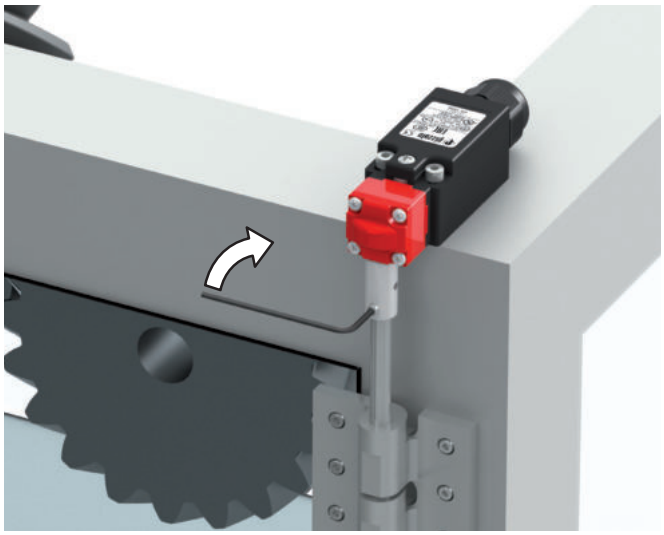
Accessories See page 321

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

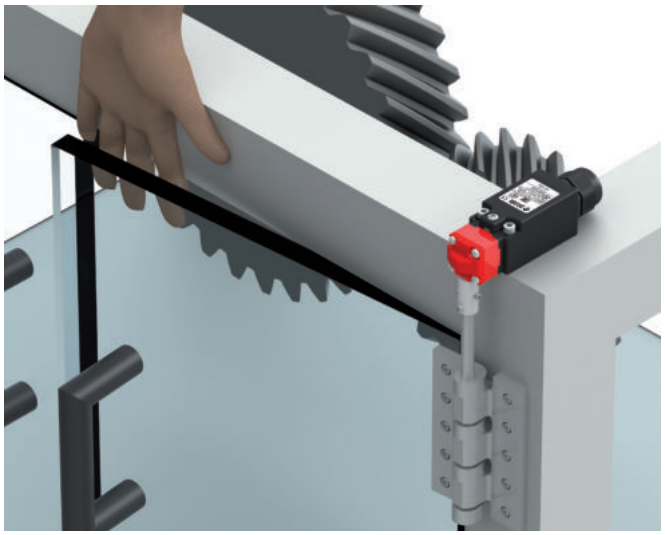
Dimensional drawings for actuators

Option	Drawing
L5	
L6	
L9	
L16	

Adjustment of the switching point



Temporary locking of the actuator
(stud screw provided).



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

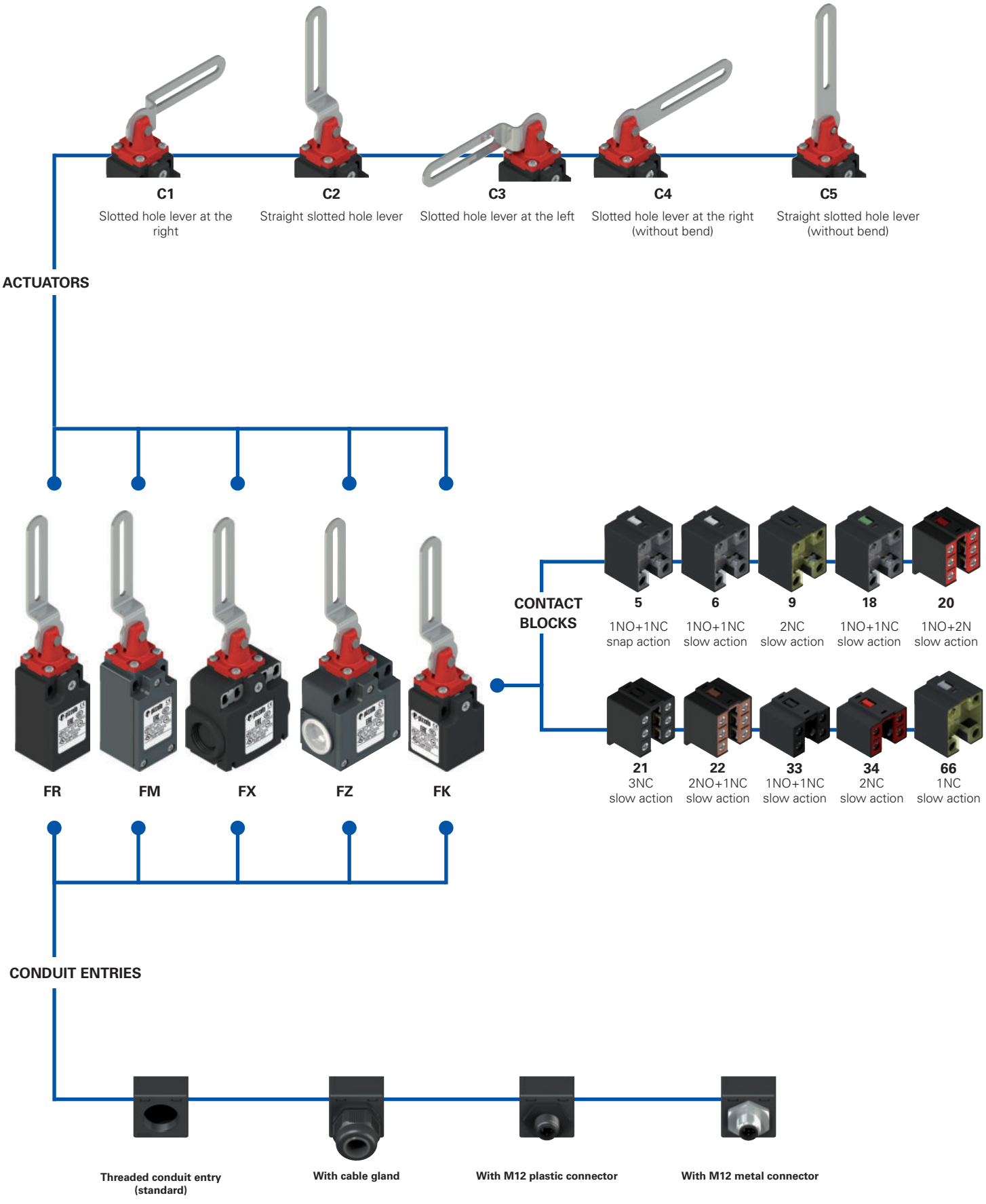
Pin the switch (pin is provided).

All values in the drawings are in mm

Accessories See page 321

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

Selection diagram



Code structure

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

article | options | options

FR 18C1-GM2K70T6

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

Contact blocks	
5	1NO+1NC, snap action
6	1NO+1NC, slow action
9	2NC, slow action
18	1NO+1NC, slow action
20	1NO+2NC, slow action
21	3NC, slow action
22	2NO+1NC, slow action
33	1NO+1NC, slow action
34	2NC, slow action
66	1NC, slow action

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

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

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

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

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

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

article | options | options

FK 33C1-GM1K24T6

Housing	
FK	technopolymer, one conduit entry

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

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

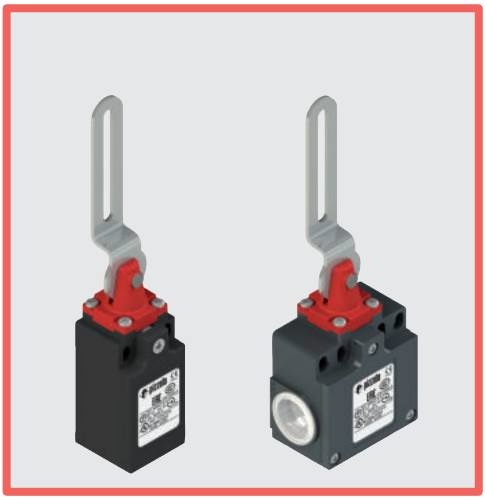
Contact type	
	silver contacts (standard)
G	silver contacts with 1 µm gold coating

Threaded conduit entry	
M1	M16x1.5 (standard)
	PG 11

Pre-installed cable glands	
	no cable gland (standard)
K24	cable gland for cables Ø 5 … 10°mm
K28	cable gland for cables Ø 3 … 7°mm

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

Safety switches **with slotted hole lever**



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

Technical data

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Mechanical interlock, not coded:	type 1 acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	2,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	180°/s
Min. actuation speed:	2°/s
Tightening torques for installation:	see page 341
Wire cross-sections and wire stripping lengths:	see page 357

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 50581, UL 508, CSA 22.2 No.14
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14, GB/T14048.5-2017.

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

Quality marks:

IMQ approval:	EG610
UL approval:	E131787
CCC approval:	2007010305230013
EAC approval:	RU C-IT.УТ03.B.00035/19

⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.

Electrical data

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

Utilization category

Alternating current: AC15 (50÷60 Hz)

U_e (V)	250	400	500
I_e (A)	6	4	1

Direct current: DC13

U_e (V)	24	125	250
I_e (A)	3	0.55	0.3

Alternating current: AC15 (50÷60 Hz)

U_e (V)	24	120	250
I_e (A)	4	4	4

Direct current: DC13

U_e (V)	24	125	250
I_e (A)	3	0.55	0.3

Alternating current: AC15 (50÷60 Hz)

U_e (V)	24
I_e (A)	2

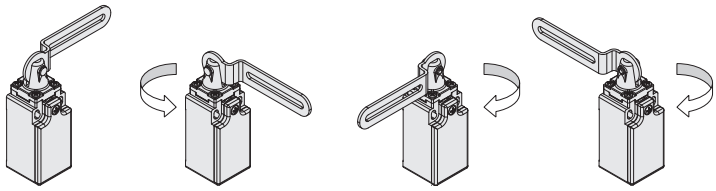
Direct current: DC13

U_e (V)	24
I_e (A)	2

Description

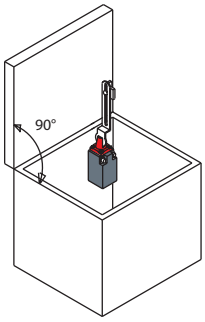
These safety switches are used to control gates or guards with hinges protecting dangerous parts of machines without inertia. Easy to install, they do not need the interaction with the hinge of the guard. They are very sensitive, open the contacts after few degrees of rotation and immediately send the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

Head with variable orientation

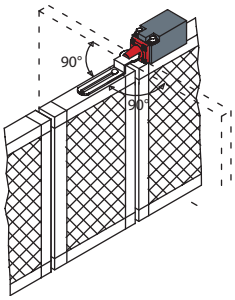


For all switches, the head can be adjusted in 90° steps after removing the four fastening screws. This allows you to use the same switch on both right- and left-facing door fronts.

Application examples



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



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

Protection degree IP67

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

Extended temperature range

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

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

Features approved by IMQ

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

Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X

Positive opening contacts on contact blocks 5, 7, 9, 18, 20, 21, 22, 33, 34, 66

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

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

Features approved by UL

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

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

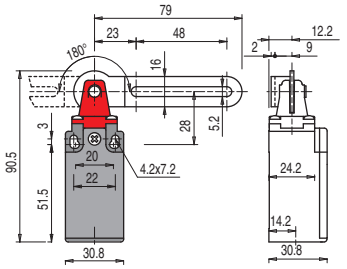
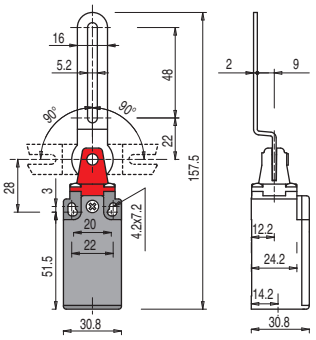
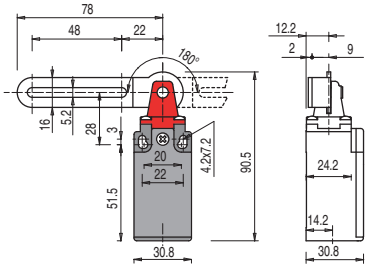
For FR, FX, FK series: the hub is to be connected to the conduit before the hub is connected to the enclosure.

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

Safety switches **with slotted hole lever**

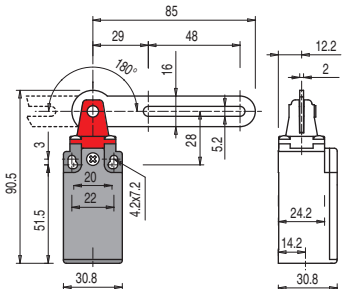
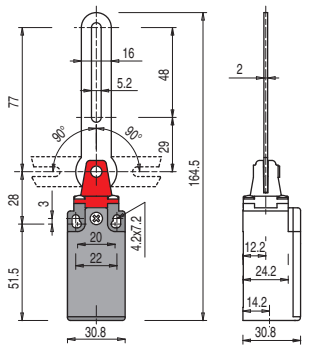
Contact type:

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

Contact blocks		Technopolymer housing	Technopolymer housing	Technopolymer housing
				
5	R	FR 5C1-M2 → 1NO+1NC	FR 5C2-M2 → 1NO+1NC	FR 5C3-M2 → 1NO+1NC
6	L	FR 6C1-M2 → 1NO+1NC	FR 6C2-M2 → 1NO+1NC	FR 6C3-M2 → 1NO+1NC
9	L	FR 9C1-M2 → 2NC	FR 9C2-M2 → 2NC	FR 9C3-M2 → 2NC
18	LA	FR 18C1-M2 → 1NO+1NC	FR 18C2-M2 → 1NO+1NC	FR 18C3-M2 → 1NO+1NC
20	L	FR 20C1-M2 → 1NO+2NC	FR 20C2-M2 → 1NO+2NC	FR 20C3-M2 → 1NO+2NC
21	L	FR 21C1-M2 → 3NC	FR 21C2-M2 → 3NC	FR 21C3-M2 → 3NC
22	L	FR 22C1-M2 → 2NO+1NC	FR 22C2-M2 → 2NO+1NC	FR 22C3-M2 → 2NO+1NC
33	L	FR 33C1-M2 → 1NO+1NC	FR 33C2-M2 → 1NO+1NC	FR 33C3-M2 → 1NO+1NC
34	L	FR 34C1-M2 → 2NC	FR 34C2-M2 → 2NC	FR 34C3-M2 → 2NC
66	L	FR 66C1-M2 → 1NC	FR 66C2-M2 → 1NC	FR 66C3-M2 → 1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 344 - group 10	page 344 - group 11	page 344 - group 10

Contact type:

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

Contact blocks		Technopolymer housing	Technopolymer housing
			
5	R	FR 5C4-M2 → 1NO+1NC	FR 5C5-M2 → 1NO+1NC
6	L	FR 6C4-M2 → 1NO+1NC	FR 6C5-M2 → 1NO+1NC
9	L	FR 9C4-M2 → 2NC	FR 9C5-M2 → 2NC
18	LA	FR 18C4-M2 → 1NO+1NC	FR 18C5-M2 → 1NO+1NC
20	L	FR 20C4-M2 → 1NO+2NC	FR 20C5-M2 → 1NO+2NC
21	L	FR 21C4-M2 → 3NC	FR 21C5-M2 → 3NC
22	L	FR 22C4-M2 → 2NO+1NC	FR 22C5-M2 → 2NO+1NC
33	L	FR 33C4-M2 → 1NO+1NC	FR 33C5-M2 → 1NO+1NC
34	L	FR 34C4-M2 → 2NC	FR 34C5-M2 → 2NC
66	L	FR 66C4-M2 → 1NC	FR 66C5-M2 → 1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 344 - group 10	page 344 - group 11

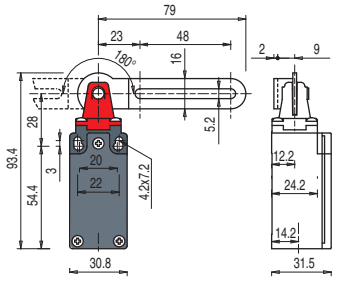
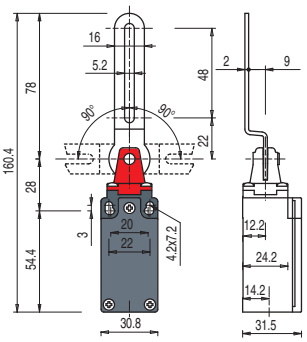
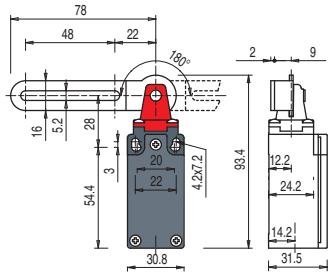
All values in the drawings are in mm

Accessories See page 321

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

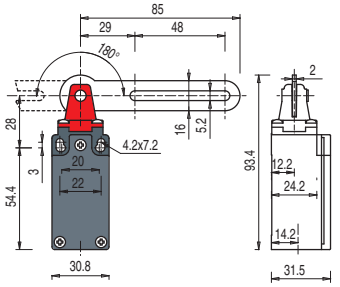
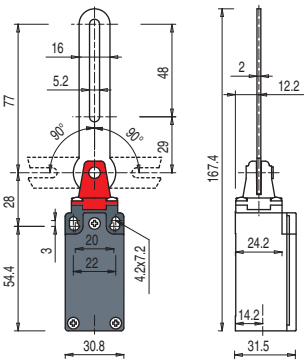
Contact type:

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

Contact blocks		Metal housing	Metal housing	Metal housing
				
5	R	FM 5C1-M2 1NO+1NC	FM 5C2-M2 1NO+1NC	FM 5C3-M2 1NO+1NC
6	L	FM 6C1-M2 1NO+1NC	FM 6C2-M2 1NO+1NC	FM 6C3-M2 1NO+1NC
9	L	FM 9C1-M2 2NC	FM 9C2-M2 2NC	FM 9C3-M2 2NC
18	LA	FM 18C1-M2 1NO+1NC	FM 18C2-M2 1NO+1NC	FM 18C3-M2 1NO+1NC
20	L	FM 20C1-M2 1NO+2NC	FM 20C2-M2 1NO+2NC	FM 20C3-M2 1NO+2NC
21	L	FM 21C1-M2 3NC	FM 21C2-M2 3NC	FM 21C3-M2 3NC
22	L	FM 22C1-M2 2NO+1NC	FM 22C2-M2 2NO+1NC	FM 22C3-M2 2NO+1NC
33	L	FM 33C1-M2 1NO+1NC	FM 33C2-M2 1NO+1NC	FM 33C3-M2 1NO+1NC
34	L	FM 34C1-M2 2NC	FM 34C2-M2 2NC	FM 34C3-M2 2NC
66	L	FM 66C1-M2 1NC	FM 66C2-M2 1NC	FM 66C3-M2 1NC
Actuating force		0.11 Nm (0.15 Nm)	0.11 Nm (0.15 Nm)	0.11 Nm (0.15 Nm)
Travel diagrams		page 344 - group 10	page 344 - group 11	page 344 - group 10

Contact type:

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

Contact blocks		Metal housing	Metal housing
			
5	R	FM 5C4-M2 1NO+1NC	FM 5C5-M2 1NO+1NC
6	L	FM 6C4-M2 1NO+1NC	FM 6C5-M2 1NO+1NC
9	L	FM 9C4-M2 2NC	FM 9C5-M2 2NC
18	LA	FM 18C4-M2 1NO+1NC	FM 18C5-M2 1NO+1NC
20	L	FM 20C4-M2 1NO+2NC	FM 20C5-M2 1NO+2NC
21	L	FM 21C4-M2 3NC	FM 21C5-M2 3NC
22	L	FM 22C4-M2 2NO+1NC	FM 22C5-M2 2NO+1NC
33	L	FM 33C4-M2 1NO+1NC	FM 33C5-M2 1NO+1NC
34	L	FM 34C4-M2 2NC	FM 34C5-M2 2NC
66	L	FM 66C4-M2 1NC	FM 66C5-M2 1NC
Actuating force		0.11 Nm (0.15 Nm)	0.11 Nm (0.15 Nm)
Travel diagrams		page 344 - group 10	page 344 - group 11

All values in the drawings are in mm

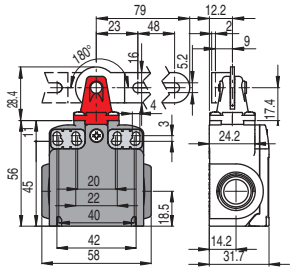
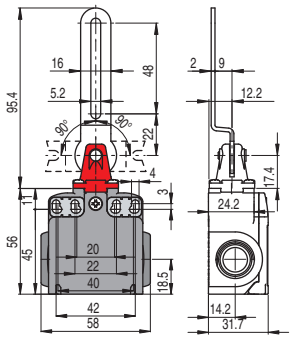
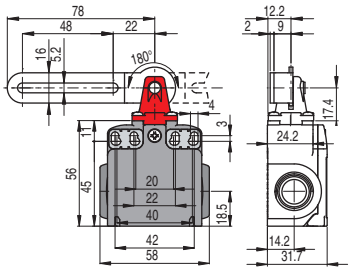
Accessories See page 321

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

Safety switches **with slotted hole lever**

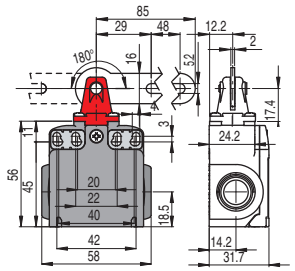
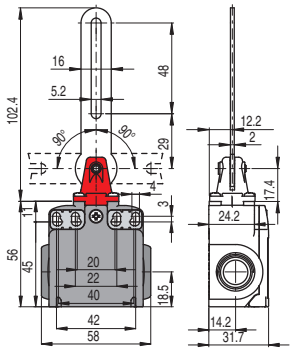
Contact type:

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

Contact blocks		Technopolymer housing	Technopolymer housing	Technopolymer housing
				
5	R	FX 5C1-M2 → 1NO+1NC	FX 5C2-M2 → 1NO+1NC	FX 5C3-M2 → 1NO+1NC
6	L	FX 6C1-M2 → 1NO+1NC	FX 6C2-M2 → 1NO+1NC	FX 6C3-M2 → 1NO+1NC
9	L	FX 9C1-M2 → 2NC	FX 9C2-M2 → 2NC	FX 9C3-M2 → 2NC
18	LA	FX 18C1-M2 → 1NO+1NC	FX 18C2-M2 → 1NO+1NC	FX 18C3-M2 → 1NO+1NC
20	L	FX 20C1-M2 → 1NO+2NC	FX 20C2-M2 → 1NO+2NC	FX 20C3-M2 → 1NO+2NC
21	L	FX 21C1-M2 → 3NC	FX 21C2-M2 → 3NC	FX 21C3-M2 → 3NC
22	L	FX 22C1-M2 → 2NO+1NC	FX 22C2-M2 → 2NO+1NC	FX 22C3-M2 → 2NO+1NC
33	L	FX 33C1-M2 → 1NO+1NC	FX 33C2-M2 → 1NO+1NC	FX 33C3-M2 → 1NO+1NC
34	L	FX 34C1-M2 → 2NC	FX 34C2-M2 → 2NC	FX 34C3-M2 → 2NC
66	L	FX 66C1-M2 → 1NC	FX 66C2-M2 → 1NC	FX 66C3-M2 → 1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 344 - group 10	page 344 - group 11	page 344 - group 10

Contact type:

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

Contact blocks		Technopolymer housing	Technopolymer housing
			
5	R	FX 5C4-M2 → 1NO+1NC	FX 5C5-M2 → 1NO+1NC
6	L	FX 6C4-M2 → 1NO+1NC	FX 6C5-M2 → 1NO+1NC
9	L	FX 9C4-M2 → 2NC	FX 9C5-M2 → 2NC
18	LA	FX 18C4-M2 → 1NO+1NC	FX 18C5-M2 → 1NO+1NC
20	L	FX 20C4-M2 → 1NO+2NC	FX 20C5-M2 → 1NO+2NC
21	L	FX 21C4-M2 → 3NC	FX 21C5-M2 → 3NC
22	L	FX 22C4-M2 → 2NO+1NC	FX 22C5-M2 → 2NO+1NC
33	L	FX 33C4-M2 → 1NO+1NC	FX 33C5-M2 → 1NO+1NC
34	L	FX 34C4-M2 → 2NC	FX 34C5-M2 → 2NC
66	L	FX 66C4-M2 → 1NC	FX 66C5-M2 → 1NC
Actuating force		0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams		page 344 - group 10	page 344 - group 11

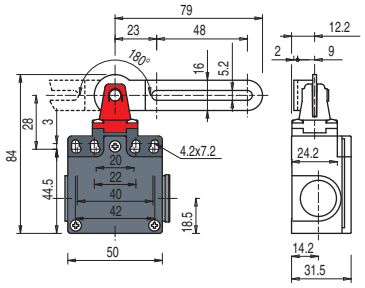
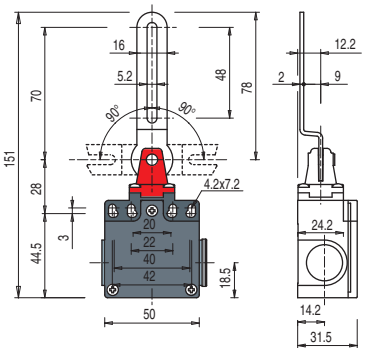
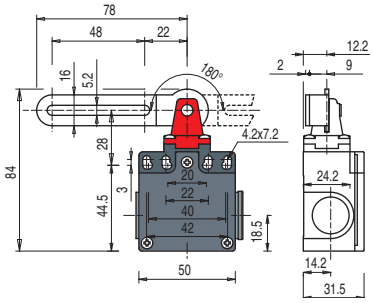
All values in the drawings are in mm

Accessories See page 321

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

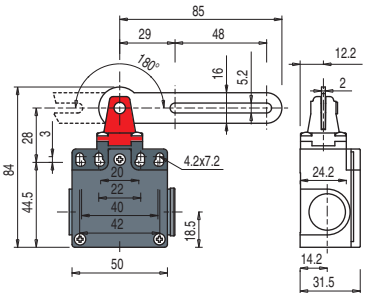
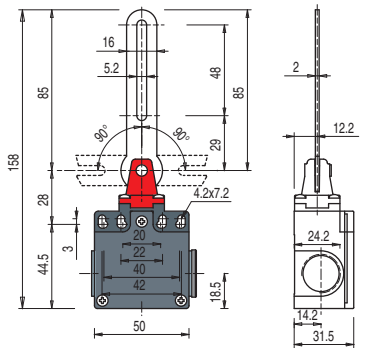
Contact type:

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

Contact blocks		Metal housing		Metal housing		Metal housing	
							
5	R	FZ 5C1-M2	1NO+1NC	FZ 5C2-M2	1NO+1NC	FZ 5C3-M2	1NO+1NC
6	L	FZ 6C1-M2	1NO+1NC	FZ 6C2-M2	1NO+1NC	FZ 6C3-M2	1NO+1NC
9	L	FZ 9C1-M2	2NC	FZ 9C2-M2	2NC	FZ 9C3-M2	2NC
18	LA	FZ 18C1-M2	1NO+1NC	FZ 18C2-M2	1NO+1NC	FZ 18C3-M2	1NO+1NC
20	L	FZ 20C1-M2	1NO+2NC	FZ 20C2-M2	1NO+2NC	FZ 20C3-M2	1NO+2NC
21	L	FZ 21C1-M2	3NC	FZ 21C2-M2	3NC	FZ 21C3-M2	3NC
22	L	FZ 22C1-M2	2NO+1NC	FZ 22C2-M2	2NO+1NC	FZ 22C3-M2	2NO+1NC
33	L	FZ 33C1-M2	1NO+1NC	FZ 33C2-M2	1NO+1NC	FZ 33C3-M2	1NO+1NC
34	L	FZ 34C1-M2	2NC	FZ 34C2-M2	2NC	FZ 34C3-M2	2NC
66	L	FZ 66C1-M2	1NC	FZ 66C2-M2	1NC	FZ 66C3-M2	1NC
Actuating force		0.11 Nm (0.15 Nm)		0.11 Nm (0.15 Nm)		0.11 Nm (0.15 Nm)	
Travel diagrams		page 344 - group 10		page 344 - group 11		page 344 - group 10	

Contact type:

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

Contact blocks		Metal housing		Metal housing	
					
5	R	FZ 5C4-M2	1NO+1NC	FZ 5C5-M2	1NO+1NC
6	L	FZ 6C4-M2	1NO+1NC	FZ 6C5-M2	1NO+1NC
9	L	FZ 9C4-M2	2NC	FZ 9C5-M2	2NC
18	LA	FZ 18C4-M2	1NO+1NC	FZ 18C5-M2	1NO+1NC
20	L	FZ 20C4-M2	1NO+2NC	FZ 20C5-M2	1NO+2NC
21	L	FZ 21C4-M2	3NC	FZ 21C5-M2	3NC
22	L	FZ 22C4-M2	2NO+1NC	FZ 22C5-M2	2NO+1NC
33	L	FZ 33C4-M2	1NO+1NC	FZ 33C5-M2	1NO+1NC
34	L	FZ 34C4-M2	2NC	FZ 34C5-M2	2NC
66	L	FZ 66C4-M2	1NC	FZ 66C5-M2	1NC
Actuating force		0.11 Nm (0.15 Nm)		0.11 Nm (0.15 Nm)	
Travel diagrams		page 344 - group 10		page 344 - group 11	

All values in the drawings are in mm

Accessories See page 321

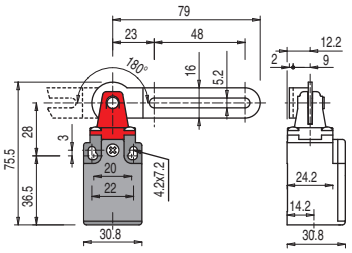
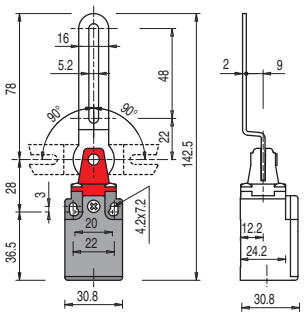
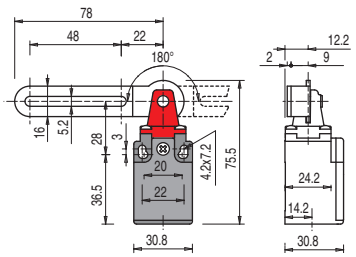
→ The 2D and 3D files are available at **www.pizzato.com**

Safety switches **with slotted hole lever**

Contact type:

L = slow action

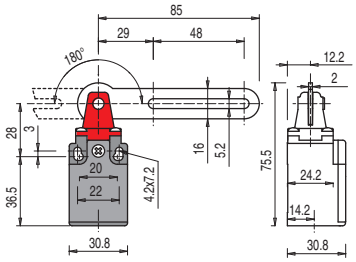
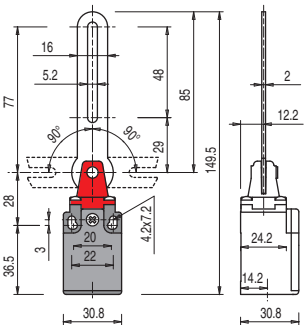
Contact blocks

	Technopolymer housing	Technopolymer housing	Technopolymer housing
			
33 L	FK 33C1-M1 → 1NO+1NC	FK 33C2-M1 → 1NO+1NC	FK 33C3-M1 → 1NO+1NC
34 L	FK 34C1-M1 → 2NC	FK 34C2-M1 → 2NC	FK 34C3-M1 → 2NC
Actuating force	0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams	page 344 - group 10	page 344 - group 11	page 344 - group 10

Contact type:

L = slow action

Contact blocks

	Technopolymer housing	Technopolymer housing
		
33 L	FK 33C4-M1 → 1NO+1NC	FK 33C5-M1 → 1NO+1NC
34 L	FK 34C4-M1 → 2NC	FK 34C5-M1 → 2NC
Actuating force	0.11 Nm (0.15 Nm →)	0.11 Nm (0.15 Nm →)
Travel diagrams	page 344 - group 10	page 344 - group 11

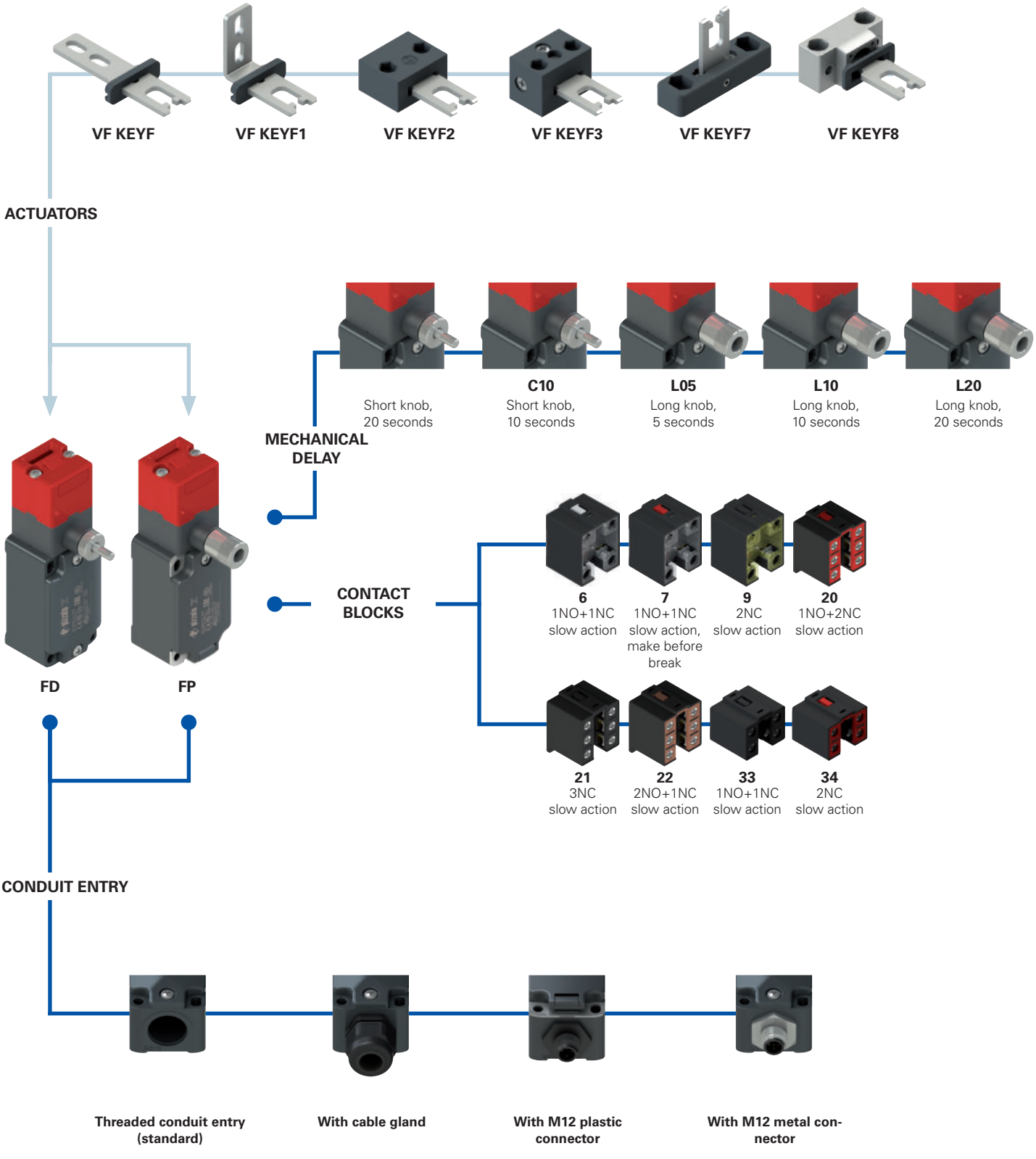
All values in the drawings are in mm

Accessories See page 321

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

Notes

Selection diagram



product option

sold separately as accessory

Code structure

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

article: **FD 6R2** — options: **-L10F1G** — options: **M2K50T6**

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

Contact blocks	
6	1NO+1NC, slow action
7	1NO+1NC, slow action, make before break
9	2NC, slow action
20	1NO+2NC, slow action
21	3NC, slow action
22	2NO+1NC, slow action
33	1NO+1NC, slow action
34	2NC, slow action

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

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

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

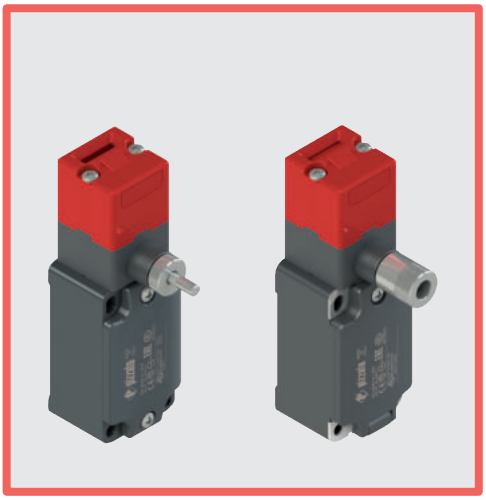
Threaded conduit entry	
M2	M20x1.5 (standard)
	PG 13.5

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

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

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

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



Main features

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

Quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Interlock with mechanical lock, coded:	type 2 acc. to EN ISO 14119
Coding level:	low acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	1,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	360 operating cycles/hour
Mechanical endurance:	500,000 operating cycles
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{1max}	1000 N acc. to EN ISO 14119
Max. holding force F_{Zh}	770 N acc. to EN ISO 14119
Max. clearance of the actuator:	4.5 mm
Tightening torques for installation:	see page 339
Wire cross-sections and wire stripping lengths:	see page 357

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 50581, BG-GS-ET-15, UL 508, CSA 22.2 No.14
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14, GB/T14048.5-2017.

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

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

Electrical data			Utilization category
without connector	Thermal current (I_{th}):	10 A	
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	Alternating current: AC15 (50÷60 Hz) U_e (V) 250 400 500 I_e (A) 6 4 1
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)	Direct current: DC13
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	U_e (V) 24 125 250
	Protection against short circuits:	type aM fuse 10 A 500 V	I_e (A) 3 0.55 0.3
	Pollution degree:	3	
with M12 connector, 4 and 5-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 120 250 I_e (A) 4 4 4
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	
	Protection against short circuits:	type gG fuse 4 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 I_e (A) 2
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	
	Protection against short circuits:	type gG fuse 2 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 I_e (A) 2

Features approved by IMQ

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

Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X

Positive opening contacts on contact blocks 6, 7, 9, 20, 21, 22, 33, 34

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

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

Features approved by UL

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

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

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

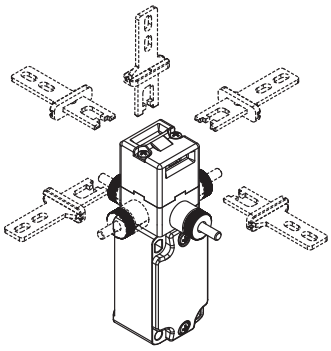
Please contact our technical department for the list of approved products.

Description

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

These switches are considered interlocks with guard locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

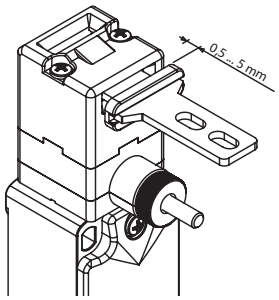
Head and knobs with variable orientation



The head can be quickly turned to each of the four sides of the switch by unfastening the two fastening screws.

The mechanical delay device can be rotated in 90° steps as well. This enables the switch to assume 32 different configurations.

Adjustment range



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

Protection degree IP67

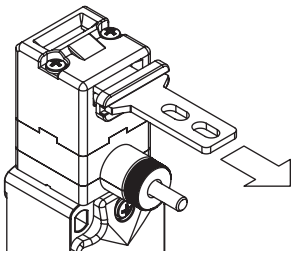
IP67

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

Contact block

Contact blocks with captive screws, finger protection, twin bridge contacts and double interruption for higher contact reliability. Available in multiple versions with shifted, simultaneous or overlapping actuation paths. They are suitable for many different applications.

Holding force of the unlocked actuator



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

Extended temperature range

-40°C

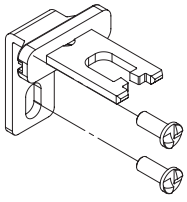
These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +80°C.

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

Laser engraving

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

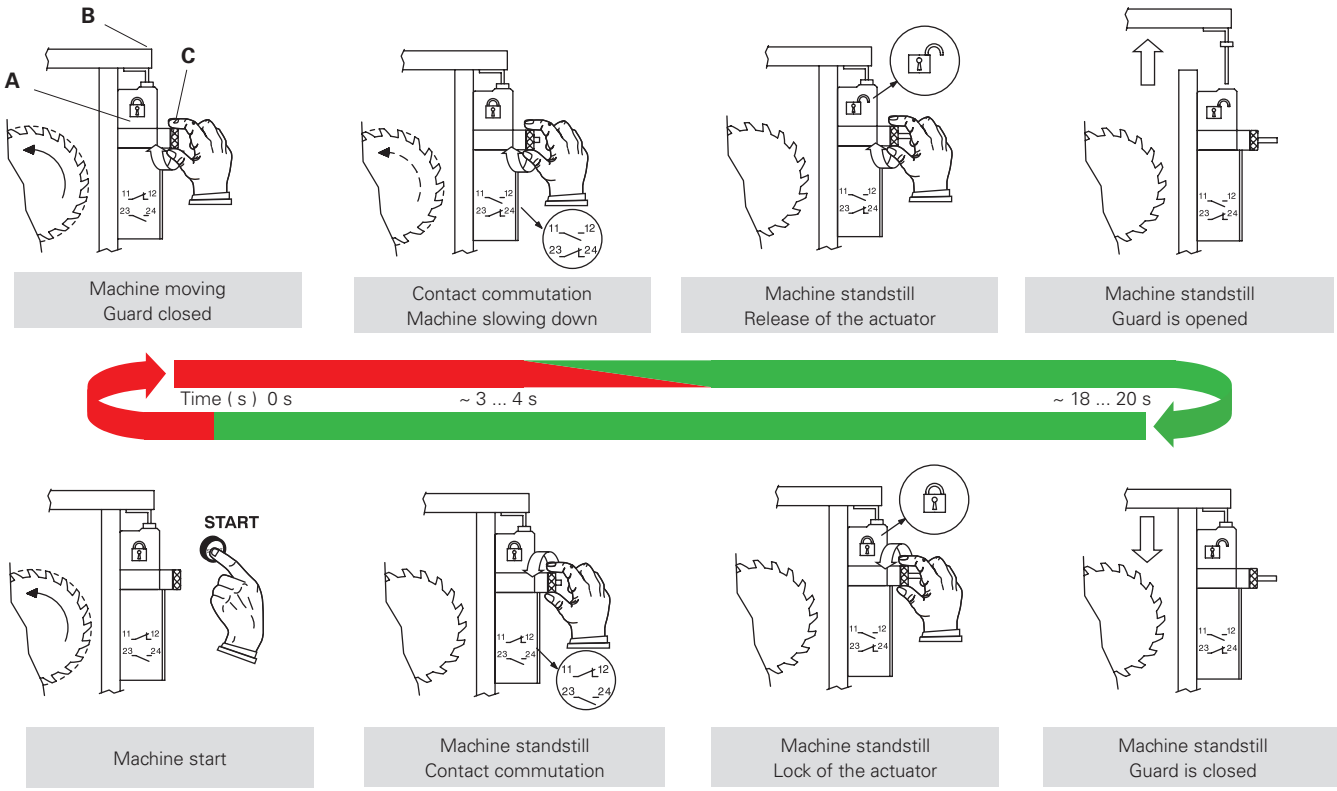
Safety screws for actuators



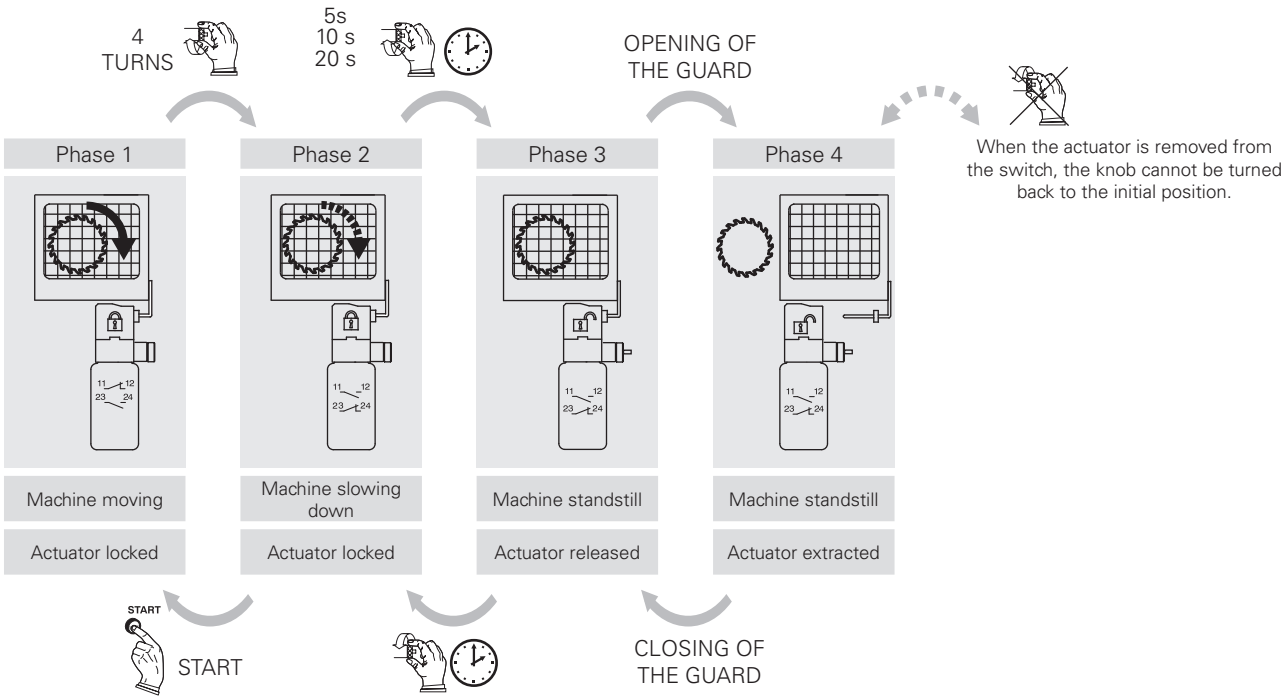
As required by EN ISO 14119, the actuator must be fixed immovably to the guard frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered by using common tools. See accessories on page 332.

Operation (FP 6R2-M2F1)

The switch is fastened to the machine body (A), while the stainless steel actuator is fastened to the guard (B). Once installed, the switch will firmly lock the actuator. In order to remove the actuator, the knob (C) has to be rotated. On the first turns the electrical contacts will positively open, then, after about 20 seconds (or 10 seconds depending on the version), the actuator will be released. In order to close the guard, the knob must be rotated in the opposite direction. This switch doesn't need power supply or timer and can be easily installed on old machines without important changes in their electrical circuit. The knob (C) may be supplied in a short (standard) or in a long version.



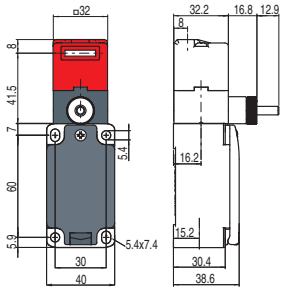
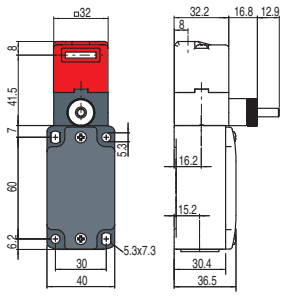
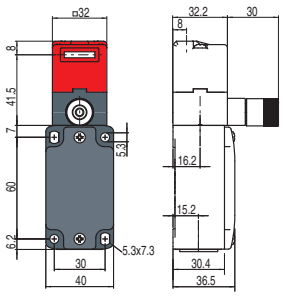
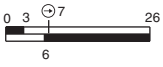
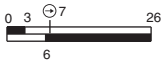
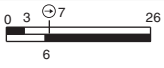
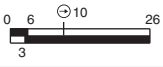
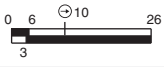
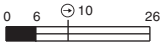
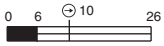
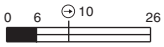
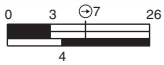
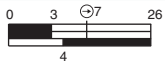
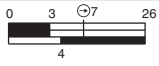
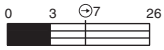
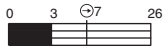
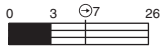
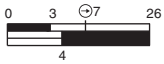
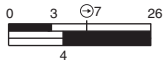
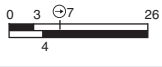
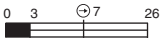
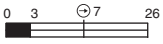
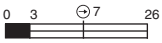
Operating phases (FD 6R2-M2F1)



Contact type:

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

Contact blocks

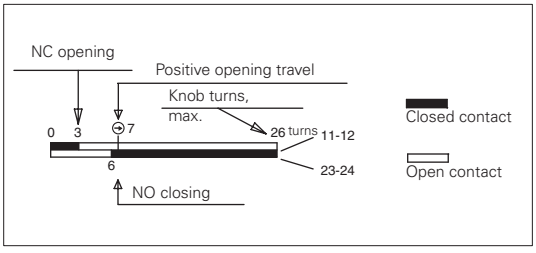
		Technopolymer housing Without actuator	Metal housing Without actuator	Metal housing Without actuator
				
6	L	FP 6R2-M2 1NO+1NC	FD 6R2-M2 1NO+1NC	FD 6R2-L10M2 1NO+1NC
				
7	LO	FP 7R2-M2 1NO+1NC	FD 7R2-M2 1NO+1NC	FD 7R2-L10M2 1NO+1NC
				
9	L	FP 9R2-M2 2NC	FD 9R2-M2 2NC	FD 9R2-L10M2 2NC
				
20	L	FP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

All values in the diagrams are in turns of the knob

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

How to read travel diagrams

All values in the diagrams are in turns of the knob



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

Limits of use

Do not use where dust and dirt may penetrate in any way into the head and deposit there. Especially not where powder, shavings, concrete or chemicals are sprayed. Adhere to the EN ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with presence of explosive or flammable gas. In these case use ATEX products (see dedicated Pizzato catalogue).
Attention! These switches alone are not suitable for applications where operators may physically enter the dangerous area, because an eventual closing of the door behind them could restart the machine operation. In these cases, the maintenance personnel must use the actuator entry locking device VF KB1 shown on page 98.

All values in the drawings are in mm

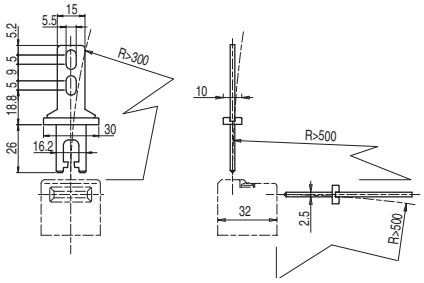
Accessories See page 321

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

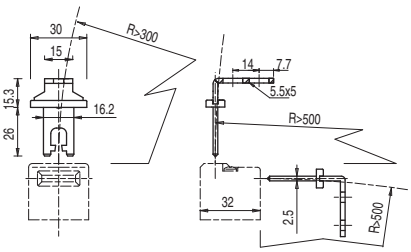
Stainless steel actuators

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

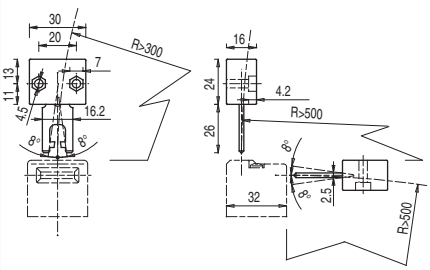
Article	Description
VF KEYF	Straight actuator



Article	Description
VF KEYF1	Angled actuator

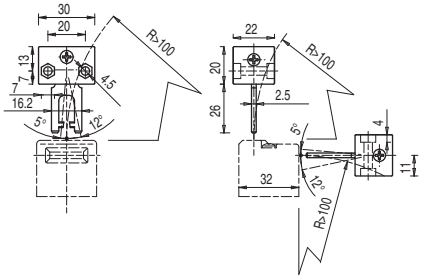


Article	Description
VF KEYF2	Jointed actuator



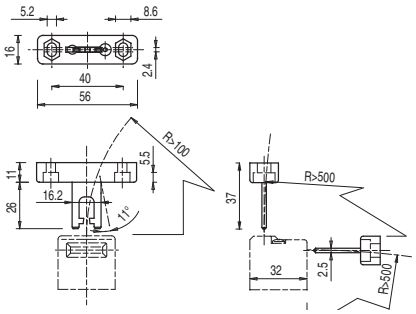
The actuator can flex in four directions for applications where the guard alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions



Actuator adjustable in two directions for guards with reduced dimensions.

Article	Description
VF KEYF7	Actuator adjustable in one direction



Actuator adjustable in one direction for guards with reduced dimensions.

All values in the drawings are in mm

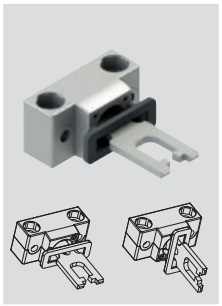
Accessories See page 321

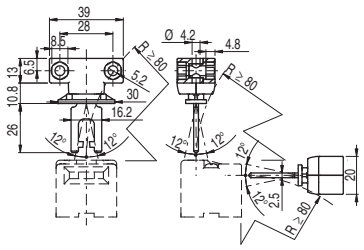
→ The 2D and 3D files are available at **www.pizzato.com**

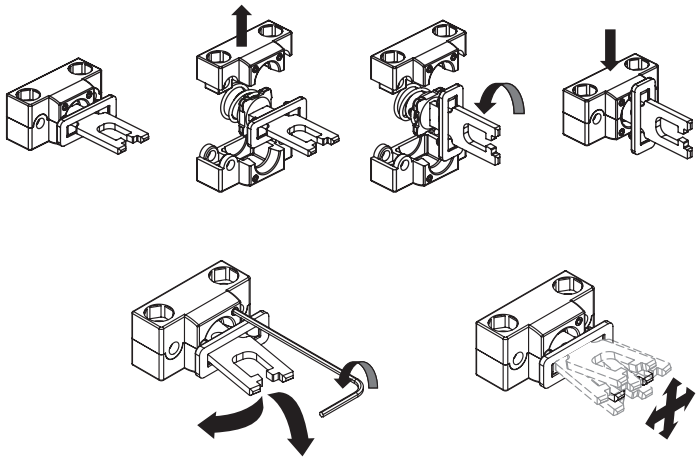
Universal actuator VF KEYF8

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

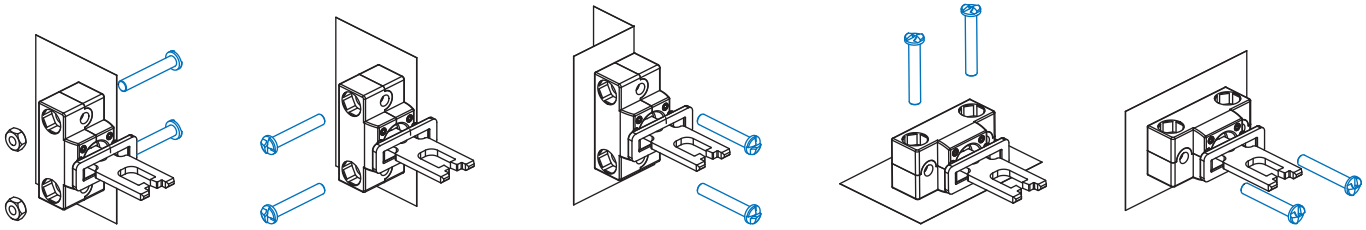
Article	Description
VF KEYF8	Universal actuator





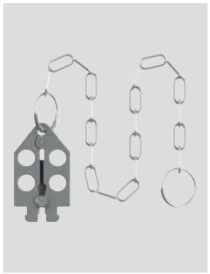


Jointed actuator for guards with poor alignment, adjustable in two dimensions for small doors; can be mounted in various positions.
The metal fixing body has two pairs of bore holes; it is provided for rotating the working plane of the actuator by 90°.



Accessories

Article	Description
VF KB1	Lock out device



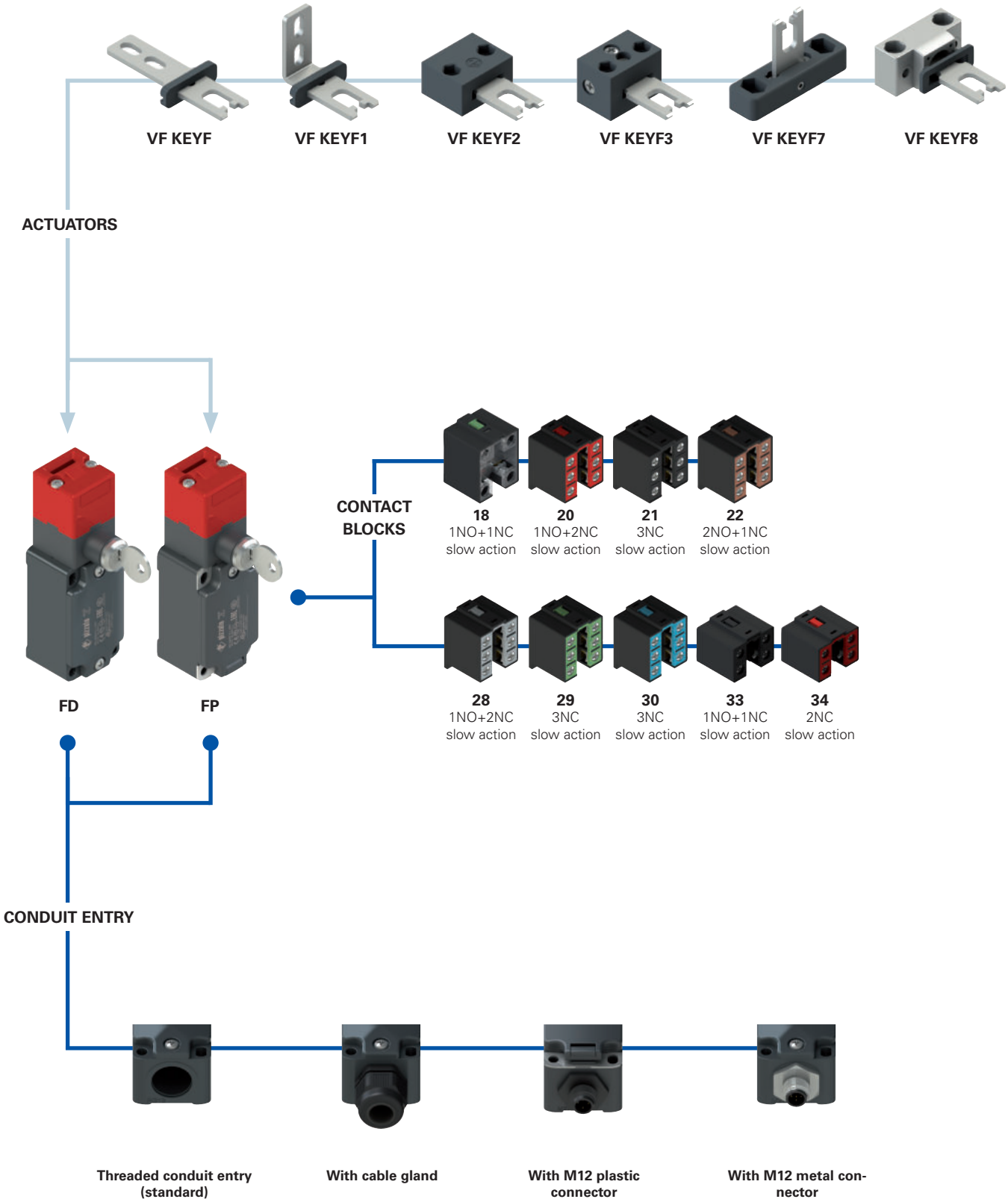
Padlockable lock out device to prevent the actuator entry and the accidental closing of the door behind operators while they are in the danger area.
Hole diameter for padlocks: 9 mm.

All values in the drawings are in mm

Accessories See page 321

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

Selection diagram



Code structure

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

article | options | options

FD 1899-F1GM2K50T6V200

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

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

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

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

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

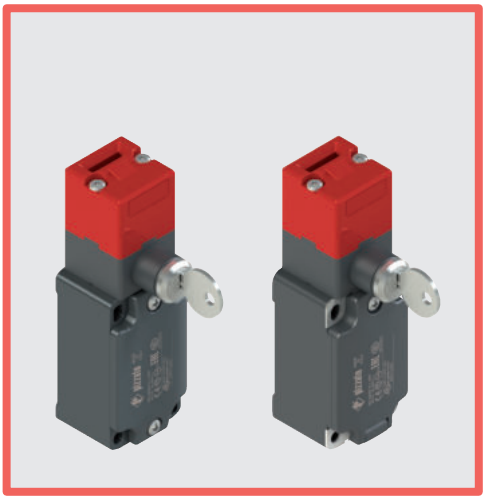
Pre-installed cable glands or connectors	
	no cable gland or connector (standard)
K23	cable gland for cables Ø 6 … 12 mm
…	……
K50	M12 metal connector, 5-pole
…	……

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

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

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

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



Main features

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

Quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Interlock with mechanical lock, coded:	type 2 acc. to EN ISO 14119
Coding level:	low acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	1,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	3600 operating cycles/hour
Mechanical endurance:	500,000 operating cycles
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage $F_{1max:}$	1000 N acc. to EN ISO 14119
Max. holding force F_{Zh}:	770 N acc. to EN ISO 14119
Max. clearance of the actuator:	4.5 mm
Actuator extraction force:	30 N
Tightening torques for installation:	see page 339
Wire cross-sections and wire stripping lengths:	see page 357

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 50581, BG-GS-ET-15, UL 508, CSA 22.2 No.14.
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14, GB/T14048.5-2017.

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

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

	Electrical data		Utilization category
without connector	Thermal current (I_{th}):	10 A	
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)	Alternating current: AC15 (50÷60 Hz) U_e (V) 250 400 500 I_e (A) 6 4 1
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)	Direct current: DC13 U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	
	Protection against short circuits:	type aM fuse 10 A 500 V	
	Pollution degree:	3	
with M12 connector, 4 and 5-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 120 250 I_e (A) 4 4 4
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	Direct current: DC13 U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
	Protection against short circuits:	type gG fuse 4 A 500 V	
	Pollution degree:	3	
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 I_e (A) 2
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	Direct current: DC13 U_e (V) 24 I_e (A) 2
	Protection against short circuits:	type gG fuse 2 A 500 V	
	Pollution degree:	3	

Features approved by IMQ

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

Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X
Positive opening contacts on contact blocks 18, 20, 21, 22, 28, 29, 30
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

Features approved by UL

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

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

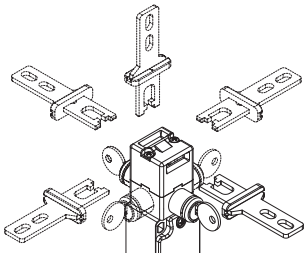
For FP series: the hub is to be connected to the conduit before the hub is connected to the enclosure.

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

Description

This type of switches is applied on fences or guards where entrance is allowed to authorized personnel only. They have been designed to control large protected areas where operators may physically enter. Supplied with a strong lock, the actuator can be removed from the head only after a complete rotation (180°) of the locking key. The electrical contacts are switched as the key is turned; the actuator is released only after the NC contacts have been positively opened. Contacts activated by the lock are reset to the initial position only with inserted actuator and with the key in the locking position. It is impossible to rotate the key when the key locking device is unlocked and the actuator is removed (C state). These switches are considered interlocks with guard locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

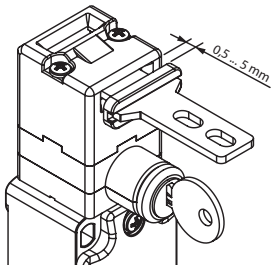
Head and release devices with variable orientation



The head can be quickly turned to each of the four sides of the switch by unfastening the two fastening screws.

The auxiliary key release device can be rotated in 90° steps as well. This enables the switch to assume 32 different configurations.

Adjustment range



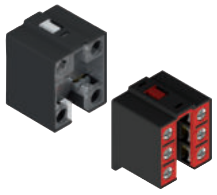
The actuation head of this switch features a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5 mm) without causing unwanted machine shutdowns. This wide range of travel is available in all actuators in order to ensure maximum device reliability.

Protection degree IP67

IP67

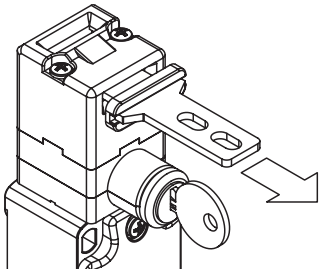
These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where maximum protection degree of the housing is required.

Contact block



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

Holding force of the unlocked actuator



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

Extended temperature range

-40°C

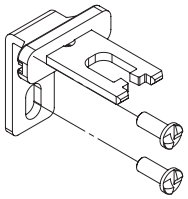
These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +80°C.

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

Laser engraving

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

Safety screws for actuators

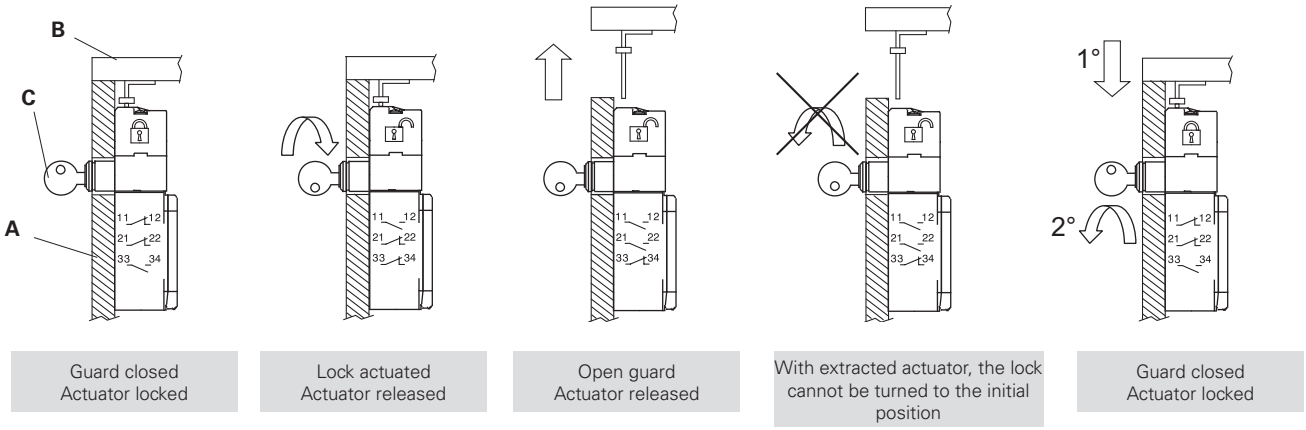


As required by ISO 14119, the actuator must be fixed immovably to the guard frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered by using common tools. See accessories on page 332.

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

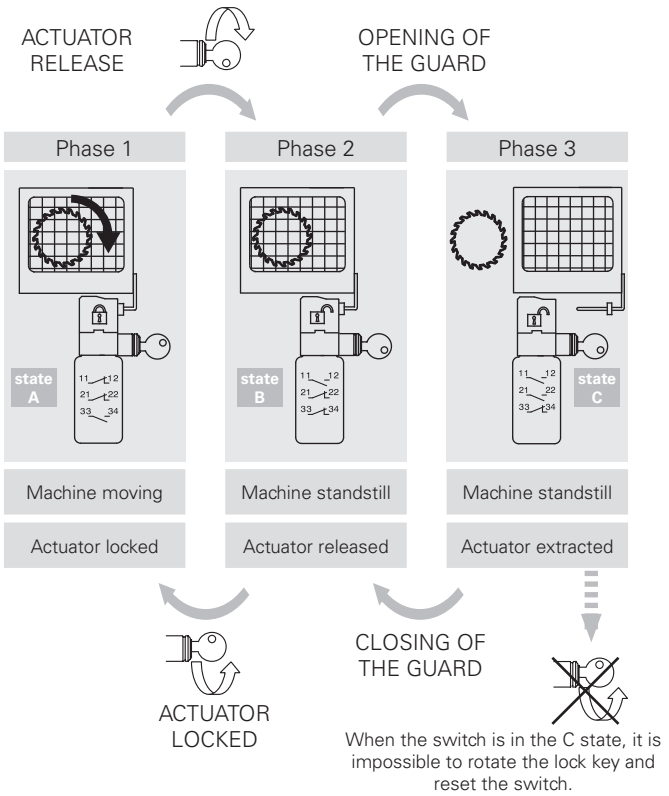
Operation

The switch is fastened to the machine body (A), while the stainless steel actuator is fastened to the guard (B). Once installed, the switch will firmly lock the actuator. To remove the actuator, the lock must be unlocked by turning the key (C). When the actuator is removed, the key cannot be put into the initial position anymore. The example shows how the contacts of the lock and actuator are switched and how the switch can be installed within the machine in such a way that only the release device is visible from the outside.



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

Operating phases

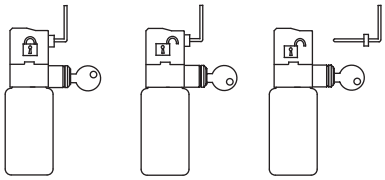


When the switch is in the C state, it is impossible to rotate the lock key and reset the switch.

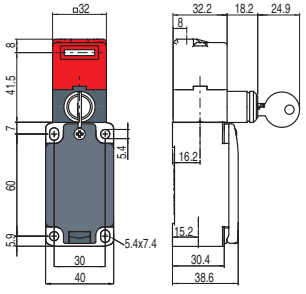
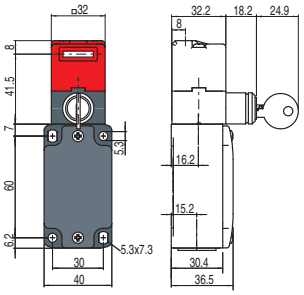
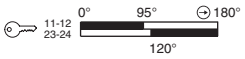
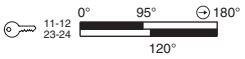
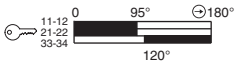
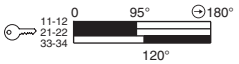
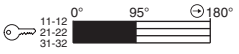
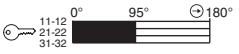
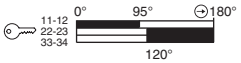
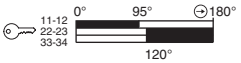
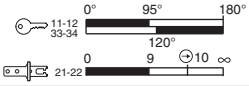
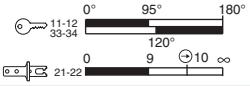
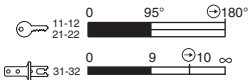
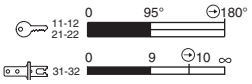
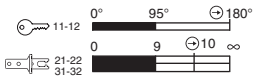
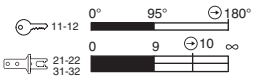
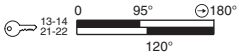
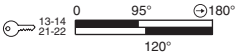
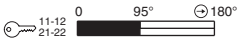
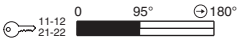
Limits of use

Do not use where dust and dirt may penetrate in any way into the head and deposit there. Especially not where powder, shavings, concrete or chemicals are sprayed. Adhere to the ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with presence of explosive or flammable gas. In these case use ATEX products (see dedicated Pizzato catalogue). Attention! These switches alone are not suitable for applications where operators may physically enter the dangerous area, because an eventual closing of the door behind them could restart the machine operation. In these cases the actuator entry locking device VF KB1 shown on page 106 must be used.

Contact positions related to switch states

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

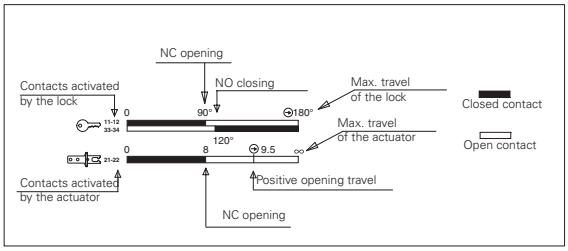
The key can be extracted from the lock with locked or released actuator.

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

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

How to read travel diagrams

All values in the diagrams are in mm or in degrees



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

All values in the drawings are in mm

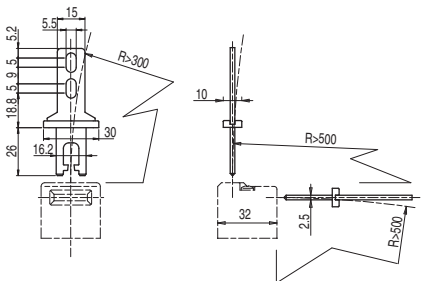
Accessories See page 321

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

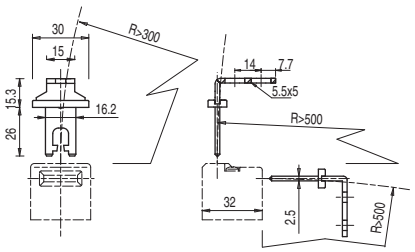
Stainless steel actuators

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

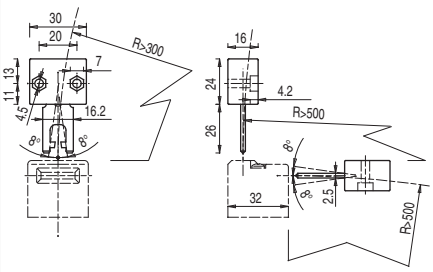
Article	Description
VF KEYF	Straight actuator



Article	Description
VF KEYF1	Angled actuator

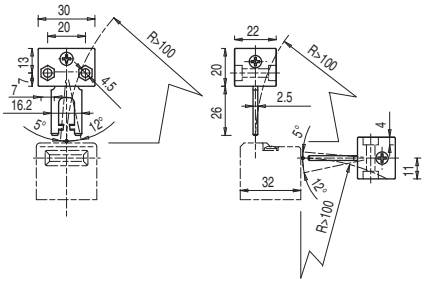


Article	Description
VF KEYF2	Jointed actuator



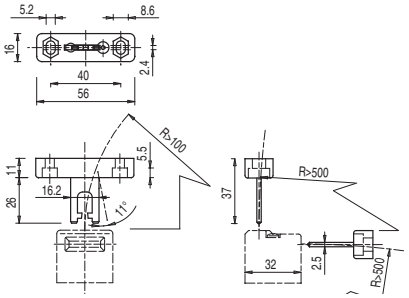
The actuator can flex in four directions for applications where the guard alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions



Actuator adjustable in two directions for guards with reduced dimensions.

Article	Description
VF KEYF7	Actuator adjustable in one direction



Actuator adjustable in one direction for guards with reduced dimensions.

All values in the drawings are in mm

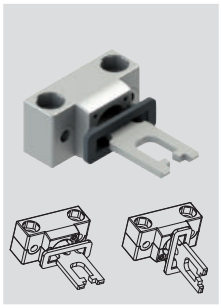
Accessories See page 321

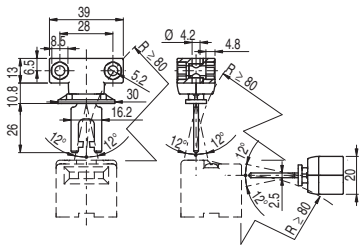
→ The 2D and 3D files are available at **www.pizzato.com**

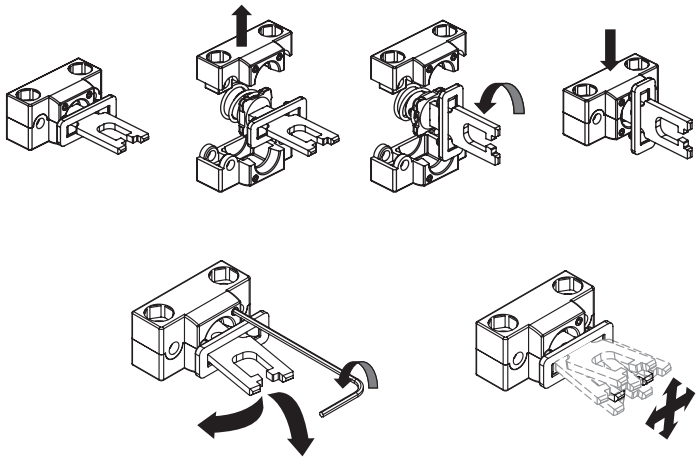
Universal actuator VF KEYF8

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

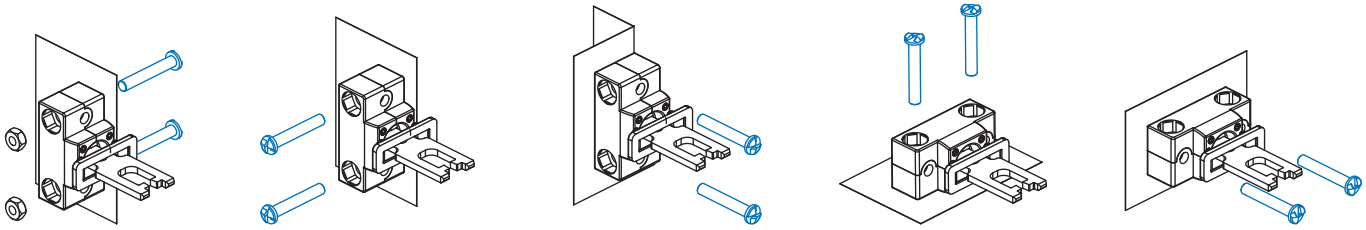
Article	Description
VF KEYF8	Universal actuator





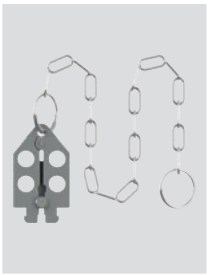


Jointed actuator for guards with poor alignment, adjustable in two dimensions for small doors; can be mounted in various positions.
The metal fixing body has two pairs of bore holes; it is provided for rotating the working plane of the actuator by 90°.



Accessories

Article	Description
VF KB1	Lock out device



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

Article	Description
VF KLA371	Set of two locking keys

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

All values in the drawings are in mm

Accessories See page 321

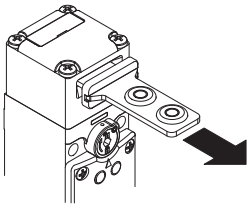
➔ The 2D and 3D files are available at **www.pizzato.com**

FG series safety switches with separate actuator with lock

Description

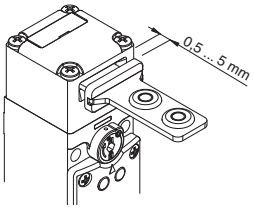
These switches are used on machines where the hazardous conditions remain for a while, even after the machines have been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. Thus, the switches can also be used if individual guards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

Holding force of the locked actuator



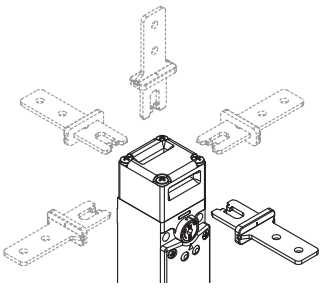
The strong interlocking system guarantees a maximum actuator holding force of F_{1max} = 2800 N.

Wide-ranging actuator travel



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

Heads and devices with variable orientation

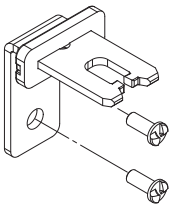


The system can be variably configured by loosening the 4 screws on the head.
The key release device and the release button can also be rotated and secured independently of one another in steps of 90°. The device can thus assume 32 different configurations.

Contact blocks with 4 contacts

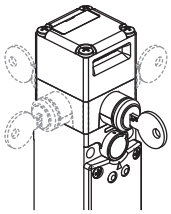
Innovative contact block with 4 contacts, available in various contact configurations for monitoring the actuator or the solenoid (patented). The unit is supplied with captive screws and self-lifting clamping plates. Removable finger protection for eyelet terminal.
High-reliability electrical contacts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

Safety screws for actuators



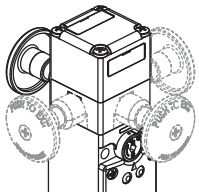
As required by EN ISO 14119, the actuator must be fixed immovably to the guard frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered by using common tools. See accessories on page 332.

Turnable key release with lock



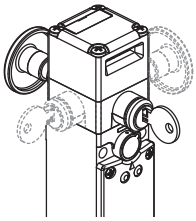
The auxiliary key release device is used to allow the maintenance or the entry into the machinery to authorized personnel only. Turning the key corresponds to actuating the solenoid: the actuator is released. The device can be turned, thereby enabling installation of the safety switch in the machine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

Escape release button



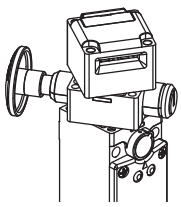
This device is used to safeguard a hazardous area that an operator may enter with his entire body. The release button, which is oriented towards the inside of the danger zone, allows the operator to escape even in the event of a power failure. Pushing the button results in the same function as the auxiliary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

Key release device and escape release button



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

Non-detachable heads and release devices



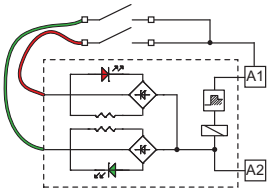
The head and the release device can be rotated but cannot be detached from each other. This makes the switch more secure since the problem of incorrect assembly by the installer cannot occur; in addition, the risk of damage is lower (loss of small parts, penetration of dirt, etc.).

LED display unit, type A

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

LED display unit, types B and C

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

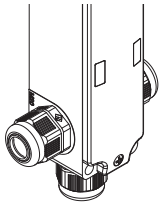


Protection degree IP67

IP67

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

Three conduit entries



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

Extended temperature range

-40°C

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

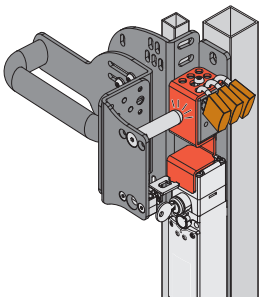
Sealable auxiliary release device

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

Laser engraving

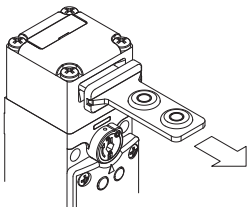
All FG series switches are permanently marked with a special laser system. As a result, the marking remains legible even under extreme operating conditions. Thanks to this system that does not use labels, the loss of plate data is prevented and a greater resistance of the marking is achieved over time.

Access monitoring



These safety switches alone do not provide sufficient personal protection to the operators or maintenance personnel in situations where they completely enter the danger zone, since unintentional closing of a door after entry could cause the machine to re-start. If the re-start release is completely dependent on these switches, a system for preventing this danger must be provided, e.g. a padlockable device for actuator entry locking VF KB2 (page 118) or a safety handle, such as a P-KUBE 1 (page 159).

Holding force of the unlocked actuator

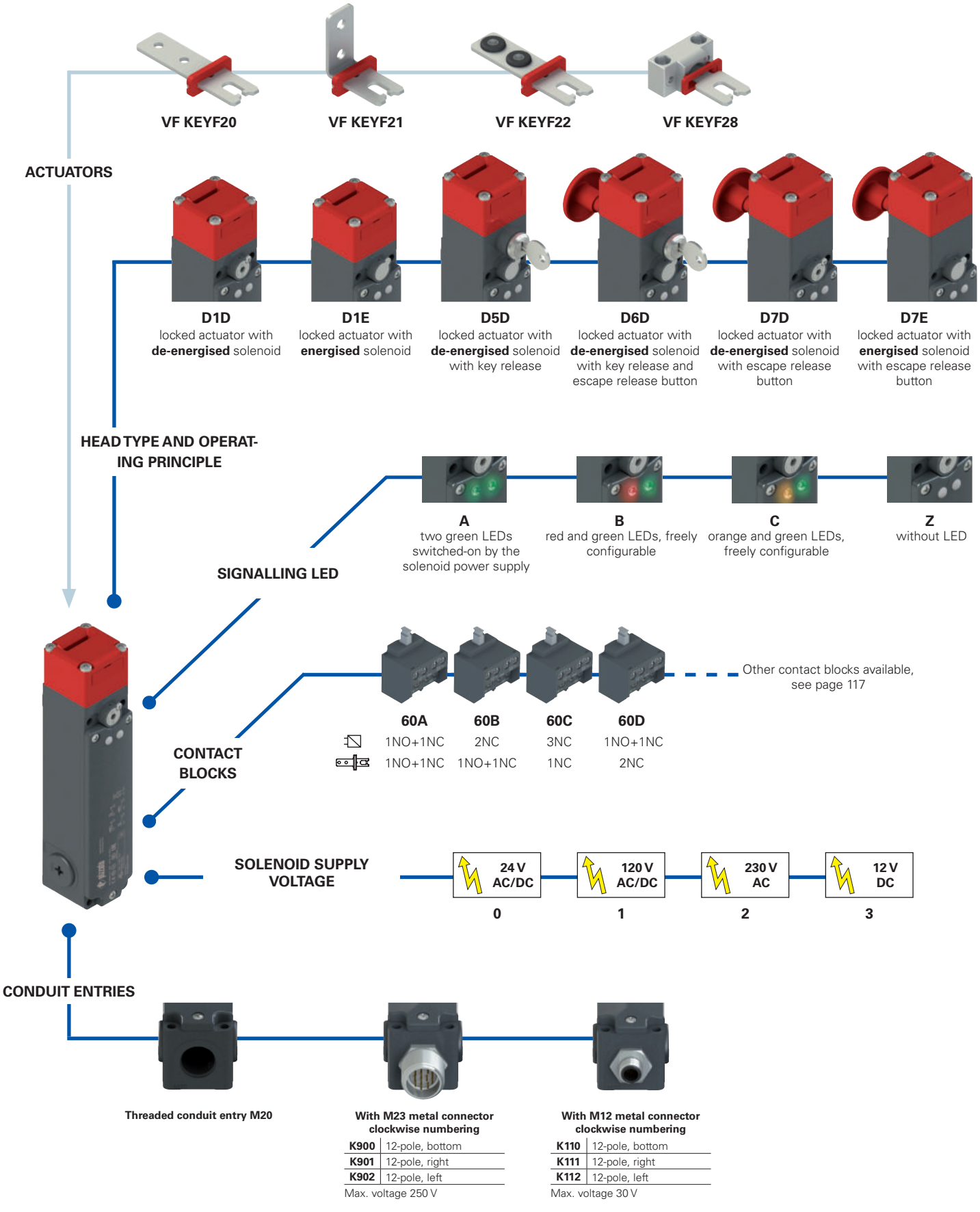


The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several guards are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked guards in their position with a retaining force of approx.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

LED signalling lights

Thanks to the three threaded cable entries, the high luminosity LED signalling lights of the VF SL series can be installed on the switch.
The LED signalling lights can be be easily installed by screwing them on one of the conduit entries not used for electric cables. They can be used for many different purposes: for example, to signal, from a distance, whether the switch has been actuated; whether the guard has closed correctly; or whether the guard is locked or unlocked.
For more information see chapter Accessories, page 321.

Selection diagram



product option

sold separately as accessory

Code structure

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

article: **FG 60AD1D0A** — options: **-LP30F20GK900T6V34**

Contact blocks

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

Note: contact blocks 60U, 61A, 61B, 61C cannot be combined with operating principles D6D, D7D, D7E

Operating principle

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

Signalling LED

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

Solenoid supply voltage

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

Release button length

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

Actuators

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

Contact type

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

Pre-installed connectors

	without connector (standard)
K900	M23 metal connector, 12-pole, bottom
…	…
K110	M12 metal connector, 12-pole, bottom
…	…

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

Ambient temperature

	-25°C … +60°C (standard)
T6	-40°C … +60°C

Removing the release key

	The key can be removed in locked and unlocked actuator position (standard)
V34	The key can be removed only in the locked position of the actuator

Safety switches with separate actuator and lock series **FG**

Main features

- Actuator holding force F_{1max}: 2800 N
- 30 contact blocks with 4 contacts
- Metal housing, three M20 conduit entries
- Protection degree IP67
- Versions with key release and escape release button
- 4 stainless steel actuators
- Head and release devices, individually turnable and non-detachable
- Signalling LED
- Operation with energised or de-energised solenoid

Quality marks:

IMQ approval:	CA02.03808
UL approval:	E131787
CCC approval:	2013010305602309
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Interlock with mechanical lock, coded:	type 2 acc. to EN ISO 14119
Coding level:	low acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	5,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +60°C (standard) -40°C … +60°C (T6 option)
Max. actuation frequency:	600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{1max}:	2800 N acc. to EN ISO 14119
Max. holding force F_{Zh}:	2150 N acc. to EN ISO 14119
Maximum clearance of locked actuator:	4.5 mm
Released actuator extraction force:	30 N
Tightening torques for installation:	see page 339
Wire cross-sections and wire stripping lengths:	see page 357

Solenoid

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

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, IEC 61000-6-2, IEC 61000-6-3, EN 50581, BG-GS-ET-15, UL 508, CSA 22.2 N. 14.
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 N. 14, GB/T14048.5-2017.

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

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

Electrical data

without connector	Thermal current (I_{th}):	10 A
	Rated insulation voltage (U_i):	400 Vac 300 Vdc
	Rated impulse withstand voltage (U_{imp}):	6 kV
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1
	Protection against short circuits:	type gG fuse 10 A 500 V
	Pollution degree:	3
with M23 connector, 12-pole	Thermal current (I_{th}):	8 A
	Rated insulation voltage (U_i):	250 Vac 300 Vdc
	Protection against short circuits:	type gG fuse 8 A 500 V
	Pollution degree:	3
with M12 connector, 12-pole	Thermal current (I_{th}):	1.5 A
	Rated insulation voltage (U_i):	30 Vac 36 Vdc
	Protection against short circuits:	type gG fuse 1.5 A
	Pollution degree:	3

Utilization category

without connector	Alternating current: AC15 (50÷60 Hz)			
	U_e (V)	120	250	400
	I_e (A)	6	5	3
	Direct current: DC13			
	U_e (V)	24	125	250
	I_e (A)	3	0.7	0.4
with M23 connector, 12-pole	Alternating current: AC15 (50÷60 Hz)			
	U_e (V)	120	250	
	I_e (A)	6	5	
	Direct current: DC13			
	U_e (V)	24	125	250
	I_e (A)	3	0.7	0.4
with M12 connector, 12-pole	Alternating current: AC15 (50÷60 Hz)			
	U_e (V)	24		
	I_e (A)	1.5		
	Direct current: DC13			
	U_e (V)	24		
	I_e (A)	1.5		

Features approved by IMQ

Rated insulation voltage (U_i):	400 Vac
Conventional free air thermal current (I_{th}):	10 A
Protection against short circuits:	type gG fuse 10 A 500 V
Rated impulse withstand voltage (U_{imp}):	6 kV
Protection degree of the housing:	IP67
MV terminals (screw terminals)	
Pollution degree:	3
Utilization category:	AC15
Operating voltage (U_e):	400 Vac (50 Hz)
Operating current (I_e):	3 A

Forms of the contact element: X+X+X+X, Y+Y+Y+Y, X+Y+Y+Y, X+X+Y+Y, X+X+X+Y

Positive opening of contacts on all contact blocks: 60A, 60B, 60C, 60D, 60E, 60F, 60G, 60H, 60I, 60L, 60M, 60N, 60P, 60R, 60S, 60T, 60U, 60V, 60X, 60Y, 61A, 61B, 61C, 61D, 61E, 61G, 61H, 61M, 61R, 61S

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

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

Features approved by UL

Electrical Ratings:	A300 pilot duty (720 VA, 120-300 Vac)
	Q300 pilot duty (69 VA, 125-250 Vdc)
Environmental Ratings:	Types 1, 4X, 12, 13

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

Operating principle

The operating principle of these safety switches allows three different operating states:

state A: with inserted and locked actuator

state B: with inserted but not locked actuator

state C: with extracted actuator

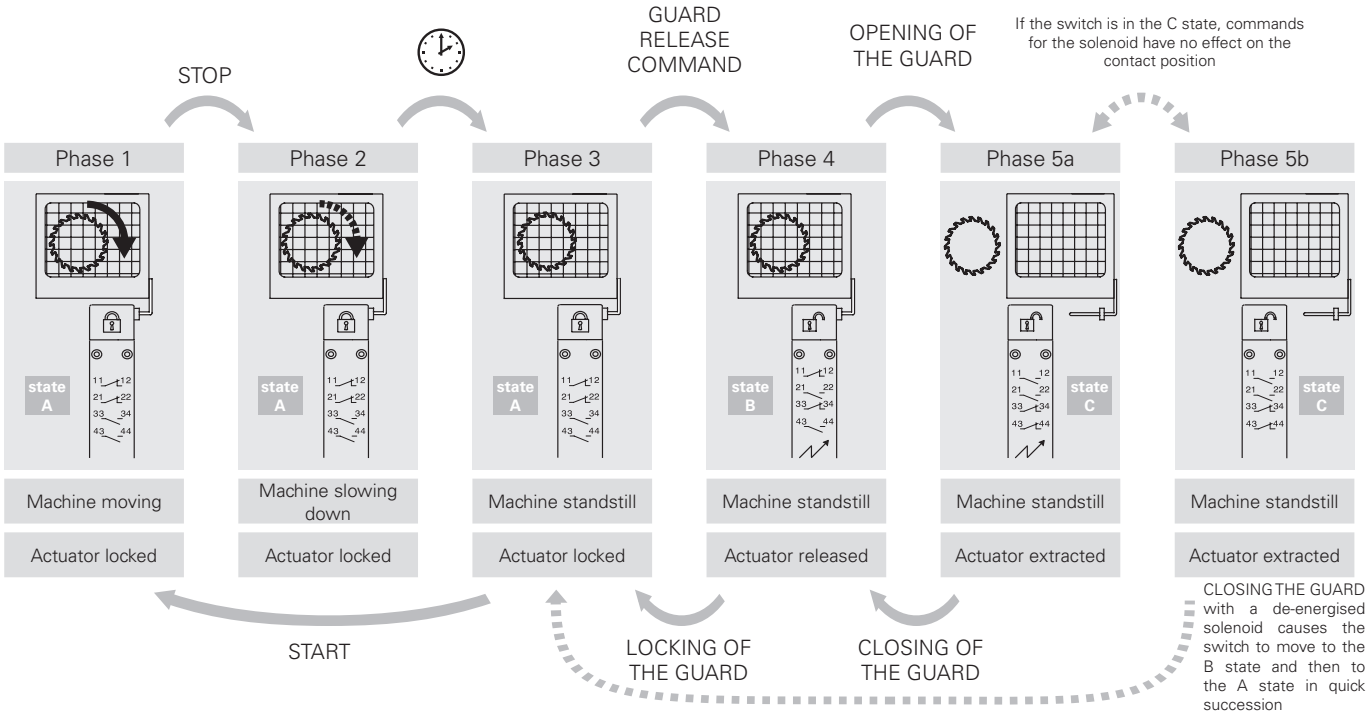
All or some of these states can be monitored by means of electrical NO contacts or NC contacts with positive opening by selecting the appropriate contact blocks. In detail, contact blocks that have electric contacts marked with the symbol of the solenoid ( ) are switched in the transition between the state A and state B, while the electric contacts marked with the symbol of the actuator ( ) are switched between state B and state C.

Operating principle

Select from two operating principles for actuator locking:

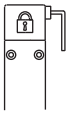
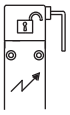
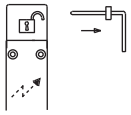
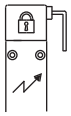
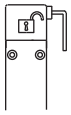
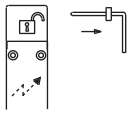
- **Operating principle D**: locked actuator with de-energised solenoid. The actuator is released by applying the power supply to the solenoid (see example of the operating phases).
- **Operating principle E**: locked actuator with energised solenoid. The actuator is released by switching off the power supply to the solenoid. This version should only be used under certain conditions, since a power failure at the system will result in the immediate opening of the guard.

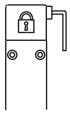
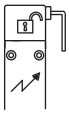
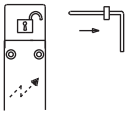
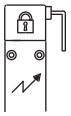
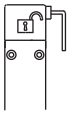
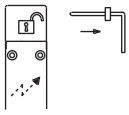
Example: operating phases with FG 60AD1D0A-F21 (switch with operating principle D)



Safety switches with separate actuator and lock series **FG**

Contact positions related to switch states

Operating state	**Operating principle D** locked actuator with de-energised solenoid			**Operating principle E** locked actuator with energised solenoid		
	state A	state B	state C	state A	state B	state C
Actuator	Inserted and locked	Inserted and released	Extracted	Inserted and locked	Inserted and released	Extracted
Solenoid	De-energised	Energised	-	Energised	De-energised	-
						
FG 60A••••• 1NO+1NC controlled by the solenoid 1NO+1NC controlled by the actuator	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44
FG 60B••••• 2NC controlled by the solenoid 1NO+1NC controlled by the actuator	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44
FG 60C••••• 3NC controlled by the solenoid 1NC controlled by the actuator	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42
FG 60D••••• 1NO+1NC controlled by the solenoid 2NC controlled by the actuator	13-14 21-22 31-32 41-42	13-14 21-22 31-32 41-42	13-14 21-22 31-32 41-42	13-14 21-22 31-32 41-42	13-14 21-22 31-32 41-42	13-14 21-22 31-32 41-42
FG 60E••••• 1NO+2NC controlled by the solenoid 1NC controlled by the actuator	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44
FG 60F••••• 1NO+2NC controlled by the solenoid 1NO controlled by the actuator	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44
FG 60G••••• 2NC controlled by the solenoid 2NC controlled by the actuator	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42
FG 60H••••• 4NC controlled by the solenoid	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42
FG 60I••••• 3NC controlled by the solenoid 1NO controlled by the actuator	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44	11-12 21-22 31-32 43-44
FG 60L••••• 2NO+1NC controlled by the solenoid 1NC controlled by the actuator	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44
FG 60M••••• 2NO+1NC controlled by the solenoid 1NO controlled by the actuator	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44
FG 60N••••• 1NO+1NC controlled by the solenoid 2NO controlled by the actuator	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44	13-14 21-22 33-34 43-44
FG 60P••••• 1NC controlled by the solenoid 3NC controlled by the actuator	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42	11-12 21-22 31-32 41-42
FG 60R••••• 2NO+2NC controlled by the solenoid	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44
FG 60S••••• 1NC controlled by the solenoid 2NO+1NC controlled by the actuator	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44	11-12 21-22 33-34 43-44

Operating state	Operating principle D locked actuator with de-energised solenoid			Operating principle E locked actuator with energised solenoid		
	state A	state B	state C	state A	state B	state C
Actuator	Inserted and locked	Inserted and released	Extracted	Inserted and locked	Inserted and released	Extracted
Solenoid	De-energised	Energised	-	Energised	De-energised	-
						
FG 60T••••• 1NC controlled by the solenoid 1NO+2NC controlled by the actuator	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44
FG 60U••••• 4NC controlled by the actuator	11-12, 21-22, 31-32, 41-42	11-12, 21-22, 31-32, 41-42	11-12, 21-22, 31-32, 41-42	11-12, 21-22, 31-32, 41-42	11-12, 21-22, 31-32, 41-42	11-12, 21-22, 31-32, 41-42
FG 60V••••• 2NC controlled by the solenoid 2NO controlled by the actuator	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44
FG 60X••••• 1NO controlled by the solenoid 3NC controlled by the actuator	13-14, 21-22, 31-32, 41-42	13-14, 21-22, 31-32, 41-42	13-14, 21-22, 31-32, 41-42	13-14, 21-22, 31-32, 41-42	13-14, 21-22, 31-32, 41-42	13-14, 21-22, 31-32, 41-42
FG 60Y••••• 1NO controlled by the solenoid 1NO+2NC controlled by the actuator	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44
FG 61A••••• 1NO+3NC controlled by the actuator	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44
FG 61B••••• 2NO+2NC controlled by the actuator	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44
FG 61C••••• 3NO+1NC controlled by the actuator	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44
FG 61D••••• 1NC controlled by the solenoid 3NO controlled by the actuator	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44
FG 61E••••• 1NO controlled by the solenoid 2NO+1NC controlled by the actuator	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44
FG 61G••••• 2NO controlled by the solenoid 1NO+1NC controlled by the actuator	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44
FG 61H••••• 2NO controlled by the solenoid 2NC controlled by the actuator	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44	11-12, 21-22, 33-34, 43-44
FG 61M••••• 3NO controlled by the solenoid 1NC controlled by the actuator	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44
FG 61R••••• 1NO+3NC controlled by the solenoid	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44	11-12, 21-22, 31-32, 43-44
FG 61S••••• 3NO+1NC controlled by the solenoid	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44	13-14, 21-22, 33-34, 43-44

Safety switches with separate actuator and lock series **FG**

Contact type
L = slow action

Contact blocks

		Operating principle D, with sealable auxiliary release device, without actuator			Operating principle E, without actuator			Operating principle D, with key release, without actuator		
60A	L	FG 60AD1D0A	1NO+1NC	1NO+1NC	FG 60AD1E0A	1NO+1NC	1NO+1NC	FG 60AD5D0A	1NO+1NC	1NO+1NC
60B	L	FG 60BD1D0A	2NC	1NO+1NC	FG 60BD1E0A	2NC	1NO+1NC	FG 60BD5D0A	2NC	1NO+1NC
60C	L	FG 60CD1D0A	3NC	1NC	FG 60CD1E0A	3NC	1NC	FG 60CD5D0A	3NC	1NC
60D	L	FG 60DD1D0A	1NO+1NC	2NC	FG 60DD1E0A	1NO+1NC	2NC	FG 60DD5D0A	1NO+1NC	2NC
60E	L	FG 60ED1D0A	1NO+2NC	1NC	FG 60ED1E0A	1NO+2NC	1NC	FG 60ED5D0A	1NO+2NC	1NC
60F	L	FG 60FD1D0A	1NO+2NC	1NO	FG 60FD1E0A	1NO+2NC	1NO	FG 60FD5D0A	1NO+2NC	1NO
60G	L	FG 60GD1D0A	2NC	2NC	FG 60GD1E0A	2NC	2NC	FG 60GD5D0A	2NC	2NC
60H	L	FG 60HD1D0A	4NC	/	FG 60HD1E0A	4NC	/	FG 60HD5D0A	4NC	/
60I	L	FG 60ID1D0A	3NC	1NO	FG 60ID1E0A	3NC	1NO	FG 60ID5D0A	3NC	1NO
60L	L	FG 60LD1D0A	2NO+1NC	1NC	FG 60LD1E0A	2NO+1NC	1NC	FG 60LD5D0A	2NO+1NC	1NC
60M	L	FG 60MD1D0A	2NO+1NC	1NO	FG 60MD1E0A	2NO+1NC	1NO	FG 60MD5D0A	2NO+1NC	1NO
60N	L	FG 60ND1D0A	1NO+1NC	2NO	FG 60ND1E0A	1NO+1NC	2NO	FG 60ND5D0A	1NO+1NC	2NO
60P	L	FG 60PD1D0A	1NC	3NC	FG 60PD1E0A	1NC	3NC	FG 60PD5D0A	1NC	3NC
60R	L	FG 60RD1D0A	2NO+2NC	/	FG 60RD1E0A	2NO+2NC	/	FG 60RD5D0A	2NO+2NC	/
60S	L	FG 60SD1D0A	1NC	2NO+1NC	FG 60SD1E0A	1NC	2NO+1NC	FG 60SD5D0A	1NC	2NO+1NC
60T	L	FG 60TD1D0A	1NC	1NO+2NC	FG 60TD1E0A	1NC	1NO+2NC	FG 60TD5D0A	1NC	1NO+2NC
60U	L	FG 60UD1D0A	/	4NC	FG 60UD1E0A	/	4NC	FG 60UD5D0A	/	4NC
60V	L	FG 60VD1D0A	2NC	2NO	FG 60VD1E0A	2NC	2NO	FG 60VD5D0A	2NC	2NO
60X	L	FG 60XD1D0A	1NO	3NC	FG 60XD1E0A	1NO	3NC	FG 60XD5D0A	1NO	3NC
60Y	L	FG 60YD1D0A	1NO	1NO+2NC	FG 60YD1E0A	1NO	1NO+2NC	FG 60YD5D0A	1NO	1NO+2NC
61A	L	FG 61AD1D0A	/	1NO+3NC	FG 61AD1E0A	/	1NO+3NC	FG 61AD5D0A	/	1NO+3NC
61B	L	FG 61BD1D0A	/	2NO+2NC	FG 61BD1E0A	/	2NO+2NC	FG 61BD5D0A	/	2NO+2NC
61C	L	FG 61CD1D0A	/	3NO+1NC	FG 61CD1E0A	/	3NO+1NC	FG 61CD5D0A	/	3NO+1NC
61D	L	FG 61DD1D0A	1NC	3NO	FG 61DD1E0A	1NC	3NO	FG 61DD5D0A	1NC	3NO
61E	L	FG 61ED1D0A	1NO	2NO+1NC	FG 61ED1E0A	1NO	2NO+1NC	FG 61ED5D0A	1NO	2NO+1NC
61G	L	FG 61GD1D0A	2NO	1NO+1NC	FG 61GD1E0A	2NO	1NO+1NC	FG 61GD5D0A	2NO	1NO+1NC
61H	L	FG 61HD1D0A	2NO	2NC	FG 61HD1E0A	2NO	2NC	FG 61HD5D0A	2NO	2NC
61M	L	FG 61MD1D0A	3NO	1NC	FG 61MD1E0A	3NO	1NC	FG 61MD5D0A	3NO	1NC
61R	L	FG 61RD1D0A	1NO+3NC	/	FG 61RD1E0A	1NO+3NC	/	FG 61RD5D0A	1NO+3NC	/
61S	L	FG 61SD1D0A	3NO+1NC	/	FG 61SD1E0A	3NO+1NC	/	FG 61SD5D0A	3NO+1NC	/
Actuating force		30 N (60 N ⊕)			30 N (60 N ⊕)			30 N (60 N ⊕)		
Travel diagrams		Page 117			Page 117			Page 117		

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

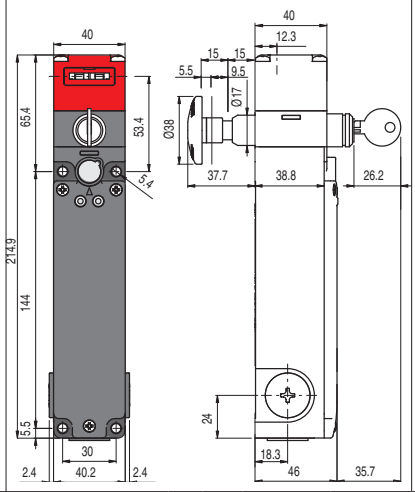
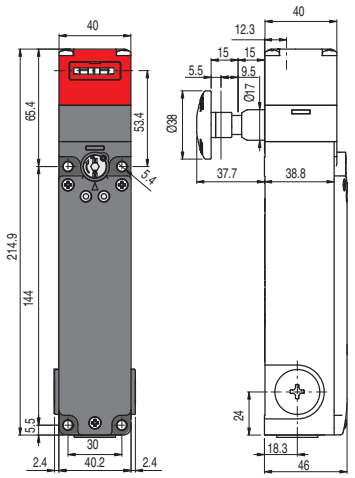
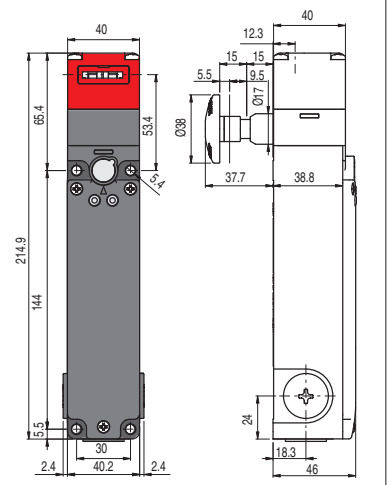
All values in the drawings are in mm

Accessories See page 321

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

Contact type
L = slow action

Contact blocks

	Operating principle D, with key release, escape release button, without actuator			Operating principle D, with escape release button, without actuator			Operating principle E, with escape release button, without actuator		
									
60A L	FG 60AD6D0A		1NO+1NC	1NO+1NC	FG 60AD7D0A	1NO+1NC	1NO+1NC	FG 60AD7E0A	1NO+1NC	1NO+1NC
60B L	FG 60BD6D0A		2NC	1NO+1NC	FG 60BD7D0A	2NC	1NO+1NC	FG 60BD7E0A	2NC	1NO+1NC
60C L	FG 60CD6D0A		3NC	1NC	FG 60CD7D0A	3NC	1NC	FG 60CD7E0A	3NC	1NC
60D L	FG 60DD6D0A		1NO+1NC	2NC	FG 60DD7D0A	1NO+1NC	2NC	FG 60DD7E0A	1NO+1NC	2NC
60E L	FG 60ED6D0A		1NO+2NC	1NC	FG 60ED7D0A	1NO+2NC	1NC	FG 60ED7E0A	1NO+2NC	1NC
60F L	FG 60FD6D0A		1NO+2NC	1NO	FG 60FD7D0A	1NO+2NC	1NO	FG 60FD7E0A	1NO+2NC	1NO
60G L	FG 60GD6D0A		2NC	2NC	FG 60GD7D0A	2NC	2NC	FG 60GD7E0A	2NC	2NC
60H L	FG 60HD6D0A		4NC	/	FG 60HD7D0A	4NC	/	FG 60HD7E0A	4NC	/
60I L	FG 60ID6D0A		3NC	1NO	FG 60ID7D0A	3NC	1NO	FG 60ID7E0A	3NC	1NO
60L L	FG 60LD6D0A		2NO+1NC	1NC	FG 60LD7D0A	2NO+1NC	1NC	FG 60LD7E0A	2NO+1NC	1NC
60M L	FG 60MD6D0A		2NO+1NC	1NO	FG 60MD7D0A	2NO+1NC	1NO	FG 60MD7E0A	2NO+1NC	1NO
60N L	FG 60ND6D0A		1NO+1NC	2NO	FG 60ND7D0A	1NO+1NC	2NO	FG 60ND7E0A	1NO+1NC	2NO
60P L	FG 60PD6D0A		1NC	3NC	FG 60PD7D0A	1NC	3NC	FG 60PD7E0A	1NC	3NC
60R L	FG 60RD6D0A		2NO+2NC	/	FG 60RD7D0A	2NO+2NC	/	FG 60RD7E0A	2NO+2NC	/
60S L	FG 60SD6D0A		1NC	2NO+1NC	FG 60SD7D0A	1NC	2NO+1NC	FG 60SD7E0A	1NC	2NO+1NC
60T L	FG 60TD6D0A		1NC	1NO+2NC	FG 60TD7D0A	1NC	1NO+2NC	FG 60TD7E0A	1NC	1NO+2NC
60V L	FG 60VD6D0A		2NC	2NO	FG 60VD7D0A	2NC	2NO	FG 60VD7E0A	2NC	2NO
60X L	FG 60XD6D0A		1NO	3NC	FG 60XD7D0A	1NO	3NC	FG 60XD7E0A	1NO	3NC
60Y L	FG 60YD6D0A		1NO	1NO+2NC	FG 60YD7D0A	1NO	1NO+2NC	FG 60YD7E0A	1NO	1NO+2NC
61D L	FG 61DD6D0A		1NC	3NO	FG 61DD7D0A	1NC	3NO	FG 61DD7E0A	1NC	3NO
61E L	FG 61ED6D0A		1NO	2NO+1NC	FG 61ED7D0A	1NO	2NO+1NC	FG 61ED7E0A	1NO	2NO+1NC
61G L	FG 61GD6D0A		2NO	1NO+1NC	FG 61GD7D0A	2NO	1NO+1NC	FG 61GD7E0A	2NO	1NO+1NC
61H L	FG 61HD6D0A		2NO	2NC	FG 61HD7D0A	2NO	2NC	FG 61HD7E0A	2NO	2NC
61M L	FG 61MD6D0A		3NO	1NC	FG 61MD7D0A	3NO	1NC	FG 61MD7E0A	3NO	1NC
61R L	FG 61RD6D0A		1NO+3NC	/	FG 61RD7D0A	1NO+3NC	/	FG 61RD7E0A	1NO+3NC	/
61S L	FG 61SD6D0A		3NO+1NC	/	FG 61SD7D0A	3NO+1NC	/	FG 61SD7E0A	3NO+1NC	/
Actuating force	30 N (60 N →)				30 N (60 N →)			30 N (60 N →)		
Travel diagrams	Page 117				Page 117			Page 117		

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

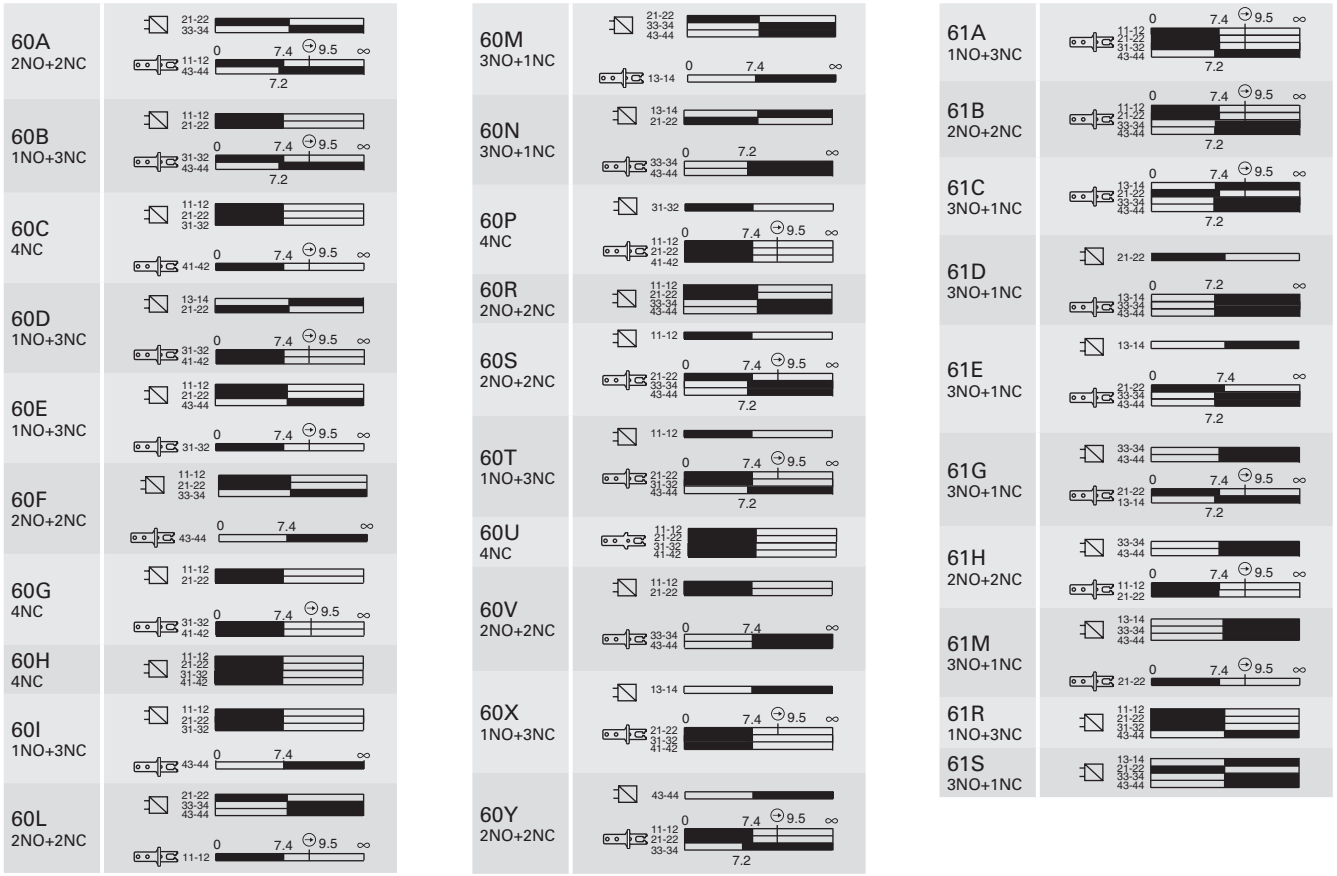
All values in the drawings are in mm

Accessories See page 321

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

Safety switches with separate actuator and lock series **FG**

Travel diagrams



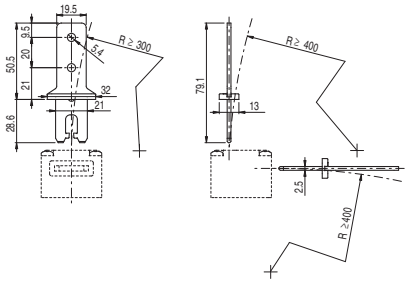
Legend:

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

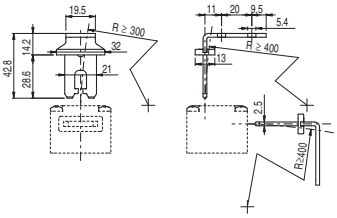
Stainless steel actuators

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

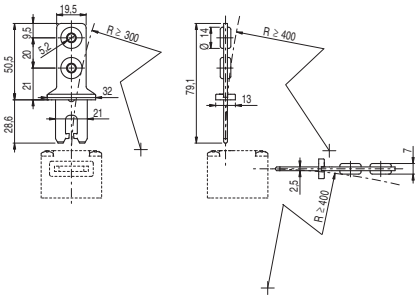
Article	Description
VF KEYF20	Straight actuator



Article	Description
VF KEYF21	Angled actuator



Article	Description
VF KEYF22	Actuator with rubber pads



All values in the drawings are in mm

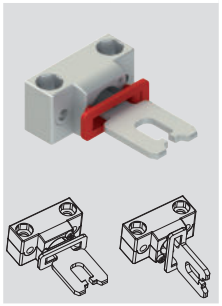
Accessories See page 321

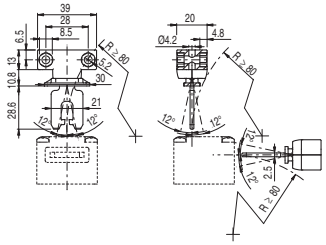
→ The 2D and 3D files are available at **www.pizzato.com**

Universal actuator VF KEYF28

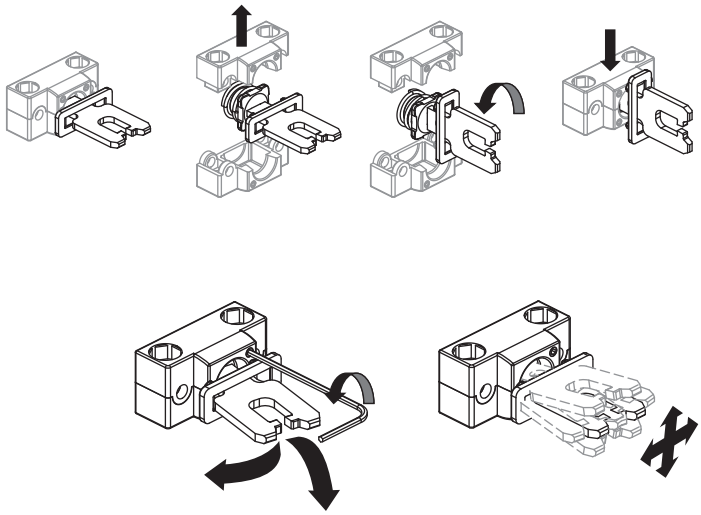
IMPORTANT: These actuators can be used only with items of the FG series (e.g. FG 60AD1D0A).
Low level of coding acc. to EN ISO 14119.

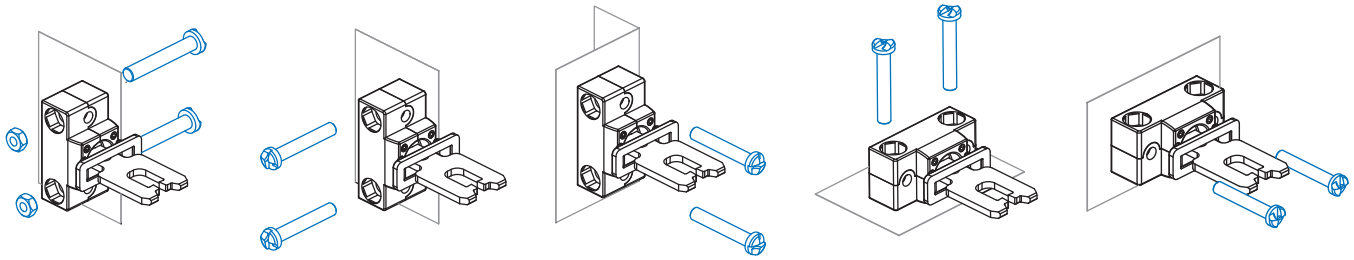
Article	Description
VF KEYF28	Universal actuator





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



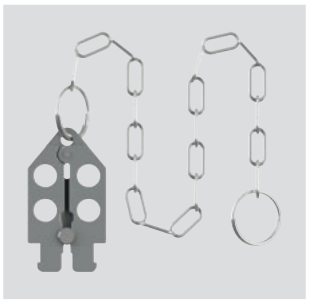


Limits of use

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

Accessories

Article	Description
VF KB2	Lock out device



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

Article	Description
VF KLA371	Set of two locking keys

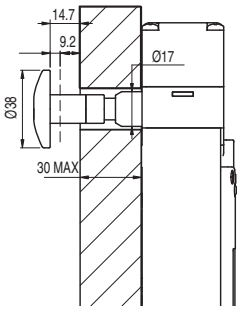
Extra copy of the locking keys to be purchased if further keys are needed (standard supply: 2 units).
The keys of all switches have the same code. Other codes on request.

All values in the drawings are in mm

Accessories See page 321

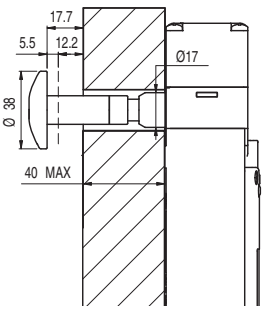
→ The 2D and 3D files are available at **www.pizzato.com**

Other release button lengths



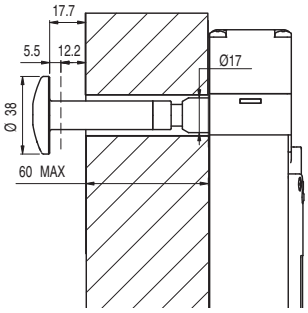
-LP30

For wall thickness
15 … 30 mm



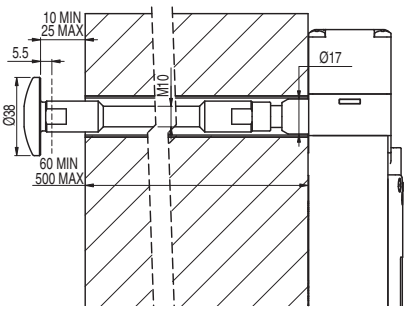
-LP40

For wall thickness
30 … 40 mm



-LP60

For wall thickness
40 … 60 mm



-LPRG

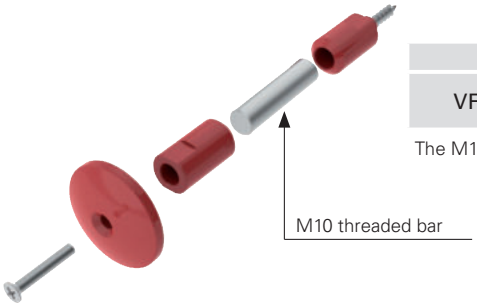
For wall thickness
60 … 500 mm

- Avoid bending and twisting the release button.
- To guarantee correct device operation, keep a distance of 10 … 25 mm between the wall and the release button.
- The actuation path of the release button must always be kept clean. Dirt or chemical products could compromise the device operation.
- Periodically check the device for proper function.

- Avoid bending and twisting the release button.
- On the inside of the wall, use a bushing or a tube with an inner diameter of 18±0.5 mm as a guide.
- Guide in the M10 threaded rod in such as way so as to prevent bending. The M10 threaded rod is not supplied with the device.
- Use medium-strength thread locker to secure the threaded rod.
- Do not exceed an overall length of 500 mm between the release button and the switch.
- To guarantee correct device operation, keep a distance of 10 … 25 mm between the wall and the release button.
- The actuation path of the release button must always be kept clean. Dirt or chemical products could compromise the device operation.
- Periodically check the device for proper function.

Release button

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



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

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

All values in the drawings are in mm

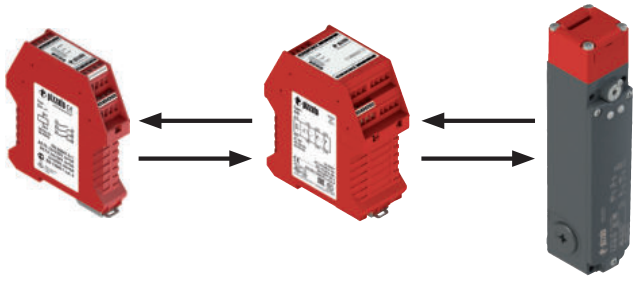
Accessories See page 321

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

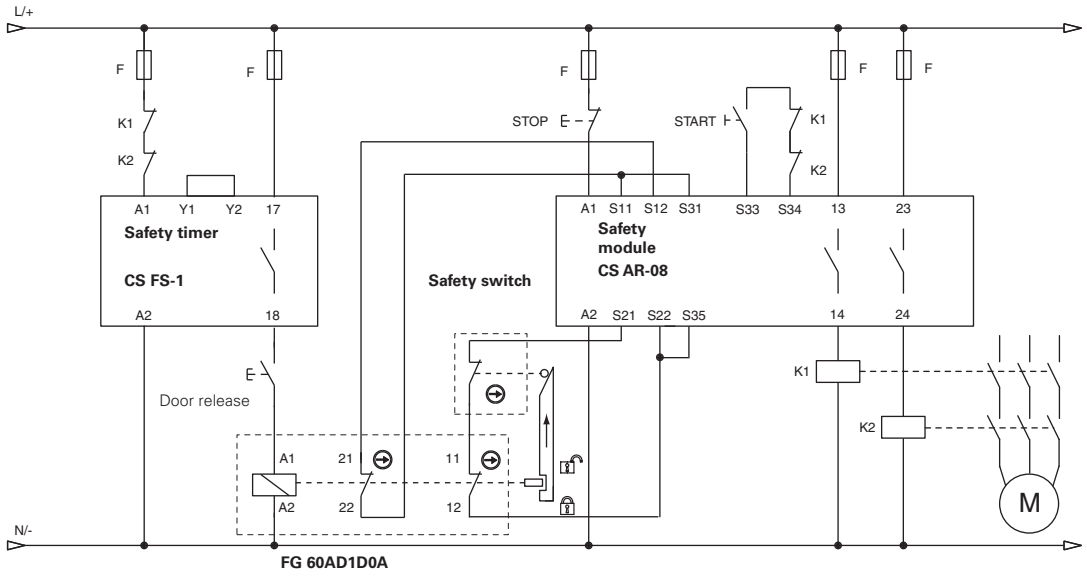
Safety modules

Pizzato Elettrica offers its customers a wide range of safety modules. These were developed taking into consideration typical problems encountered during the monitoring of safety switches under actual operating conditions. Safety modules with instantaneous or delayed contacts for emergency circuits of type 0 (immediate stop) or type 1 (controlled stop).

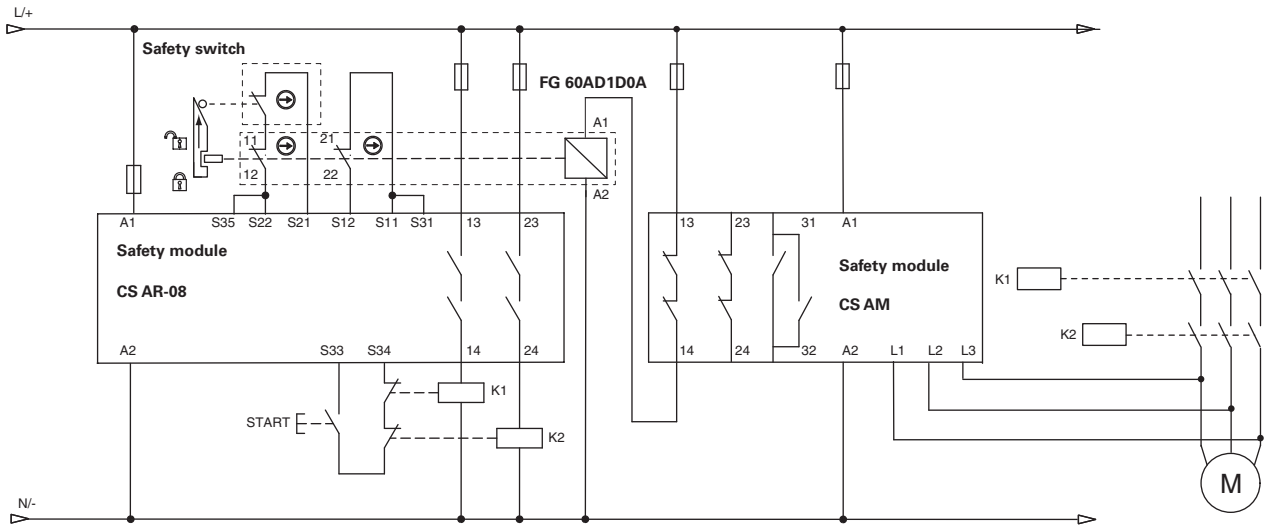
Safety switches with solenoid of the FG series can be connected to safety modules for the realization of safety circuits up to PL e acc. to EN ISO 13849. For technical information or wiring diagrams, please contact our technical office.



Application example with safety timer



Application example with safety module for standstill monitoring



NOTE: The NC contacts of K1 and K2 are mechanically guided (EN 60947-4-1, Annex F)

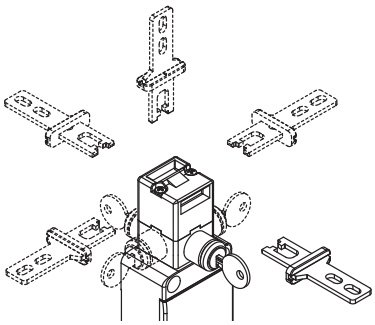
Safety switch with separate actuator and lock series **FS**

Description

These switches are used on machines where the hazardous conditions remain for a while, even after the machines have been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. Thus, the switches can also be used if individual guards are only to be opened under certain conditions.

The versions with solenoid actuated NC contacts are considered interlocks with locking in accordance with ISO 14119, and the product's label is marked with the symbol shown.

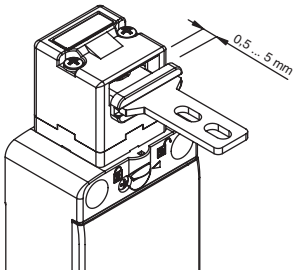
Head and release devices with variable orientation



The head can be quickly turned to each of the four sides of the switch by unfastening the two fastening screws.

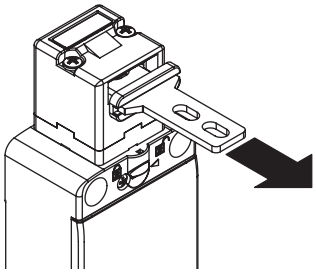
The auxiliary key release device can be rotated in 90° steps as well. This enables the switch to assume 32 different configurations.

Wide-ranging actuator travel



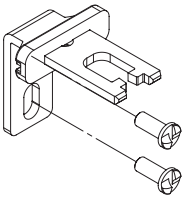
The actuation head of this switch features a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5 mm) without causing unwanted machine shutdowns. This wide range of travel is available in all actuators in order to ensure maximum device reliability.

Holding force of the locked actuator



The robust interlocking system guarantees a maximum actuator holding force of F_{1max} = 1100 N.

Safety screws for actuators



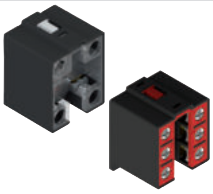
As required by EN ISO 14119, the actuator must be fixed immovably to the guard frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered by using common tools. See accessories on page 332.

Protection degree IP67

IP67

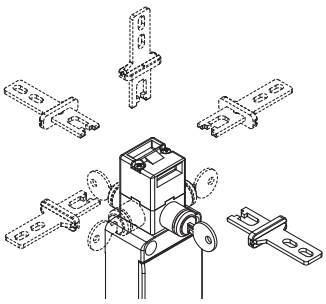
These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where maximum protection degree of the housing is required.

Contact block



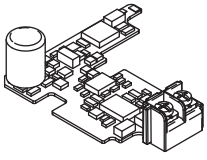
Contact blocks with captive screws, finger protection, twin bridge contacts and double interruption for higher contact reliability. Versions with gold-plated contacts available. Available in multiple variants with actuation by actuator or by solenoid.

Turnable key release with lock



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

Circuit board for monitoring the current consumption of the solenoid.

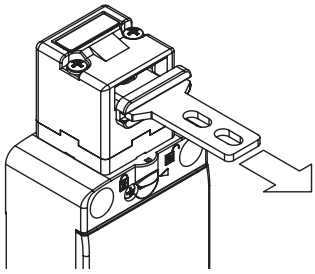


This technical solution resolves the problems that may derive from unstable power supply (machine distance from main transformers, voltage variation between night/day hours), allowing also a low solenoid power consumption and consequently enlarging the working temperature range of the switch.

Laser engraving

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

Holding force of the unlocked actuator



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

Two operating principles

D or E

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

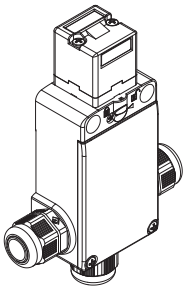
Operating principle D: locked actuator with de-energised solenoid. The actuator is released by applying the power supply to the solenoid.

Operating principle E: locked actuator with energised solenoid. The actuator is released by switching off the power supply to the solenoid. This version should only be used under certain conditions, since a power failure at the system will result in the immediate opening of the guard.

Sealable auxiliary release device

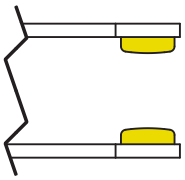
Switches with locked actuator with deactivated solenoid (function principle D) are equipped with an auxiliary release device for the solenoid to simplify installation of the switch and to facilitate entry into the danger zone in the event of a power failure. The auxiliary release device acts on the switch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

Cable outputs



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

Gold-plated contacts



The contact blocks of these devices can be supplied gold-plated upon request. Ideal for applications with low voltages or currents; it ensures increased contact reliability. Available in two thicknesses (1 or 2.5 microns), it adapts perfectly to the various fields of application, ensuring a long endurance over time.

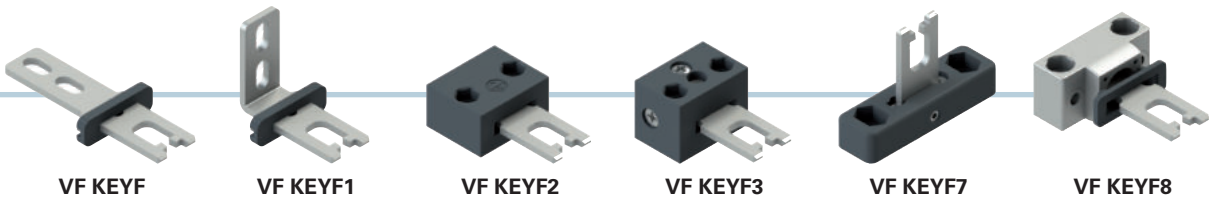
LED signalling lights

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

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

For more information see chapter Accessories, page 321.

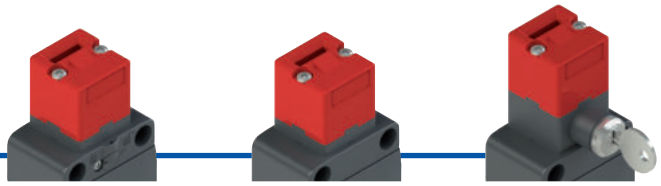
Selection diagram



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

ACTUATORS

HEAD TYPE AND OPERATING PRINCIPLE

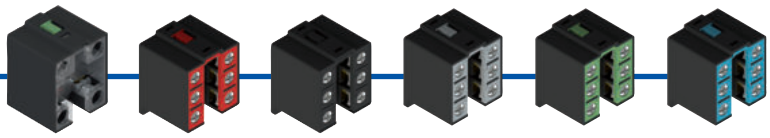


96D
Locked actuator with de-energised solenoid

96E
Locked actuator with energised solenoid

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

CONTACT BLOCKS

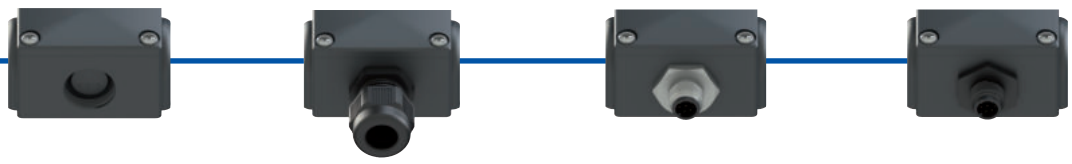


	18	20	21	28	29	30
	1NO+1NC	1NO+2NC	3NC	1NO+1NC	2NC	1NC
	/	/	/	1NC	1NC	2NC

SOLENOID SUPPLY VOLTAGE

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

CONDUIT ENTRIES



Threaded conduit entry (standard)

With cable gland

With M12 metal connector

K40	8-pole, bottom
K41	8-pole, right
K42	8-pole, left

Max. voltage 30 V

With M12 plastic connector

K45	8-pole, bottom
K46	8-pole, right
K47	8-pole, left

Max. voltage 30 V

product option

sold separately as accessory

Code structure

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

article | options | options

FS 1896D024-F1GM2K40V34

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

Head type and operating principle	
96D	locked actuator with de-energised solenoid
96E	locked actuator with energised solenoid
98D	locked actuator with de-energised solenoid with auxiliary key release

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

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

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

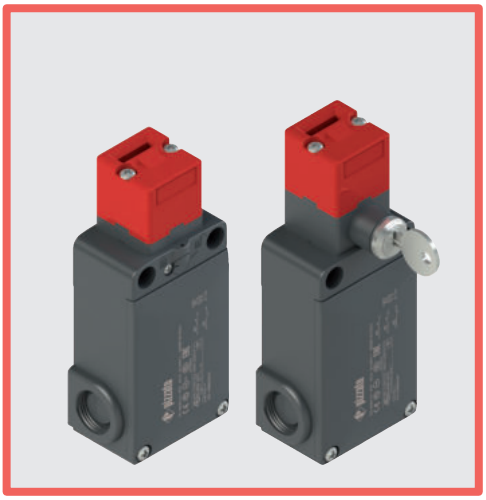
Threaded conduit entry	
M2	M20x1.5 (standard)
	PG 13.5

Pre-installed cable glands or connectors	
	no cable gland or connector (standard)
K23	cable gland for cables Ø 6 … 12 mm
…	……
K40	M12 metal connector, 8-pole
…	……
K45	M12 plastic connector, 8-pole
…	……

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

Removing the release key	
	The key can be removed in locked and unlocked actuator position (standard)
V34	The key can be removed only in the locked position of the actuator

Safety switch with separate actuator and lock series **FS**



Main features

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

Quality marks:

IMQ approval:	CA02.03808
UL approval:	E131787
CCC approval:	2007010305230011
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Interlock with mechanical lock, coded:	type 2 acc. to EN ISO 14119
Coding level:	low acc. to EN ISO 14119
Safety parameters:	
B_{10D}:	4,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C ... +60°C
Max. actuation frequency:	600 operating cycles/hour
Mechanical endurance:	800,000 operating cycles
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{1max}:	1100 N (head 96), 900 N (head 98) acc. to EN ISO 14119
Max. holding force F_{Zh}:	846 N (head 96), 692 N (head 98) acc. to EN ISO 14119
Maximum clearance of locked actuator:	4.5 mm
Released actuator extraction force:	30 N
Tightening torques for installation:	see page 339
Wire cross-sections and wire stripping lengths:	see page 357

Solenoid

Duty cycle:	100% ED (continuous operation)
Solenoid inrush power:	20 VA 0.1 s (24 V) 18 VA 0,1 s (120 V) 18 VA 0,1 s (230 V)
Solenoid consumption:	4 VA
Average overall consumption:	10 VA
Solenoid protection 24 V:	fuse 500 mA, delayed
Solenoid protection 120 V:	fuse 315 mA, delayed
Solenoid protection 230 V:	fuse 160 mA, delayed

Notes: Calculate the power supply using the average overall consumption. Please consider the solenoid inrush power in order to avoid intervention of overload-protection in case of electronic power supply.

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, IEC 61000-6-2, IEC 61000-6-3, EN 50581, BG-GS-ET-15, UL 508, CSA 22.2 N. 14.
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 N. 14, GB/T14048.5-2017.

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

⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

Electrical data

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

Utilization category

Alternating current: AC15 (50÷60 Hz)

U_e (V)	250	400	500
I_e (A)	6	4	1

Direct current: DC13

U_e (V)	24	125	250
I_e (A)	3	0.55	0.3

Alternating current: AC15 (50÷60 Hz)

U_e (V)	24
I_e (A)	2

Direct current: DC13

U_e (V)	24
I_e (A)	2

Features approved by IMQ

Rated insulation voltage (Ui):	500 Vac 400 Vac (for contact blocks 20, 21, 28, 29, 30)
Conventional free air thermal current (I_{th}):	10 A
Protection against short circuits:	type aM fuse 10 A 500 V
Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (for contact blocks 20, 21, 28, 29, 30)
Protection degree of the housing:	IP67
MV terminals (screw terminals)	
Pollution degree:	3
Utilization category:	AC15
Operating voltage (U_e):	400 Vac (50 Hz)
Operating current (I_e):	3 A

Forms of the contact element: Zb, Y+Y+X, Y+Y+Y, Y+X+X
Positive opening contacts on contact blocks 18, 20, 21, 28, 29, 30

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

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

Features approved by UL

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

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

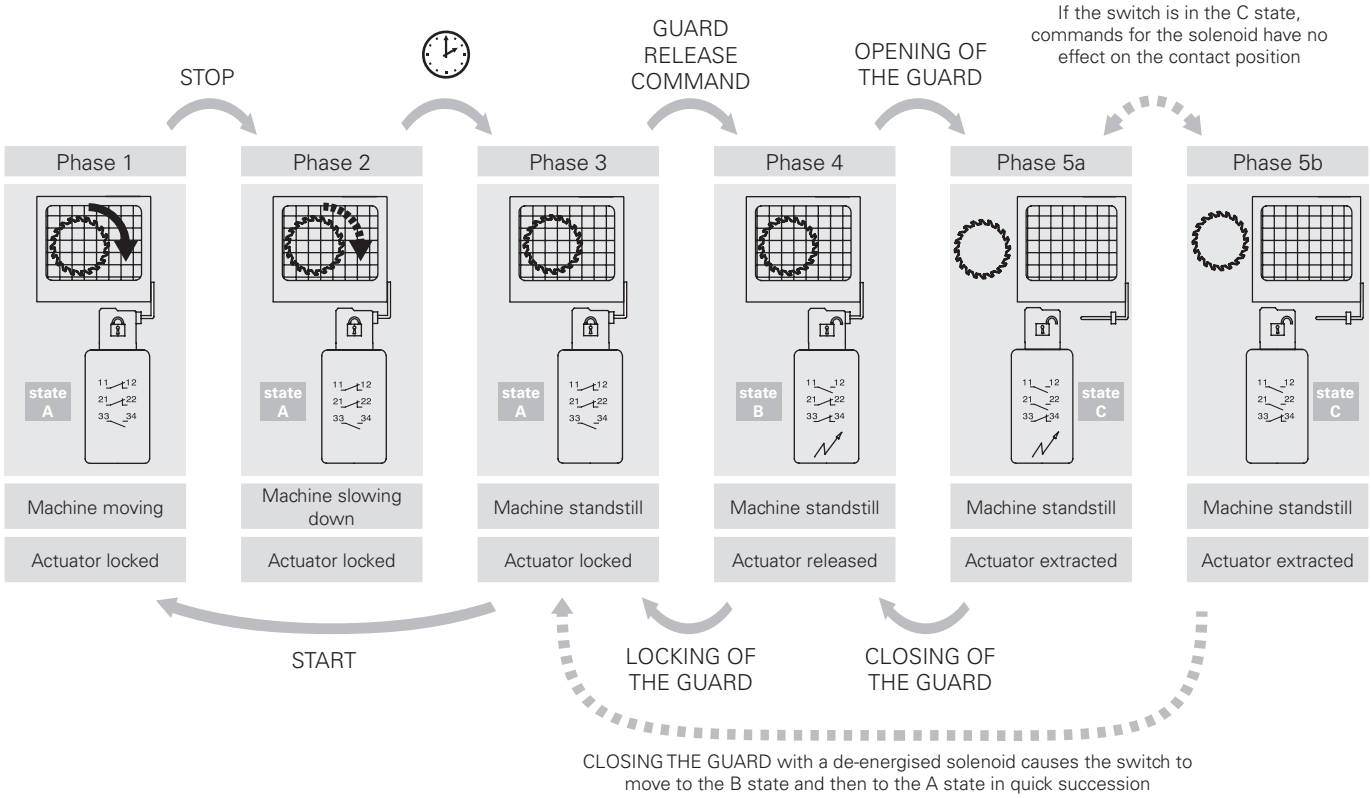
Please contact our technical department for the list of approved products.

Operating principle

The operating principle of these safety switches allows three different operating states:
state A: with inserted and locked actuator
state B: with inserted but not locked actuator
state C: with extracted actuator
All or some of these states can be monitored by means of electrical contacts with positive opening by selecting the appropriate contact blocks. In detail, contact blocks that have electric contacts marked with the symbol of the solenoid ( ) are switched in the transition between the state A and state B, while the electric contacts marked with the symbol of the actuator ( ) are switched between state B and state C.
It is also possible to choose between two operating principles for the actuator locking:

- **Operating principle D**: locked actuator with de-energised solenoid. The actuator is released by applying the power supply to the solenoid (see example of the operating phases).
- **Operating principle E**: locked actuator with energised solenoid. The actuator is released by switching off the power supply to the solenoid. This version should only be used under certain conditions, since a power failure at the system will result in the immediate opening of the guard.

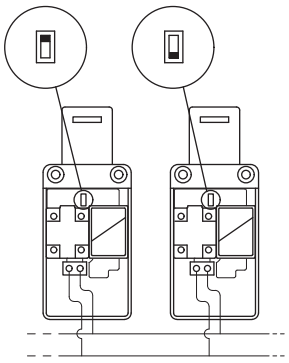
Example: operating phases with FS 2896D024-F1 (switch with operating principle D)



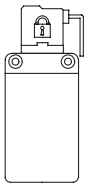
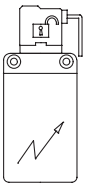
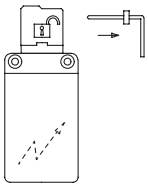
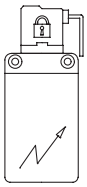
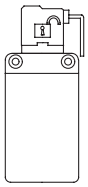
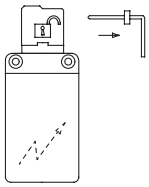
Installation of two or more switches connected to the same power supply

24 V AC/DC versions only

- This operation is intended to reduce the effects of the combined solenoid inrush currents on the power supply and should only be executed if necessary and with great care.
- Switch off the power supply.
- Open the switch cover.
- Loosen the two screws that secure the black plastic protective cover of the solenoid to the switch body and remove the plastic protective cover.
- Use a pin to set the selector switch so that each switch has a different combination (see figure at the side). If more than two switches are installed, repeat the combinations for any next set of two switches.
- Reposition the black plastic protective cover and tighten the two screws with a torque of 0.8 Nm.



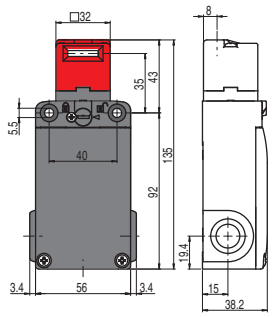
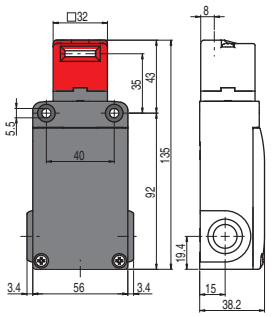
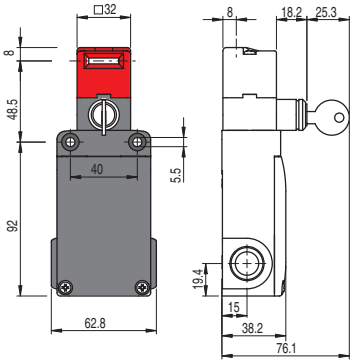
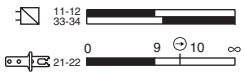
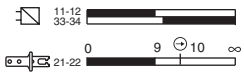
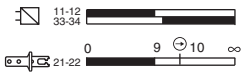
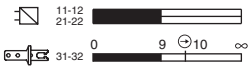
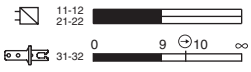
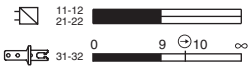
Contact positions related to switch states

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

Limits of use

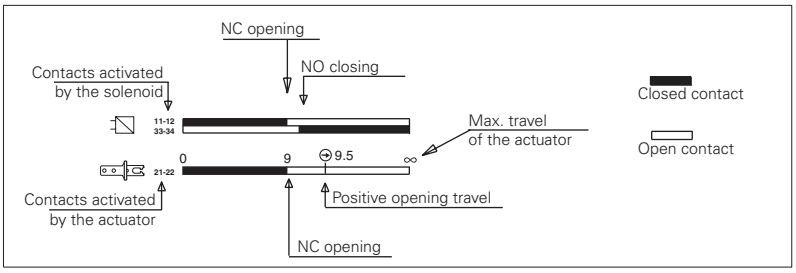
Do not use where dust and dirt may penetrate in any way into the head and deposit there. Especially not where powder, shavings, concrete or chemicals are sprayed. Adhere to the EN ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with presence of explosive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

Attention! These switches alone are not suitable for applications where operators may physically enter the dangerous area, because an eventual closing of the door behind them could restart the machine operation. In these cases the actuator entry locking device VF KB1 shown on page 129 must be used.

Contact type: L = slow action / Contact blocks	Operating principle D, with sealable auxiliary release device, without actuator	Operating principle E, without actuator	Operating principle D, with auxiliary key release, without actuator
			
18 L	FS 1896D024-M2 1NO+1NC	FS 1896E024-M2 1NO+1NC	FS 1898D024-M2 1NO+1NC
			
20 L	FS 2096D024-M2 1NO+2NC	FS 2096E024-M2 1NO+2NC	FS 2098D024-M2 1NO+2NC
			
21 L	FS 2196D024-M2 3NC	FS 2196E024-M2 3NC	FS 2198D024-M2 3NC
			
28 L	FS 2896D024-M2 1NO+2NC	FS 2896E024-M2 1NO+2NC	FS 2898D024-M2 1NO+2NC
			
29 L	FS 2996D024-M2 3NC	FS 2996E024-M2 3NC	FS 2998D024-M2 3NC
			
30 L	FS 3096D024-M2 3NC	FS 3096E024-M2 3NC	FS 3098D024-M2 3NC
			
Actuating force	30 N (40 N ⊖)	30 N (40 N ⊖)	30 N (40 N ⊖)

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

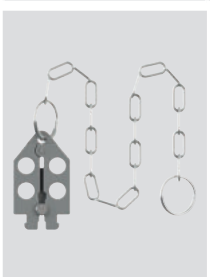
How to read travel diagrams



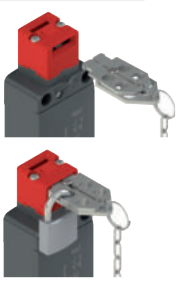
IMPORTANT:
The state of the NC contact refers to the switch with inserted actuator and locked lock. In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol ⊖. Actuate the switch **at least with the positive opening force**,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

Accessories

Article	Description
VF KB1	Lock out device



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



Article	Description
VF KLA371	Set of two locking keys

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

All values in the drawings are in mm

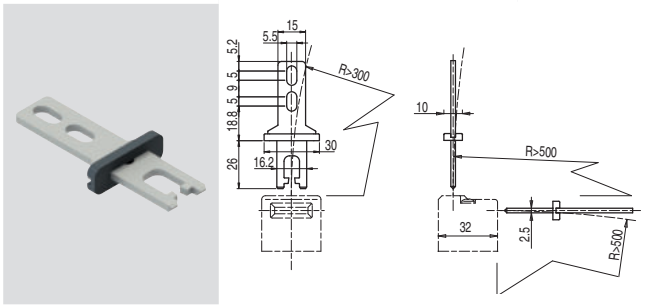
Accessories See page 321

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

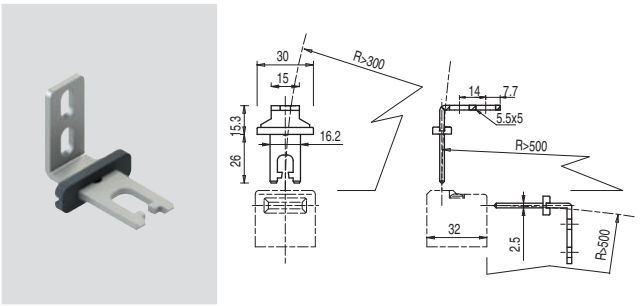
Stainless steel actuators

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

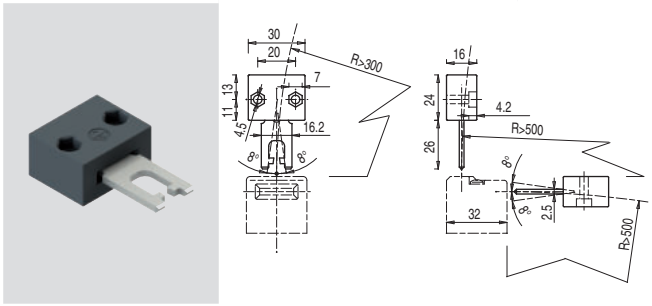
Article	Description
VF KEYF	Straight actuator



Article	Description
VF KEYF1	Angled actuator

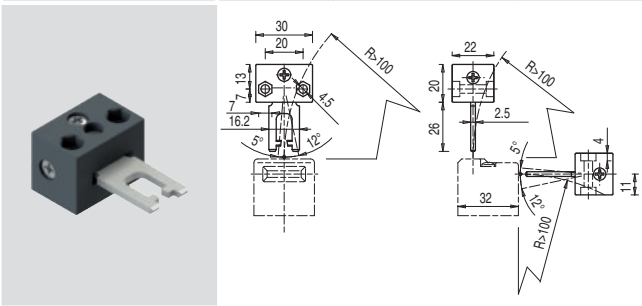


Article	Description
VF KEYF2	Jointed actuator



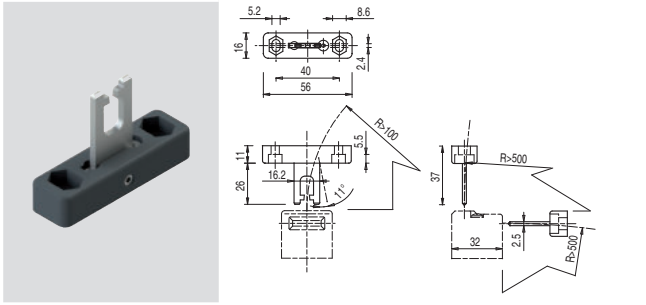
The actuator can flex in four directions for applications where the guard alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions



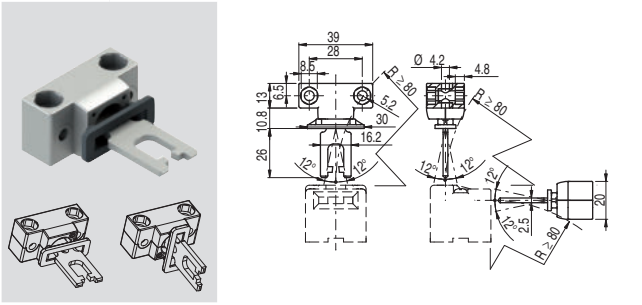
Actuator adjustable in two directions for guards with reduced dimensions.

Article	Description
VF KEYF7	Actuator adjustable in one direction



Actuator adjustable in one direction for guards with reduced dimensions.

Article	Description
VF KEYF8	Universal actuator



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

All values in the drawings are in mm

Accessories See page 321

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

NG series safety locking switches with RFID technology

Description

These switches are used on machines where the hazardous conditions remain for a while, even after the machines have been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. Thus, the switches can also be used if individual guards are only to be opened under certain conditions.
Versions with mode 1 and 3 (safety outputs active when guard closed and locked) are interlocks with guard locking acc. to ISO 14119; the product is labelled with the symbol shown.

Maximum safety with a single device

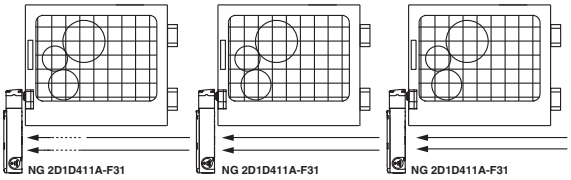
PL e + SIL 3

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

Series connection of several switches

PL e + SIL 3

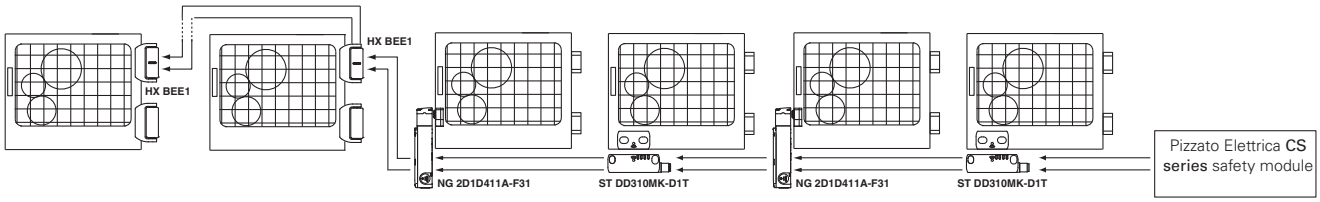
One of the most important features of the NG series is the possibility of connecting up to 32 sensors in series, while still maintaining the maximum safety levels PL e laid down in EN 13849-1 and SIL 3 acc. to EN 62061.
This connection type is permissible in safety systems which have a safety module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



Series connection with other devices

PL e + SIL 3

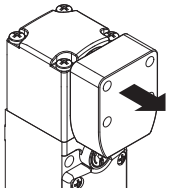
The NG series features two safety inputs and two safety outputs, which can be connected in series with other Pizzato Elettrica safety devices. This option allows the creation of safety chains containing various devices. For example, stainless steel safety hinges (HX BEE1 series), transponder sensors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



RFID actuators with high coding level

The NG series is provided with an electronic system based on RFID technology to detect the actuator. This allows to provide each actuator with different coding and makes it impossible to tamper with a device by using another actuator of the same series. Millions of different coding combinations are possible for the actuators. They are therefore classified as high level coded actuators, according to EN ISO 14119.

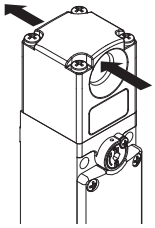
Holding force of the locked actuator



9750 N

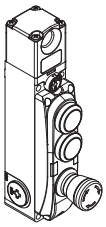
The strong interlocking system guarantees a maximum actuator holding force of F_{1max} = 9750 N. This is one of the highest values currently available on the market today, making this device suitable for heavy-duty applications.

Dustproof



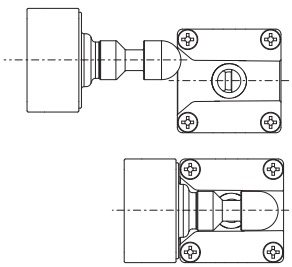
The switch is provided with a through hole for inserting the actuator. Thanks to this unique feature, any dust that enters the actuator hole can always come out on the opposite side instead of remaining inside. Moreover, the lock pin is provided with a diaphragm seal, making the system suitable for critical environments with a high level of dust.

Integrated control devices



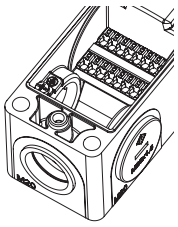
The switch is also available with elevated cover. Control devices such as buttons, emergency buttons, indicator lights or selectors can thereby be attached directly to the switch together with corresponding contact blocks.
The result is a compact solution with direct access to control devices without needing to install them separately on the switch panel or in their own housing. The devices can be illuminated and, thanks to the PUSH-IN spring-operated connections, wiring is quick and intuitive.

Centring



The switch is provided with a wide centring inlet for the actuator pin. This solution makes it easier to align the actuator and the opening hole on the head during installation. Moreover, this solution drastically reduces the probability of a collision between the switch and the actuator, making it possible to install the device even on inaccurately closing doors.

Push-in spring-operated connections

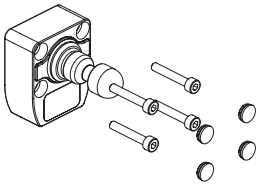


The switch is provided with a PUSH-IN type spring-operated connection system on the inside. This technology allows wiring to be performed quickly and easily, as the wire just needs to be inserted into the appropriate hole in order to establish the electrical connection and automatically secure the wire. This operation can be performed with rigid or flexible wires with a crimped wire-end sleeve and requires no tools. Release is obtained by pressing the appropriate wire-releasing button.

Six LEDs for immediate diagnosis

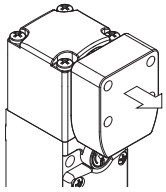
As the LEDs have been designed for quick immediate diagnosis, the status of each input and output is highlighted by one specific LED. This makes it possible to quickly identify the interruption points in the safety chain, which device is released, which door is opened and any errors inside the device.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

Protection against tampering



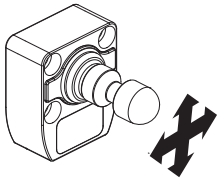
Each actuator of the NG series is supplied with four protection caps. Not only do the caps prevent dirt from accumulating and simplify cleaning, they also block access to the fastening screws of the actuator. As a result, standard screws can be used instead of tamper-proof screws.

Holding force of the unlocked actuator



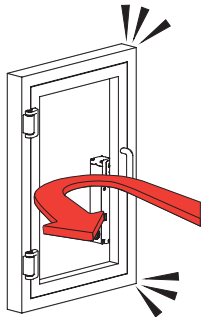
The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several guards are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked guards in their position with a retaining force of approx.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

Jointed actuator for inaccurately closing guards



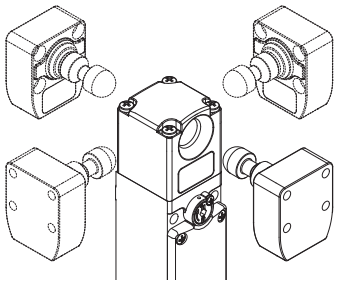
All NG series actuators are articulated, thereby allowing the actuator pin to be safely guided into the switch through the centring hole. As a result, the actuator and switch do not need to be precisely aligned during installation. In addition, the device can thereby be used on guards with a minimum actuation radius of 150 mm without the actuation pin needing to be angled.

Function for protecting against recoil forces



If a guard is closed too quickly or with so much force that the recoil would cause it to open again, a special function in the NG switch prevents locking. This function prevents the immediate locking of the guard if the lock signal is applied. This protects the switch against recoil forces that occur during instantaneous locking. This serves to protect the switch from damage and forces the operator to close the guard more gently.

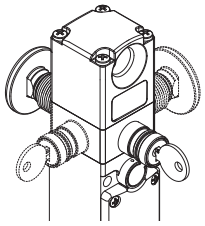
Head and devices with variable orientation



The system can be variably configured by loosening the 4 screws on the head.

The key release device and the escape release button can also be rotated and secured independently of one another in steps of 90°. The device can thus assume 16 different configurations.

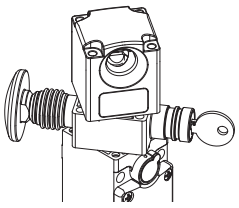
Key release device and escape release button



The key release device (auxiliary release) is used to permit unlocking of the actuator only by personnel in possession of the key. The device also functions with no power supply and, once actuated, prevents the guard from being locked.

The escape release button allows actuator release and immediate opening of the guard. Generally used in machines within which an operator could inadvertently become trapped, it faces towards the machine interior, to allow the operator to exit even in the event of a power failure. The button has two stable states and can be freely extended in length with suitable extensions (see accessories). Both devices can be positioned on the four sides of the switch. As a result, it can be installed both towards the interior and towards the exterior of the machine.

Non-detachable head and release devices



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

High protection degree

IP69K
IP67

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

Three safety output actuation modes

MODE 1
MODE 2
MODE 3

The device is available with 3 different actuation modes for safety outputs:
- mode 1: safety outputs active with inserted and locked actuator, for machines with inertia;
- mode 2: safety outputs active with inserted actuator, for machines without inertia;
- mode 3: a first safety output active with actuator inserted and locked and a second safety output active with actuator inserted, for special applications.

External device monitoring

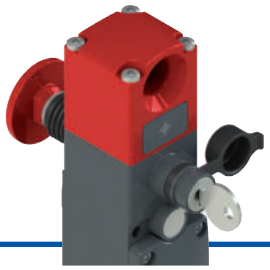
EDM

On request, the switch can be supplied with EDM function (External Device Monitoring). In this case, the switch itself checks the proper function of the devices connected to the safety outputs. These devices (usually relays or safety contactors) must send a feedback signal to the EDM input, which checks that the received signal is consistent with the state of the safety outputs.

Selection diagram

D5D

Locked actuator with **de-energised** solenoid with key release



D6D

Locked actuator with **de-energised** solenoid with key release and escape release button

D7D

Locked actuator with **de-energised** solenoid with escape release button

D7E

Locked actuator with **energised** solenoid with escape release button

HEAD TYPE AND OPERATING PRINCIPLE

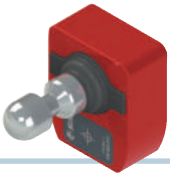
D1D

Locked actuator with **de-energised** solenoid

D1E

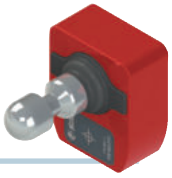
Locked actuator with **energised** solenoid

ACTUATORS



VN NG-F30

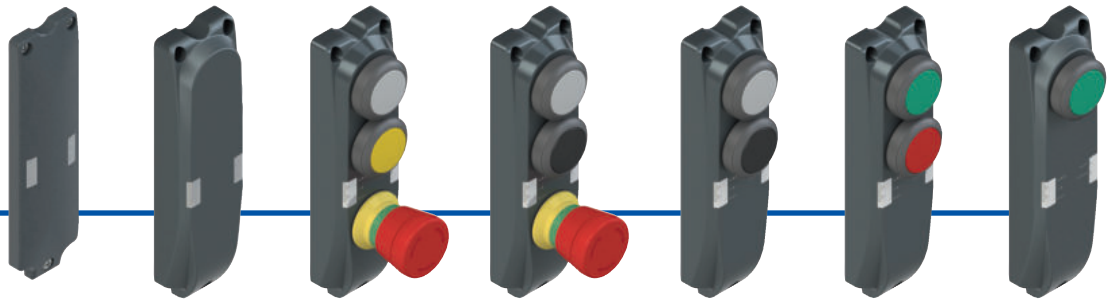
Low level coded actuator



VN NG-F31

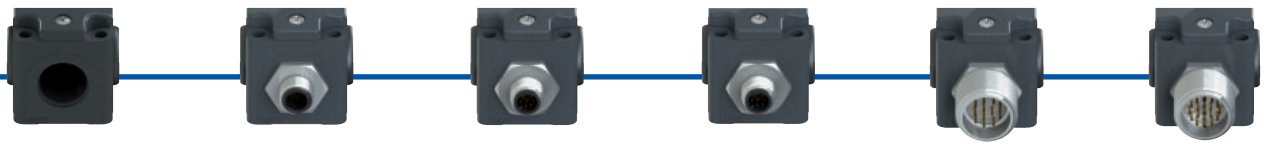
High level coded actuator

COVER CONFIGURATIONS



1A **1B** **1C** **1D** **1E** **1F** **1G**

CONDUIT ENTRIES



Threaded conduit entry M20

With M12 metal connector

K110	12-pole, bottom
K111	12-pole, right
K112	12-pole, left

With M12 metal connector for stand-alone connection

K953	8-pole, bottom
K954	8-pole, right
K955	8-pole, left

With M12 metal connector for series connection with "Y" connectors

K950	8-pole, bottom
K951	8-pole, right
K952	8-pole, left

With M23 metal connector (clockwise numbering)

K900	12-pole, bottom
K901	12-pole, right
K902	12-pole, left

With M23 metal connector (clockwise numbering)

K601	19-pole, bottom, configuration 1
K602	19-pole, bottom, configuration 2
•••	.....

product options

Sold separately as accessory

Code structure

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

article: **NG 2D1D411A** — options: **-F31E34K900LP30**

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

Inputs and outputs	
3	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: actuator inserted 1 signalling output O4: actuator locked I4 or IE1/IE2 inputs for solenoid activation 1 reset input I3 Note: Supplied only together with actuator
4	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: actuator inserted 1 signalling output O4: actuator locked I4 or IE1/IE2 inputs for solenoid activation 1 input I3: actuator programming / reset
5	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: actuator inserted 1 signalling output O4: actuator locked I4 or IE1/IE2 inputs for solenoid activation 1 input I3: actuator programming / reset 1 feedback input EDM I5
6	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: actuator inserted 1 signalling output FAULT O4 I4 or IE1/IE2 inputs for solenoid activation 1 input I3: actuator programming / reset

Activation of OS outputs	
1	mode 1: safety outputs OS1 and OS2 active with inserted and locked actuator
2	mode 2: safety outputs OS1 and OS2 active with inserted actuator
3	mode 3: safety output OS1 active with inserted and locked actuator, safety output OS2 active with inserted actuator

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

Pre-installed connectors	
	without connector (standard)
K110	M12 metal connector, 12-pole, bottom
K601	M23 metal connector, 19-pole, bottom, configuration 1
K900	M23 metal connector, 12-pole, bottom
K950	M12 metal connector, 8-pole, bottom, for series connection
...	other connectors on request

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

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

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

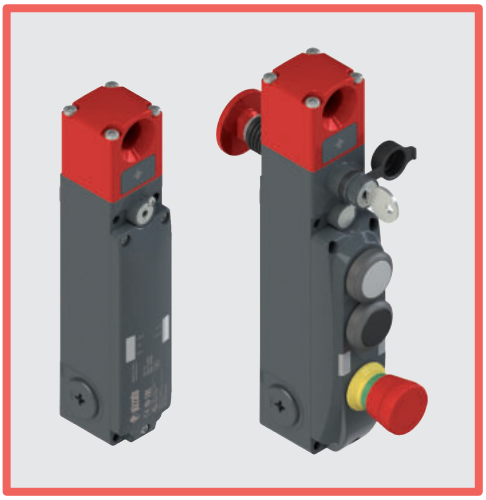
Cover configurations	
1A	low cover (standard)
1B	raised cover without holes
1C	cover with white button / yellow button / emergency button with rotary release
1D	cover with white button / black button / emergency button with rotary release
1E	cover with white button / black button
1F	cover with green button / red button
1G	cover with green button
...	other configurations on request

Code structure for actuator

VN NG-F30

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

NG series safety locking switches with RFID technology



Main features

- Actuation without contact, using RFID technology
- Digitally coded actuator
- Actuator holding force: 9750 N
- SIL 3 and PL e with a single device
- Metal housing, three M20 conduit entries
- Protection degree up to IP67 and IP69K
- PL e also with series connection of up to 32 devices
- Signalling LED

Quality marks:

0123

EC type examination certificate: M6A180475157023
UL approval: E131787
TÜV SÜD approval: Z10 18 04 75157 022
EAC approval: RU C-IT.УТ03.B.00035/19

In compliance with standards:
EN ISO 14119, EN 60947-5-3, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 12100, IEC 60529, EN 60529, EN 61000-6-2, EN 61000-6-3, BG-GS-ET-19, IEC 61508-1, IEC 61508-2, IEC 61508-3, IEC 61508-4, SN 29500, EN ISO 13849-1, EN ISO 13849-2, EN 62061, EN 61326-1, EN 61326-3-1, EN 61326-3-2, EN 50581, ETSI 301 489-1, ETSI 301 489-3, ETSI 300 330-2, UL 508, CSA 22.2 No.14

Compliance with the requirements of:
Machinery Directive 2006/42/EC, EMC Directive 2014/30/EC, RED Directive 2014/53/EU, RoHS directive 2011/65/EU, FCC Part 15.

Features approved by UL

Electrical Ratings: 24 Vdc, 0,25 A.
Input supplied by Class 2 source or limited voltage limited energy.
Environmental Ratings: Types 1, 4X, 12, 13 (versions without control devices), Type 1 (versions with control devices).

Features approved by TÜV SÜD

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

In compliance with standards: 2006/42/EC, EN 60947-1:2007/A2:2014, EN 60947-5-2:2007/A1:2012, EN 60947-5-3:2013, EN ISO 14119:2013, EN 61508-1:2010 (SIL 3), EN 61508-2:2010 (SIL 3), EN 61508-3:2010 (SIL 3), EN 61508-4:2010 (SIL 3), EN 62061:2005/A2:2015 (SIL CL 3), EN ISO 13489-1:2015 (PL e, Cat 4).

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

Technical data

Metal head and housing, baked powder coating.

Three threaded conduit entries:	M20x1.5
Protection degree:	IP67 acc. to EN 60529, IP69K acc. to ISO 20653
Protection degree with control devices:	IP65 acc. to EN 60529 with cable gland of equal or higher protection degree

General data

Safety parameters	SIL	PL	Cat.	DC	PFH_D	$MTTF_D$
Monitoring function: actuator locked - Mode 1	3	e	4	High	1,15E-09	2968
Monitoring function: actuator present - Mode 2	3	e	4	High	1,15E-09	3946
Monitoring function: actuator locked - Mode 3	2	d	2	High	1,48E-09	2957
Monitoring function: actuator present - Mode 3	2	d	2	High	1,48E-09	3927
Dual-channel control for locking function of the actuator	3	e	4	High	1,51E-10	4011
Single-channel control for locking function of the actuator	2	d	2	High	1,51E-10	4011

Interlock with lock, no contact, coded:	type 4 acc. to EN ISO 14119
Level of coding acc. to EN ISO 14119:	low with F30 actuator High with F31 actuator
Mission time:	20 years
Ambient temperature:	-20°C ... +50°C
Max. actuation frequency with actuator lock and release:	600 operating cycles/hour
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{1max}:	9750 N acc. to EN ISO 14119
Max. holding force F_{Zh}:	7500 N acc. to EN ISO 14119
Maximum clearance of locked actuator:	4 mm
Released actuator extraction force:	~ 30 N

Power supply electrical data

Rated operating voltage U_e:	24 Vdc ±10% SELV
Operating current at U_e voltage:	40 mA min.; 0.4 A with activated solenoid; 1.2 A with activated solenoid and all outputs at maximum power
Rated insulation voltage U_i:	32 Vdc
Rated impulse withstand voltage U_{imp}:	1.5 kV
External protection fuse:	2 A type gG or equivalent device
Overvoltage category:	III
Solenoid duty cycle:	100% ED (continuous operation)
Solenoid consumption:	9 W max.
Pollution degree:	3 acc. to EN 60947-1

Electrical data of IS1/IS2/I3/I4/I5/IE1/IE2/EDM inputs

Rated operating voltage U_{e1}:	24 Vdc
Rated current consumption I_{e1}:	5 mA

Electrical data of OS1/OS2 safety outputs

Rated operating voltage U_{e2}:	24 Vdc
Output type:	PNP type OSSD
Maximum current per output I_{e2}:	0.25 A
Minimum current per output I_{m2}:	0.5 mA
Thermal current I_{th2}:	0.25 A
Utilization category:	DC13; U_{e2}=24 Vdc, I_{e2}=0.25 A
Short circuit detection:	Yes
Overcurrent protection:	Yes
Internal self-resettable protection fuse:	1.1 A
Duration of the deactivation impulses at the safety outputs:	< 300 µs
Permissible maximum capacitance between outputs:	< 200 nF
Permissible maximum capacitance between output and ground:	< 200 nF
Activation time of safety outputs OS1 and OS2 after deactivation of inputs IS1, IS2:	typically 7 ms, max. 15 ms
Activation time upon unlocking the guard:	typically 7 ms, max. 12 ms
Maximum delay of EDM status change:	500 ms

Electrical data of O3/O4 signalling output

Rated operating voltage U_{e3}:	24 Vdc
Output type:	PNP
Maximum current per output I_{e3}:	0.1 A
Utilization category:	DC13; U_{e3}=24 Vdc, I_{e3}=0.1 A
Short circuit detection:	No
Overcurrent protection:	Yes
Internal self-resettable protection fuse:	1.1 A

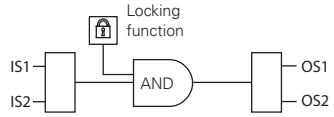
RFID sensor data

Assured operating distance S_{ao}:	2 mm
Assured release distance S_{ar}:	4 mm (actuator not locked) 10 mm (actuator locked)
Rated operating distance S_n:	2.5 mm
Repeat accuracy:	≤ 10 % s_n
Differential travel:	≤ 20 % s_n
RFID transponder frequency:	125 kHz
Max. switching frequency:	1 Hz

Actuation mode of the OS1 and OS2 safety outputs

Mode 1

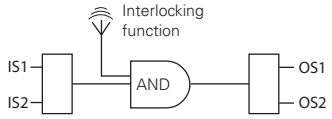
Safety outputs OS1 and OS2 are active when the actuator is inserted and locked.



In case of machines with or without inertia of the dangerous elements.
Safety category of the safety outputs: PL e, SIL 3.

Mode 2

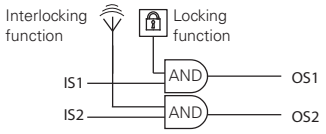
Safety outputs OS1 and OS2 are active when the actuator is inserted.



In case of machines without inertia of the dangerous elements.
Safety category of the safety outputs: PL e, SIL 3.

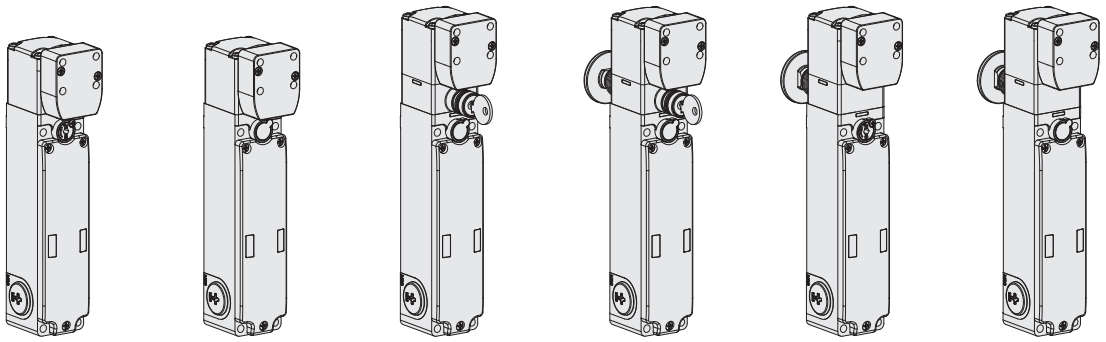
Mode 3

Safety output OS1 is active when the actuator is inserted and locked and IS1 is active. Safety output OS2 is active when the actuator is inserted and IS2 is active.



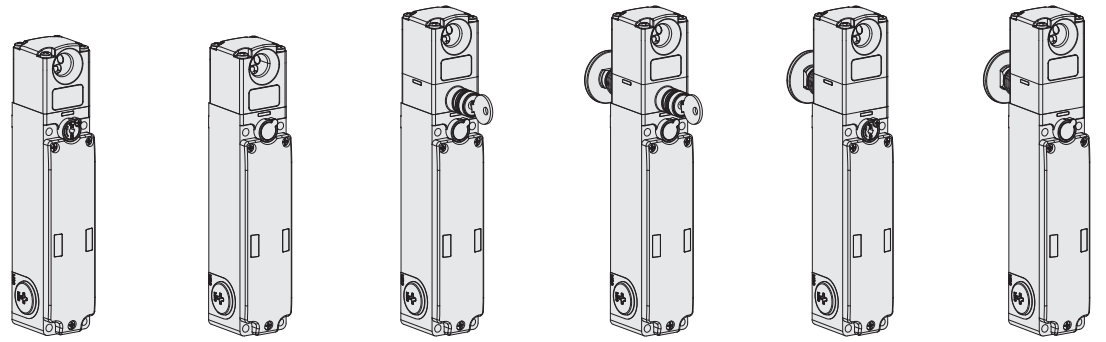
In case of machines with or without inertia of the dangerous elements.
Safety category of the safety outputs: PL d, SIL 2.

Selection table for switches with high level coded actuators



Operating principle	Locked actuator with de-energised solenoid. With sealable auxiliary release device	Locked actuator with energised solenoid.	Locked actuator with de-energised solenoid. With key release.	Locked actuator with de-energised solenoid. With key release and escape release button.	Locked actuator with de-energised solenoid. With escape release button and sealable auxiliary release device.	Locked actuator with energised solenoid. With escape release button.
Mode 1	NG 2D1D411A-F31	NG 2D1E411A-F31	NG 2D5D411A-F31	NG 2D6D411A-F31	NG 2D7D411A-F31	NG 2D7E411A-F31
Mode 2	NG 2D1D421A-F31	NG 2D1E421A-F31	NG 2D5D421A-F31	NG 2D6D421A-F31	NG 2D7D421A-F31	NG 2D7E421A-F31
Mode 3	NG 2D1D431A-F31	NG 2D1E431A-F31	NG 2D5D431A-F31	NG 2D6D431A-F31	NG 2D7D431A-F31	NG 2D7E431A-F31

Selection table for switches

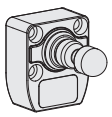


Operating principle	Locked actuator with de-energised solenoid. With sealable auxiliary release device	Locked actuator with energised solenoid.	Locked actuator with de-energised solenoid. With key release.	Locked actuator with de-energised solenoid. With key release and escape release button.	Locked actuator with de-energised solenoid. With escape release button and sealable auxiliary release device.	Locked actuator with energised solenoid. With escape release button.
Mode 1	NG 2D1D411A	NG 2D1E411A	NG 2D5D411A	NG 2D6D411A	NG 2D7D411A	NG 2D7E411A
Mode 2	NG 2D1D421A	NG 2D1E421A	NG 2D5D421A	NG 2D6D421A	NG 2D7D421A	NG 2D7E421A
Mode 3	NG 2D1D431A	NG 2D1E431A	NG 2D5D431A	NG 2D6D431A	NG 2D7D431A	NG 2D7E431A

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

Legend: interlock with lock monitoring acc. to EN ISO 14119

Selection table for actuators



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

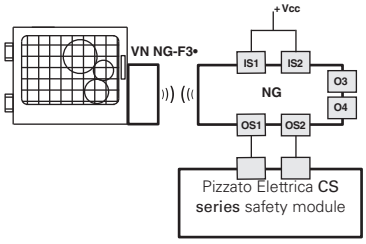
The use of RFID technology in NG series devices makes them suitable for several applications. Pizzato Elettrica offers two different versions of actuators, in order to best suit customers' specific needs.
Type F30 actuators are all encoded with the same code. This implies that a device associated with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

Complete safety system

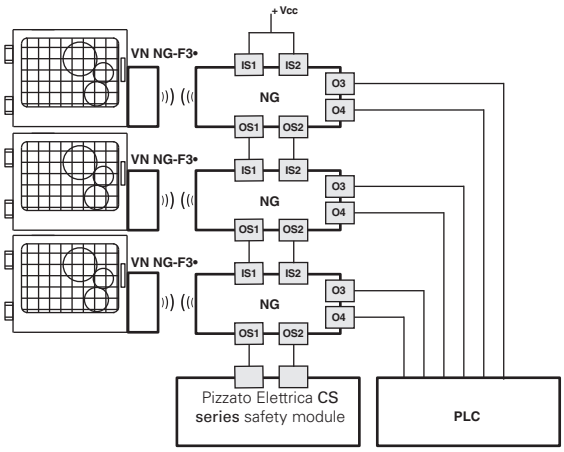
The use of complete and tested solutions guarantees the electrical compatibility between the NG series switches and the safety modules from Pizzato Elettrica, as well as high reliability. The switches have been tested with the modules listed in the adjacent table.

Switches	Compatible safety modules	Safety module output contacts		
		Instantaneous safety contacts	Delayed safety contacts	Signalling contacts
NG 2••••••	CS AR-05••••	3NO	/	1NC
	CS AR-06••••	3NO	/	1NC
	CS AR-08••••	2NO	/	/
	CS AT-0•••••	2NO	2NO	1NC
	CS AT-1•••••	3NO	2NO	/
	CS MP••••••	page 277		
	CS MF••••••	page 305		

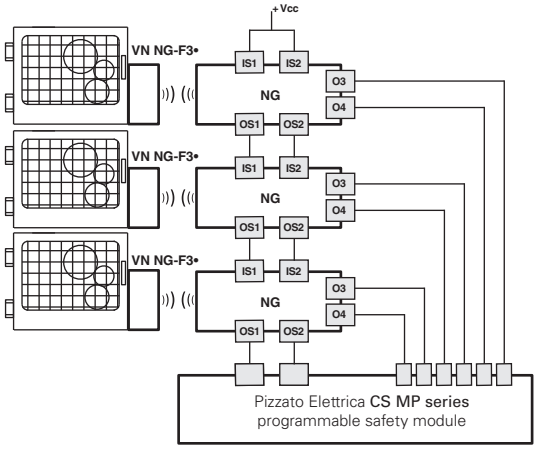
All NG series switches can be connected to safety modules or safety PLCs with OSSD inputs provided compatibility is ensured in advance.



NG series switches can be used as individual devices provided that the safety outputs be evaluated by a Pizzato Elettrica safety module (see table for combinable safety modules).

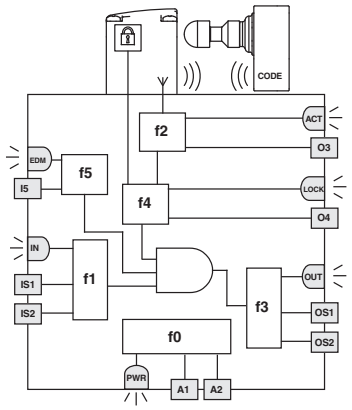


Possibility of series connection of multiple switches for simplifying the wiring of the safety system, whereby only the outputs of the last switch are evaluated by a Pizzato Elettrica safety module (see table with compatible safety modules). Each NG series switch is provided with two signalling outputs which are activated when the guard is closed (O3) or locked (O4). Depending on the specific requirements of the system that has been realised, the signals of the signalling outputs can be evaluated by a PLC.



Possibility of series connection of multiple switches for simplifying the wiring of the safety system, whereby only the outputs of the last switch are evaluated by a Pizzato Elettrica safety module of the CS MP series. Both the safety-relevant evaluation and the evaluation of the signalling outputs are performed by the CS MP series.
The examples listed above refer to applications with NG 2•••4•••

Internal block diagram

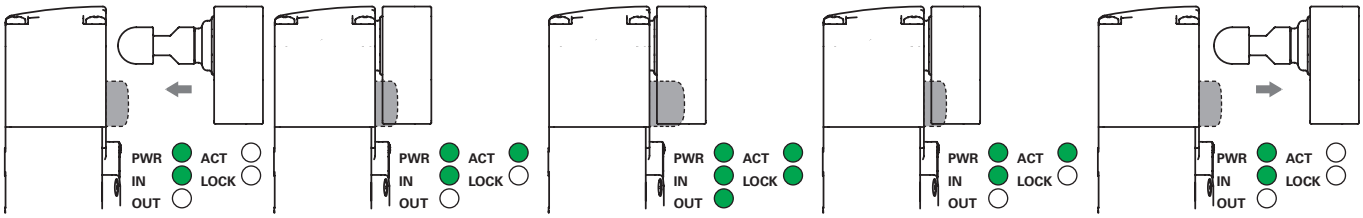


LED	Function
PWR	Power supply / self-diagnosis
IN	status of safety inputs
OUT	status of safety outputs
ACT	actuator state
LOCK	actuator locked
EDM	state of EDM input (NG 2D••5•••)

The diagram on the side represents the 6 logic functions which interact inside the device.
Function f0 is a basic function and includes the monitoring of the power supply as well as internal, cyclical tests.
Function f1 monitors the status of the device inputs, whereas function f2 monitors the presence of the actuator within the detection areas of the switch.
Function f4 checks the actuator lock condition.
Function f3 is intended to activate or deactivate the safety outputs and check for any faults or short circuits in the outputs.
In the EDM versions, the f5 function verifies the consistency of the EDM signal during safety output state changes.
The safety-related function, which combines the sub-functions mentioned above, activates the safety outputs according to the chosen operating mode:
- Both safety outputs OS1/OS2 for switches in mode 1 are activated only if both IS1/IS2 safety inputs are active and the actuator is inserted and locked;
- Both safety outputs OS1/OS2 for switches in mode 2 are activated only if both IS1/IS2 safety inputs are active and the actuator is inserted;
- The safety output OS1 for switches in mode 3 is activated only if the IS1 safety input is active and the actuator is inserted and locked, whereas the safety output OS2 is activated only if the IS2 safety input is active and the actuator is inserted.

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

Actuation sequence in mode 1



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

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

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

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

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

Actuation sequence in mode 2 and mode 3

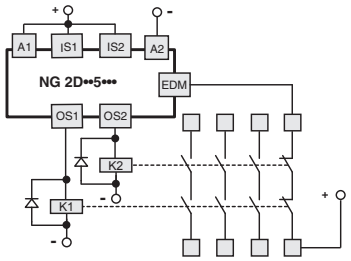
In contrast to the above mode 2 description, the safety outputs OS1 and OS2 are activated when the actuator is detected, and deactivated when the actuator is no longer detectable, in mode 3, the OS1 safety output is active with inserted and locked actuator and IS1 active, the OS2 safety output is active with inserted actuator and IS2 active.

Operating states

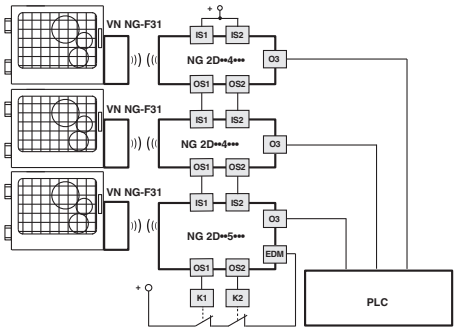
PWR LED	IN LED	OUT LED	ACT LED	LOCK LED	EDM LED (a)	Device state	Description
○	○	○	○	○	○	OFF	Device switched off.
◑	◑	◑	◑	◑	◑	POWER ON	Internal tests upon activation.
●	○	○	✳	✳	●	RUN	Safety inputs of the device not active.
●	●	✳	✳	✳	✳	RUN	Activation of safety inputs.
●	◑	○	✳	✳	✳	RUN	Safety inputs incoherence. Recommended action: check for presence and/or wiring of inputs.
●	✳	✳	●	✳	✳	RUN	Actuator in safe area. O3 signalling output active.
●	✳	✳	●	●	○	RUN	Actuator in safe area and locked; O3 and O4 outputs active.
●	●	●	●	●	○	RUN	**Mode 1** Activation of safety inputs IS1, IS2. Actuator in safe area and locked. O3, O4, OS1 and OS2 outputs active.
●	●	●	●	✳	○	RUN	**Mode 2** Activation of safety inputs IS1, IS2. Actuator in safe area. O3, OS1 and OS2 outputs active.
●	●	●	●	●	○	RUN	**Mode 3.** Actuator present, guard closed and locked, IS1 enabled, IS2 disabled, OS1 enabled, OS2 disabled
●	●	●	●	○	○	RUN	**Mode 3.** Actuator present, guard closed and not locked, IS1 and IS2 enabled, OS1 disabled, OS2 enabled
●	✳	◉	✳	✳	✳	ERROR	Error on safety outputs. Recommended action: check for any short circuits between the outputs, outputs and ground or outputs and power supply, then restart the device.
●	○	○	◉	○	○	ERROR	Actuator detection error. Check the physical integrity of the device and, in case of failure, please replace the entire device. If undamaged, realign the actuator with the switch and restart the device.
●	○	○	○	○	○	ERROR	Internal error. Recommended action: restart the device. If the failure persists, replace the device.
●	✳	○	✳	✳	●	RUN	EDM signal active (external relay off)[a]
●	●	●	●	●	○	RUN	EDM signal not active (external relay on)[a]
●	○	○	○	○	◉	ERROR	Error in the EDM[a] function

Legend: ○ = off ● = on ◉ = flashing ◑ = alternating colours ✳ = indifferent
(a) Available for NG 2D••5••• versions only

External device monitoring (EDM)



The NG 2D••5•••version, in addition to maintaining the operating and safety characteristics of the NG series, allows control of **forcibly guided NC contacts of contactors or relays** controlled by the safety outputs of the switch itself. As an alternative to the relays or contactors you can use Pizzato Elettrica expansion modules CS ME-03. See page 267. This check is carried out via the EDM input (External Device Monitoring as defined in EN 61496-1) of the switch.



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

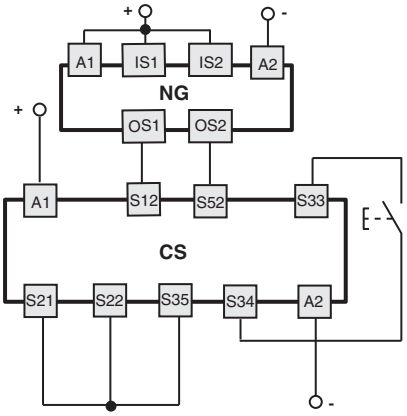
This solution allows you to dispense with the safety module connected to the last device in the chain.

Connection with safety modules

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

Input configuration with monitored start

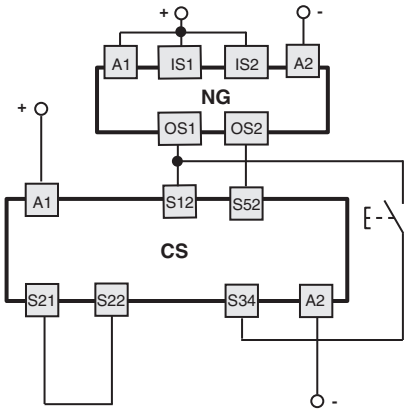
2 channels / Category 4 / up to SIL 3 / PL e



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

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

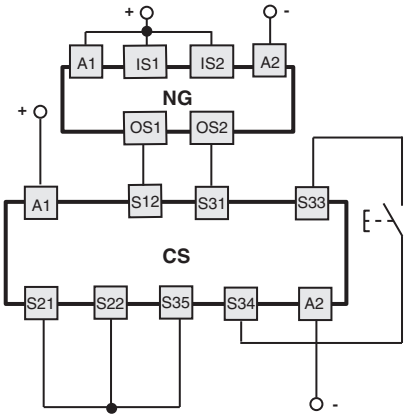
2 channels / Category 4 / up to SIL 3 / PL e



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

Input configuration with monitored start

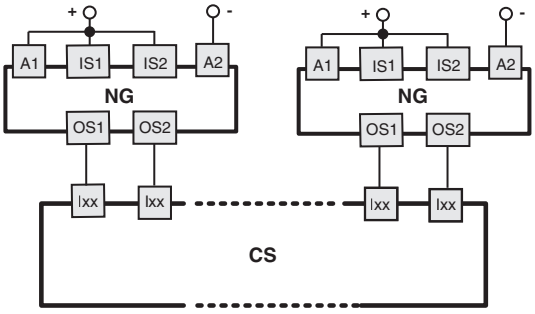
2 channels / Category 4 / up to SIL 3 / PL e



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

The connections vary according to the program of the module

Category 4/ up to SIL 3 / PL e

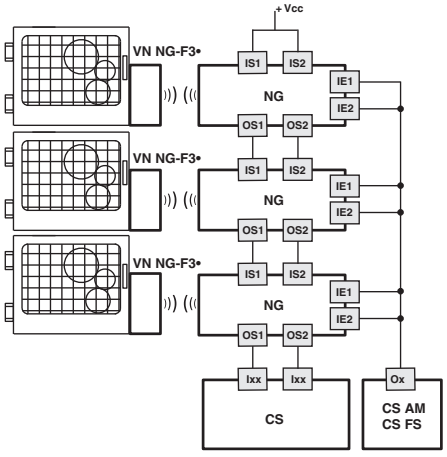


Application example on page 275.

Series connection of several switches

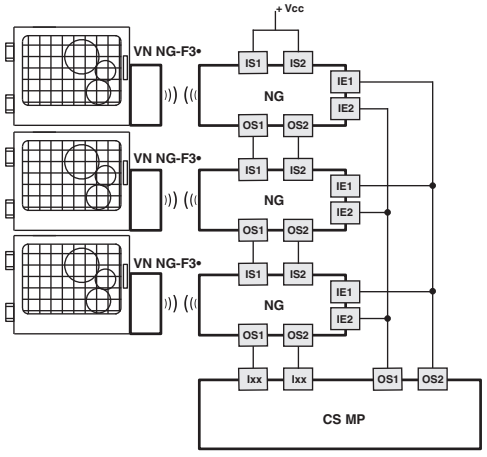
Monitoring function: actuator locked
2 channels / Category 4 / up to SIL 3 / PL e

Single-channel control for locking function of the actuator
1 channel / Category 2 / up to SIL 2 / PL d



Monitoring function: actuator locked
2 channels / Category 4 / up to SIL 3 / PL e

Dual-channel control for locking function of the actuator
2 channels / Category 4 / up to SIL 3 / PL e



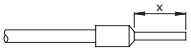
Connection terminals

PUSH-IN type spring-operated connection system

Cross-section of rigid/flexible wires w. wire-end sleeve:
min. 1 x 0.34 mm² (1 x AWG 22)
max. 1 x 1.5 mm² (1 x AWG 16)

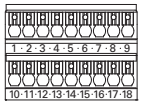
Wire cross-section with pre-insulated wire-end sleeve:
min. 1 x 0.34 mm² (1 x AWG 22)
max. 1 x 0.75 mm² (1 x AWG 18)

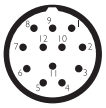
Cable stripping length (x):
min.: 8 mm
max.: 12 mm

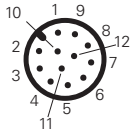


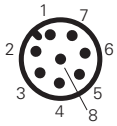
Pin assignments (version with standard cover NG 2D••••1A)

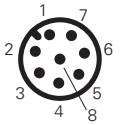
Internal terminal strip	M23 connector 12-pole	M12 connector, 12-pole	M12 connector, 8-pole stand-alone connection	M12 connector, 8-pole series connection with "Y" connectors	Connection	
A2 1	3	3	3	3	**A2**	Supply input 0 V
B2 2	3	3	3	3	**B2**	0 V auxiliary supply output
I4 3	10	10	8	8	**I4**	Solenoid activation input for single channel mode (c)
O3 4	5	5	2	/	**O3**	Signalling output, actuator inserted (e)
O4 5	9	9	5	5 (f)	**O4**	Signalling output, actuator inserted and locked (b) (e)
I3 6	8	8	6	/	**I3**	Actuator programming input / reset
IE1 8	10	10	/	/	**IE1**	Solenoid activation input for double channel mode
IE2 9	12	12	/	/	**IE2**	Solenoid activation input for double channel mode (d)
A1 10	1	1	1	1	**A1**	Supply input +24 Vdc
B1 11	1	1	1	1	**B1**	Auxiliary supply output +24 Vdc, 8 A max.
IS1 12	2	2	/	2	**IS1**	Safety input
IS2 13	6	6	/	6	**IS2**	Safety input
I5 14	11	11	/	/	**I5**	EDM input (a)
OS1 15	4	4	4	4	**OS1**	Safety output
OS2 16	7	7	7	7	**OS2**	Safety output









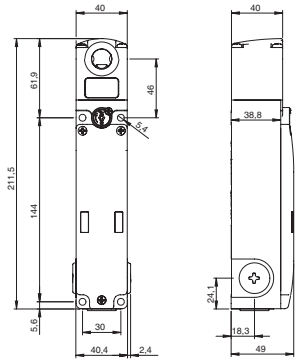


Important: terminals 7, 17, 18, of the internal terminal strip must not be used.
(a) Available in NG 2D••5••• version only.
(b) For NG 2D••6•••: the output signals the fault condition of the device.
(c) In single-channel actuation mode, inputs IE1 and IE2 must be short-circuited.
(d) In double-channel actuation mode, remove the internal bridge between terminals 8-9 and connect the pin 12 wire to the internal terminal 9.
(e) For NG 2D••7••• articles: the signalling outputs O3 and O4 have negative operating logic (low active signal).
(f) Available for 8-pole connector, not available for the end of a chain with Y connectors.

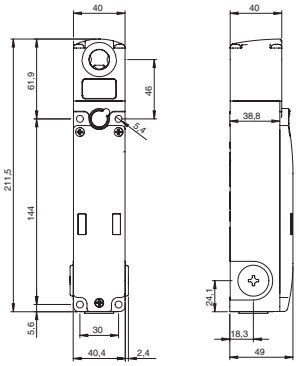
Female connectors See page 321

Dimensional drawings

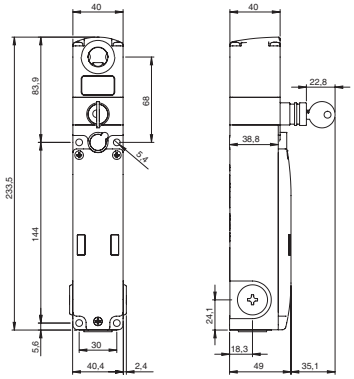
Switch NG 2D1D••1A
Operating principle D, with sealable auxiliary release device, without actuator



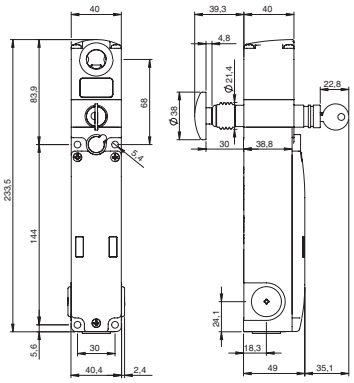
Switch NG 2D1E••1A
Operating principle E, without actuator



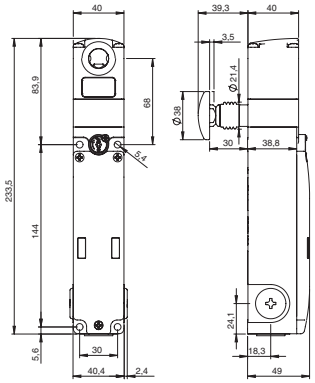
Switch NG 2D5D••1A
Operating principle D, with key release, without actuator



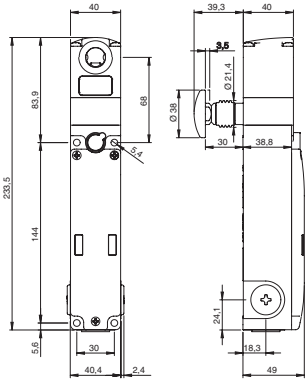
Switch NG 2D6D••1A
Operating principle D, with key release and escape release button, without actuator



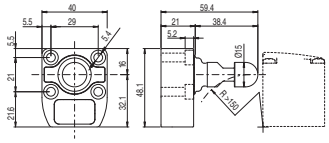
Switch NG 2D7D••1A
Operating principle D, with escape release button, without actuator



Switch NG 2D7E••1A
Operating principle E, with escape release button, without actuator



Actuator VN NG-F3•



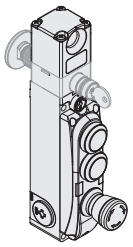
All values in the drawings are in mm

Accessories See page 321

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

NG series safety locking switches with RFID technology

Switch with integrated field-wireable control devices



NG 2D••••1C

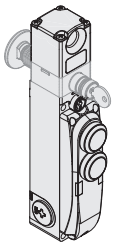
	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO+1NC	white	19 21 31 / 20 22 34 LED
Device 2	illuminated button, spring-return 1NO+1NC	yellow	23 25 32 / 24 26 34 LED
Device 3	emergency button, not illuminated, with rotary release 2NC	red	27 29 / 28 30

NG 2D••••1D

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO+1NC	white	19 21 31 / 20 22 34 LED
Device 2	button, not illuminated, spring-return 1NO+1NC	black	23 25 / 24 26
Device 3	emergency button, not illuminated, with rotary release 2NC	red	27 29 / 28 30

NG 2D••••2V

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO+1NC	white	19 21 31 / 20 22 34 LED
Device 2	illuminated button, spring-return 1NO+1NC	blue	23 25 32 / 24 26 34 LED
Device 3	emergency button, not illuminated, with rotary release 2NC	red	27 29 / 28 30



NG 2D••••1E

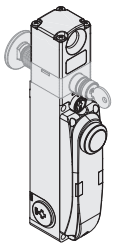
	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO+1NC	white	19 21 31 / 20 22 34 LED
Device 2	button, not illuminated, spring-return 1NO+1NC	black	23 25 / 24 26

NG 2D••••1F

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO+1NC	green	19 21 31 / 20 22 34 LED
Device 2	illuminated button, spring-return 1NO+1NC	red	23 25 32 / 24 26 34 LED

NG 2D••••7F

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO+1NC	white	19 21 31 / 20 22 34 LED
Device 2	illuminated button, spring-return 1NO+1NC	blue	23 25 32 / 24 26 34 LED



NG 2D••••1G

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO+1NC	green	19 21 31 / 20 22 34 LED

NG 2D••••1H

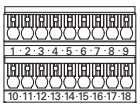
	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO+1NC	white	19 21 31 / 20 22 34 LED

NG 2D••••3G

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO+1NC	blue	19 21 31 / 20 22 34 LED

Internal connections (version with integrated control devices)

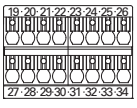
Internal terminal strip for switch



Terminal no.		Connection
1	A2	Supply input 0 V
2	B2	0 V auxiliary supply output
3	I4	Solenoid activation input for single channel mode (c)
4	O3	Signalling output, actuator inserted (d)
5	O4	Signalling output, actuator inserted and locked (b) (d)
6	I3	Actuator programming input / reset
8	IE1	Solenoid activation input for double channel mode
9	IE2	Solenoid activation input for double channel mode
10	A1	Supply input +24 Vdc
11	B1	Auxiliary supply output +24 Vdc, 1.5 A max.
12	IS1	Safety input
13	IS2	Safety input
14	I5	EDM input (a)
15	OS1	Safety output
16	OS2	Safety output

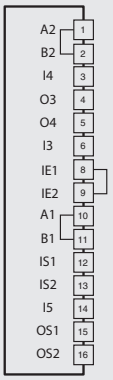
Important: terminals 7, 17, 18, of the internal terminal strip must not be used.
(a) Available in NG 2D••5••• version only.
(b) For NG 2D••6•••: the output signals the fault condition of the device.
(c) In single-channel actuation mode, inputs IE1 and IE2 must be short-circuited.
(d) For NG 2D••7••• articles: the signalling outputs O3 and O4 have negative operating logic (low active signal).

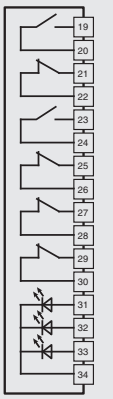
Internal terminal strip integrated control devices



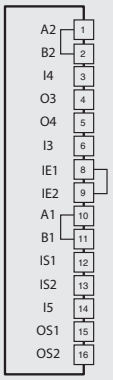
19	Contact 1	Device 1	
20			
21	Contact 2		
22			
23	Contact 1	Device 2	
24			
25	Contact 2		
26			
27	Contact 1	Device 3	
28			
29	Contact 2		
30			
31	Supply input +24 Vdc / LED device 1		
32	Supply input +24 Vdc / LED device 2		
33	Supply input +24 Vdc / LED device 3		
34	Supply input 0 V / LED		

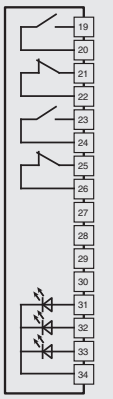
NG 2D••••1C / NG 2D••••1D / NG 2D••••2V



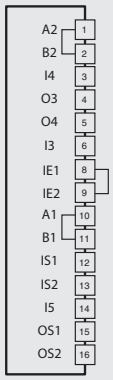


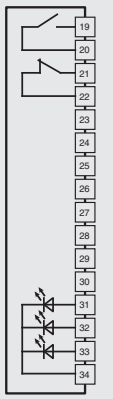
NG 2D••••1E / NG 2D••••1F / NG 2D••••7F



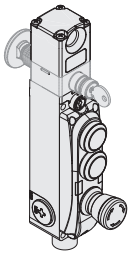


NG 2D••••1G / NG 2D••••1H / NG 2D••••3G





Switch with integrated control devices and M23 connector, 19-pole



NG 2D••••1C-K603

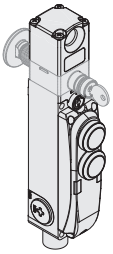
	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO	white	17 18 / 6 19 LED
Device 2	illuminated button, spring-return 1NO	yellow	15 16 / 6 19 LED
Device 3	emergency button, not illuminated, with rotary release 2NC	red	10 13 / 11 14

NG 2D••••1D-K603

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO	white	17 18 / 6 19 LED
Device 2	button, not illuminated, spring-return 1NO	black	15 / 6
Device 3	emergency button, not illuminated, with rotary release 2NC	red	10 13 / 11 14

NG 2D••••2V-K603

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO	white	17 18 / 6 19 LED
Device 2	illuminated button, spring-return 1NO	blue	15 16 / 6 19 LED
Device 3	emergency button, not illuminated, with rotary release 2NC	red	10 13 / 11 14



NG 2D••••1E-K602

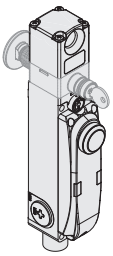
	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO	white	17 18 / 6 19 LED
Device 2	button, not illuminated, spring-return 1NO	black	15 / 6

NG 2D••••1F-K602

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO	green	17 18 / 6 19 LED
Device 2	illuminated button, spring-return 1NO	red	15 16 / 6 19 LED

NG 2D••••7F-K602

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO	white	17 18 / 6 19 LED
Device 2	illuminated button, spring-return 1NO	blue	15 16 / 6 19 LED



NG 2D••••1G-K601

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO	green	17 18 / 6 19 LED

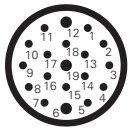
NG 2D••••1H-K601

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO	white	17 18 / 6 19 LED

NG 2D••••3G-K601

	Description	Colour	Terminals
Device 1	illuminated button, spring-return 1NO	blue	17 18 / 6 19 LED

Internal connections (version with integrated control devices)

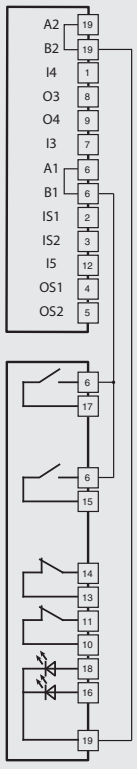


M23 connector, 19-pole	Connection	
19	A2	Supply input 0 V
19	B2	0 V auxiliary supply output
1	I4	Solenoid activation input for single channel mode
8	O3	Signalling output, actuator inserted (c)
9	O4	Signalling output, actuator inserted and locked (b) (c)
7	I3	Actuator programming input / reset
/	IE1	Solenoid activation input for double channel mode (d)
/	IE2	Solenoid activation input for double channel mode (d)
6	A1	Supply input +24 Vdc
6	B1	Auxiliary supply output +24 Vdc, 1.5 A max.
2	IS1	Safety input
3	IS2	Safety input
12	I5	EDM input (a)
4	OS1	Safety output
5	OS2	Safety output

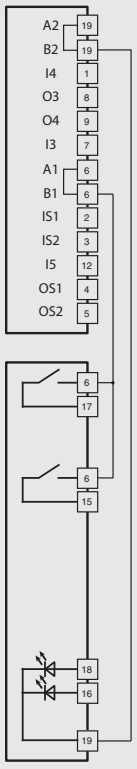
Important: terminals 7, 17, 18, of the internal terminal strip must not be used.
(a) Available in NG 2D••5••• version only.
(b) For NG 2D••6•••: the output signals the fault condition of the device.
(c) For NG 2D••7••• articles: the signalling outputs O3 and O4 have negative operating logic (low active signal).
(d) Input not connected.

17	Contact 1	Device 1
6	Contact 2	
/		
/		
15	Contact 1	Device 2
6	Contact 2	
/		
/		
10	Contact 1	Device 3
11		
13	Contact 2	
14		
18	Supply input +24 Vdc / LED device 1	
16	Supply input +24 Vdc / LED device 2	
/	Supply input +24 Vdc / LED device 3	
19	Supply input 0 V / LED	

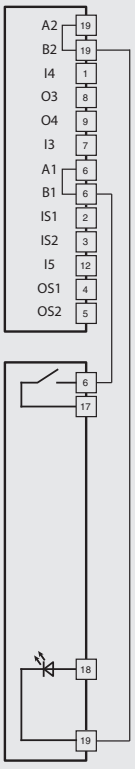
NG 2D••••1C-K603 NG 2D••••1D-K603 NG 2D••••2V-K603



NG 2D••••1E-K602 NG 2D••••1F-K602 NG 2D••••7F-K602



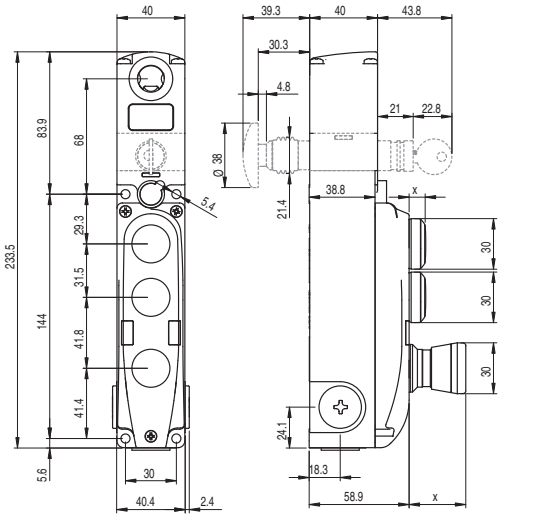
NG 2D••••1G-K601 NG 2D••••1H-K601 NG 2D••••3G-K601



Female connectors See page 321

Dimensional drawings

NG 2D •••••• switch with integrated control devices



All values in the drawings are in mm

Available integrated devices

	Description	Colours	Article	Combinable with contacts	Installation height (x) mm
	Illuminated button, spring-return	○ White ● Red ● Green ● Yellow ● Blue	VN NG-AC26005 VN NG-AC26001 VN NG-AC26003 VN NG-AC26002 VN NG-AC26004	1NO 2NO 1NO+1NC	10
	Button, not illuminated, spring-return	● Black	VN NG-AC26007	1NO 2NO 1NO+1NC	10
	Indicator light	○ White ● Red ● Green	VN NG-AC26064 VN NG-AC26060 VN NG-AC26062	/	9.7
	Emergency button acc. to. EN ISO 13850 Rotary release Push-pull release	 ● Red ● Red	 VN NG-AC26052 VN NG-AC26055	2NC	33.4
	Emergency release button, illuminated, acc. to. EN ISO 13850 Rotary release Push-pull release	 ● Red ● Red	 VN NG-AC26051 VN NG-AC26054	2NC	33.4
	Illuminated selector switch with handle, with transparent lens for LED	● Black ● Black	VN NG-AC26033 VN NG-AC26034	1NO 2NO 1NO+1NC	23.8
	Key selector switch, 2 positions	● Black ● Black	VN NG-AC26040 VN NG-AC26043	1NO 2NO 1NO+1NC	without key 21~ with key 46~
	Closing cap	● Black	VN NG-AC26090	/	4
	Fixing key	● Black	VN NG-AC26080	/	/

Legend: Maintained Spring-return Key extraction position

Other devices and contacts on request.
Please contact our technical office for the complete list of available products.

Technical data of the integrated control devices

General data

Protection degree:	IP65 acc. to EN 60529
Mechanical endurance:	
Spring-return button:	1 million operating cycles
Emergency stop button:	50,000 operating cycles
Selector switch:	300,000 operating cycles
Key selector switch:	50,000 operating cycles 30,000 operating cycles including removal of the key
Safety parameter B_{10D}:	100,000 (emergency stop button)

Actuating force

Spring-return button:	4 N min	100 N max.
Emergency stop button:	20 N min	100 N max.
Selector switch:	0.1 Nm min	1.5 Nm max.
Key selector switch:	0.1 Nm min	1.3 Nm max.

Contact blocks of the control devices

Material of the contacts:	silver contacts
Contact type:	Self-cleaning contacts with double interruption

Electrical data:

Thermal current I_{th}:	1 A
Rated insulation voltage U_i:	32 Vac/dc
Rated impulse withstand voltage U_{imp}:	1.5 kV
LED supply voltage:	24 Vdc ± 15%
LED supply current:	10 mA per LED

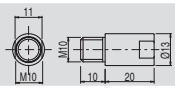
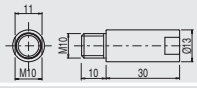
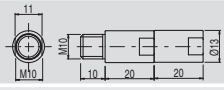
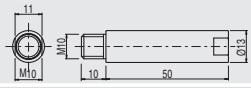
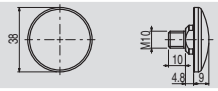
Utilization category of the contact block:
Direct current: DC13

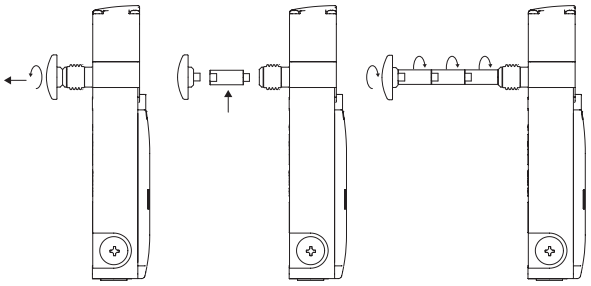
U_e (V)	24
I_e (A)	0.55

In compliance with standards:
IEC 60947-5-1, IEC 60947-5-5, EN ISO 13850

⚠ Installation for safety applications:
Always connect the safety circuit to the **NC contacts** (normally closed contacts) as stated in standard EN 60947-5-1.

Extensions for release button

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



- Metal extensions can be combined with one another to achieve the desired length.
- Do not exceed an overall length of 500 mm between the release button and the switch.
- Use medium-strength thread locker to secure the extensions.

Adhesive labels for escape release button

Polycarbonate yellow adhesive, rectangular, 300x32 mm, red inscription. It has to be fixed on the internal part of the jamb and helps finding the escape release button.

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

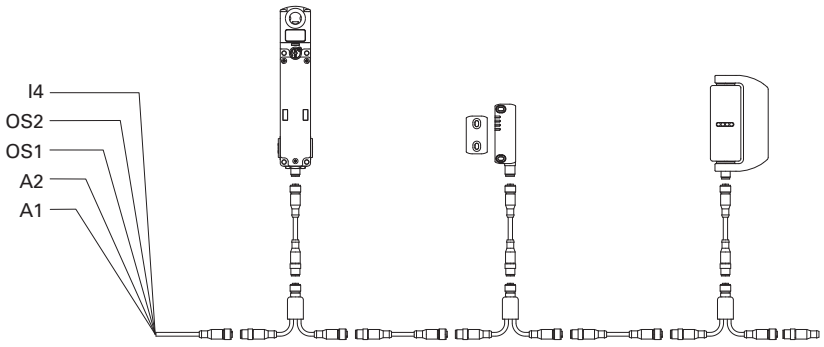
Accessories

Article	Description
VF KLB300	Set of two locking keys

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

Series connection

To simplify series connections of the devices, various M12 connectors are available that allow complete wiring.
This solution significantly reduces installation times while at the same time maintaining the maximum safety levels PL e and SIL 3.
For further information see page 326.



All values in the drawings are in mm

Accessories See page 321

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

NS series safety locking switches with RFID technology

Description

These switches are used mainly on machines where the hazardous conditions persist even after the machine has been switched off. Mechanical parts such as pulleys, saw blades, etc., could continue to move after the machine is switched off or could still be hot or under pressure. Thus, the switches can also be used if individual guards are only to be opened under certain conditions.
Versions with mode 1 and 3 (safety outputs active when guard closed and locked) are interlocks with guard locking acc. to ISO 14119; the product is labelled with the symbol shown.

Maximum safety with a single device

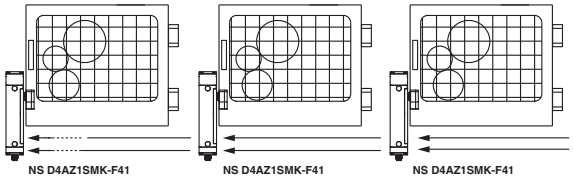
PL e + SIL 3

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

Series connection of several switches

PL e + SIL 3

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

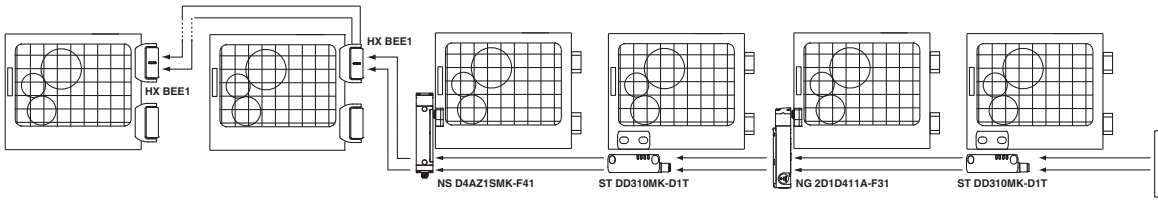


Pizzato Elettrica **CS series** safety module

Series connection with other devices

PL e + SIL 3

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

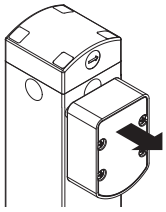


Pizzato Elettrica **CS series** safety module

RFID actuators with high coding level

The NS series is provided with an electronic system based on RFID technology to detect the actuator. This allows to provide each actuator with different coding and makes it impossible to tamper with a device by using another actuator of the same series. Millions of different coding combinations are possible for the actuators. They are therefore classified as high level coded actuators, according to EN ISO 14119.

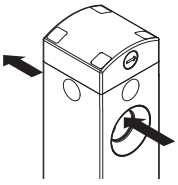
Holding force of the locked actuator



2100 N

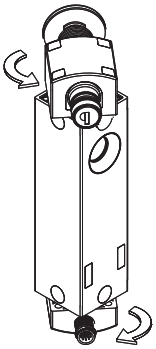
The strong interlocking system guarantees a maximum actuator holding force of F_{1max} = 2100 N.

Dustproof



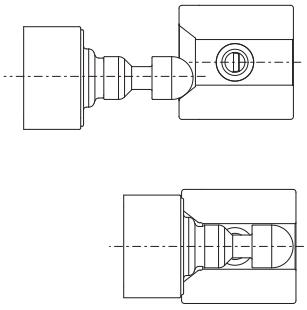
The switch is provided with a through hole for inserting the actuator. Thanks to this unique feature, any dust that enters the actuator hole can always come out on the opposite side instead of remaining inside. Moreover, the lock pin is provided with a diaphragm seal, making the system suitable for critical environments with a high level of dust.

Head and release devices with variable orientation, not detachable



The upper part of the switch, which contains the release devices, can be rotated and is permanently connected to the lower part, which contains the outputs for the electrical connection. After loosening the fastening screws, the individual modules can be rotated in 90° steps. As a result, a single device can be used to realise various configurations without the installation technician needing to concern himself with the correct assembly of various parts.
The fastening screws are provided with protection caps to prevent dirt build-up and thereby simplify cleaning.

Centring



The switch is provided with a wide centring inlet for the actuator pin. This solution makes it easier to align the actuator and the opening hole on the head during installation. Moreover, this solution drastically reduces the probability of a collision between the switch and the actuator, making it possible to install the device even on inaccurately closing guards.

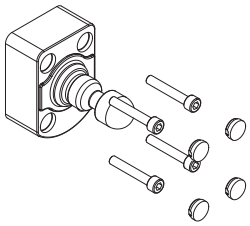
Modularity

The innovative design of the auxiliary releases makes possible a wide range of combinations of auxiliary releases with lock, escape release buttons or screwdriver releases with front and rear mounting.
The electrical connection is also highly flexible: outputs are available with cables as well as with connectors, which can be oriented axially or laterally.

Six LEDs for immediate diagnosis

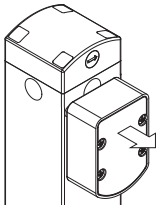
As the LEDs have been designed for quick immediate diagnosis, the status of each input and output is highlighted by one specific LED. This makes it possible to quickly identify the interruption points in the safety chain, which device is released, which guard is opened and any errors inside the device.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

Protection against tampering



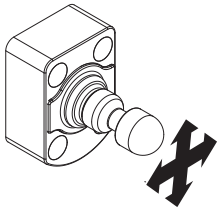
Each actuator of the NS series is supplied with four protection caps. Not only do the caps prevent dirt from accumulating and simplify cleaning, they also block access to the fastening screws of the actuator. As a result, standard screws can be used instead of tamper-proof screws.

Holding force of the unlocked actuator



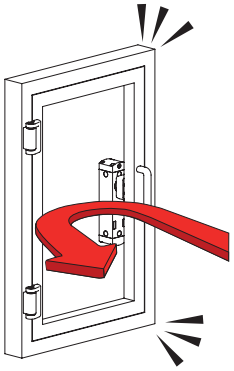
The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several guards are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked guards in their position with a retaining force of approx. 20 N, stopping any vibrations or gusts of wind from opening them.

Jointed actuator for inaccurately closing guards



All NS series actuators are articulated, thereby allowing the actuator pin to be safely guided into the switch through the centring hole. As a result, the actuator and switch do not need to be precisely aligned during installation. In addition, the device can thereby be used on guards with a minimum actuation radius of 150 mm without the actuation pin needing to be angled.

Function for protecting against recoil forces

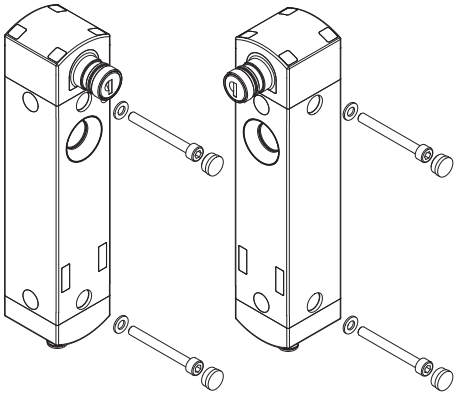


If a guard is closed too quickly or with so much force that the recoil would cause it to open again, a special function in the NS switch prevents locking. This function prevents the immediate locking of the guard if the lock signal is applied. This protects the switch against recoil forces that occur during instantaneous locking, thus avoiding possible damage to the device.

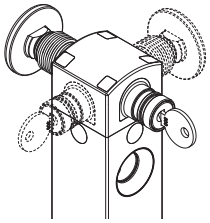
Front and side mounting

Integrated in the housing of the NS series is a hole for inserting the actuator pin. Fixing holes are also provided in the robust body for front and side mounting.

This makes it easier to mount the switch during lateral installation: the switch is directly mounted without needing to rotate the module that contains the hole for inserting the actuator pin. The fixing holes can be sealed with the protection caps provided for this purpose. Dirt deposits and tampering attempts are thereby prevented.



Key release device and escape release button



The key release device (auxiliary release) is used to permit unlocking of the actuator only by personnel in possession of the key. The device also functions with no power supply and, once actuated, prevents the guard from being locked.

The escape release button allows actuator release and immediate opening of the guard. Generally used in machines within which an operator could inadvertently become trapped, it faces towards the machine interior, to allow the operator to exit even in the event of a power failure. The button has two stable states and can be freely extended in length with suitable extensions (see accessories).

Both devices can be positioned on the four sides of the switch. As a result, it can be installed both towards the interior and towards the exterior of the machine.

High protection degree

IP69K
IP67

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

Three safety output actuation modes

MODE 1
MODE 2
MODE 3

The device is available with 3 different actuation modes for safety outputs:

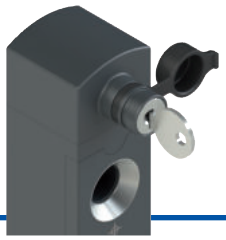
- mode 1: safety outputs active with inserted and locked actuator, for machines with inertia;
- mode 2: safety outputs active with inserted actuator, for machines without inertia;
- mode 3: a first safety output active with actuator inserted and locked and a second safety output active with actuator inserted, for special applications.

External device monitoring

EDM

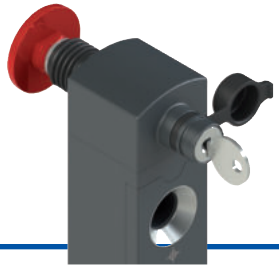
On request, the switch can be supplied with EDM function (External Device Monitoring). In this case, the switch itself checks the proper function of the devices connected to the safety outputs. These devices (usually relays or safety contactors) must send a feedback signal to the EDM input, which checks that the received signal is consistent with the state of the safety outputs.

Selection diagram



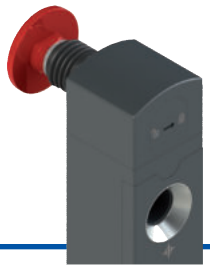
D•ST

Locked actuator with **de-energised** solenoid key release at front



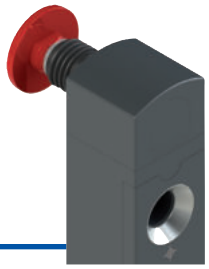
D•SE

Locked actuator with **de-energised** solenoid key release at front and escape release button at back



D•CE

Locked actuator with **de-energised** solenoid release by means of screwdriver at front and escape release button at back

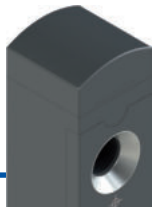


E•TE

Locked actuator with **energised** solenoid
Without release at front and escape release button at back

D•AZ

Locked actuator with **de-energised** solenoid release by means of screwdriver at front



E•ZZ

Locked actuator with **energised** solenoid

RELEASE AND OPERATING PRINCIPLE

ACTUATORS

VN NS-F40

Low level coded actuator

VN NS-F41

High level coded actuator

CONNECTIONS

M12 connector, at bottom

SMK	12-pole
SPK	8-pole for stand-alone connection
SQK	8-pole, for series connection with Y connectors

M12 connector, lateral, orientable

DMK	12-pole
DPK	8-pole for stand-alone connection
DQK	8-pole, for series connection with Y connectors

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

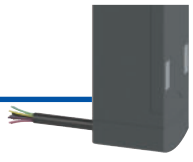
SM0.2	12-pole
SP0.2	8-pole for stand-alone connection
SQ0.2	8-pole, for series connection with Y connectors

Cable, length: 0.2 m, with M12 connector, lateral, orientable

DM0.2	12-pole
DP0.2	8-pole for stand-alone connection
DQ0.2	8-pole, for series connection with Y connectors

With PVC cable at bottom

SA2	12-pole, length: 2 m
SB2	8-pole, length: 2 m, for standalone connections



With PVC cable, lateral, orientable

DA2	12-pole, length: 2 m
DB2	8-pole, length: 2 m, for standalone connections

product options

sold separately as accessory

Code structure

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

article: **NS D4AZ1SMK** — options: **-F41E36LP30**

Operating principle

D	locked actuator with de-energised solenoid. mode 1: OS safety outputs active with inserted and locked actuator
E	locked actuator with energised solenoid. mode 1: OS safety outputs active with inserted and locked actuator
G	locked actuator with de-energised solenoid. mode 2: OS safety outputs active with inserted actuator
H	locked actuator with energised solenoid. mode 2: OS safety outputs active with inserted actuator
L	locked actuator with de-energised solenoid. mode 3: first safety output OS1 active with inserted and locked actuator, second safety output OS2 active with inserted actuator
M	locked actuator with energised solenoid. mode 3: first safety output OS1 active with inserted and locked actuator, second safety output OS2 active with inserted actuator

Inputs and outputs

3	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: actuator inserted 1 signalling output O4: actuator locked 2 solenoid activation inputs IE1, IE2 1 reset input I3 Note: Supplied only together with actuator
4	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: actuator inserted 1 signalling output O4: actuator locked 2 solenoid activation inputs IE1, IE2 1 programming / reset input I3
5	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: actuator inserted 1 signalling output O4: actuator locked 2 solenoid activation inputs IE1, IE2 1 programming / reset input I3 1 feedback input EDM I5 Note: Not available with mode 3

Auxiliary release at front and back

AZ	release by means of screwdriver at front only available for operating principle D, G and L
ST	key release at front only available for operating principle D, G and L
SE	key release at front and escape release button at back only available for operating principle D, G and L
CE	release by means of screwdriver at front and escape release button at back only available for operating principle D, G and L
ZZ	without release only available for operating principle E, H and M
TE	Without release at front and escape release button at back only available for operating principle E, H and M

Release button length

	for max. 15 mm wall thickness (standard)
LP30	for max. 30 mm wall thickness
LP40	for max. 40 mm wall thickness
LP50	for max. 50 mm wall thickness

Actuator extraction force

	actuator extraction force 20 N (standard)
E36	actuator freely removable
E37	actuator extraction force 40 N

Actuator

F40	low level coded actuator VN NS-F40 the switch recognises any type F40 actuator
F41	high level coded actuator VN NS-F41 the switch recognises one single type F41 actuator

Connection type

K	integrated M12 connector (standard)
0.2	cable, length: 0.2 m, with M12 connector
2	cable, length: 2 m (standard)
...	.....
10	cable, length: 10 m

Cable or connector type

A	PVC cable 12x0.14 mm² (standard)
B	PVC cable 8x0.34 mm² for stand-alone connection Note: without inputs IS1, IS2, I5 and without output O4
E	PUR cable, halogen-free, 8x0.34 mm² for stand-alone connection Note: without inputs IS1, IS2, I5 and without output O4
M	M12 connector, 12-pole (standard)
P	M12 connector, 8-pole, for stand-alone connections Note: without inputs IS1, IS2, I5 and without output O4
Q	M12 connector, 8-pole, for series connection with Y connectors Note: without inputs IE2, I3, I5 and without output O3

Output direction, connections

D	cable or connector, lateral
S	cable or connector, at bottom

Code structure for actuator

VN NS-F40

Actuator

F40	low level coded actuator the switch recognises any type F40 actuator
F41	high level coded actuator the switch recognises one single type F41 actuator

NS series safety locking switches with RFID technology

Main features

- Actuation without contact, using RFID technology
- Digitally coded actuator
- SIL 3 and PL e also with series connection of up to 32 devices
- Max. actuator holding force: 2100 N
- SIL 3 and PL e with a single device
- Protection degrees IP67 and IP69K
- 6 signalling LEDs

Quality marks:

0123

EC type examination certificate: M6A171075157020
UL approval: E131787
TÜV SÜD approval: Z10 075157 0025
EAC approval: RU C-IT.УТ03.B.00035/19

In compliance with standards:
EN ISO 14119, EN 60947-5-3, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 12100, IEC 60529, EN 60529, EN 61000-6-2, EN 61000-6-3, BG-GS-ET-19, IEC 61508-1, IEC 61508-2, IEC 61508-3, IEC 61508-4, SN 29500, EN ISO 13849-1, EN ISO 13849-2, EN 62061, EN 61326-1, EN 61326-3-1, EN 61326-3-2, EN 50581, ETSI 301 489-1, ETSI 301 489-3, ETSI 300 330-2, UL 508, CSA 22.2 No.14

Compliance with the requirements of:
Machinery Directive 2006/42/EC, EMC Directive 2014/30/EC, RED Directive 2014/53/EU, RoHS directive 2011/65/EU, FCC Part 15.

Features approved by UL

Electrical Ratings: 24 Vdc, 0,25 A.
Input supplied by 24 Vdc, Class 2 source or limited voltage limited energy
Environmental Ratings: Types 1, 4X, 12, 13.

Features approved by TÜV SÜD

Protection degree: IP67, IP69K
Ambient temperature: -20°C…+50°C
PL, category: Cat 2 / 4, PL d / e
SIL: SIL 2/3, SIL CL 2/3
In compliance with standards: EN ISO 14119:2013, EN 60947-5-3:2013, EN 61508-1:2010 (SIL 3), EN 61508-2:2010 (SIL 3), EN 61508-3:2010 (SIL 3), EN 61508-4:2010 (SIL 3), EN 62061:2005/A2:2015 (SIL CL 3), EN ISO 13849-1:2015 (Cat. 4, PL e).
Complies with machinery directive 2006/42/EC
Please contact our technical department for the list of approved products.

Technical data

Housing made of glass fibre reinforced technopolymer, self-extinguishing and shock-proof
Versions with 12x0.14mm² or 8x0.34mm² integrated cable, length 2 m, other lengths from 0.5 to 10 m on request
Versions with integrated M12 stainless steel connector
Versions with 0.2 m cable and M12 connector, other lengths from 0.1 … 3 m on request
Protection degree: IP67 acc. to EN 60529
IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)

General data

Safety parameters	SIL	PL	Cat.	DC	PFH_D	$MTTF_D$
Monitoring function: actuator locked - Mode 1	3	e	4	High	1.23E-09	2657
Monitoring function: actuator present - Mode 2	3	e	4	High	1.22E-09	1840
Monitoring function: actuator locked - Mode 3	2	d	2	High	1.50E-09	2627
Monitoring function: actuator present - Mode 3	2	d	2	High	1.49E-09	3987
Dual-channel control for locking function of the actuator	3	e	4	High	2.04E-10	2254
Single-channel control for locking function of the actuator	2	d	2	High	2.04E-10	2254

Interlock, no contact, coded, with guard locking: type 4 acc. to EN ISO 14119
Level of coding acc. to EN ISO 14119: low with F40 actuator
High with F41 actuator
Mission time: 20 years
Ambient temperature: -20°C ... +50°C
Max. actuation frequency with actuator lock and release: 600 operating cycles/hour
Mechanical endurance: 1 million operating cycles
Max. actuation speed: 0.5 m/s
Min. actuation speed: 1 mm/s
Maximum force before breakage F_{1max}: 2100 N acc. to EN ISO 14119
Max. holding force F_{Zh}: 1615 N acc. to EN ISO 14119
Maximum clearance of locked actuator: 4 mm
Released actuator extraction force: ~ 20 N

Power supply electrical data

Rated operating voltage U_e SELV: 24 Vdc ±10%
Operating current at U_e voltage: 40 mA min.; 0.4 A max. with activated solenoid; 1.2 A with activated solenoid and all outputs at maximum power
Rated insulation voltage U_i: 32 Vdc
Rated impulse withstand voltage U_{imp}: 1.5 kV
External protection fuse: type gG fuse 2 A or equivalent device
Overvoltage category: III
Electrical endurance: 1 million operating cycles
Solenoid duty cycle: 100% ED (continuous operation)
Solenoid consumption: 9 W max.
Pollution degree: 3 acc. to EN 60947-1

Electrical data of inputs IS1/IS2/I3/IE1/IE2/I5/EDM

Rated operating voltage U_{e1}: 24 Vdc
Rated current consumption I_{e1}: 5 mA

Electrical data of OS1/OS2 safety outputs

Rated operating voltage U_{e2}: 24 Vdc
Output type: PNP type OSSD
Maximum current per output I_{e2}: 0.25 A
Minimum current per output I_{m2}: 0.5 mA
Thermal current I_{th2}: 0.25 A
Utilization category: DC13; U_{e2}=24 Vdc, I_{e2}=0.25 A
Short circuit detection: Yes
Overcurrent protection: Yes
Internal self-resettable protection fuse: 1.1 A
Duration of the deactivation impulses at the safety outputs: < 300 µs
Permissible maximum capacitance between outputs: < 200 nF
Permissible maximum capacitance between output and ground: < 200 nF
Activation time of safety outputs OS1 and OS2 after deactivation of safety inputs IS1, IS2: typically 7 ms, max. 15 ms
Activation time upon unlocking the actuator: typically 7 ms, max. 12 ms
Activation time upon removal of the actuator: typically 120 ms, max. 200 ms
Maximum delay for EDM status change: 500 ms

Electrical data of O3/O4 signalling outputs

Rated operating voltage U_{e3}: 24 Vdc
Output type: PNP
Maximum current per output I_{e3}: 0.1 A
Utilization category: DC13; U_{e3}=24 Vdc, I_{e3}=0.1 A
Short circuit detection: No
Overcurrent protection: Yes
Internal self-resettable protection fuse: 1.1 A

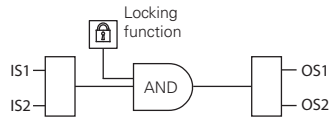
RFID sensor data

Assured operating distance S_{ao}: 2 mm
Assured release distance S_{ar}: 6 mm (actuator not locked)
10 mm (actuator locked)
Rated operating distance S_n: 3 mm
Repeat accuracy: ≤ 10 % s_n
Differential travel: ≤ 20 % s_n
RFID transponder frequency: 125 kHz
Max. switching frequency: 1 Hz

Actuation mode of the OS1 and OS2 safety outputs

Mode 1

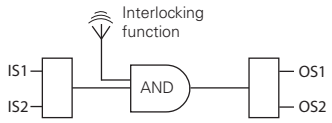
Safety outputs OS1 and OS2 are active when the actuator is inserted and locked.



In case of machines with or without inertia of the dangerous elements.
Safety category of the safety outputs: PL e, SIL 3.

Mode 2

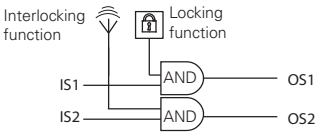
Safety outputs OS1 and OS2 are active when the actuator is inserted.



In case of machines without inertia of the dangerous elements.
Safety category of the safety outputs: PL e, SIL 3.

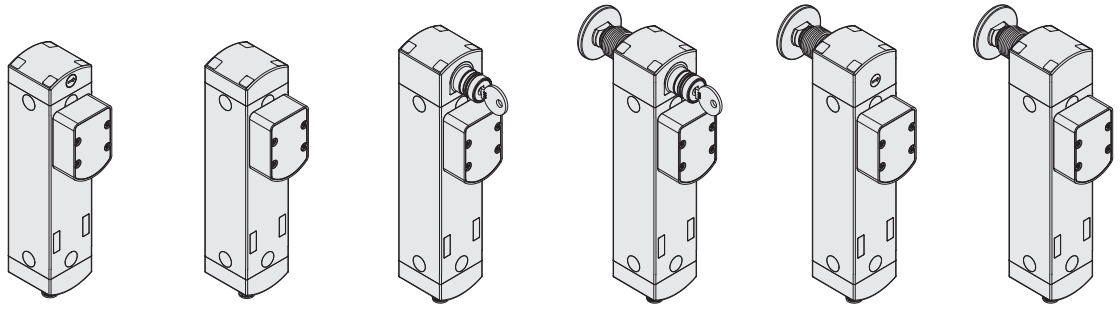
Mode 3

Safety output OS1 is active when the actuator is inserted and locked and IS1 is active. Safety output OS2 is active when the actuator is inserted and IS2 is active.



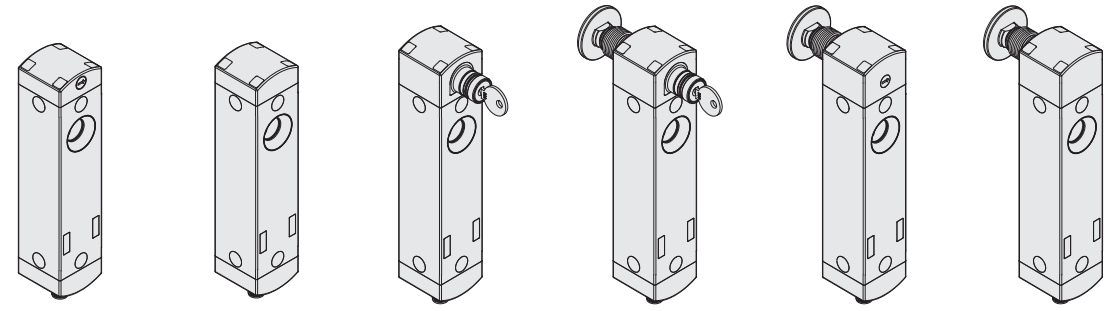
In case of machines with or without inertia of the dangerous elements.
Safety category of the safety outputs: PL d, SIL 2.

Selection table for switches with high level coded actuators



Operating principle	Locked actuator with de-energised solenoid. With screwdriver release	Locked actuator with energised solenoid	Locked actuator with de-energised solenoid. With key release	Locked actuator with de-energised solenoid. With key release and escape release button	Locked actuator with de-energised solenoid. With screwdriver release and escape release button	Locked actuator with energised solenoid. With escape release button
Mode 1	NS D4AZ1SMK-F41	NS E4ZZ1SMK-F41	NS D4ST1SMK-F41	NS D4SE1SMK-F41	NS D4CE1SMK-F41	NS E4TE1SMK-F41
Mode 2	NS G4AZ1SMK-F41	NS H4ZZ1SMK-F41	NS G4ST1SMK-F41	NS G4SE1SMK-F41	NS G4CE1SMK-F41	NS H4TE1SMK-F41
Mode 3	NS L4AZ1SMK-F41	NS M4ZZ1SMK-F41	NS L4ST1SMK-F41	NS L4SE1SMK-F41	NS L4CE1SMK-F41	NS M4TE1SMK-F41

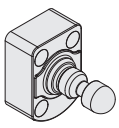
Selection table for switches



Operating principle	Locked actuator with de-energised solenoid. With screwdriver release	Locked actuator with energised solenoid	Locked actuator with de-energised solenoid. With key release	Locked actuator with de-energised solenoid. With key release and escape release button	Locked actuator with de-energised solenoid. With screwdriver release and escape release button	Locked actuator with energised solenoid. With escape release button
Mode 1	NS D4AZ1SMK	NS E4ZZ1SMK	NS D4ST1SMK	NS D4SE1SMK	NS D4CE1SMK	NS E4TE1SMK
Mode 2	NS G4AZ1SMK	NS H4ZZ1SMK	NS G4ST1SMK	NS G4SE1SMK	NS G4CE1SMK	NS H4TE1SMK
Mode 3	NS L4AZ1SMK	NS M4ZZ1SMK	NS L4ST1SMK	NS L4SE1SMK	NS L4CE1SMK	NS M4TE1SMK

To order a product with lateral connection replace character **S** with character **D** in the order codes shown above. Example: NS D4AZ1**S**MK → NS D4AZ1**D**MK
To order a product with EDM input replace number **4** with number **5** in the codes shown above. Example: NS D**4**AZ1SMK → NS D**5**AZ1SMK
Legend: interlock with lock monitoring acc. to EN ISO 14119

Selection table for actuators



Level of coding acc. to EN ISO 14119	Article
low	VN NS-F40
high	VN NS-F41

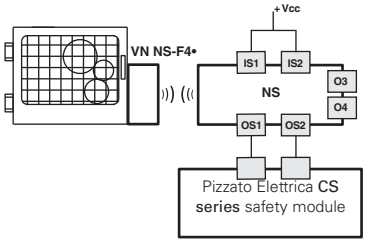
The use of RFID technology in NS series devices makes them suitable for several applications. Pizzato Elettrica offers two different versions of actuators, in order to best suit customers' specific needs.
Type F40 actuators are all encoded with the same code. This implies that a device associated with an actuator type F40 can be activated by other actuators type F40.
Type F41 actuators are always encoded with different codes. This implies that a device associated with an actuator type F41 can be activated only by a specific actuator. Another F41 type actuator will not be recognised by the device until a new association procedure is carried out (reprogramming). After reprogramming, the old actuator F41 will no longer be recognized.
Reprogramming of the actuator can be performed repeatedly.

Complete safety system

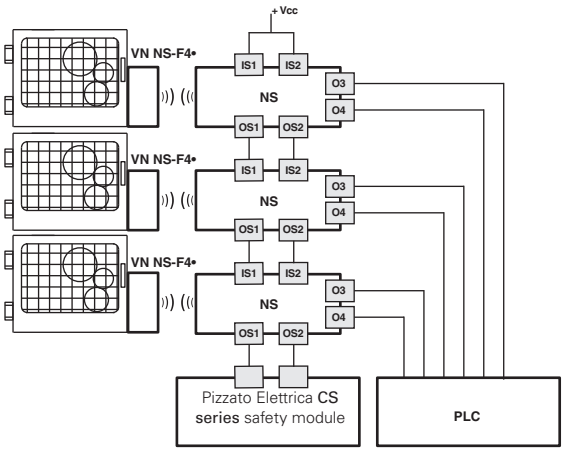
The use of complete and tested solutions guarantees the electrical compatibility between the NS series switches and the safety modules from Pizzato Elettrica, as well as high reliability. The switches have been tested with the modules listed in the adjacent table.

Switches	Compatible safety modules	Safety module output contacts		
		Instantaneous safety contacts	Delayed safety contacts	Signalling contacts
NS ••••1•••	CS AR-05••••	3NO	/	1NC
	CS AR-06••••	3NO	/	1NC
	CS AR-08••••	2NO	/	/
	CS AT-0•••••	2NO	2NO	1NC
	CS AT-1•••••	3NO	2NO	/
	CS MP••••••	page 277		
	CS MF••••••	page 305		

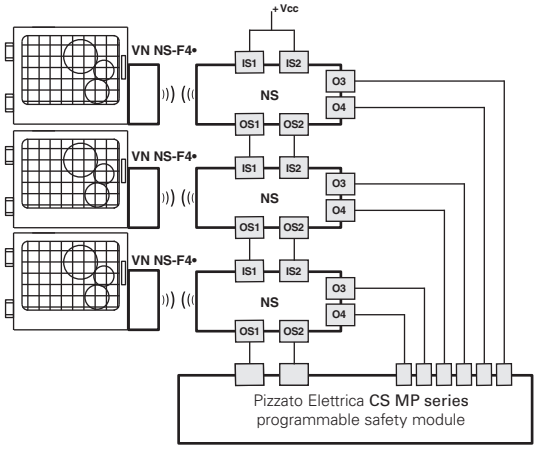
All NS series switches can be connected, provided that compatibility is checked, to safety modules or safety PLCs with OSSD inputs.



NS series switches can be used as individual devices provided that the safety outputs be evaluated by a Pizzato Elettrica safety module (see table for combinable safety modules).

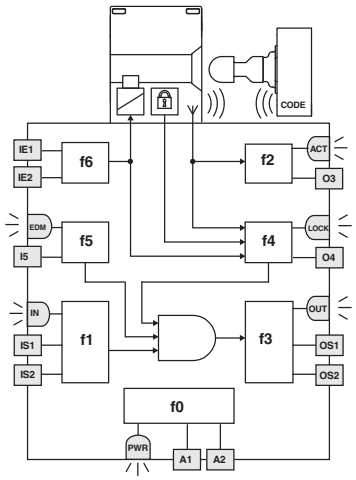


Possibility of series connection of multiple switches for simplifying the wiring of the safety system, whereby only the outputs of the last switch are evaluated by a Pizzato Elettrica safety module (see table with compatible safety modules). Each NS series switch is provided with two signalling outputs which are activated when the guard is closed (O3) or locked (O4). Depending on the specific requirements of the system that has been realised, the signals of the signalling outputs can be evaluated by a PLC.



Possibility of series connection of multiple switches for simplifying the wiring of the safety system, whereby only the outputs of the last switch are evaluated by a Pizzato Elettrica safety module of the CS MP series. Both the safety-relevant evaluation and the evaluation of the signalling outputs are performed by the CS MP series.
The examples listed above refer to applications with NS ••••1•••.

Internal block diagram

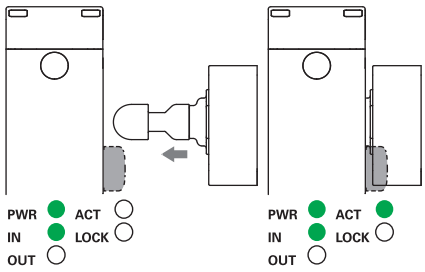


LED	Function
PWR	Power supply / self-diagnosis
IN	status of safety inputs
OUT	status of safety outputs
ACT	actuator state
LOCK	actuator locked
EDM	state of EDM inputs (NS •5••1•••)

The diagram on the side represents the 7 logic functions which interact inside the device.
Function f0 is a basic function and includes the monitoring of the power supply as well as internal, cyclical tests. Function f1 monitors the status of the device inputs, whereas function f2 monitors the presence of the actuator within the detection areas of the switch.
Function f4 checks the actuator lock condition.
Function f3 is intended to activate or deactivate the safety outputs and check for any faults or short circuits in the outputs.
In the EDM versions, the f5 function verifies the consistency of the EDM signal during safety output state changes.
The safety-related function, which combines the sub-functions mentioned above, activates the safety outputs according to the chosen operating mode:
- Both safety outputs OS1/OS2 for switches in mode 1 are activated only if both IS1/IS2 safety inputs are active and the actuator is inserted and locked;
- Both safety outputs OS1/OS2 for switches in mode 2 are activated only if both IS1/IS2 safety inputs are active and the actuator is inserted;
- The safety output OS1 for switches in mode 3 is activated only if the IS1 safety input is active and the actuator is inserted and locked, whereas the safety output OS2 is activated only if the IS2 safety input is active and the actuator is inserted.

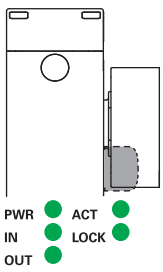
The f6 function verifies the coherence of the enable/disable signals of the actuator lock command.
The status of each function is displayed by the corresponding LED (PWR, IN, OUT, ACT, LOCK, EDM), in such a way that the general device status becomes immediately obvious to the operator.

Actuation sequence in mode 1

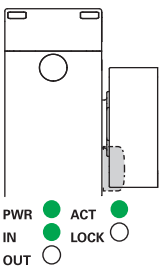


The switch is supplied with power (PWR LED on, green), the IS1 and IS2 inputs are enabled (IN LED on, green), the OS1 and OS2 safety outputs are disabled (OUT LED off). The actuator is outside of the actuation zone (LED ACT off).

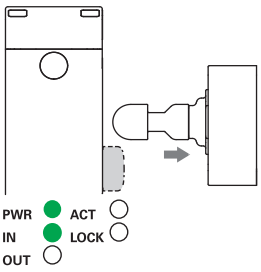
When the actuator is brought inside the safe actuation area (dark grey area), the switch turns on the ACT LED (green). In this position, the O3 signalling output (door-closed) is activated. The actuator is not locked (LOCK LED off).



The IE1, IE2 inputs can be used to lock the actuator (LOCK LED on, green). The OS1 and OS2 safety outputs are enabled (OUT LED on, green). The O4 signalling output is activated at the same time. The safe actuation area is extended in order to allow greater play for the actuator.



The IE1, IE2 inputs can be used to unlock the actuator (LOCK LED off). The switch disables the OS1 and OS2 safety outputs and turns off the OUT LED. The O4 signalling output is deactivated at the same time. The safe actuation area returns to the initial values.



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

Actuation sequence in mode 2 and mode 3

In contrast to the above mode 2 description, the safety outputs OS1 and OS2 are activated when the actuator is detected, and deactivated when the actuator is no longer detectable, in mode 3, the OS1 safety output is active with inserted and locked actuator and IS1 active, the OS2 safety output is active with inserted actuator and IS2 active.

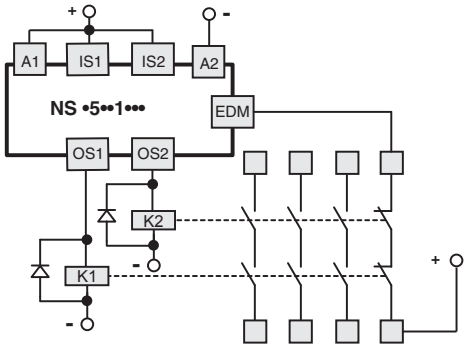
Operating states

PWR LED	IN LED	OUT LED	ACT LED	LOCK LED	EDM LED (a)	Device state	Description
○	○	○	○	○	○	OFF	Device switched off.
◐	◐	◐	◐	◐	◐	POWER ON	Internal tests upon activation.
●	○	○	✳	✳	●	RUN	Safety inputs of the device not active.
●	●	✳	✳	✳	✳	RUN	Activation of safety inputs.
●	◐	○	✳	✳	✳	RUN	Safety inputs incoherence. Recommended action: check for presence and/or wiring of inputs.
●	✳	✳	✳	●	✳	RUN	Incoherence of solenoid activation inputs IE1, IE2. Recommended action: check for presence and/or wiring of inputs.
●	✳	✳	✳	◐	✳	RUN	Auxiliary release activated. Deactivate the auxiliary release to lock the actuator
●	✳	✳	●	✳	✳	RUN	Actuator in safe area. O3 signalling output active.
●	✳	✳	●	●	○	RUN	Actuator in safe area and locked; O3 and O4 outputs active.
●	●	●	●	●	○	RUN	**Mode 1** Activation of safety inputs IS1, IS2. Actuator in safe area and locked. O3, O4, OS1 and OS2 outputs active.
●	●	●	●	✳	○	RUN	**Mode 2** Activation of safety inputs IS1, IS2. Actuator in safe area. O3, OS1 and OS2 outputs active.
●	◐	◐	●	●	○	RUN	**Mode 3** Actuator present, guard closed and locked, IS1 enabled, IS2 disabled, OS1 enabled, OS2 disabled
●	●	◐	●	○	○	RUN	**Mode 3** Actuator present, guard closed and not locked, IS1 and IS2 enabled, OS1 disabled, OS2 enabled
◐	✳	✳	✳	✳	✳	RUN	Rapid flashing: supply voltage too high. Slow flashing: temperature outside admissible range
●	✳	●	✳	✳	✳	ERROR	Error on safety outputs. Recommended action: check for any short circuits between the outputs, outputs and ground or outputs and power supply, then restart the device.
●	○	○	●	○	○	ERROR	Actuator detection error. Check the physical integrity of the device and, in case of failure, please replace the entire device. If undamaged, realign the actuator with the switch and restart the device.
●	○	○	○	○	○	ERROR	Internal error. Recommended action: restart the device. If the failure persists, replace the device.
●	✳	○	✳	✳	●	RUN	EDM signal active (external relay off)[a]
●	●	●	●	●	○	RUN	EDM signal not active (external relay on)[a]
●	○	○	○	○	●	ERROR	Error in the EDM[a] function

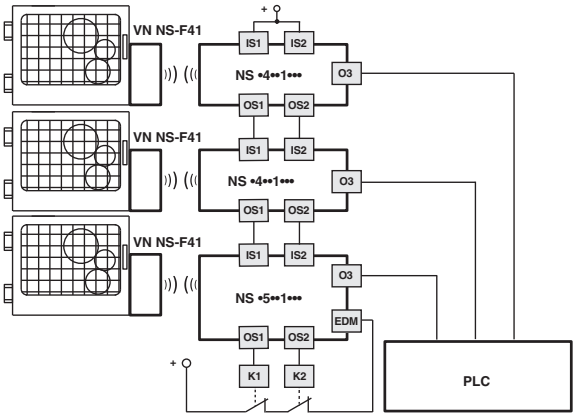
Legend:
○ = off
● = on
● = blinking
◐ = changing colours
✳ = indifferent

(a) Available for NS •5••1••• versions only

External device monitoring (EDM)



The NS •5••1••• version, in addition to maintaining the operating and safety characteristics of the NS series, allows control of **forcibly guided NC contacts of contactors or relays** controlled by the safety outputs of the switch itself. As an alternative to the relays or contactors you can use Pizzato Elettrica expansion modules CS ME-03 (see page 267). This check is carried out via the EDM input (External Device Monitoring as defined in EN 61496-1) of the switch.



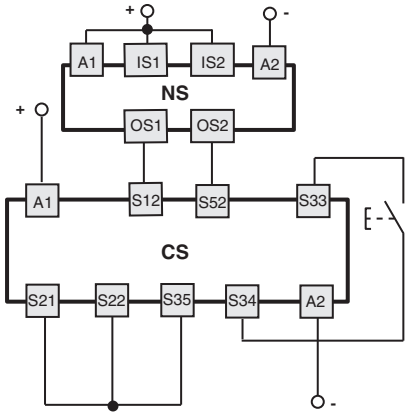
This version, with the IS safety inputs, **can be used at the end of a series** of NS switches, **up to a maximum number of 32 devices**, while maintaining the maximum PL e safety level and acc. to EN ISO 13849-1 and SIL 3 safety level acc. to EN 62061.
This solution allows you to dispense with the safety module connected to the last device in the chain.
If present, the EDM function must be used.

Connection with safety modules

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

Input configuration with monitored start

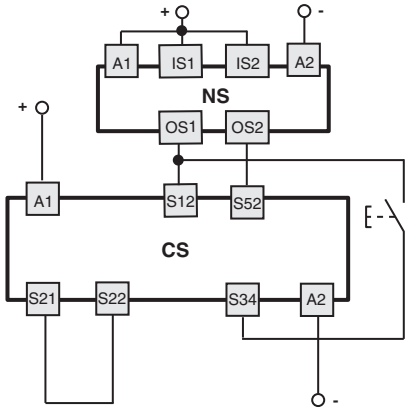
2 channels / Category 4 / up to SIL 3 / PL e



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

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

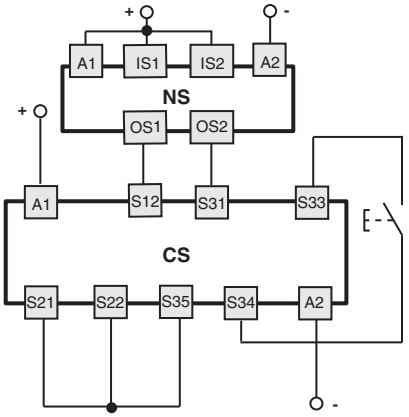
2 channels / Category 4 / up to SIL 3 / PL e



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

Input configuration with monitored start

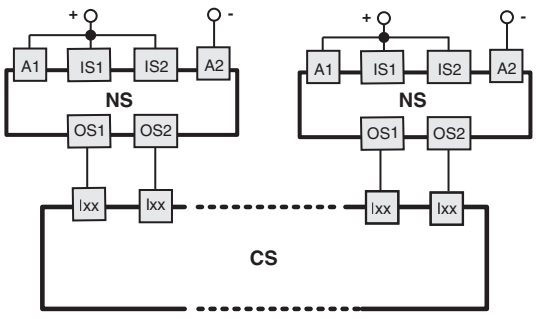
2 channels / Category 4 / up to SIL 3 / PL e



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

The connections vary according to the program of the module

Category 4/ up to SIL 3 / PL e

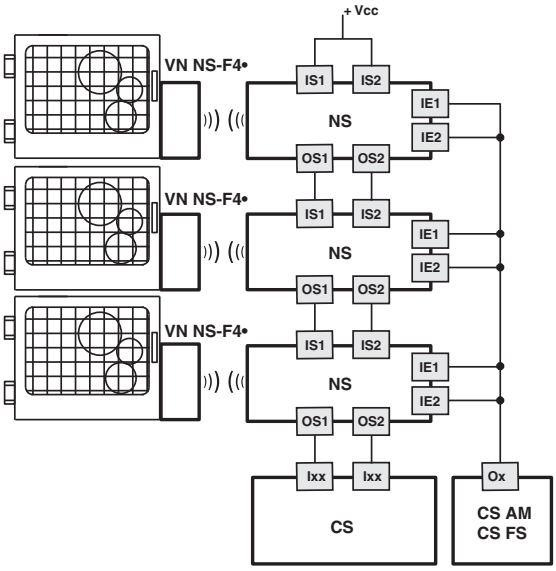


Application example on page 275.

Series connection of several switches

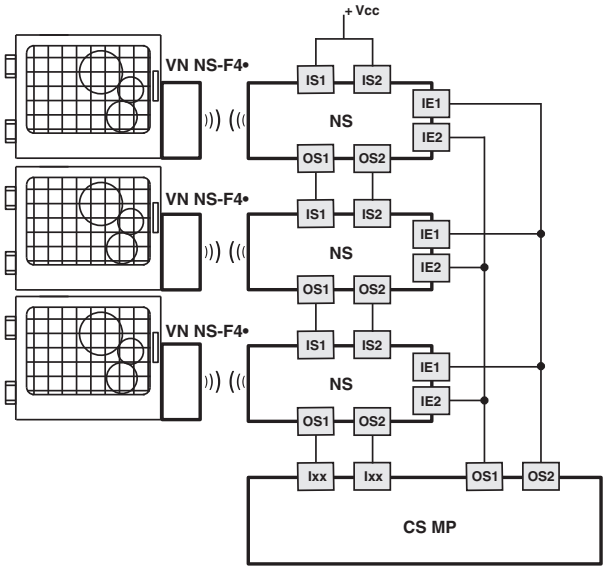
Monitoring function: actuator locked
2 channels / Category 4 / up to SIL 3 / PL e

Single-channel control for locking function of the actuator
1 channel / Category 2 / up to SIL 2 / PL d



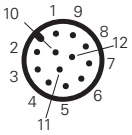
Monitoring function: actuator locked
2 channels / Category 4 / up to SIL 3 / PL e

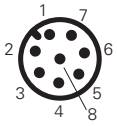
Dual-channel control for locking function of the actuator
2 channels / Category 4 / up to SIL 3 / PL e

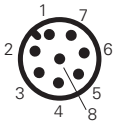


Internal connections

Versions with connector			Versions with cable			
M12 connector, 12-pole	M12 connector, 8-pole stand-alone connection	M12 connector, 8-pole series connection with "Y" connectors	Cable 12x0.14 mm² external Ø 6 mm	Cable 8x0.34 mm² external Ø 7 mm	Connection	
3	3	3	White	Blue	A2	Supply input 0 V
10	8	8	Purple	Red	IE1	Solenoid activation input
12	5	/	Red-Blue	Purple	IE2	Solenoid activation input
5	2	/	Pink	Black	O3	Signalling output, actuator inserted
9	/	5(b)	Red	/	O4	Signalling output, actuator inserted and locked
8	6	/	Grey	purple-white	I3	Actuator programming input / reset
1	1	1	Brown	Brown	A1	Supply input +24 Vdc
2	/	2	Blue	/	IS1	Safety input
6	/	6	Yellow	/	IS2	Safety input
11	/	/	Grey-Pink	/	I5	EDM input (a)
4	4	4	Green	Red-White	OS1	Safety output
7	7	7	Black	Black-White	OS2	Safety output

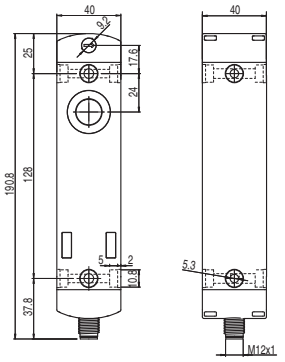




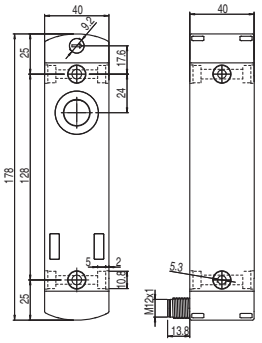


(a) Available for NS •5••1••• version only
(b) Available for 8-pole connector, not available for the end of a chain with Y connectors.

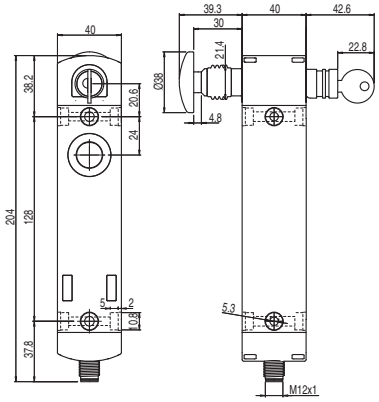
Switch
NS ••AZ1SMK
NS ••ZZ1SMK



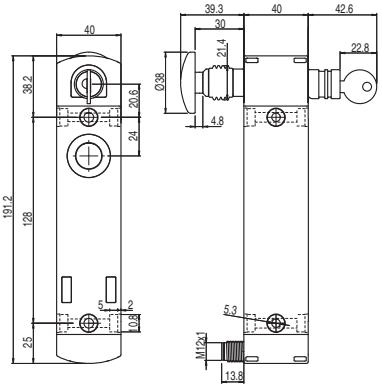
Switch
NS ••AZ1DMK
NS ••ZZ1DMK



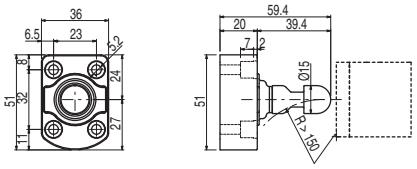
Switch
NS ••ST1SMK NS ••CE1SMK
NS ••SE1SMK NS ••TE1SMK



Switch
NS ••ST1DMK NS ••CE1DMK
NS ••SE1DMK NS ••TE1DMK



Actuator VN NS-F4•

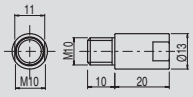
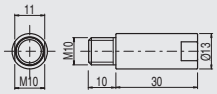
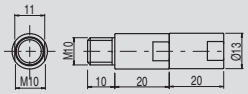
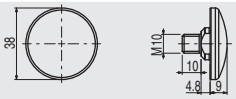


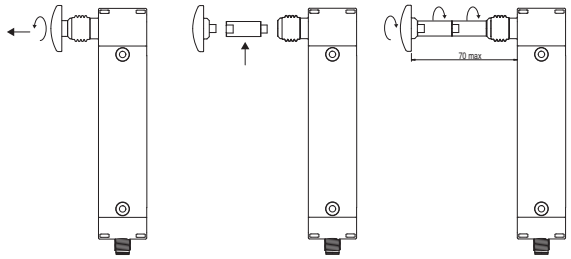
Accessories

Article	Description
VF KLB300	Set of two locking keys

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

Extensions for release button

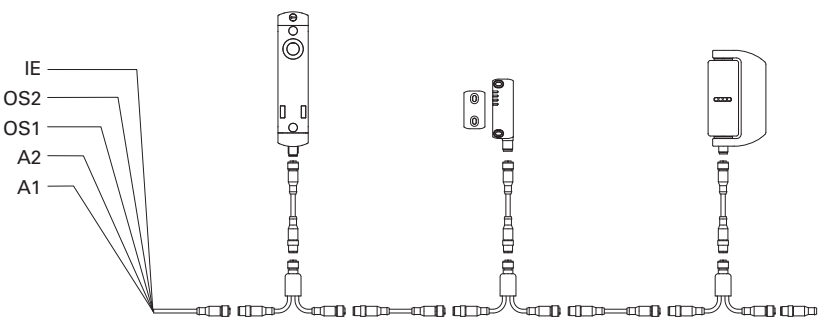
Article	Description	Drawing
VN NG-LP30	Metal extension for release button. For max. wall thickness of 30 mm	
VN NG-LP40	Metal extension for release button. For max. wall thickness of 40 mm	
VN NG-LP50	Metal extension for release button. For max. wall thickness of 50 mm	
VN NG-ERB	Red metal release button	



- Metal extensions can be combined with one another to achieve the desired length.
- Do not exceed an overall length of 70 mm between the release button and the switch.
- Use medium-strength thread locker to secure the extensions.

Series connection

To simplify series connections of the devices, various M12 connectors are available that allow complete wiring.
This solution significantly reduces installation times while at the same time maintaining the maximum safety levels PL e and SIL 3 for the interlocking function.
For further information see page 326.



All values in the drawings are in mm

Accessories See page 321

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

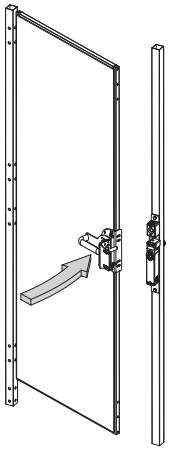
Notes

General data

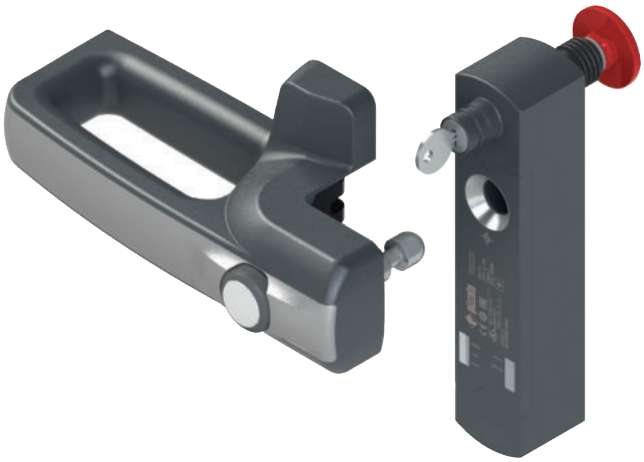
P-KUBE

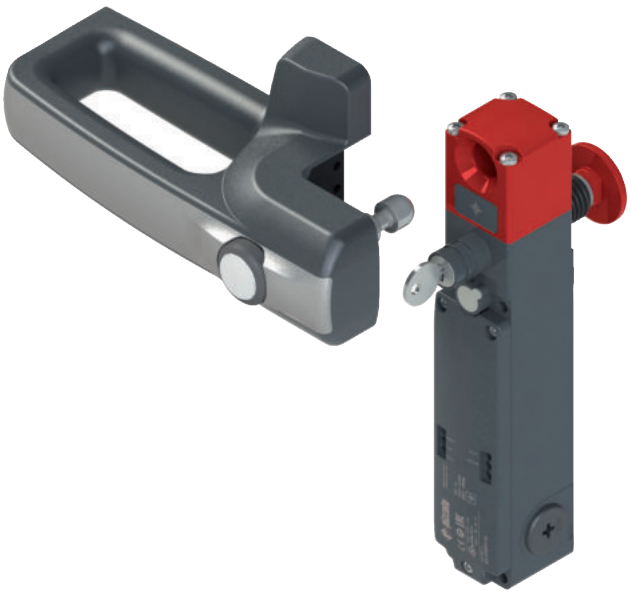
Building on its decades of experience in the field of safety switches for machinery guards, Pizzato Elettrica presents the **P-KUBE** family of safety handles. These handles, with their characteristic simplicity, versatility, and robustness, constitute an effective solution for machine builders and installers.

Robust, and compatible with all guard-locking switches, the P-KUBE safety handles can be used on all types of door – both hinged and sliding, left or right – with a unique product code; and they adapt with ease to all installation situations, thanks to metal brackets with adjustable slots.

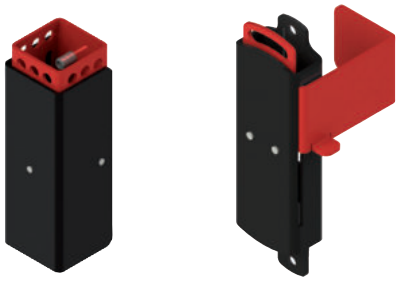


P-KUBE Krome

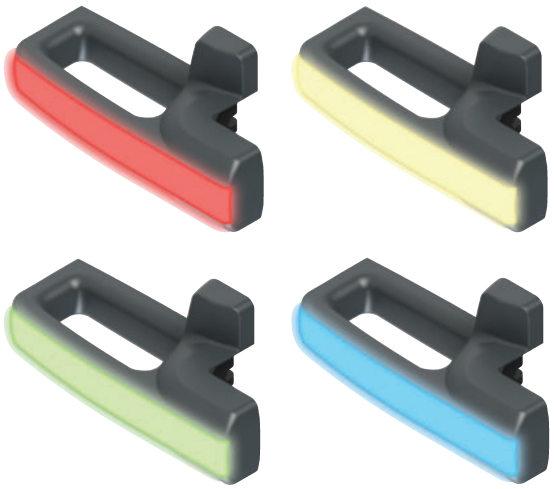




- Modern and ergonomic design; fully concealed fixing screws and cabling.
- High anti bypass coding level, thanks to RFID technology actuators.
- Tamper prevention, from interlocking protection caps inserted to fixing screw holes.
- Illuminated control button, built into grip, to request functions like opening, reset, start and others.
- Front handle customisable in various finishes.
- Compatible with NG and NS series safety locking switches with RFID technology.
- Compatible with lock out devices for NG and NS series safety switches with RFID technology.

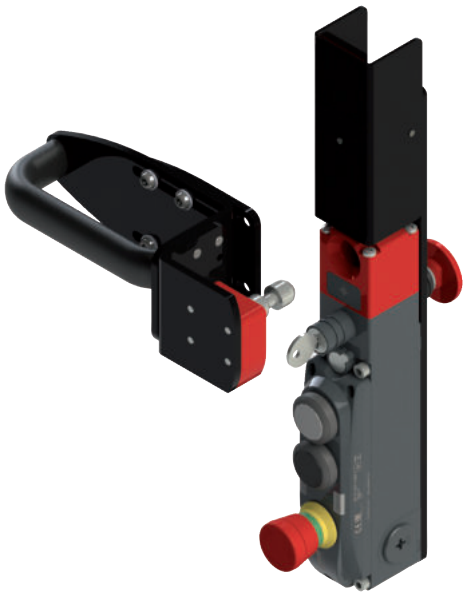


- Available also with integrated RGB LEDs, for local signalling of guard state.
- Ability to light up a single handle in green, yellow, red, blue, white, purple, and pale blue.



P-KUBE 1

- Can be used with FD series safety switches with separate actuator without lock, and FG series with lock.
- Robust metal self-centring pin, to ensure perfect alignment between door and jamb.
- Metal pin with mechanical door stop at limit of travel: no safety switch mechanical stress.
- Integral lock out device to which a padlock can be fitted, to prevent accidental guard closure.

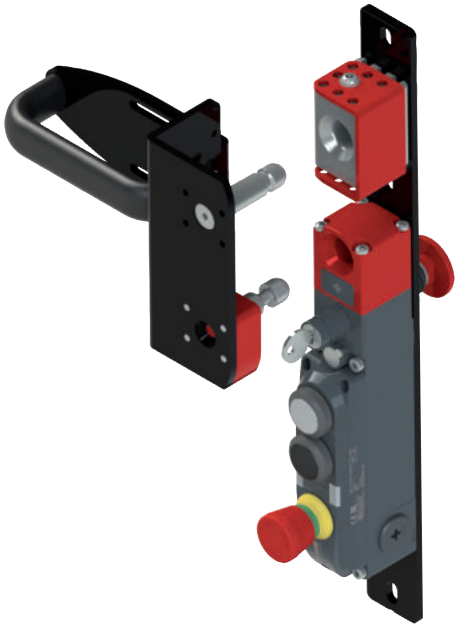


P-KUBE 2

- Can be used with NG series safety switches with lock and RFID technology.
- Increased locked actuator holding force: up to 9,750 N.
- Door retaining force (30 N) when door unlocked, to prevent accidental opening.
- High level of anti bypass coding, thanks to actuators with RFID technology.
- Lock out device available on request, to which a padlock can be fitted to prevent accidental guard closure.
- Dual safety lock out: mechanical shielding, also of actuator RFID recognition.

P-KUBE Fast

- Can be used with FD series safety switches with separate actuator without lock, and FG series with lock.
- Compact, lightweight solution.
- Integrated internal lever for emergency guard opening.
- Sliding motion with internal mechanical stop, to prevent impacts between actuator and switch during closure.
- Integral lock out device to which a padlock can be fitted, to prevent accidental guard closure.



P-KUBE Super

- Designed for installation in particularly demanding work environments (rolling mills, for example).
- Dual centring pin, ideal for heavier doors with significant misalignment.
- Can be used with NG series safety switches with lock and RFID technology.
- Increased locked actuator holding force: up to 9,750 N.
- Door retaining force (30 N) when door unlocked, to prevent accidental opening.
- Metal pin with mechanical door stop at limit of travel: no safety switch mechanical stress.
- High anti bypass coding level, thanks to RFID technology actuators.
- Integral lock out device to which a padlock can be fitted, to prevent accidental guard closure.

P-KUBE 1 safety handles for FD and FG series switches

Description

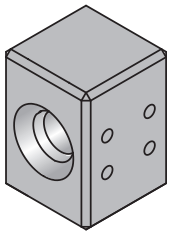
The **P-KUBE 1** safety handles are designed to install Pizzato Elettrica's FD and FG series safety switches to machine guards quickly and easily, offering an effective solution to machine designers and installers for problems relating to the mechanical precision of guard movements.

The basic principle of this series of products is a mechanical centring and stop system along the direction of movement of the door. The centring system is extremely robust and can also be used in heavy duty applications or in the presence of careless personnel.

The lock out device is used to block the door in the open position and prevent an unexpected system restart when maintenance personnel access the system.

Thanks to their adjustable design these handles can be installed on different types of doors or barriers: hinged or sliding, right or left closing, as well as on various types of profiles.

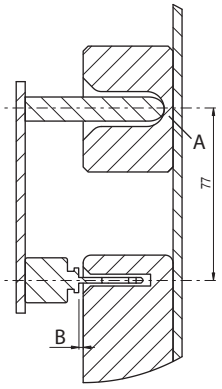
Robustness



Thanks to its particular design and its special materials the safety handle can be used in heavy duty applications and with sturdy wide-ranging guards (min. 700 mm).

- Mounting system made up of robust painted brackets with thicknesses of 4 and 5 mm.
- Single-body centering block in stainless steel
- Large diameter centring pin in stainless steel
- Max. holding force of the actuator equal to 2800 N (versions with FG series switches).
- Stainless steel tamper proof bolts and screws and elastic washers (safety inserts excluded, see page 163).

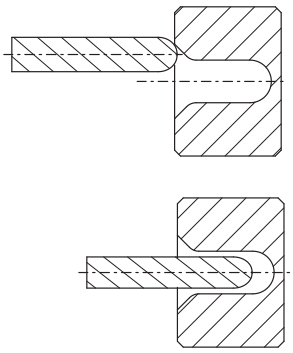
Mechanical stop



During door closing, the metal pin is flush to the bottom of the centring block (A) before the actuator can bump against the switch housing, leaving a safe distance (B), thus avoiding possible damage.

The metal pin is always flush on surfaces that transmit the impact to the frame and not to the switch, regardless of whether the lock out device is open or closed.

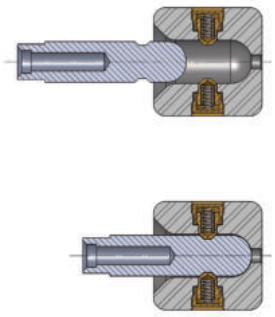
Centring



The centering of the pin on the block (both in stainless steel) forces the alignment between actuator and switch, ensuring a proper insertion preventing any risk of collisions.

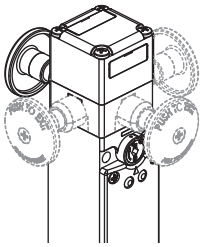
This also allows a safe re-alignment of the protection to the frame, even in case of big axial misalignments.

Holding force of the unlocked actuator



A version of the lock out device with 100 N holding force is available on request. With this new optional feature, the handle is kept in its limit-stop closed position; a moderately energetic pull is required to open the door. This device is ideal for all applications where multiple doors are unlocked simultaneously but only one is actually opened; all unlocked doors are held in position, thereby preventing vibrations or gusts of wind from opening them.

Escape release button (FG series)

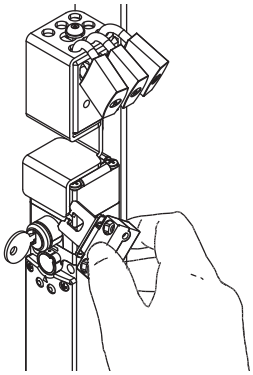


The FG series switches with actuator lock can be provided with an escape release button that, if oriented towards the inside of the machinery, allows accidentally trapped personnel to escape even during a blackout.

Pushing the button results in the same function as the auxiliary release device. To reset the switch, just return the button to its initial position.

The escape release button can be rotated and is available with different lengths. It is fixed to the switch by means of a screw allowing the installation of the switch both inside and outside the guards.

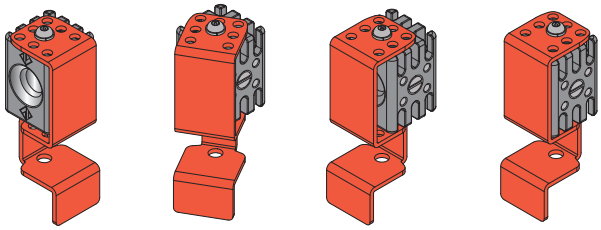
Impossible to bypass with a separate actuator



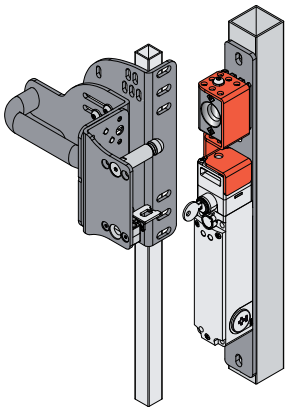
As soon as the lock out device has been actuated and locked, the slot in the switch for the actuator is no longer accessible.

If an operator is in possession of a second, separate actuator, he is not able to bypass blocking of the device and actuate the switch.

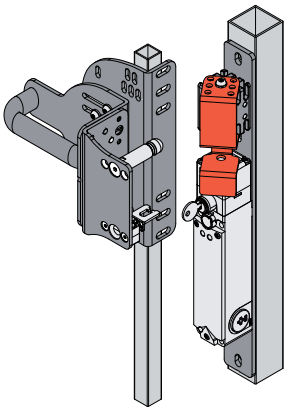
Lock out device



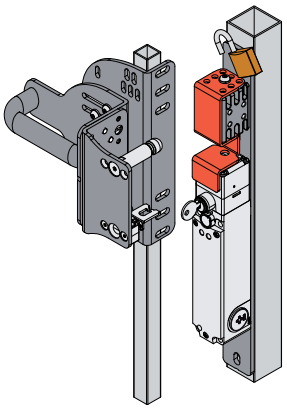
With a single operation, the lock out device enables the closure of both the centring hole and the slot for the actuator present in the switch, thus making the mechanical closure of the door and the electrical commutation of the switch contacts impossible.
The lock out device moves the red cover so that the holes in the cover do not coincide with the holes in the underlying metal block. This ensures that it is not possible to put a padlock on the device when it is open.
Up to 10 padlocks with a shackle diameter of up to 5 mm can be used.



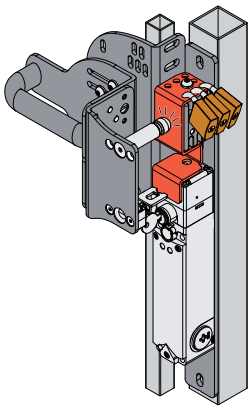
Lock out device open.
Safety switch is accessible.



Closing of the lock out device.

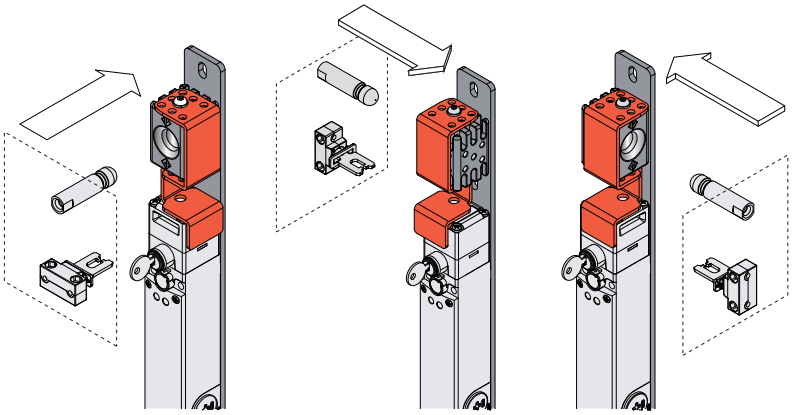


Lock out device closed.
Padlock insertion.



Lock out device locked.
Padlock locked.
Safety switch is not accessible.

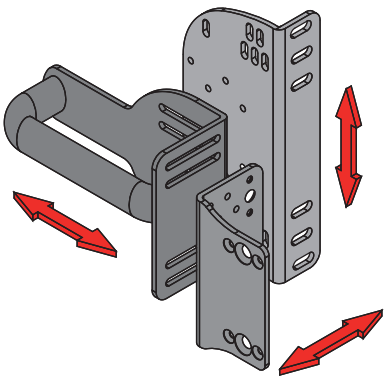
Turnable centring block

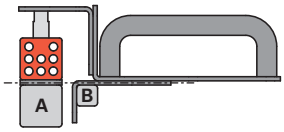


Thanks to its symmetrical design, the lock out device can be installed on hinged and sliding doors, with both right and left closing, while still retaining its centring function and allowing for the attachment of multiple padlocks.

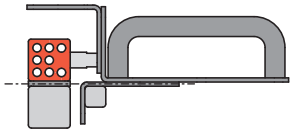
Flexibility and installation on different profiles

The slots of the three brackets applied on the door allow to carry out independent adjustments on 3 axes, providing an extremely easy installation and avoiding any modification of the existing protection structure. Thanks to these adjustments the handle can be installed on door profiles with different dimensions, from 40x40 mm to 60x60 mm **(A)** on the jamb and from 20x20 mm to 40x40 mm **(B)** on the door. The brackets are bolted together by means of anti-tampering screws.
Thanks to its vertical design, the bracket containing the safety switch and the lock out device does not protrude beyond the jamb's profile.

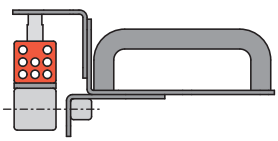




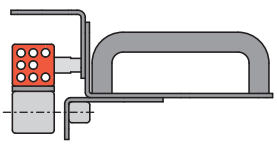
Hinged door and jamb frontally aligned



Hinged door and jamb frontally aligned



Hinged door and jamb axially aligned



Sliding door and jamb axially aligned

P-KUBE 1 safety handles for FD and FG series switches

Code structure

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

VF AP-P11A-200P

LOCK OUT device	
0	Centering block only
1	LOCK OUT device
2	LOCK OUT device with 100 N holding force

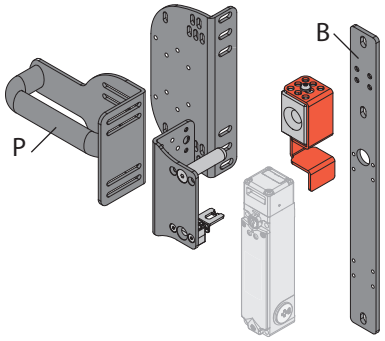
Grip	
P	plastic grip
M	metal grip
Z	without grip

Mounting bracket supplied for installation	
A	FD ••••
B	FG ••••••••
Z	without plate (B) for FG brackets
Y	without plate (A) for FD brackets

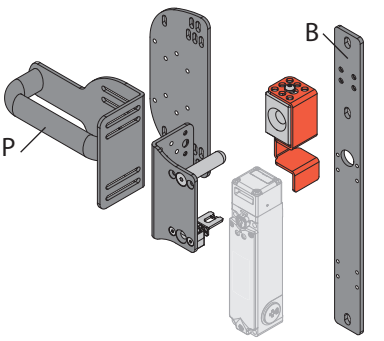
Plate configuration	
200	Configuration with adjustable "L" plate for door profiles
201	Configuration with adjustable plain plate for door profiles
202	Configuration without adjustable plate for door profiles

Note: the handle is supplied complete with switch actuator as well as fastening screws for the grip, the switch, the actuator, and between the plates.

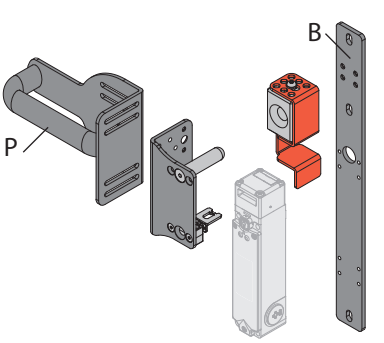
VF AP-P11B-200P

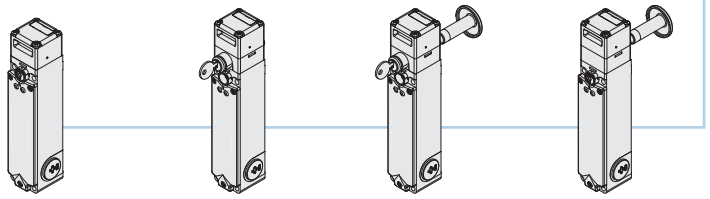


VF AP-P11B-201P



VF AP-P11B-202P





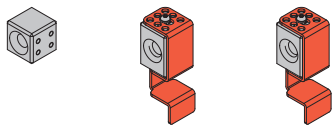
FG •••D1D••
Safety switch with solenoid and separate actuator.

FG •••D5D••
Safety switch with solenoid and separate actuator.
With key release.

FG •••D6D••
Safety switch with solenoid and separate actuator.
With key release and escape release button.

FG •••D7D••
Safety switch with solenoid and separate actuator.
With escape release button.

Lock out device options:

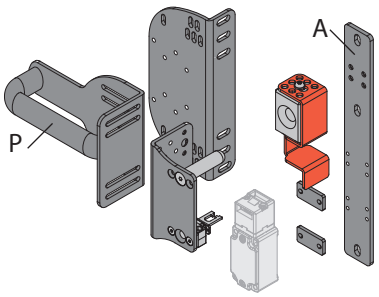


0
Centering block only

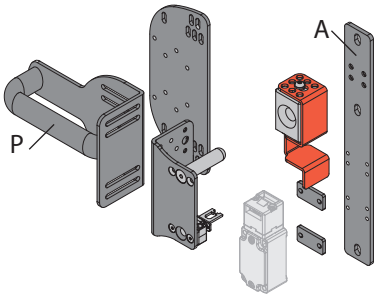
1
With LOCK OUT device

2
With LOCK OUT device with 100 N holding force

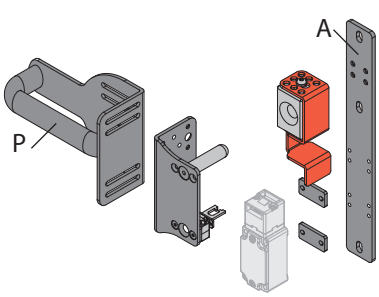
VF AP-P11A-200P



VF AP-P11A-201P



VF AP-P11A-202P



FD •93-M2
Safety switch with separate actuator.

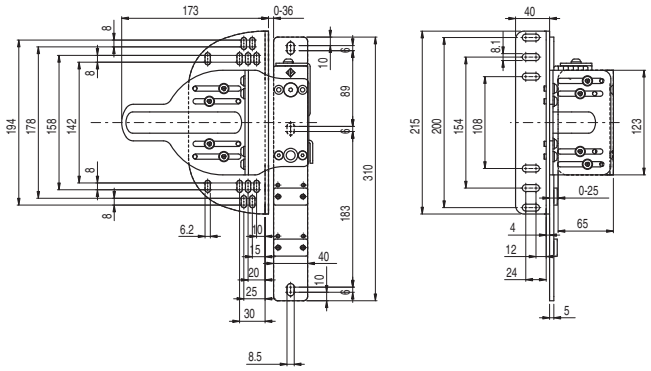
FD •99-M2
Safety switch with separate actuator and key release.

→ article sold separately

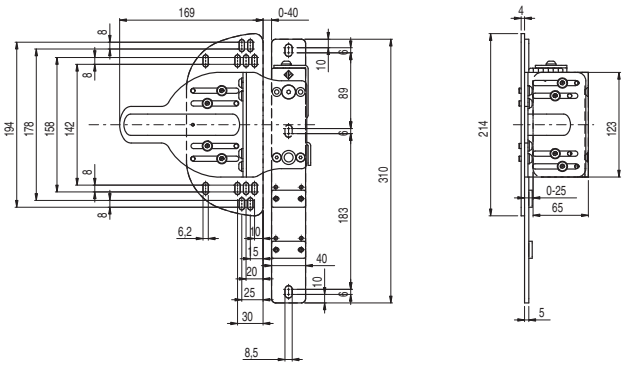
For articles and options of the FG series switches see page 107.
For articles and options of the FD series switches see page 15.

Dimensional drawings

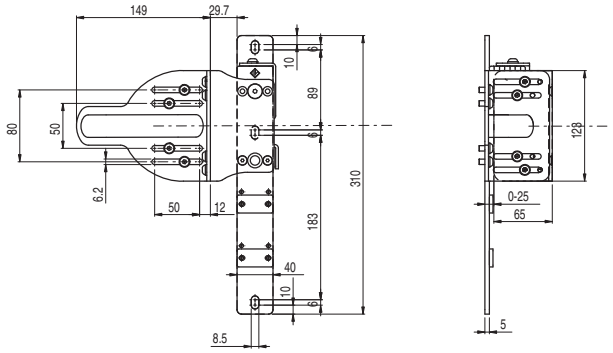
Safety handle VF AP-P1•A-200•



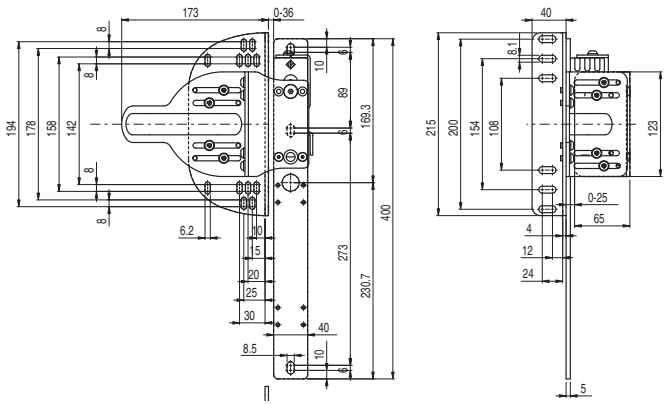
Safety handle VF AP-P1•A-201•



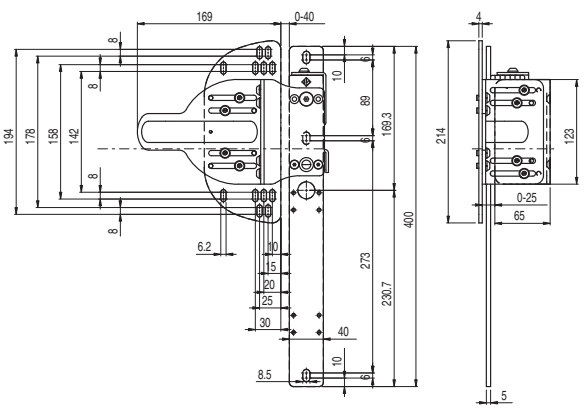
Safety handle VF AP-P1•A-202•



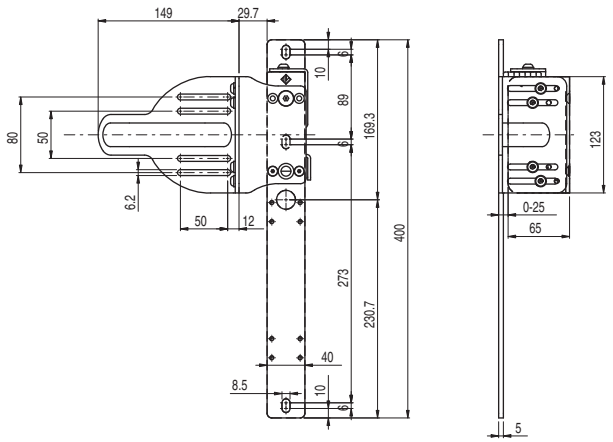
Safety handle VF AP-P1•B-200•



Safety handle VF AP-P1•B-201•



Safety handle VF AP-P1•B-202•



All values in the drawings are in mm

Accessories See page 321

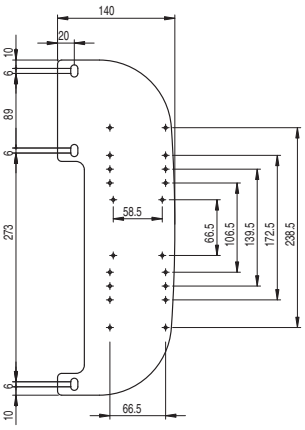
➔ The 2D and 3D files are available at **www.pizzato.com**

P-KUBE 1 safety handles for FD and FG series switches

Accessories

Profiled plate

Profiled plate to be installed under the fixing plate of the switch. Suitable for both right and left mounting and provided with holes, this plate can be used for the installation of housings for the Pizzato Elettrica EROUND line panel buttons (by means of common self-threading screws available on the market).



Article	Description
VF AP-C001	Profiled lateral plate

Adhesive labels for escape release button

Polycarbonate yellow adhesive, rectangular, 300x32 mm, red inscription. It has to be fixed on the internal part of the jamb and helps finding the escape release button.

Article	Description and language	
VF AP-A1AGR01	PREMERE PER USCIRE	ita
VF AP-A1AGR02	PUSH TO EXIT	eng
VF AP-A1AGR04	ZUM ÖFFNEN DRÜCKEN	deu
VF AP-A1AGR05	POUSSER POUR SORTIR	fra
VF AP-A1AGR06	PULSAR PARA SALIR	spa
VF AP-A1AGR07	НАЖАТЬ ДЛЯ ВЫХОДА	rus
VF AP-A1AGR08	NACISNĄĆ ABY WYJŚĆ	pol
VF AP-A1AGR09	PRESSIONAR PARA SAIR	por

Safety inserts set

Set with 3 x 1/4" hexagonal safety inserts. Connection DIN 3126, C 6.35. Hex mount with hole.
The P-KUBE 1 safety handle is provided with tamper-proof screws. Therefore all 3 safety inserts of the set are required.

Article composition **VF AP-K01:**

Qty	Description	⊙	Length
1	Hexagonal insert 1/4" ⬡ for M5 screws	3 mm	25 mm
1	Hexagonal insert 1/4" ⬡ for M6 screws	4 mm	25 mm
1	Hexagonal insert 1/4" ⬡ for M8 screws	5 mm	25 mm

All values in the drawings are in mm

Accessories See page 321

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

Complete housings for profiled plate

ES AC32010

Description	Features			Diagram
Button - 1NO E2 1PU2R421L35	flush, spring-return, green			
Contacts 1x E2 CF10G2V1	pos. 2 /	pos. 3 1NO	pos. 1 /	
Button - 1NC E2 1PU2S321L1	projecting, spring-return, red			
Contacts 1x E2 CF01G2V1	pos. 2 /	pos. 3 1NC ⊖	pos. 1 /	

ES AC32043

Description	Features			Diagram
Indicator light E2 1ILA210	white			
LED unit E2 LF1A2V1	White LED, 12 … 30 Vac/dc			
Button - 1NO E2 1PU2R4210	flush, spring-return, green			
Contacts 1x E2 CF10G2V1	pos. 2 /	pos. 3 1NO	pos. 1 /	

ES AC33076

Description	Features			Diagram
Illuminated button - 1NO E2 1PL2R2210	flush, spring-return, white			
LED unit E2 LF1A2V1	White LED, 12 … 30 Vac/dc			
Contacts 1x E2 CF10G2V1	pos. 2 /	pos. 3 LED	pos. 1 1NO	
Illuminated button - 1NO E2 1PL2R5210	flush, spring-return, yellow			
LED unit E2 LF1A2V1	White LED, 12 … 30 Vac/dc			
Contacts 1x E2 CF10G2V1	pos. 2 /	pos. 3 LED	pos. 1 1NO	
Emergency button Ø 40 mm- 2NC E2 1PERZ4531	rotary release, Ø 40 mm, red			
Label with shaped hole VE TF32G5700	yellow, 30x60 mm rectangular, no engraving			
Contacts 2x E2 CF01G2V1	pos. 2 1NC ⊖	pos. 3 /	pos. 1 1NC ⊖	

All values in the drawings are in mm

Accessories See page 321

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

P-KUBE 2 safety handles for NG series switches

Description

Together with the NG series RFID safety switches with guard locking, the **P-KUBE 2** safety handles form an integrated locking system for guards that enables access control to dangerous areas, offering an effective solution to designers and installers for problems related to the mechanical precision of the movements of the guard.

The basic principle of this product series is to use the self-centering properties of the actuator on the NG switch by means of hinge pins and a large insertion range into the device. The use of fixing plates with slotted holes also allows for easy and quick alignment of the switch and actuator.

The lock out device is used to block the door in the open position and prevent an unexpected system restart when maintenance personnel access the system.

Thanks to their adjustable design these handles can be installed on different types of doors or barriers: hinged or sliding, right or left closing, as well as on various types of profiles.

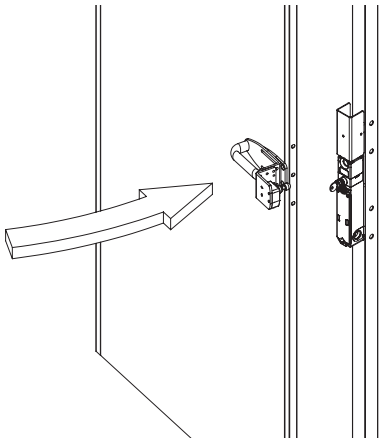
Maximum safety with a single device

PL e + SIL 3 The P-KUBE 2 safety handles can be combined with the NG series switches. As a result, the maximum PL e and SIL 3 safety levels can be achieved through the use of a single device on a guard. This avoids expensive wiring in the field and allows faster installation. Inside the control cabinet, the two electronic safety outputs must be connected to a safety module with OSSD inputs or to a safety PLC.

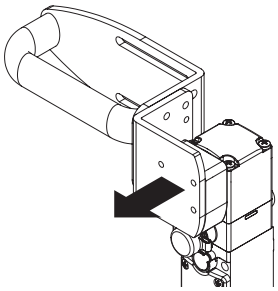
Easy to use

There are no specific sequences required for opening or closing the door, but only a single opening / closing movement.

If the door interlock is realised by means of a handle provided with a release push button, the door can be opened with a single movement even under stress (panic situations).

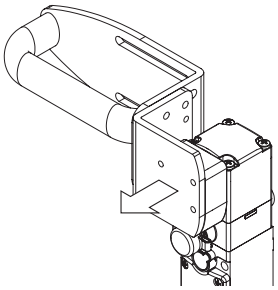


Holding force of the locked actuator



9750 N The strong interlocking system guarantees a maximum actuator holding force of F_{1max} = 9750 N. This is one of the highest values currently available on the market today, making this device suitable for heavy-duty applications.

Holding force of the unlocked actuator



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

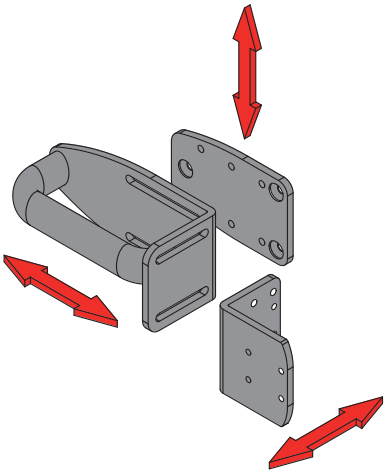
Sturdiness and easy installation

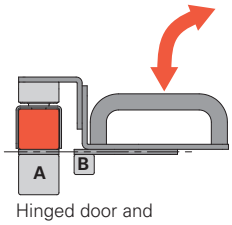
The handle is provided with 5 mm thick sturdy brackets in painted steel. The slots in the brackets allow independent adjustments to be performed. This ensures easy installation, eliminating the need to make changes to structure of the existing guard.

The adjustments make it possible to attach the handle to aluminium profiles or steel frames of various dimensions, from 40 x 40 mm to 80 x 80 mm for the frame jamb **(A)** and from 20 x 20 mm to 40 x 40 mm for the door **(B).**

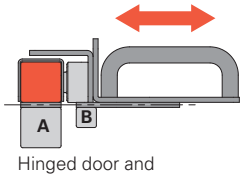
It can be installed both on hinged doors and sliding doors, either with right or left closing.

The handle is supplied with all of the components necessary for fastening at the appropriate distances with tamper-proof screws. The installer only has to assemble the components according to the application, fix the selected switch (supplied separately) and make centring adjustments.

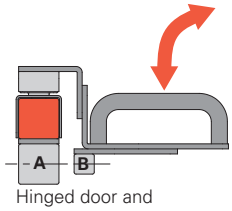




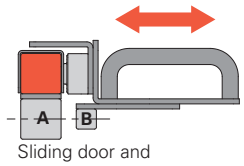
Hinged door and jamb frontally aligned



Hinged door and jamb frontally aligned



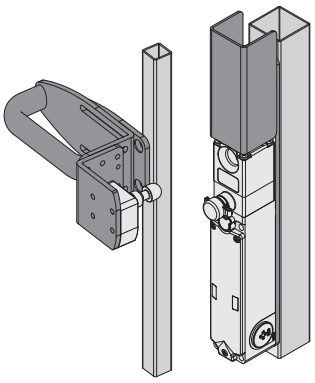
Hinged door and jamb axially aligned



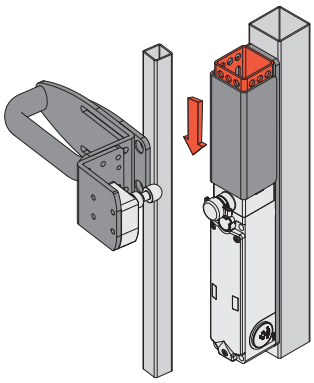
Sliding door and jamb axially aligned

Padlocking option for protecting against errors

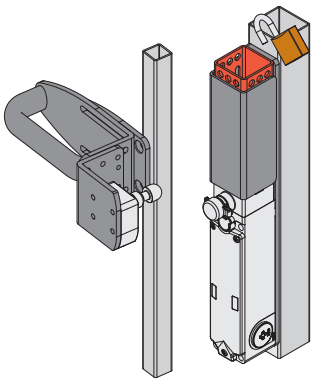
The lock out device is simply pushed downward to expose the holes for mounting padlocks. As a result, padlocks can no longer be mounted incorrectly, since the holes are not exposed until the switch is fully locked. 9 holes for padlocks with a diameter of 7 mm are present. The head of the switch can be quickly rotated in four different directions after loosening the fixing screws, while the lock out device reliably protects on 3 sides. The lock out device can thus be used on hinged and sliding doors – with both right and left closing – without any modification.



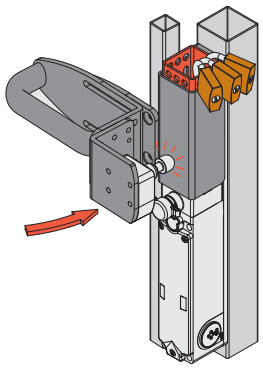
Lock out device open.
Safety switch is accessible.



Closing of the
lock out device.



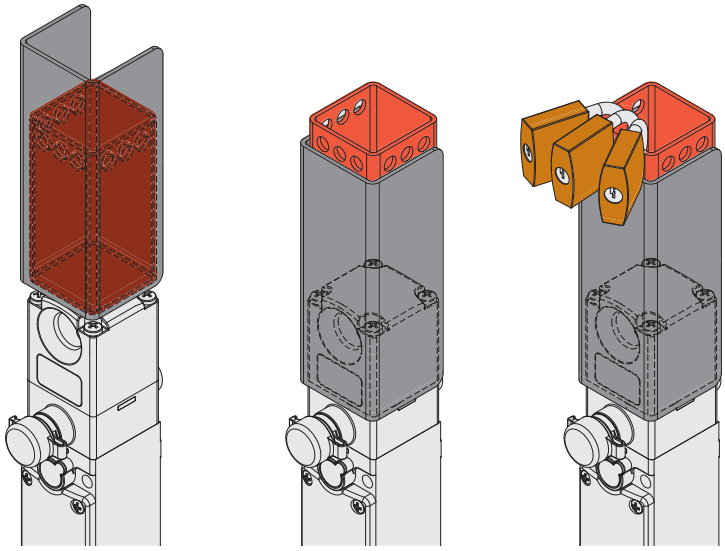
Lock out device closed.
Padlock insertion.



Lock out device locked.
Padlock locked.
Safety switch is not accessible.

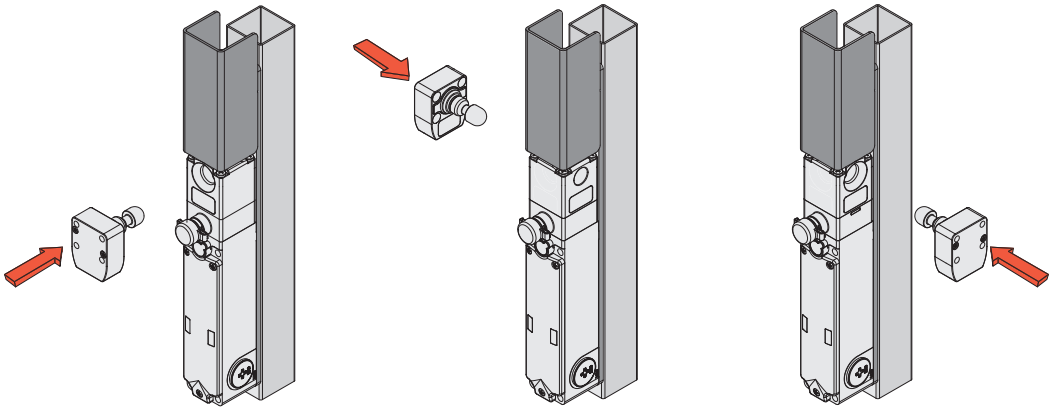
Lock out: maximum safety with just one movement

With a single operation, the lock out device can close the centring hole in the NG switch as well as shield the RFID recognition system for detecting the actuator. Accidental closing of the guard is thereby prevented by inhibiting both the mechanical locking of the door and the electrical switching of the switch contacts.



Head rotation

Because the lock out device covers the switch head in the 3 possible approach directions, it can be used on hinged and sliding doors – with both right and left closing – without any additional modification.



Code structure

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

AP G1A-111P

LOCK OUT device	
1	with LOCK OUT device
0	Without LOCK OUT device

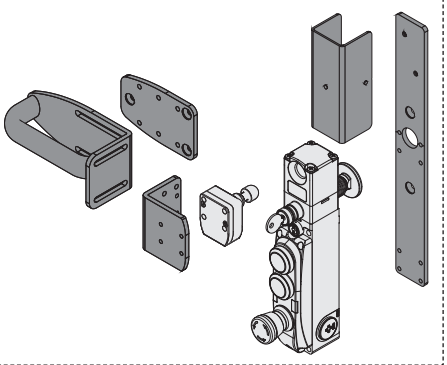
Grip	
P	plastic grip
M	metal grip
Z	without grip

Fixing on frames	
A	Long plate
B	Short plate
Z	Without plate

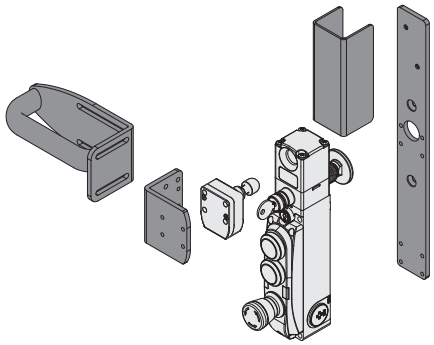
Plates for fastening the door handle	
000	Without door fastening plate
111	3 plates with multiple fastening options
011	2 plates with multiple fastening options
200	Configuration with 1 fixed plate

Note: the handle is supplied with fastening screws for the grip, for the switch, and for bolting the plates together.

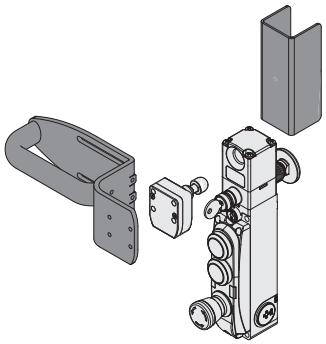
AP G1A-111P



AP G1A-011P

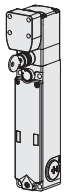


AP G1Z-200P



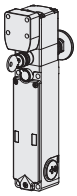
NG 2D1D••A-F3•

Safety locking switch, complete with separate actuator.



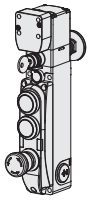
NG 2D5D••A-F3•

Safety locking switch, complete with separate actuator.
With key release.



NG 2D6D••A-F3•

Safety locking switch, complete with separate actuator.
With key release and escape release button.



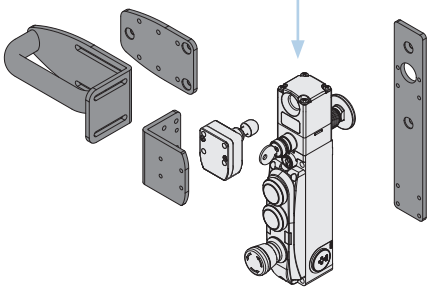
NG 2D7D••••D-F3•

Safety locking switch, complete with separate actuator.
With escape release button, lock and integrated control devices.

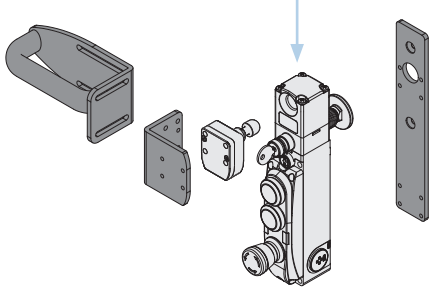
Lock out device:

In case of special applications, the AP G1Z-000Z lock out device can also be supplied as single device

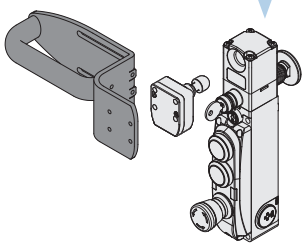
AP G0B-111P



AP G0B-011P



AP G0Z-200P

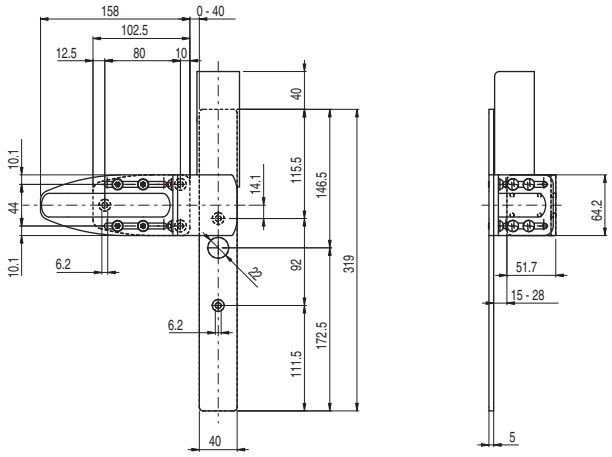


→ Sold separately as accessory

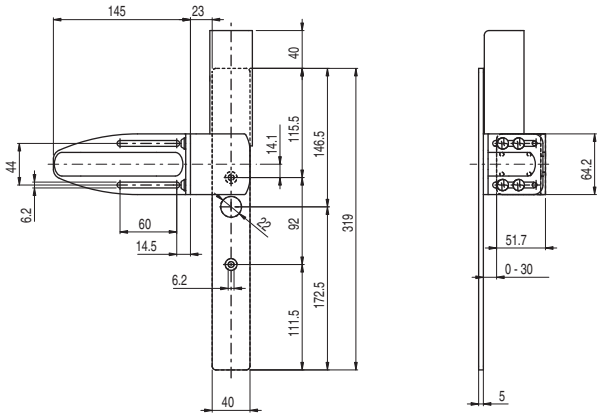
The NG series safety switch is also available in other versions. For further information see page 131.

Dimensional drawings

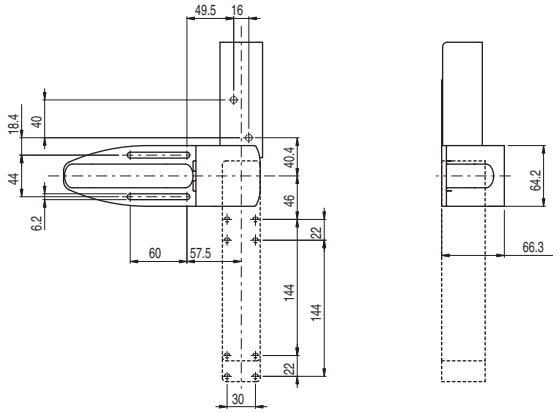
AP G1A-111• safety handles



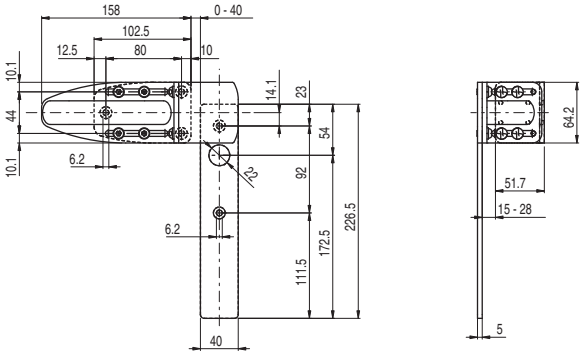
AP G1A-011• safety handles



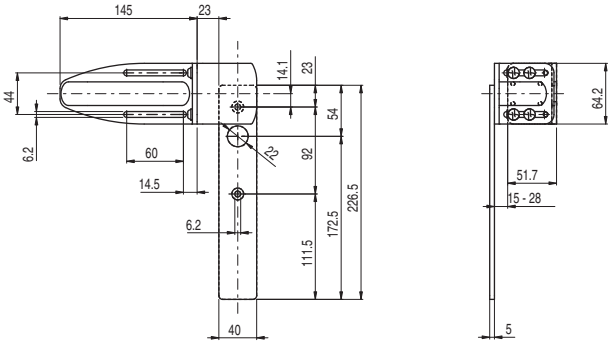
AP G1Z-200• safety handles



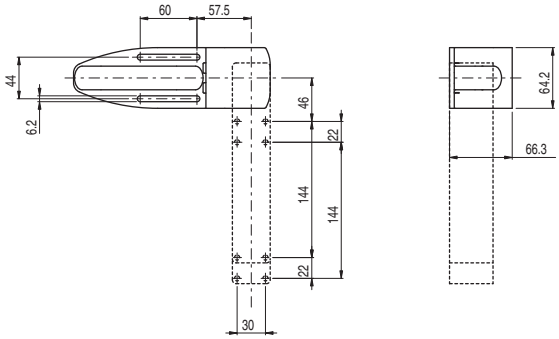
AP G0B-111• safety handles



AP G0B-011• safety handles



AP G0Z-200• safety handles



All values in the drawings are in mm

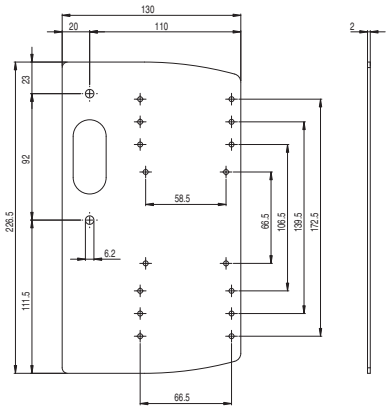
Accessories See page 321

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

Accessories

Profiled plate

Profiled plate to be installed under the fixing plate of the switch. Suitable for both right and left mounting and provided with holes, this plate can be used for the installation of housings for the Pizzato Elettrica EROUND line panel buttons (by means of common self-threading screws available on the market).



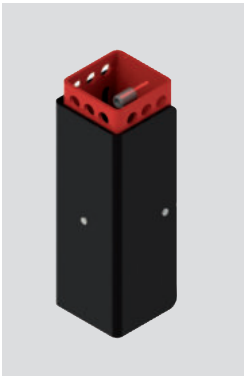
Article	Description
AP A001	Profiled lateral plate

Adhesive labels for escape release button

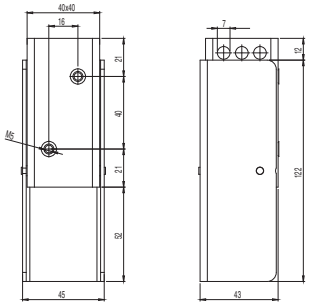
Polycarbonate yellow adhesive, rectangular, 300 x 32 mm, red inscription. It has to be fixed on the internal part of the jamb and helps finding the escape release button.

Article	Description and language	
VF AP-A1AGR01	PREMERE PER USCIRE	ita
VF AP-A1AGR02	PUSH TO EXIT	eng
VF AP-A1AGR04	ZUM ÖFFNEN DRÜCKEN	deu
VF AP-A1AGR05	POUSSER POUR SORTIR	fra
VF AP-A1AGR06	PULSAR PARA SALIR	spa
VF AP-A1AGR07	НАЖАТЬ ДЛЯ ВЫХОДА	rus
VF AP-A1AGR08	NACISNĄĆ ABY WYJŚĆ	pol
VF AP-A1AGR09	PRESSIONAR PARA SAIR	por

Lock out device for NG series switches

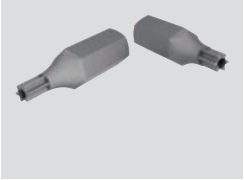


Lock out device made entirely of metal to be installed with NG series switches with solenoid and RFID technology.
To prevent unintentional guard closure, simply move the black slider down so that the actuator entry hole is fully covered.
When the slider is lowered, a perforated plate emerges on the top of the device, allowing insertion of up to 9 padlocks.
The slider also serves as a shield for the RFID receiver antenna on the NG switch.



Article	Description
AP G1Z-000Z	Lock out device for NG series switches

Bits for safety screws



Bits for safety screws with pin, with ¼" hexagonal connection.

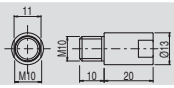
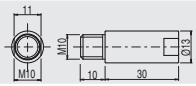
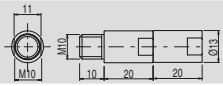
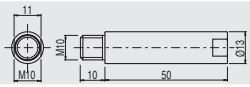
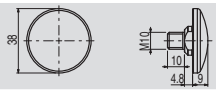
Article	Description
VF VAIT1T25	Bits for M5 screws with Torx T25 fitting
VF VAIT1T30	Bits for M6 screws with Torx T30 fitting

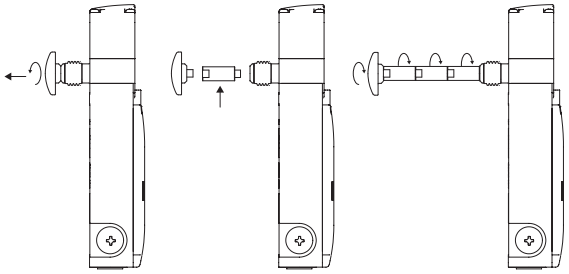
All values in the drawings are in mm

Accessories See page 321

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

Extensions for release button

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



- Metal extensions can be combined with one another to achieve the desired length.
- Do not exceed an overall length of 500 mm between the release button and the switch.
- Use medium-strength thread locker to secure the extensions.

Complete housings for profiled plate

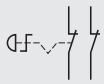
ES AC32010

Description	Features			Diagram
Button - 1NO E2 1PU2R421L35	flush, spring-return, green			
Contacts 1x E2 CF10G2V1	pos. 2 /	pos. 3 1NO	pos. 1 /	
Button - 1NC E2 1PU2S321L1	projecting, spring-return, red			
Contacts 1x E2 CF01G2V1	pos. 2 /	pos. 3 1NC ⊖	pos. 1 /	

ES AC32043

Description	Features			Diagram
Indicator light E2 1ILA210	white			
LED unit E2 LF1A2V1	White LED, 12 … 30 Vac/dc			
Button - 1NO E2 1PU2R4210	flush, spring-return, green			
Contacts 1x E2 CF10G2V1	pos. 2 /	pos. 3 1NO	pos. 1 /	

ES AC33076

Description	Features			Diagram
Illuminated button - 1NO E2 1PL2R2210	flush, spring-return, white			
LED unit E2 LF1A2V1	White LED, 12 … 30 Vac/dc			
Contacts 1x E2 CF10G2V1	pos. 2 /	pos. 3 LED	pos. 1 1NO	
Illuminated button - 1NO E2 1PL2R5210	flush, spring-return, yellow			
LED unit E2 LF1A2V1	White LED, 12 … 30 Vac/dc			
Contacts 1x E2 CF10G2V1	pos. 2 /	pos. 3 LED	pos. 1 1NO	
Emergency button Ø 40 mm- 2NC E2 1PERZ4531	rotary release, Ø 40 mm, red			
Label with shaped hole VE TF32G5700	yellow, 30x60 mm rectangular, no engraving			
Contacts 2x E2 CF01G2V1	pos. 2 1NC ⊖	pos. 3 /	pos. 1 1NC ⊖	

All values in the drawings are in mm

Accessories See page 321

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

P-KUBE Fast safety handles for FD and FG series switches

Description

The **P-KUBE Fast** safety handles are designed to install Pizzato Elettrica's FD and FG series safety switches to machine guards quickly and easily, offering an effective solution to machine designers and installers for problems relating to the mechanical precision of guard movements, as well as for critical environmental conditions.
The P-KUBE Fast safety handles, unlike other products on the market, combine their compactness and lightness resulting from the sliding movement, with the robustness of the upper end models, which are distinguished by a higher weight, more bulky dimensions and greater constructive complexity.

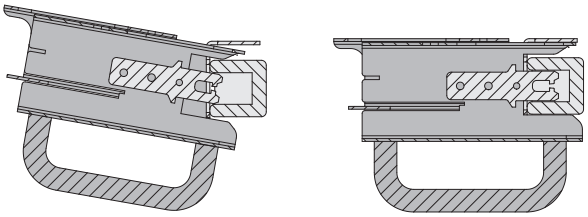
Structure

The P-KUBE Fast handle is light and compact, has a galvanized and painted metal frame and an ergonomic plastic or aluminium grip for comfortable and easy use of the door handle itself.
The absence of screws and removable components prevents any tampering.

Handle lock positions

There is a snap-on device that retains the handle in two positions: when it is pulled out, so as to contribute to the retaining force exerted by the actuator, and when retracted, to avoid undesirable movements caused by machine vibrations.

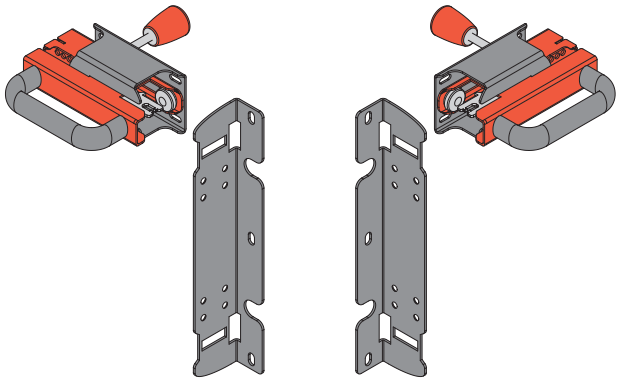
Centring



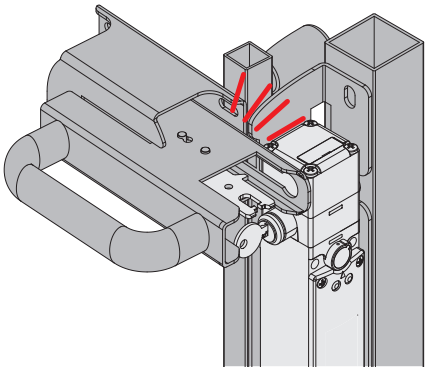
The "C"-shaped profile facilitates centring of the device when closing a guard that is not perfectly aligned with the frame. This enables an optimum alignment between actuator and switch, preventing any damage due to possible collisions.

Flexibility during installation

Thanks to its symmetrical design the device can be installed on hinged and sliding doors, either with right or left closing, without requiring any further adjustment.
The slotted brackets and the large actuator travel (60 mm) allow the device to be installed and adjusted on profiles of various sizes.



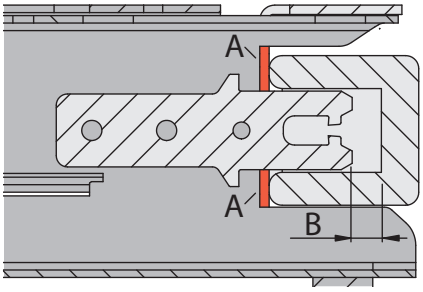
Protection of actuator and switch



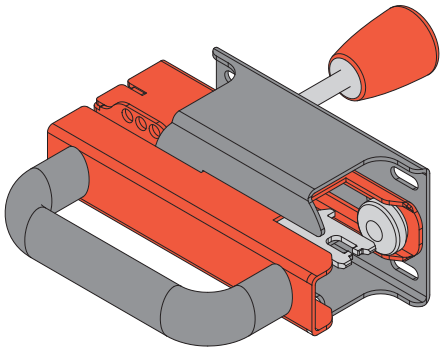
Thanks to the handle structure and the fixing bracket of the switch, both the switch and the actuator can be safely installed preventing any damage due to possible collisions. Any impacts resulting from incorrect actuation are completely absorbed on the handle frame.

Mechanical stop

During door closing, a mechanical stop (A) prevents possible impacts between the actuator and the switch by constantly ensuring a safety distance (B) between these two components and the switch housing.



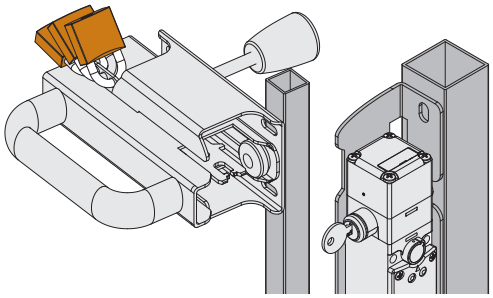
Internal lever for emergency escape



Optional lever for emergency opening from the inside: it ensures that operating personnel can exit the area should they accidentally become trapped within the dangerous area. It can be combined only with switches without lock (e.g. FD •93-M2) or switches with escape release button (e.g. FG •••D6D••).

Lock out device

The lock out device integrated in the structure of the P-KUBE Fast handles allows up to 6 padlocks to be hooked in with a shackle diameter of 6 mm to prevent unintentional closing of the guard.
When the lock out device is activated, the mechanical closing of the door and the electrical switching of the switch contacts is prevented.
The lock out device can only be unlocked when all locks have been removed, i.e. when all operators have left the danger zone.



P-KUBE Fast safety handles for FD and FG series switches

Code structure

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

VF AP-S13BP-200

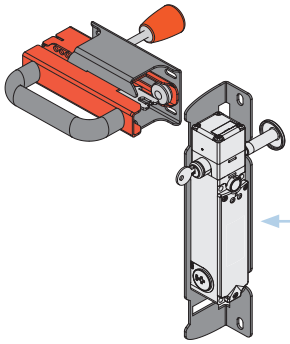
Mounting bracket supplied for installation	
A	FD ••••
B	FG ••••••••

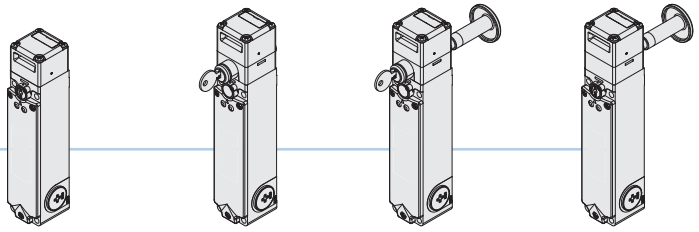
Internal lever for emergency escape	
P	internal lever for emergency escape
Z	without internal lever for emergency escape

Plate configuration	
001	without plate, with aluminium grip
002	without plate, with plastic grip
200	with plate for FG: with screwed-on aluminium grip
201	with plate for FD: with screwed-on aluminium grip
300	with plate for FG: with screwed-on plastic grip
301	with plate for FD: with screwed-on plastic grip

Note: the handle is supplied complete with switch actuator and fastening screws for fixing the switch to the plate.

VF AP-S13BP-300





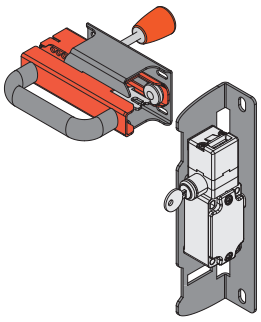
FG •••D1D••
Safety switch with solenoid and separate actuator.

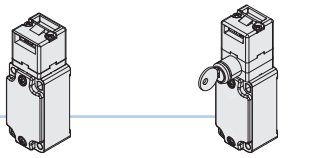
FG •••D5D••
Safety switch with solenoid and separate actuator.
With key release.

FG •••D6D••
Safety switch with solenoid and separate actuator.
With key release and escape release button.

FG •••D7D••
Safety switch with solenoid and separate actuator.
With escape release button.

VF AP-S13AP-301





FD •93-M2
Safety switch with separate actuator.

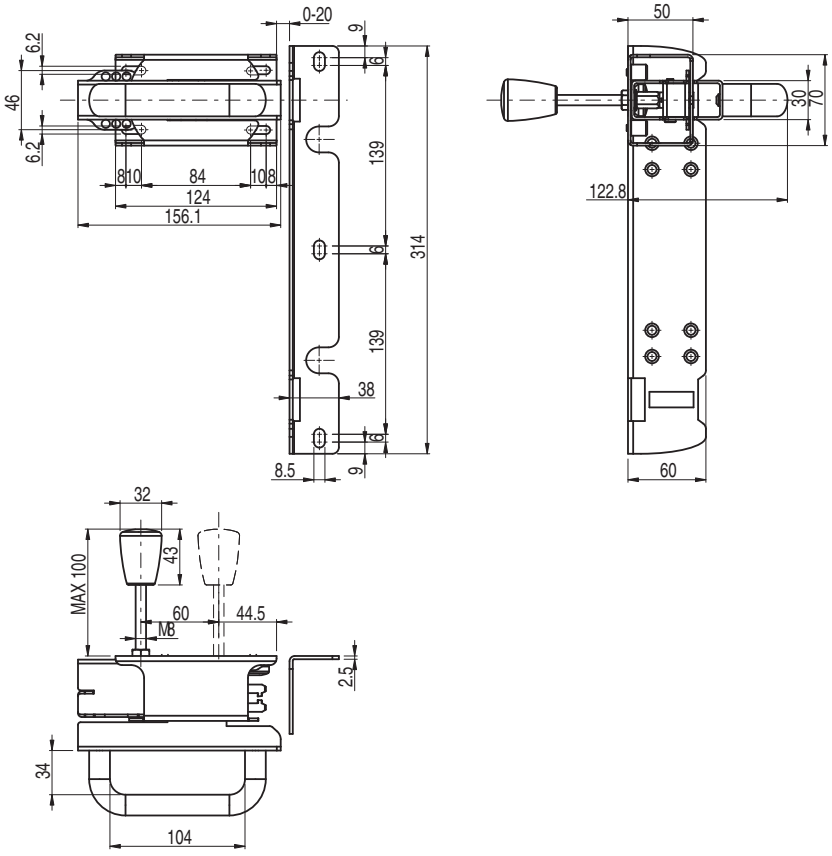
FD •99-M2
Safety switch with separate actuator and key release.

→ article sold separately

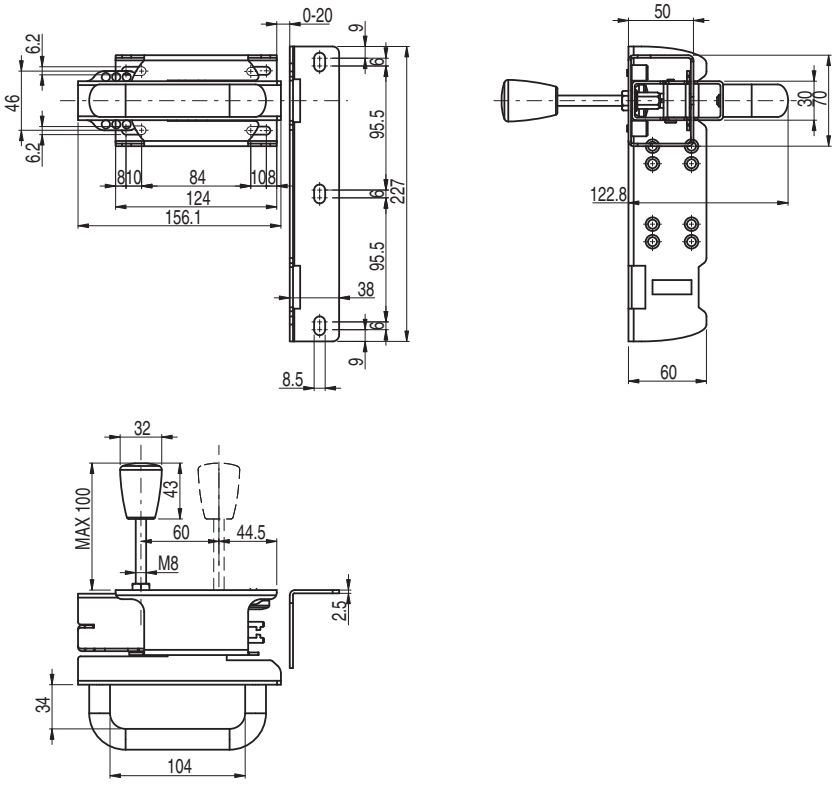
For articles and options of the FG series switches see page 107.
For articles and options of the FD series switches see page 15.

Dimensional drawings

Safety handle VF AP-S13BP-300



Safety handle VF AP-S13AP-301



All values in the drawings are in mm

Accessories See page 321

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

P-KUBE Super safety handles for NG series switches

Description

Together with the NG series RFID safety switches with guard locking, the **P-KUBE Super** safety handles form an integrated locking system for guards that enables access control to dangerous areas, offering an effective solution to designers and installers for problems related to the mechanical precision of the movements of the guard.

Designed as an evolution of the P-KUBE 2 handles, the P-KUBE Super handles with double centering pin are specifically designed for guards installed in heavy-duty work environments (e.g. rolling mills, iron and steel plants, etc.) where very heavy doors or doors with such dimensions as to generate high misalignments between the movable and fixed parts of the guard may be present.

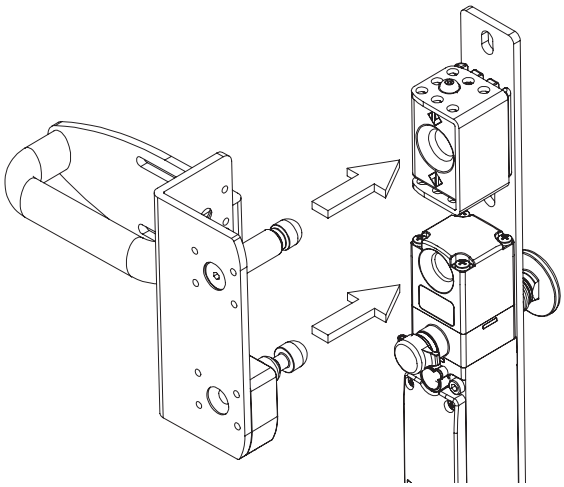
The integrated lock out device is used to block the door in the open position and prevent an unexpected system restart when maintenance personnel access the system.

Thanks to their adjustable design these handles can be installed on different types of doors or barriers: hinged or sliding, right or left closing, as well as on various types of profiles.

Maximum safety with a single device

PL e + SIL 3 The P-KUBE Super safety handles can be combined with the NG series switches. As a result, the maximum PL e and SIL 3 safety levels can be achieved through the use of a single device on a guard. This avoids expensive wiring in the field and allows faster installation. Inside the control cabinet, the two electronic safety outputs must be connected to a safety module with OSSD inputs or to a safety PLC.

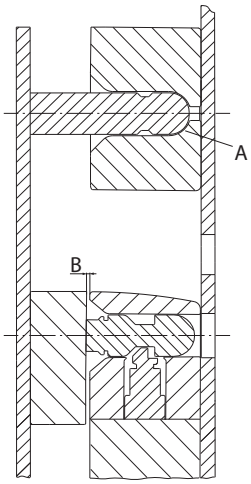
Dual centring pin



When closing the guard, the upper metal pin attached to the handle plate hits the bottom of the centering block (A) before the actuator hits the switch housing, leaving a safe distance (B) to avoid collisions between the devices.

The upper metal centering pin can also only hit surfaces that transmit the impact to the support structure of the guard but not to the switch itself, which is thus relieved of all mechanical loads when the door is opened and closed.

The coupling with the actuators of the NG series with hinge pin allows further adaptation to the centering hole even with doors with inaccurate opening, thus avoiding continuous maintenance operations to realign the actuator and switch.



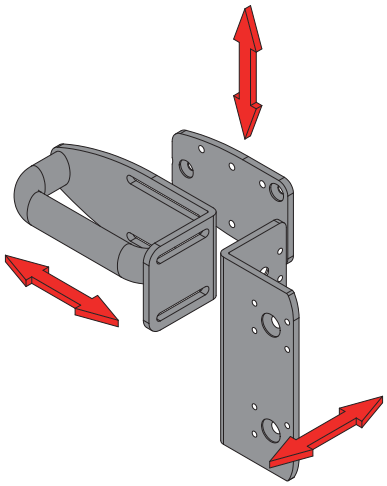
Sturdiness and easy installation

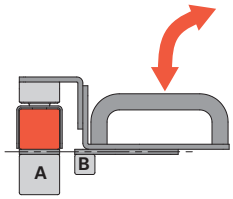
The handle is provided with 5 mm thick sturdy brackets in painted steel. The slots in the brackets allow independent adjustments to be performed. This ensures easy installation, eliminating the need to make changes to structure of the existing guard.

The adjustments make it possible to attach the handle to aluminium profiles or steel frames of various dimensions, from 40 x 40 mm to 80 x 80 mm for the frame jamb **(A)** and from 20 x 20 mm to 40 x 40 mm for the door **(B).**

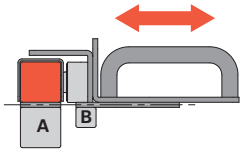
It can be installed both on hinged doors and sliding doors, either with right or left closing.

The handle is supplied with all of the components necessary for fastening at the appropriate distances with tamper-proof screws. The installer only has to assemble the components according to the application, fix the selected NG series switch (supplied separately) and make centring adjustments.

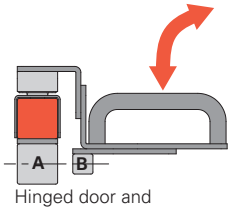




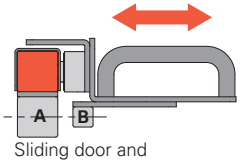
Hinged door and jamb frontally aligned



Hinged door and jamb frontally aligned

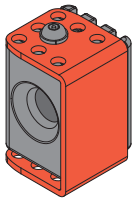


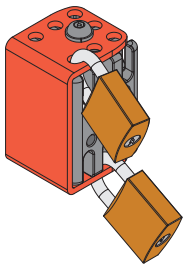
Hinged door and jamb axially aligned



Sliding door and jamb axially aligned

Lock out device



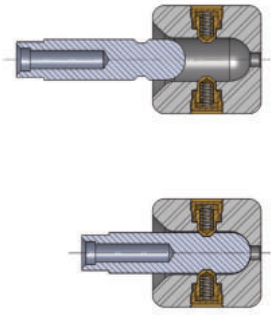


With a single operation, the lock out device can close the centering hole, making it impossible to mechanically close the door.

Simply turn the red cover so that the centering hole is completely covered and the holes on the top of the cover match the holes in the metal block underneath.

With the lock out device activated, it is possible to insert up to 12 padlocks with a shackle diameter of 5 mm; this feature makes the P-KUBE Super handle particularly suitable for large and complex systems, in which the maintenance phases require the simultaneous entry of several operators into the hazardous areas.

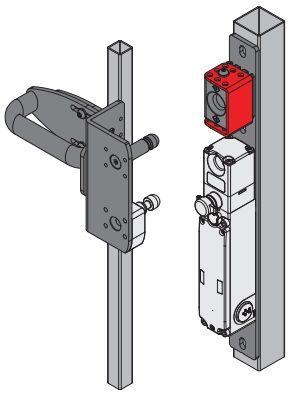
Holding force of the unlocked actuator



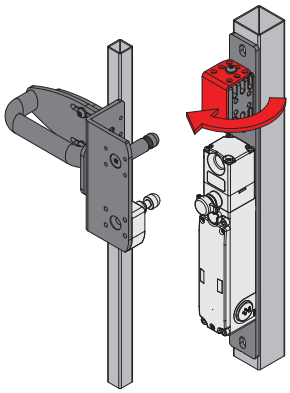
A version of the lock out device with 100 N holding force is available on request. With this new optional feature, the handle is kept in its limit-stop closed position; a moderately energetic pull is required to open the door. This device is ideal for all applications where multiple doors are unlocked simultaneously but only one is actually opened; all unlocked doors are held in position, thereby preventing vibrations or gusts of wind from opening them.

Padlocking option for protecting against errors

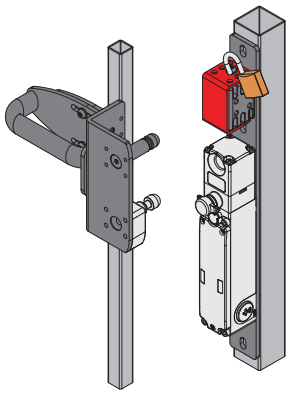
The lock out device is operated by a simple rotation of the slider to expose the holes for mounting padlocks. As a result, padlocks can no longer be mounted incorrectly, since the holes are not exposed until the switch is fully locked. 12 holes for padlocks with a diameter of 7 mm are present.



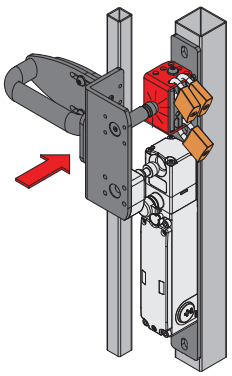
Lock out device open.
Safety switch is accessible.



Closing of the
lock out device.



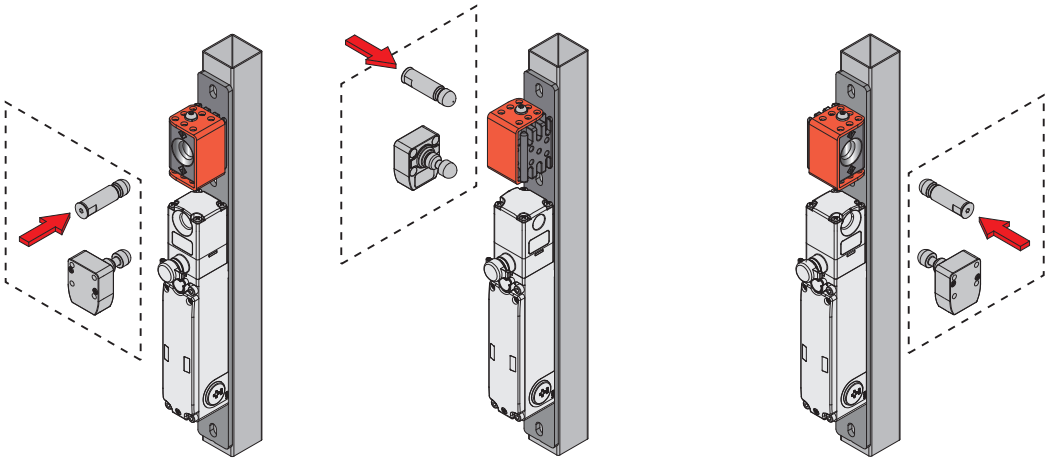
Lock out device closed.
Padlock insertion.



Lock out device locked.
Padlock locked.
Safety switch is not accessible.

Turnable centring block

The special configuration allows the use of the lock out device on hinged and sliding doors, both right and left, changing only the mounting position.



Code structure

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

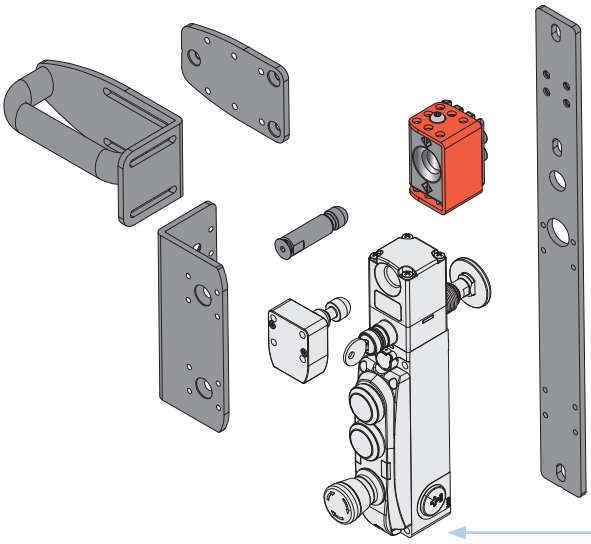
AP G2C-800P

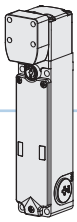
LOCK OUT device	
0	Centering block only
1	LOCK OUT device
2	LOCK OUT device with 100 N holding force

Grip	
P	plastic grip
M	metal grip

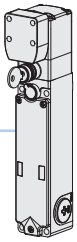
Note: the handle is supplied with fastening screws for the grip, for the switch, and for bolting the plates together.

AP G2C-800•

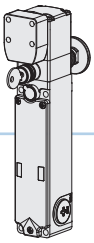




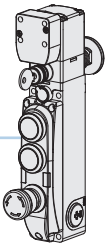
NG 2D1D••A-F3•
Safety locking switch, complete with separate actuator.



NG 2D5D••A-F3•
Safety locking switch, complete with separate actuator.
With key release.

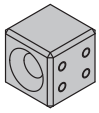


NG 2D6D••A-F3•
Safety locking switch, complete with separate actuator. With key release and escape release button.

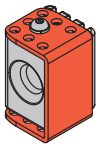


NG 2D7D••••D-F3•
Safety locking switch, complete with separate actuator.
With escape release button, lock and integrated control devices.

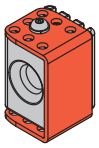
Lock out device options:



0
Centering block only



1
With LOCK OUT device

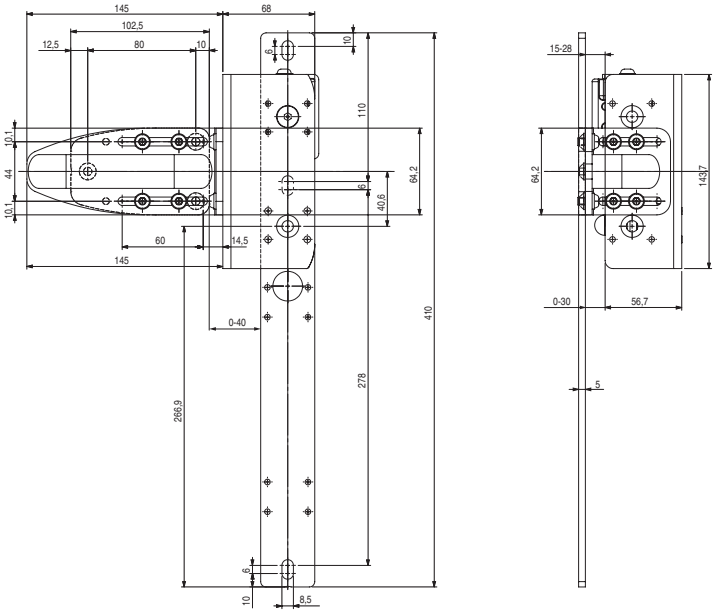


2
With LOCK OUT device with 100 N holding force

→ sold separately as accessory

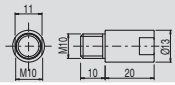
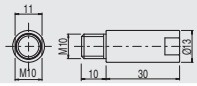
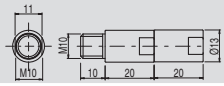
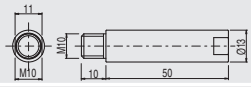
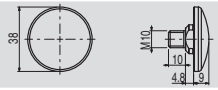
The NG series safety switch is also available in other versions. For further information see page 131.

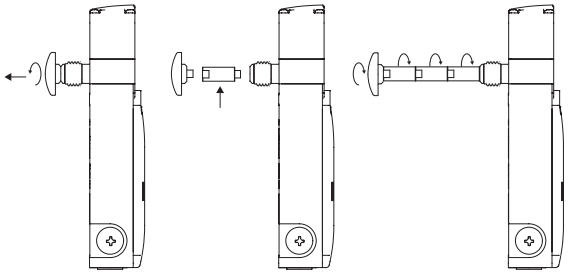
Dimensional drawings



Accessories

Extensions for release button

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



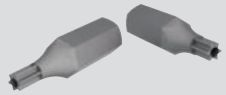
- Metal extensions can be combined with one another to achieve the desired length.
- Do not exceed an overall length of 500 mm between the release button and the switch.
- Use medium-strength thread locker to secure the extensions.

Adhesive labels for escape release button

Polycarbonate yellow adhesive, rectangular, 300 x 32 mm, red inscription. It has to be fixed on the internal part of the jamb and helps finding the escape release button.

Article	Description and language	
VF AP-A1AGR01	PREMERE PER USCIRE	ita
VF AP-A1AGR02	PUSH TO EXIT	eng
VF AP-A1AGR04	ZUM ÖFFNEN DRÜCKEN	deu
VF AP-A1AGR05	POUSSER POUR SORTIR	fra
VF AP-A1AGR06	PULSAR PARA SALIR	spa
VF AP-A1AGR07	НАЖАТЬ ДЛЯ ВЫХОДА	rus
VF AP-A1AGR08	NACISNĄĆ ABY WYJŚĆ	pol
VF AP-A1AGR09	PRESSIONAR PARA SAIR	por

Bits for safety screws



Bits for safety screws with pin, with ¼" hexagonal connection.

Article	Description
VF VAIT1T25	Bits for M5 screws with Torx T25 fitting
VF VAIT1T30	Bits for M6 screws with Torx T30 fitting

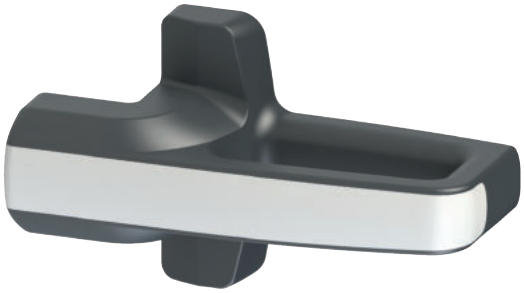
All values in the drawings are in mm

Accessories See page 321

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

P-KUBE Krome safety handles for NG and NS series switches

Description



Pizzato Elettrica is revolutionising the concept of safety handles, with the launch of the new **P-KUBE Krome** series to the market.

These products combine the characteristics of a robust handle for safety enclosures, with an ergonomic, rounded grip and customisable functions for the customer, with various illuminated signalling options, to reflect the state of the guard, or other operating conditions the manufacturer wishes to indicate. The new handles also allow integration of a control device (e.g. a button), directly in the grip.

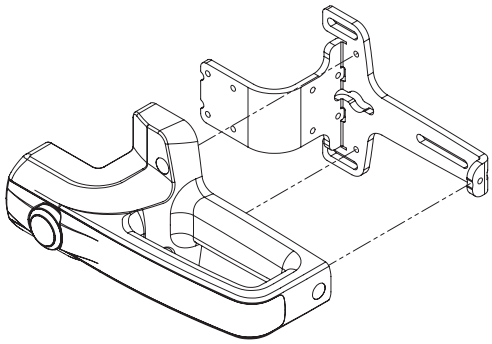
The new safety handles are a built-in and innovative solution for machine manufacturers who, with a single product and wiring harness, can optimise the cost of components, by eliminating peripheral control boxes and illuminated signalling columns, and implementing aesthetically pleasing and exclusive guards – without compromising on the quality and reliability offered by Pizzato products.

Integrated control device

In the grip of the P-KUBE Krome handle, a spring-return button with 1NO contact can be integrated. This can be illuminated with a LED, and thus allows interaction with the machinery; for example to request guard opening, or transmit a reset command. The button is available in white, red, green, yellow, blue, and black.

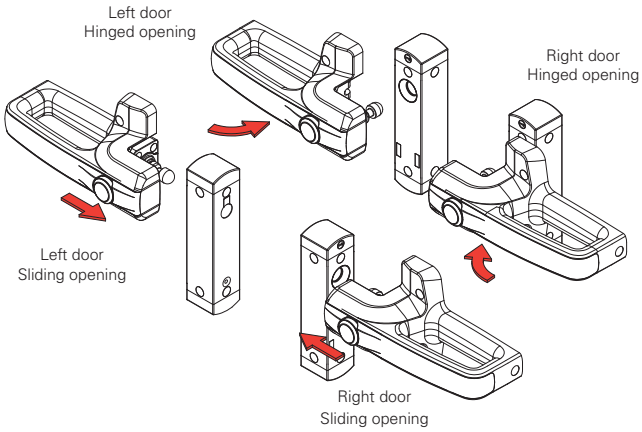
Robustness

The internal fixing plate is made of painted steel, and 5 mm thick, to ensure locking system robustness, and increased service life.



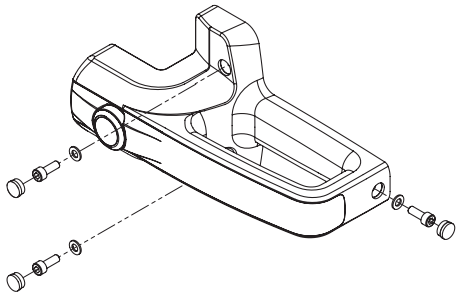
Adaptability and flexibility

The same handle can be used on both hinged and sliding doors, with opening both on the right and on the left, simply by fixing the actuator on different levels.



Protection against tampering

The P-KUBE Krome handle is supplied complete with snap-on protection caps to be applied to the holes of the fixing screws, so as to prevent access: therefore, standard screws can be used instead of tamper-proof screws, ensuring safety against deliberate tampering on the device. The caps also prevent the accumulation of soiling and facilitate the cleaning of the handle



Chrome-plated or illuminated grip

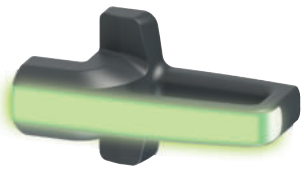
The grip is available with front strip in two finishes: satin chrome, and illuminated white. In the second version, the grip can be illuminated using RGB LED technology.

The modern, ergonomic design, combined with fully concealed fixing screws and wiring, allows implementation of machines and guards with particularly pleasing aesthetics.

Available versions

Thanks to the wide range of configurations available, the P-KUBE Krome safety handle can be ordered in the version that best suits the user's needs. Customization options apply to the handle, which can be supplied with or without a control device, or with or without RGB LED lighting. This feature allows you to find the most suitable product for a specific application or to diversify the handles that are installed on the same system, depending on the needs of machine designers and installers.

- Without control device
- Satin chrome grip not illuminated



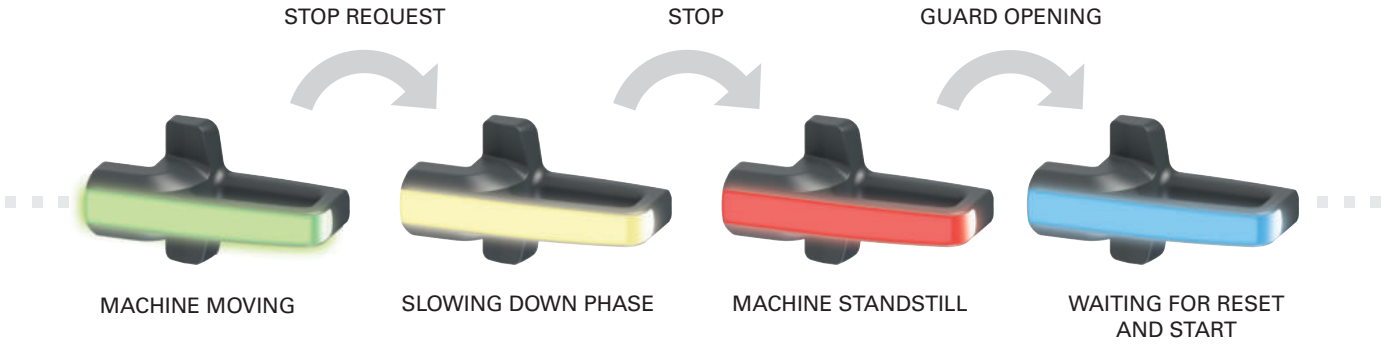
- Without control device
- White grip, can be illuminated with RGB LEDs

- With control device, can be illuminated
- Satin chrome grip not illuminated

- With control device, can be illuminated
- White grip, can be illuminated with RGB LEDs

Customisable multicoloured illumination

The P-KUBE Krome handle, with illuminated grip, allows the machine manufacturer to locally signal the state of the guard by using various colours, and fully customisable sequences. Thanks to RGB LED technology, the handle illumination is visible from a large distance; even in brightly-lit environments. The device illuminates in colours: green, yellow, red, blue, white, purple, light blue.

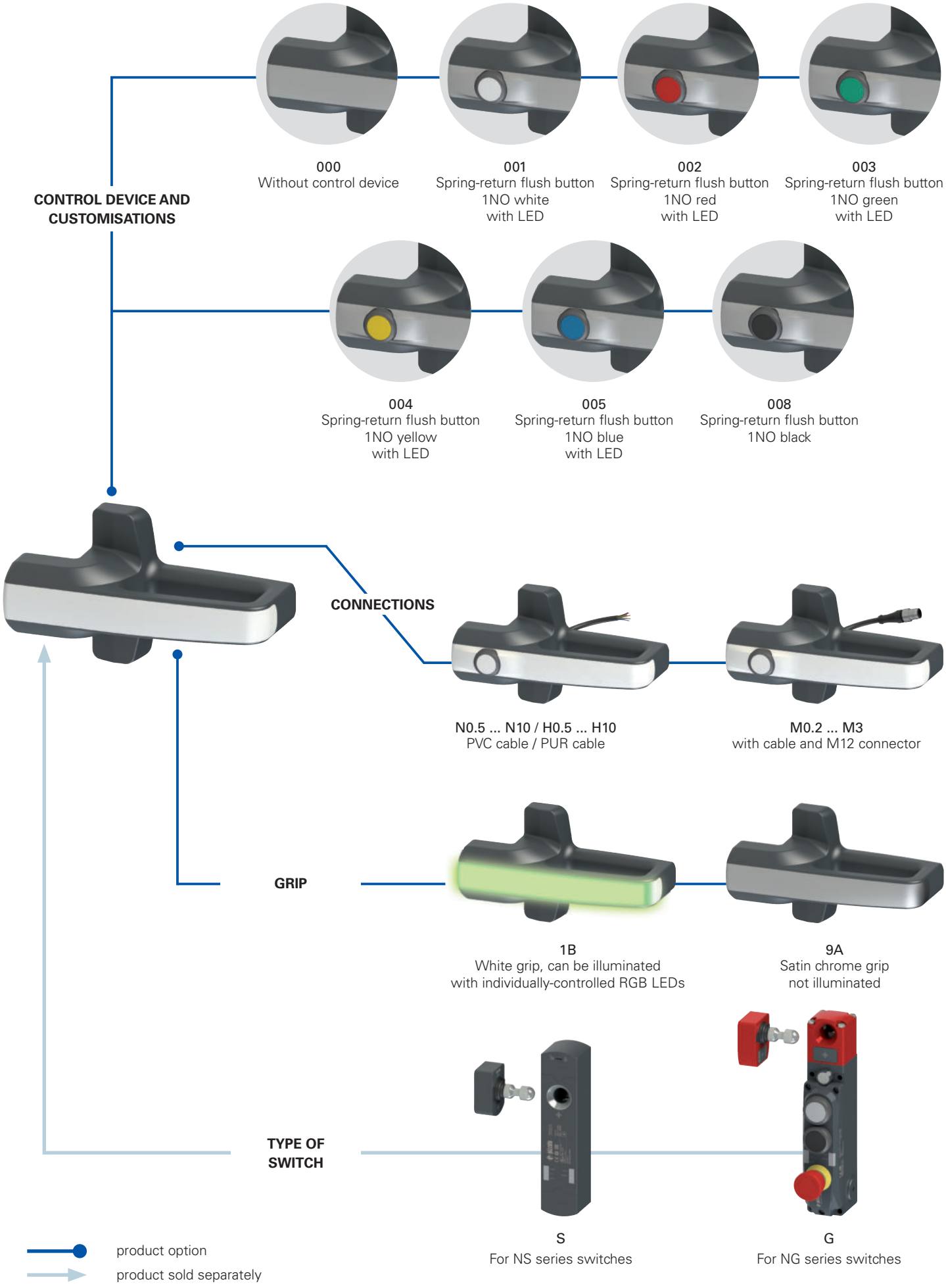


Connections

The electrical connections are made through a cable that comes out at the back of the device and can therefore be easily housed inside the frame of the guard, so as to make it completely invisible. This feature has a double advantage: contributing to the aesthetics of the machine and ensuring the protection of the cable against damage and tampering.
The P-KUBE Krome handle is available with PVC cable connections or with cable and integrated M12 connector.

P-KUBE Krome safety handles for NG and NS series switches

Selection diagram



Code structure

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

article options

AN S1B000A-PN3

Device type	
S	For NS series switches
G	For NG series switches

Note: the switches and their actuators must be purchased separately.

Grip	
1B	White grip, can be illuminated with multicolor RGB LEDs supply voltage 24 Vdc
9A	Satin chrome grip not illuminated

Control device and customisations	
000	Without control device
001	Spring-return flush button 1NO white with LED
002	Spring-return flush button 1NO red with LED
003	Spring-return flush button 1NO green with LED
004	Spring-return flush button 1NO yellow with LED
005	Spring-return flush button 1NO blue with LED
008	Spring-return flush button 1NO black

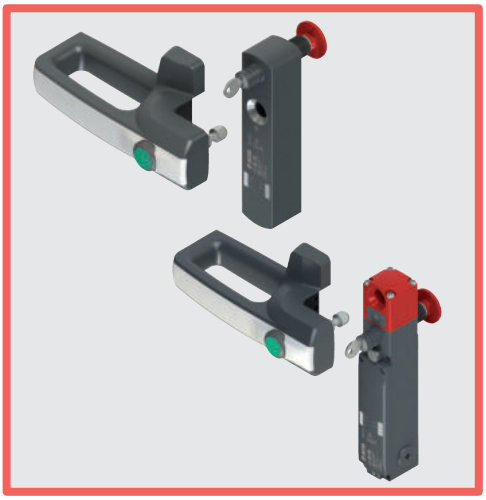
1NO+1NC, 2NC or 2NO contacts available on request.

Other control devices on request, see page 143.

Cable type and connection	
M0.2	PVC cable, IEC 60332-1-2 oil resistant, length 0.2 m and M12 connector (standard)
M0.5	PVC cable, IEC 60332-1-2 oil resistant, length 0.5 m and M12 connector
...	...
M3	PVC cable, IEC 60332-1-2 oil resistant, length 3 m and M12 connector
N0.5	PVC cable, IEC 60332-1-2 oil resistant, length 0.5 m
...	...
N3	PVC cable, IEC 60332-1-2 oil resistant, length 3 m (standard)
...	...
N10	PVC cable, IEC 60332-1-2 oil resistant, length 10 m
H0.5	PUR cable, halogen free, length 0.5 m
...	...
H3	PUR cable, halogen free, length 3 m (standard)
...	...
H10	PUR cable, halogen free, length 10 m

Output direction, connections	
P	rear output

P-KUBE Krome safety handles for NG and NS series switches



Main features

- Modern and ergonomic design
- Versions with integrated RGB LEDs, for local signalling of guard state
- Customisable multicoloured illumination
- Illuminated control button integrated into grip
- Grip with different finishes
- Compatible with NG and NS series safety locking switches with RFID technology

Quality marks:

UL approval:	E131787
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Materials
Internal fixing plate in steel, oven-cured powder-coated.
Glass fibre reinforced technopolymer grip, self-extinguishing and shock-proof.

Electrical cables
Integrated mobile installation cable 8 x 0.25 mm^2 or 5 x 0.25 mm^2.
Versions with 3 m integrated cable, other lengths 0.5 to 10 m on request.
Versions with 0.2 m cable and M12 connector, other lengths 0.2 to 3 m on request.

General data

Protection degree	
Versions with control device:	IP65 acc. to EN 60529
Versions without control device:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653
Ambient temperature:	-20 ... +50°C
Storage temperature:	-40 ... +75°C
Mission time:	20 years

Power supply electrical data

Rated operating voltage U_e:	24 Vdc ± 15%
Operating current at U_e voltage:	75 mA max
External protection fuse:	1 A type Gg or equivalent device

Electrical data of RGB LED control inputs

Rated operating voltage U_{e1}:	24 Vdc
Operating current at U_{e1} voltage:	5 mA
RGB LED life:	min. 100,000 hours at rated voltage and +25 °C ambient temperature

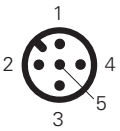
Technical data of the control devices

Mechanical endurance:	1 million operating cycles
Actuating force:	4 N min, 100 N max
Contact material:	silver contacts
Contact design:	Self-cleaning contacts with double interruption
Thermal current I_{th2}:	1 A
Rated insulation voltage U_{i2}:	32 Vac/dc
Rated impulse withstand voltage U_{imp2}:	1.5 kV
LED supply voltage:	24 Vdc ± 15%
Single LED supply current:	10 mA
Utilization category of the contact block:	DC13; U_{e2}=24 Vdc, I_{e2}=0.55 A

In compliance with standards:
For articles with integrated electrical parts:
IEC 60947-5-1, EN 60947-5-1, IEC 60947-1, EN 60947-1, IEC 60529, EN 60529, EN IEC 63000, UL 508, CSA 22.2 N. 14.

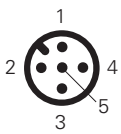
Compliance with the requirements of:
For articles with integrated electrical parts:
Low Voltage Directive 2014/35/EU,
EMC Directive 2014/30/EU.
For all products:
RoHS Directive 2011/65/EU.

Electrical connections



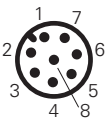
Versions with button
articles AN •9A••••

Pin	Cable colour	Connection
1	brown	Supply to white button LED +24 Vdc
2	white	Supply to white button LED 0 V
3	blue	Disconnected
4	black	Button NO contact
5	grey	Button NO contact



Versions with illuminated grip
articles AN •1B000•

Pin	Cable colour	Connection
1	brown	Supply input +24 Vdc
2	white	Supply input +0 Vdc
3	blue	Control input blue (B) +24 Vdc
4	black	Control input red (R) +24 Vdc
5	grey	Control input green (G) +24 Vdc



Versions with button and illuminated grip
articles AN •1B••••

Pin	Cable colour	Connection
1	white	Supply input +0 Vdc
2	brown	Supply input +24 Vdc
3	green	Control input green (G) +24 Vdc
4	yellow	LED power supply for button lighting +24 Vdc
5	grey	Button NO contact
6	pink	Button NO contact
7	blue	Control input blue (B) +24 Vdc
8	red	Control input red (R) +24 Vdc

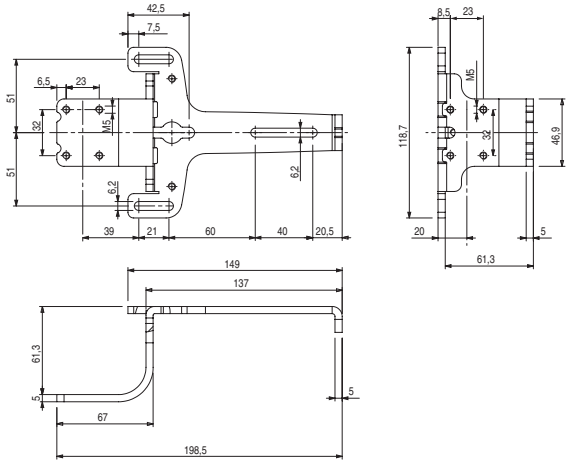
LED handle lighting combinations

R	G	B	Colour	R	G	B	Colour
0	0	0		1	1	0	
1	0	0		1	0	1	
0	1	0		0	1	1	
0	0	1		1	1	1	

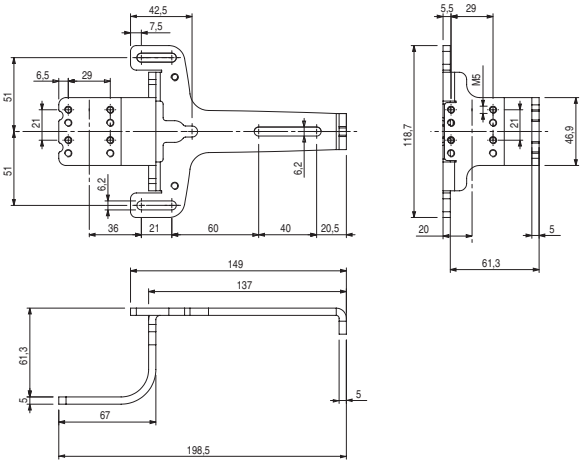
0 = colour control input off, 1 = colour control input on.

Dimensional drawings

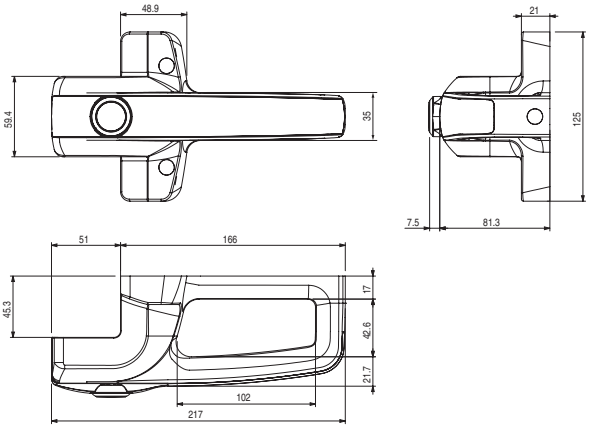
Internal fixing plate (articles AN S••••••)



Internal fixing plate (articles AN G••••••)

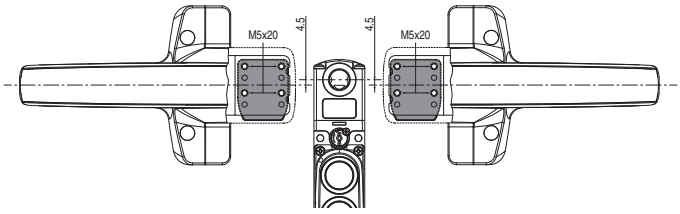


Grip

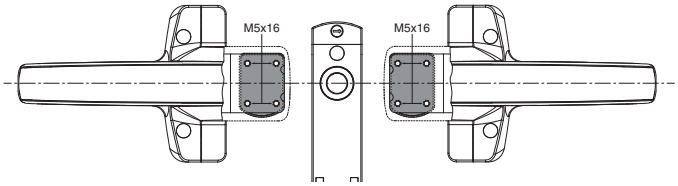


Switch-actuator alignment

Articles AN G••••••



Articles AN S••••••



All values in the drawings are in mm

Accessories See page 321

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

LK S lock out device for NS series switches

Description

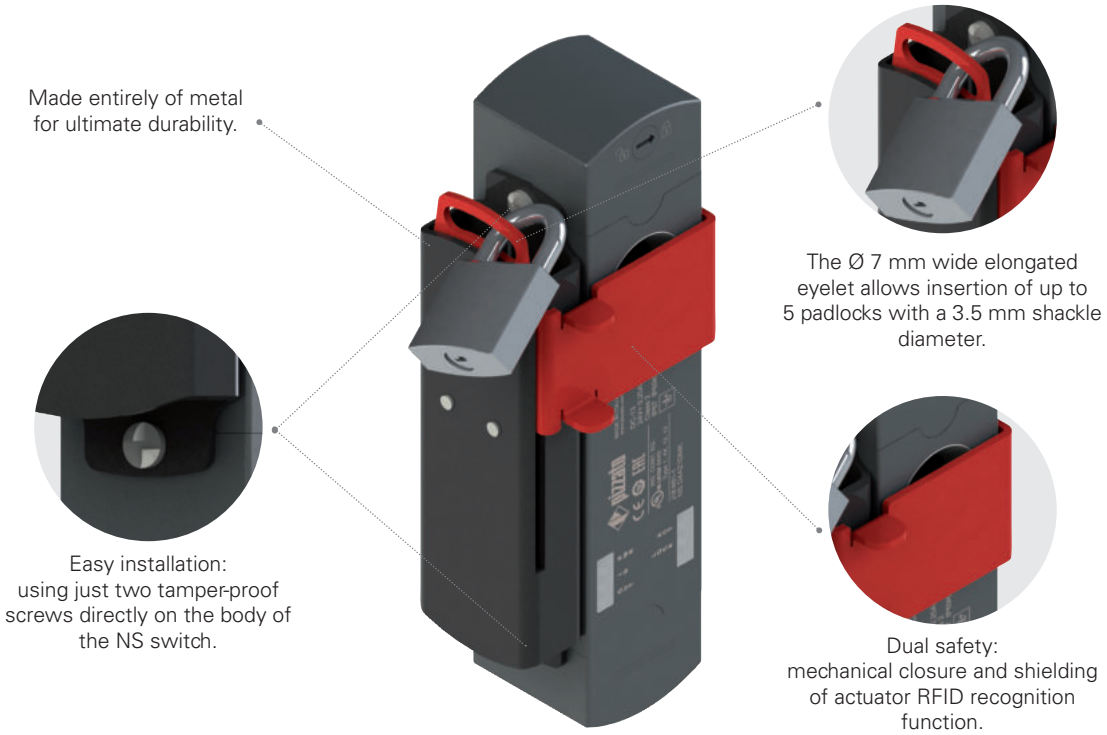
Article	Description
LK S1D001	Lock out device for NS series switches, mounting on the right side of the switch
LK S1S001	Lock out device for NS series switches, mounting on the left side of the switch

The range of P-KUBE Krome safety handles is completed by the lock out device for NS series switches with solenoid and RFID technology. The device has a full metal design and is attached laterally to the holes on the NS device, without any auxiliary fixing plate or support.

The front slider, in addition to mechanically closing the actuator entry hole, also functions as a shield for the RFID receiver antenna on the NS switch; thus ensuring an additional level of protection against accidental closure of the guard and untimely machine restart. This is particularly effective, for example, for machines with an installed low-level coded actuator, making any attempt to bypass the switch impossible.

When the slider is lifted, a Ø 7 mm wide elongated eyelet emerges on the top of the device, allowing insertion of up to 5 padlocks.

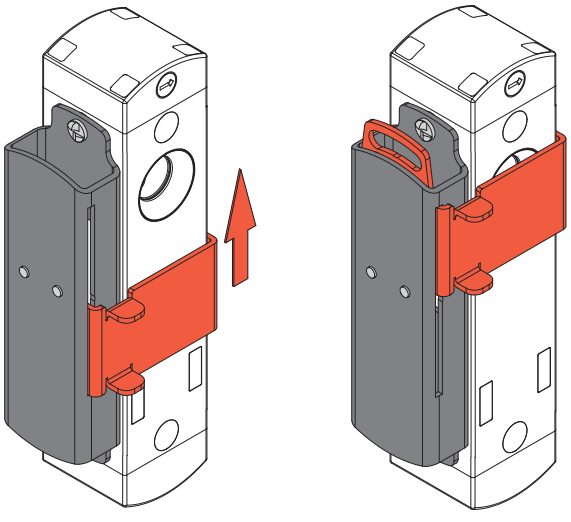
General data



Error-proof operation

To prevent unintentional guard closure, simply move the red door upwards so that the actuator entry hole is fully covered, and the pin cannot be inserted.

Before entering the danger zone, each operator must insert his or her own personal padlock in the lock out slot. This means that the lock out device can be unlocked only once all padlocks have been removed; i.e., once all operators have exited the danger zone.

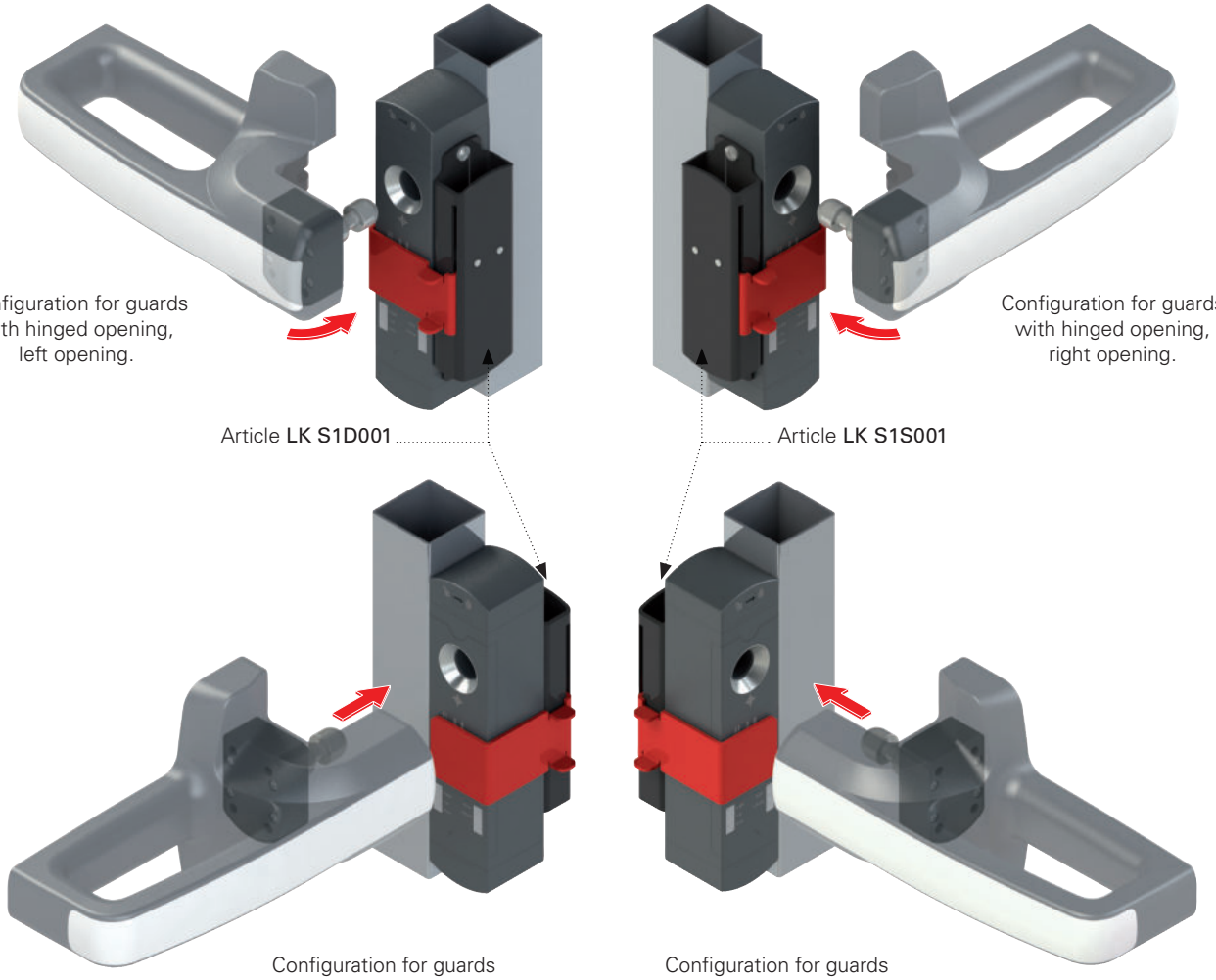


Lock out disabled

Lock out enabled

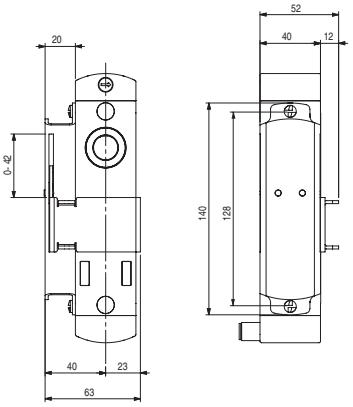
Maximum adaptability and compatibility

The precise engineering of the LK S lock out device has enabled implementation of a highly versatile product, able to easily adapt to all potential configurations of guards on which an NS series switch is used.
The unique shape of the slider that seals the actuator hole allows the LK S lock out device to be used on both hinged and sliding guards, on both left and right.
The lock out and interlock switch are designed and manufactured for ideal compatibility with the new P-KUBE Krome handles by Pizzato Elettrica; allowing implementation of robust and functional protection systems, with an innovative aesthetic impact.

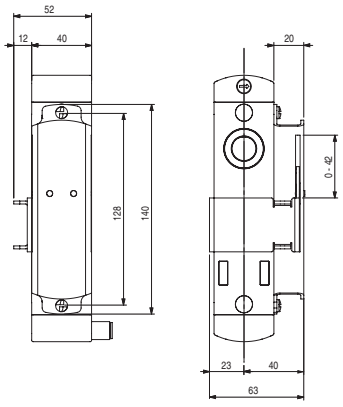


Dimensional drawings

Article LK S1S001



Article LK S1D001



All values in the drawings are in mm

Accessories See page 321

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

AP G1Z-000Z lock out device for NG series switches

Description

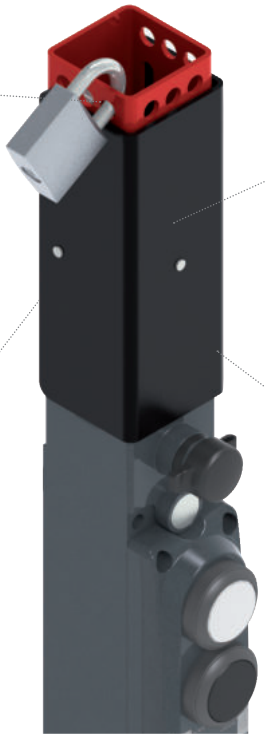
Article	Description
AP G1Z-000Z	Lock out device for NG series switches

Lock out device made entirely of metal to be installed with NG series switches with solenoid and RFID technology, compatible with the P KUBE 2 and P KUBE Krome series safety handles.
To prevent unintentional guard closure, simply move the black slider down so that the actuator entry hole is fully covered.
When the slider is lowered, a plate with Ø 7 mm holes emerges on the top of the device, allowing insertion of up to 9 padlocks.
The slider also serves as a shield for the RFID receiver antenna on the NG switch.

General data

The 7 mm diameter holes allow up to 9 padlocks to be used simultaneously.

Easy installation:
installation with only 2 screws, suitable for guards with hinged or sliding opening, without having to change the direction of installation.

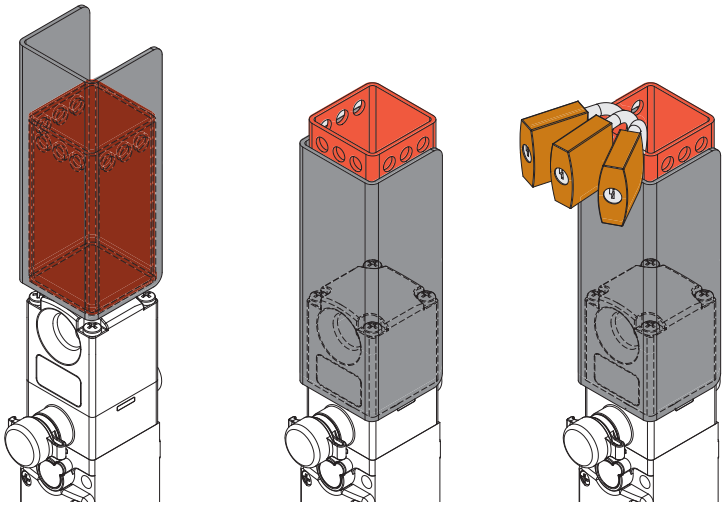


Made entirely of metal for ultimate durability.

Dual safety:
mechanical closure and shielding of actuator RFID recognition function.

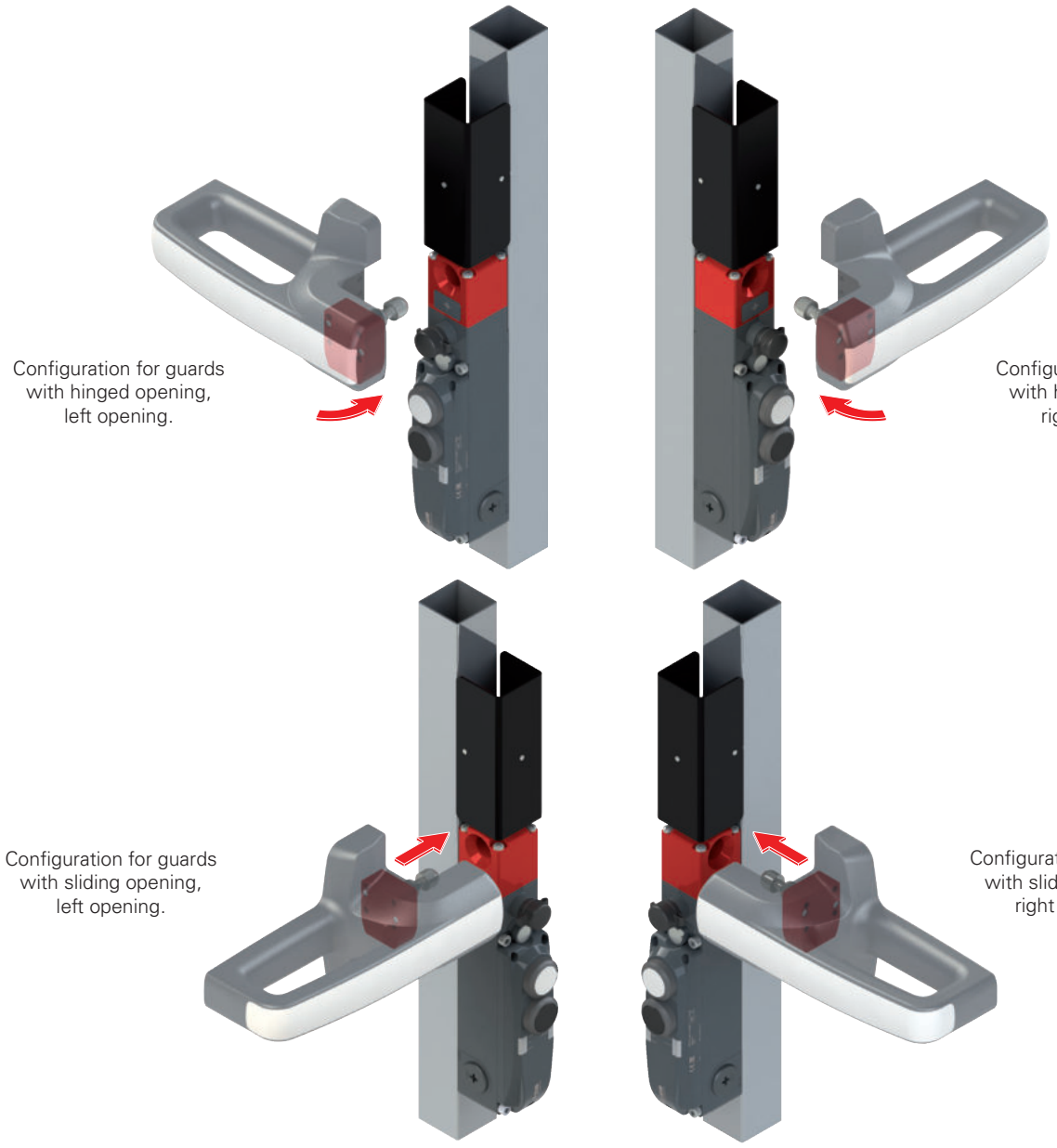
Error-proof operation

With a single operation, the lock out device can close the centring hole in the NG switch as well as shield the RFID recognition system for detecting the actuator. Accidental closing of the guard is thereby prevented by inhibiting both the mechanical locking of the door and the electrical switching of the switch contacts.



Maximum adaptability and compatibility

The symmetry of the AP G1Z-000Z lock out device allows it to be used in all possible configurations of guards on which a switch of the NG series is used, without any type of adaptation and any modification to the mounting position.
The unique shape of the slider that seals the actuator hole allows the AP G1Z-000Z lock out device to be used on both hinged and sliding guards, on both left and right.
The lock out and interlock switch are designed and manufactured for ideal compatibility with the new P-KUBE Krome handles by Pizzato Elettrica; allowing implementation of robust and functional protection systems, with an innovative aesthetic impact.



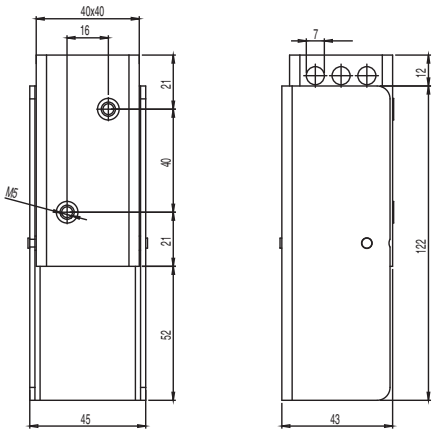
Configuration for guards with hinged opening, left opening.

Configuration for guards with hinged opening, right opening.

Configuration for guards with sliding opening, left opening.

Configuration for guards with sliding opening, right opening.

Dimensional drawings



All values in the drawings are in mm

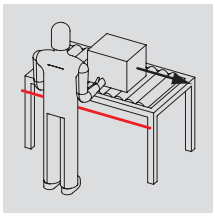
Accessories See page 321

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

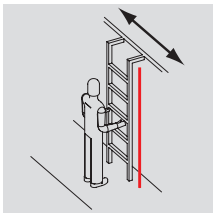
Introduction to **rope** safety switches

Description

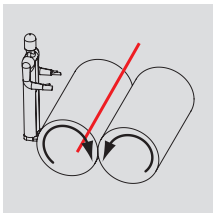
The rope switches from Pizzato Elettrica are the result of many years of experience and cooperation with major industrial machine manufacturers. The products can be used in nearly all industrial applications, including many niche solutions. The product range includes solutions for general start/stop applications as well as for emergency stop switches. The emergency-stop rope switches were the first on the market to satisfy the requirements of EN ISO 13850 with patented solutions in a small size. The range of products offered by Pizzato Elettrica is complemented with appropriate accessories for safe and long-term use, even under difficult environmental conditions. Among the latest product innovations, the fastening and tensioning systems of the "FAST" line are worth mentioning (patented). At the focus of this development was the fast installation and an attractive design that blends harmoniously into the flowing designs of current machine generations.



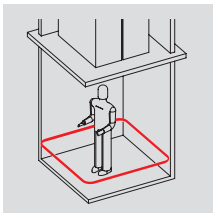
Conveyors



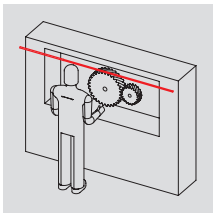
Sliding ladders



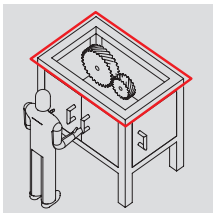
Rollers



Lift compartment



Long bay machinery



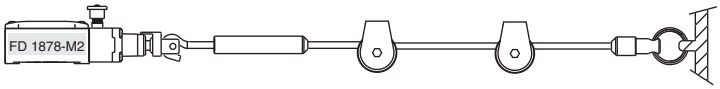
Complete perimeter protection

Rope switches are used to give different types of commands.

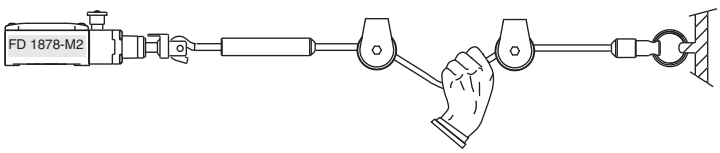
- **For stop commands,** rope switches with positive opening at medium rope tension are used; this also allows damage to the rope to be detected.
- **For emergency stop,** rope switches with positive opening in accordance with EN ISO 13850 are used. Here, the mechanical reset system opens the contact independent of the actuation speed of the rope, upon both actuation as well as breakage of the rope. With these switches, the reset system must be manually reset after each intervention.

	Requirements	Colours	How to install:
Stop commands  example: FD 1879-M2	Positive opening is required ⊖	Black is the colour suggested by standards for stop operations.	 The rope should be tensioned so as to enable detection of any breaks or stretching of the rope
Emergency stops  example: FD 1878-M2	Positive opening is required ⊖ Compliance with EN ISO 13850 is required	For emergency stops red rope is compulsory. A yellow background is recommended (see function indicator).	 The rope must be tensioned so as to enable detection of any breaks or stretching of the rope

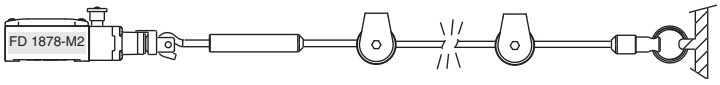
Detection of an actuated or cut rope



Rope correctly mounted and in resting position, electric contacts closed.



Rope pulled by operator, electric contacts open.



Rope cut, electric contacts open.

Accessories for rope locking and tightening, "FAST" system

Pizzato Elettrica has developed and patented special accessories for more quickly installing the ropes of safety switches and at the same time creating a more aesthetically pleasing system.

Compared to the traditional fixing method, the new accessories offer the following advantages:

- The installation is faster because only one screw is used for the fastening of every rope extremity, and the parts are designed to ease the installation. Practical tests have shown that the installation time is reduced by over half, hence the name: "FAST".
- The system is aesthetically pleasant, because thread parts (which sometimes tear operators' dresses) and the rope extremities, usually fixed by heat-shrinkable sheath or adhesive tape, have been hidden.
- The rope is fixed without kinking and, as a result, does not stretch over time; re-calibration of the rope tension is no longer necessary.

The system has been tested for correct function only if used with steel ropes of high quality like the ones Pizzato Elettrica supplies.

Rope function indicator

These function indicators help in the visualization of the rope and its emergency function highlighting its presence as recommended by the standard EN ISO 13850 chap. 4.5.1 and 4.4.5.

They are fixed on the rope through screws and thanks to their handle-shape make the operation easier. The indicators can be supplied with different texts in several languages.

LED signalling light

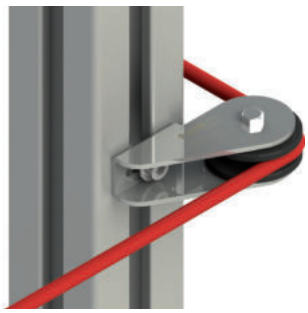
It is sometimes important to have an indicator that is visible on-site to indicate which rope switch has been actuated. The high luminosity LED signalling lights from Pizzato Elettrica were developed for this purpose and can be installed directly on the threaded cable glands of the switches. These signalling lights are robust and designed in protection degrees IP67 and IP69K. The inner part of the signalling light can rotate in such a way that it can be wired without any risk of kinking the wires. They are available for power supplies of 24 Vac/dc, 120 Vac and 230 Vac and can be delivered in red, green, yellow and white. Rope switches with three contacts facilitate the realisation of systems in which each switch has two NC contacts with positive opening for the safety chain and one NO contact for the signalling light.

For more details see page 312.

Safety springs

For some applications, ropes are needed for covering especially long spans. With day/night changes of temperature, the ropes are lengthened or shortened in proportion to the rope length, to the change of temperature and to the coefficient of expansion of the steel. The changes of the rope length do not have linear repercussions on the switch, because the very long ropes are regularly sustained by supports that modify the linearity of the system. With safety switches, the rope must be under tension within an operating tension range. As a result, an undesired actuation of the safety switch is possible with very long ropes or in the case of very high temperature differences. To reduce the effect of the changes of the temperature, it is possible to install a safety spring at the opposite extremity of the switch, so the rope elongation is equally divided between the two devices. The safety spring has been made to have an elastic coefficient equal to the spring inside the switch. In addition, the safety spring is equipped with a fixed ring that fully transfers the tensile force to the switch.

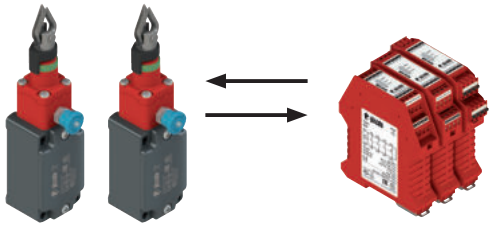
Stainless steel rope pulleys



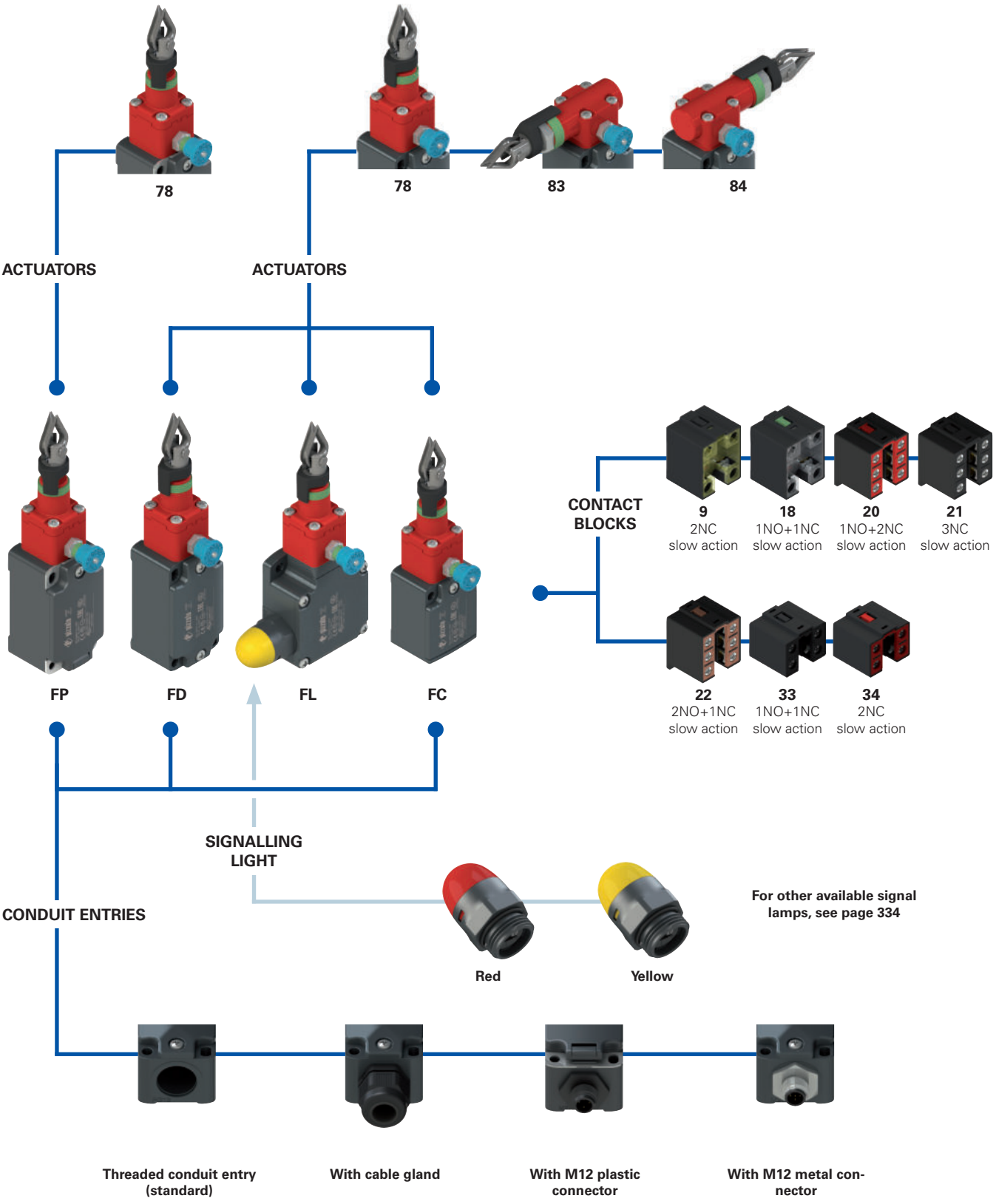
The pulleys in stainless steel are used in applications where the rope is rather long, to support its length or bend its route. The two available pulleys are robust and dimensioned so as not to deform and to securely hold the rope in the guide even if the rope is pulled energetically. The angular pulley is available in different designs with a slotted fixing hole. This simplifies installation and ensures that the rope retains the correct distance from guard edges.

Safety modules

The rope safety switches inserted in the emergency chains can be connected with the Pizzato Elettrica safety modules in order to obtain safety circuits up to PL e in accordance with EN ISO 13849. Safety modules with instantaneous and delayed contacts are available for the realization of emergency circuits type 0 (immediate stop) or type 1 (monitored stop).



Selection diagram



Code structure

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

article | options | options

FD 1878-E7GM2K50T6

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

Contact blocks	
9	2NC, slow action
18	1NO+1NC, slow action
20	1NO+2NC, slow action
21	3NC, slow action
22	2NO+1NC, slow action
33	1NO+1NC, slow action
34	2NC, slow action

Actuating head	
78	longitudinal head
83	left transversal head (FD-FL housing only)
84	right transversal head (FD-FL housing only)

Actuating force	
	standard
E7	initial 20 N...final 40 N (only head 78)
E9	initial 13 N...final 75 N (only head 83-84)

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

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

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

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

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

article | options | options

FC 3378-E7GM2K50T6

Housing	
FC	metal, one conduit entry

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

Actuating head	
78	longitudinal head
83	left transversal head
84	right transversal head

Actuating force	
	standard
E7	initial 20 N...final 40 N (only head 78)
E9	initial 13 N...final 75 N (only head 83-84)

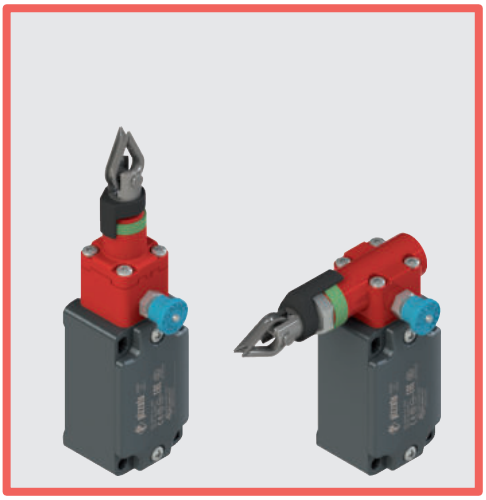
Contact type	
	silver contacts (standard)
G	silver contacts with 1 µm gold coating

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

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

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

Safety **rope switches with reset** for emergency stop



Main features

- Metal or plastic housing, from one to three conduit entries
- Protection degree IP67
- In compliance with EN ISO 13850
- 7 contact blocks available
- Versions with vertical or horizontal actuation
- Versions with assembled M12 connector
- Versions with gold-plated silver contacts

Quality marks:

IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety parameters:	
B_{10D}:	2,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	1 cycle / 6 s
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Tightening torques for installation:	see page 339
Wire cross-sections and wire stripping lengths:	see page 357

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN ISO 13850, EN 418, EN 50581, UL 508, CSA 22.2 No.14.
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14 , GB/T14048.5-2017.

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

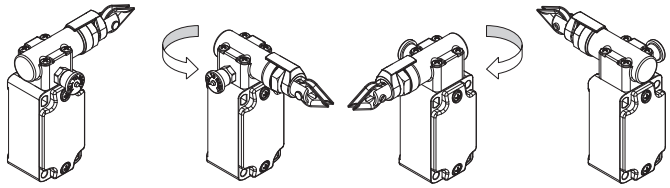
⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

	Electrical data		Utilization category
without connector	Thermal current (I_{th}):	10 A	
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	Alternating current: AC15 (50÷60 Hz) U_e (V) 250 400 500 I_e (A) 6 4 1
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)	Direct current: DC13
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	U_e (V) 24 125 250
	Protection against short circuits:	type aM fuse 10 A 500 V	I_e (A) 3 0.55 0.3
	Pollution degree:	3	
with M12 connector, 4 and 5-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24 120 250 I_e (A) 4 4 4
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	Direct current: DC13
	Protection against short circuits:	type gG fuse 4 A 500 V	U_e (V) 24 125 250
	Pollution degree:	3	I_e (A) 3 0.55 0.3
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz) U_e (V) 24
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	I_e (A) 2
	Protection against short circuits:	type gG fuse 2 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 I_e (A) 2

Description

These rope-operated safety switches are installed on machines or conveyor belts and allow the machine to be brought to an emergency stop from any point and with any pull on the rope. This means significant cost savings for medium and large machines, since multiple emergency-stop buttons can be replaced with a single switch. They are equipped with a self-control function that constantly checks the correct function and signals a possible loosening or breaking of the rope through the opening of the contacts. These safety switches keep the contacts open after activation until the reset is performed, even if the rope is released.

Head with variable orientation



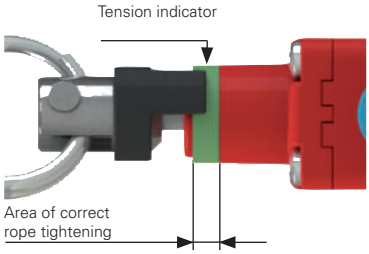
For all switches, the head can be adjusted in 90° steps after removing the four fastening screws.

Extended temperature range

-40°C

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

Indicator for rope adjustment



All switches are provided with a green ring that shows the area of the correct tightening of the rope. The installer has only to tighten the rope until the black indicator will be in the middle of the green area. With this setting, the switch can be reset by pulling the blue knob to close the electrical safety contacts.

If the tension (or loosening) on the rope is so high that the black indicator exits the green area, the electrical safety contacts will open and the reset device will trigger.

Laser engraving

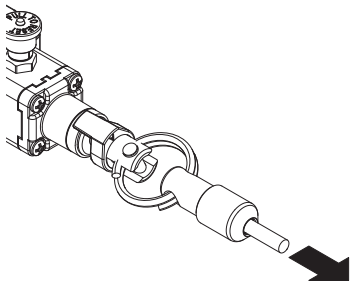
All devices are marked using a dedicated indelible laser system. These engravings are therefore suitable for extreme environments too. Thanks to this system that does not use labels, the loss of plate data is prevented and a greater resistance of the marking is achieved over time.

Protection degree IP67

IP67

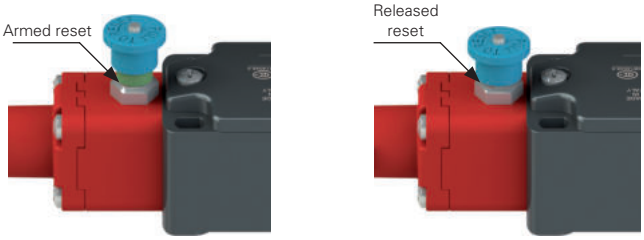
These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where maximum protection degree of the housing is required.

Reduced actuating force



These switches can be supplied with reduced hardness internal springs on request. The force required to actuate the switch can thereby be reduced without changing the actuating path of the electrical contacts. This is particularly advantageous for smaller spans, but must, however, always make use of rope pulleys.

Indicator for the state of the reset



If the tension indicator is in the green area, the electrical safety contacts can be closed by pulling the blue knob. The reset status can be identified quickly by the green ring under the blue knob.

Features approved by IMQ

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

Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X
Positive opening contacts on contact blocks 9, 18, 20, 21, 22, 33, 34
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

Features approved by UL

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

Use 60 or 75°C copper (Cu) conductor and wire size range 12, 14 AWG, stranded or solid.

The terminal tightening torque of 7.1 lb in (0.8 Nm).

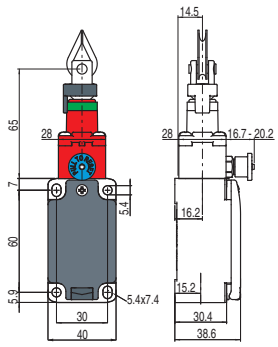
For FP series: the hub is to be connected to the conduit before the hub is connected to the enclosure.

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

Safety **rope switches with reset** for emergency stop

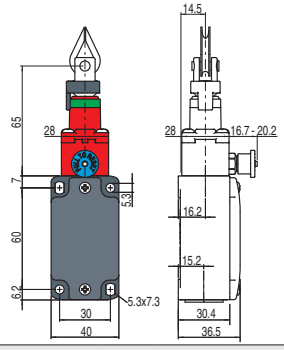
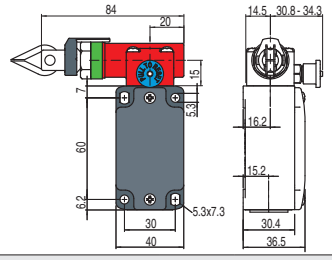
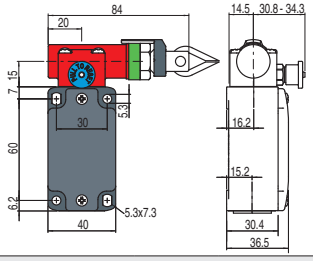
Contact type:
L = slow action

Contact blocks

		Technopolymer housing		
				
9	L	FP 978-M2	→	2NC
18	L	FP 1878-M2	→	1NO+1NC
20	L	FP 2078-M2	→	1NO+2NC
21	L	FP 2178-M2	→	3NC
22	L	FP 2278-M2	→	2NO+1NC
33	L	FP 3378-M2	→	1NO+1NC
34	L	FP 3478-M2	→	2NC
Actuating force		Initial 63 N … final 83 N (90 N →)		
Travel diagrams		Page 196 - group 1		

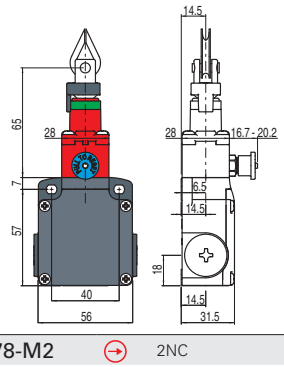
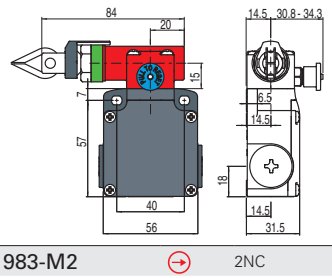
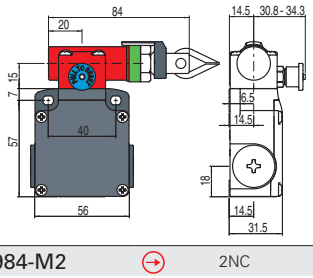
Contact type:
L = slow action

Contact blocks

		Metal housing			Metal housing			Metal housing		
										
9	L	FD 978-M2	→	2NC	FD 983-M2	→	2NC	FD 984-M2	→	2NC
18	L	FD 1878-M2	→	1NO+1NC	FD 1883-M2	→	1NO+1NC	FD 1884-M2	→	1NO+1NC
20	L	FD 2078-M2	→	1NO+2NC	FD 2083-M2	→	1NO+2NC	FD 2084-M2	→	1NO+2NC
21	L	FD 2178-M2	→	3NC	FD 2183-M2	→	3NC	FD 2184-M2	→	3NC
22	L	FD 2278-M2	→	2NO+1NC	FD 2283-M2	→	2NO+1NC	FD 2284-M2	→	2NO+1NC
33	L	FD 3378-M2	→	1NO+1NC	FD 3383-M2	→	1NO+1NC	FD 3384-M2	→	1NO+1NC
34	L	FD 3478-M2	→	2NC	FD 3483-M2	→	2NC	FD 3484-M2	→	2NC
Actuating force		Initial 63 N … final 83 N (90 N →)			Initial 147 N … final 235 N (250 N →)			Initial 147 N … final 235 N (250 N →)		
Travel diagrams		Page 196 - group 1			Page 196 - group 2			Page 196 - group 2		

Contact type:
L = slow action

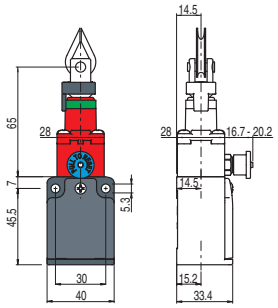
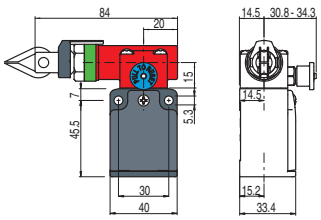
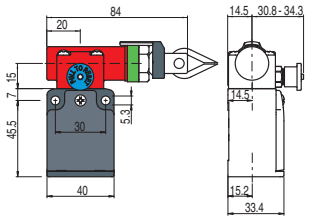
Contact blocks

		Metal housing			Metal housing			Metal housing		
										
9	L	FL 978-M2	→	2NC	FL 983-M2	→	2NC	FL 984-M2	→	2NC
18	L	FL 1878-M2	→	1NO+1NC	FL 1883-M2	→	1NO+1NC	FL 1884-M2	→	1NO+1NC
20	L	FL 2078-M2	→	1NO+2NC	FL 2083-M2	→	1NO+2NC	FL 2084-M2	→	1NO+2NC
21	L	FL 2178-M2	→	3NC	FL 2183-M2	→	3NC	FL 2184-M2	→	3NC
22	L	FL 2278-M2	→	2NO+1NC	FL 2283-M2	→	2NO+1NC	FL 2284-M2	→	2NO+1NC
33	L	FL 3378-M2	→	1NO+1NC	FL 3383-M2	→	1NO+1NC	FL 3384-M2	→	1NO+1NC
34	L	FL 3478-M2	→	2NC	FL 3483-M2	→	2NC	FL 3484-M2	→	2NC
Actuating force		Initial 63 N … final 83 N (90 N →)			Initial 147 N … final 235 N (250 N →)			Initial 147 N … final 235 N (250 N →)		
Travel diagrams		Page 196 - group 1			Page 196 - group 2			Page 196 - group 2		

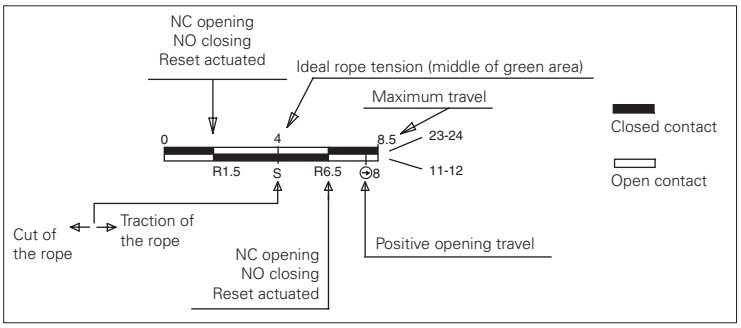
All values in the drawings are in mm

Accessories See page 321

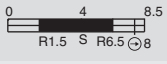
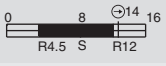
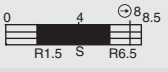
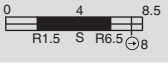
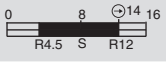
→ The 2D and 3D files are available at **www.pizzato.com**

Contact type: L = slow action	Metal housing	Metal housing	Metal housing
Contact blocks			
33 L	FC 3378-M2 ⊖ 1NO+1NC	FC 3383-M2 ⊖ 1NO+1NC	FC 3384-M2 ⊖ 1NO+1NC
34 L	FC 3478-M2 ⊖ 2NC	FC 3483-M2 ⊖ 2NC	FC 3484-M2 ⊖ 2NC
Actuating force	Initial 63 N … final 83 N (90 N ⊖)	Initial 147 N … final 235 N (250 N ⊖)	Initial 147 N … final 235 N (250 N ⊖)
Travel diagrams	Page 196 - group 1	Page 196 - group 2	Page 196 - group 2

How to read travel diagrams



Travel diagrams table

Contact blocks		Group 1	Group 2
9 2NC			
18 1NO+1NC			
20 1NO+2NC			
21 3NC			
22 2NO+1NC			
33 1NC+1NO			
34 2NC			

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

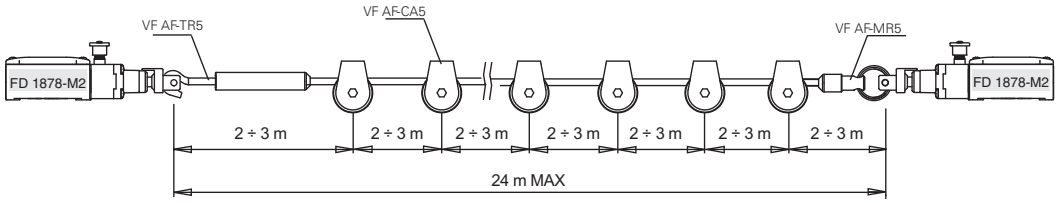
All values in the drawings are in mm

Accessories See page 321

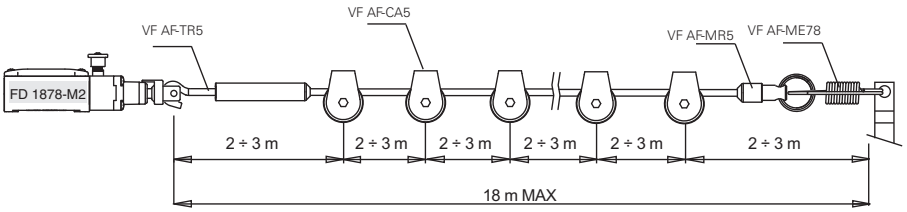
➔ The 2D and 3D files are available at **www.pizzato.com**

Application examples and max. rope length for switches with longitudinal head

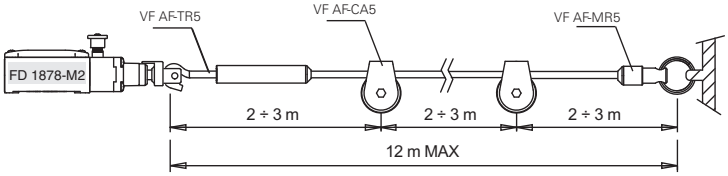
Example A



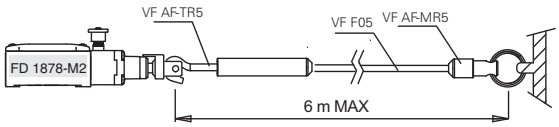
Example B



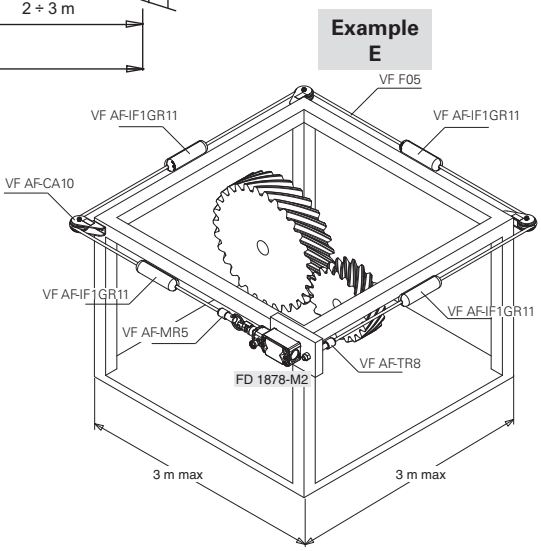
Example C



Example D

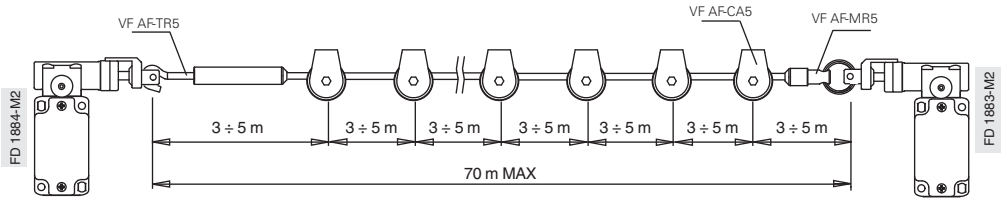


Example E

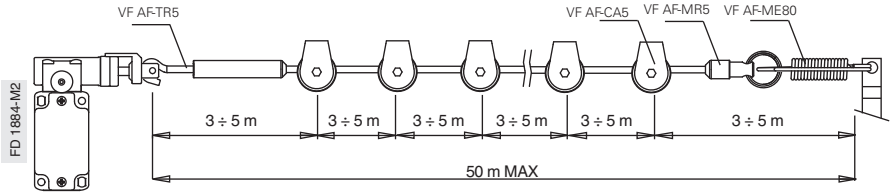


Application examples and max. rope length for switches with transversal head

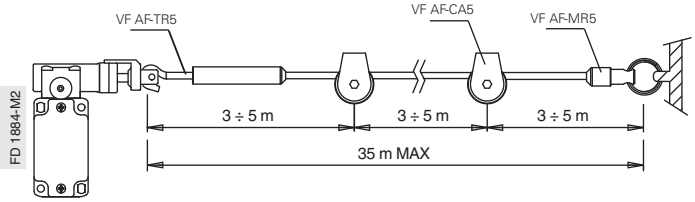
Example F



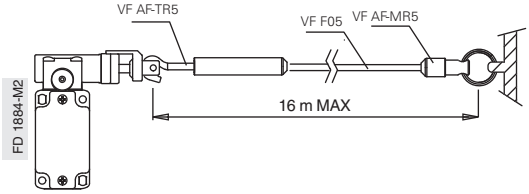
Example G



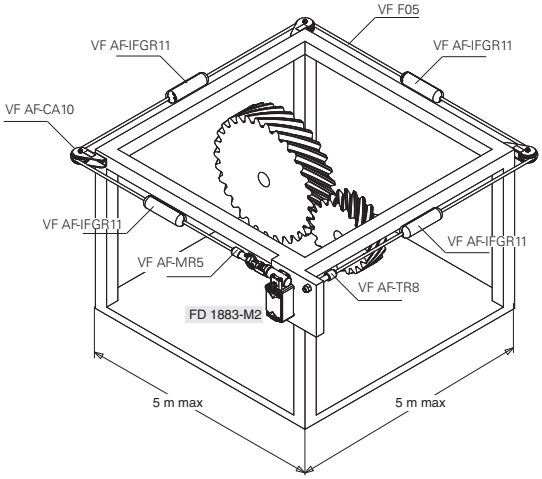
Example H



Example I

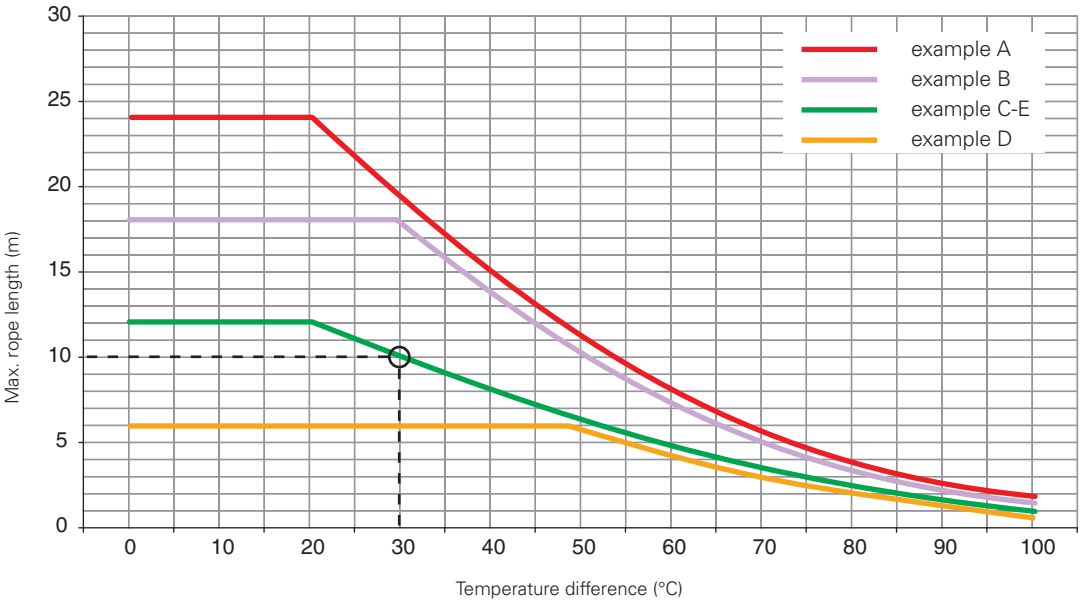


Example J



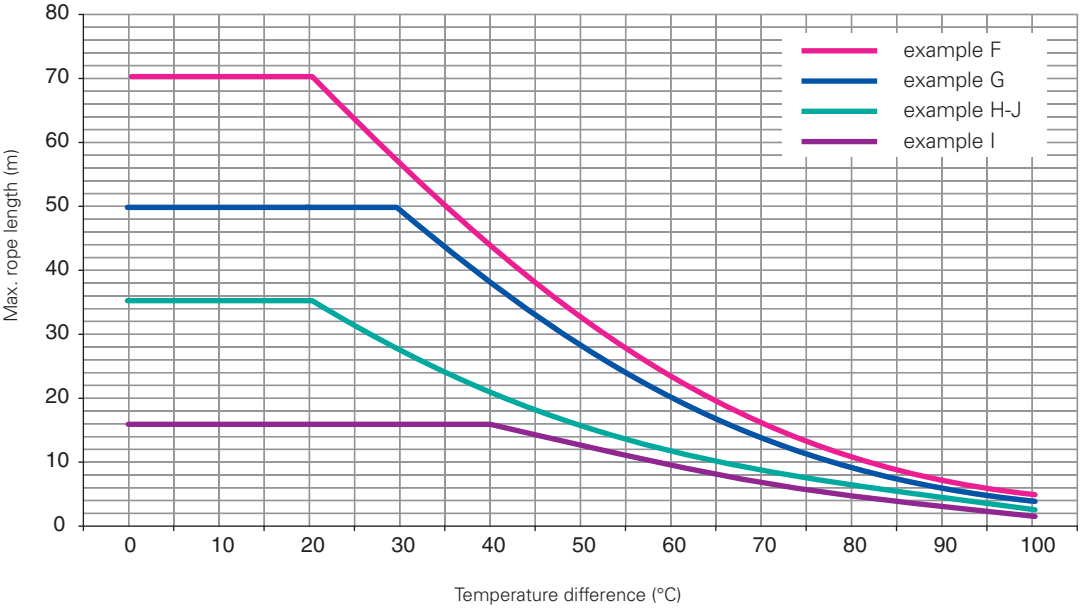
Maximum spans

Maximum spans for switches with longitudinal head



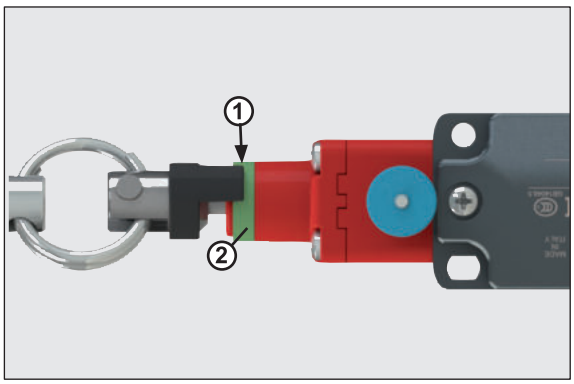
The max. recommended spans are indicated in the diagram as a function of the temperature fluctuations (temperature differences) to which the switch may be exposed at the point of use. For instance, with installation of type C and a temperature difference of 30°C, the max. recommended rope length is 10 metres.

Maximum spans for switches with transversal head

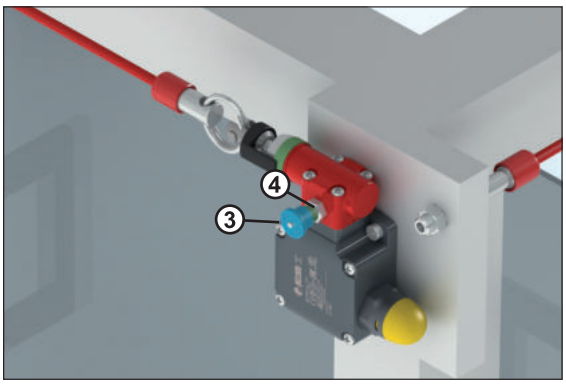


Important: The above data are guaranteed only using original rope and accessories. See page 207.

Adjustment of the switching point



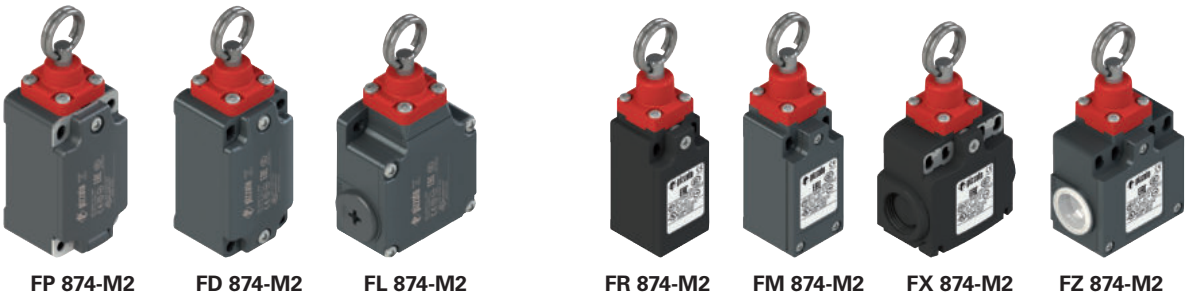
Tighten the rope connected to the switch, until the end of the indicator (1) reaches about the middle of the green ring (2).



Pull the knob (3) in order to close the safety contacts inside the switch. Below the knob a green ring (4) will be disclosed.

Safety **rope switch without reset** for simple stop

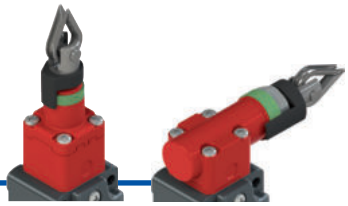
Selection diagram



FP 874-M2 | FD 874-M2 | FL 874-M2 | FR 874-M2 | FM 874-M2 | FX 874-M2 | FZ 874-M2

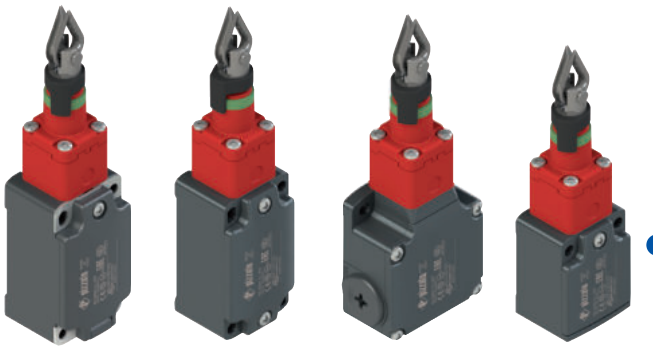
79

ACTUATORS



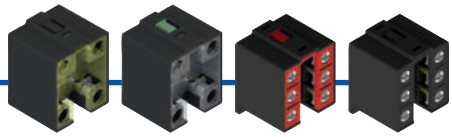
79 | 80

ACTUATORS

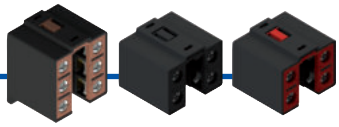


FP | FD | FL | FC

CONTACT BLOCKS



9	18	20	21
2NC slow action	1NO+1NC slow action	1NO+2NC slow action	3NC slow action



22	33	34
2NO+1NC slow action	1NO+1NC slow action	2NC slow action

CONDUIT ENTRIES

Threaded conduit entry (standard) | With cable gland | With M12 plastic connector | With M12 metal connector

product options

Code structure

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

article | options | options

FD 1879-E7GM2K50T6

Housing

FD	metal, one conduit entry
FL	metal, three conduit entries
FP	technopolymer, one conduit entry

Contact blocks

9	2NC, slow action
18	1NO+1NC, slow action
20	1NO+2NC, slow action
21	3NC, slow action
22	2NO+1NC, slow action
33	1NO+1NC, slow action
34	2NC, slow action

Actuating head

79	longitudinal head
80	transversal head (FD-FL housing only)

Actuating force

	standard
E7	initial 20 N...final 40 N (only head 79)
E9	initial 13 N...final 75 N (only head 80)

Ambient temperature

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

Pre-installed cable glands or connectors

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

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

Threaded conduit entry

M2	M20x1.5 (standard)
	PG 13.5

Contact type

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

article | options | options

FC 3379-E7GM2K50T6

Housing

FC	metal, one conduit entry

Contact blocks

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

Actuating head

79	longitudinal head
80	transversal head

Actuating force

	standard
E7	initial 20 N...final 40 N (only head 79)
E9	initial 13 N...final 75 N (only head 80)

Pre-installed cable glands

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

Threaded conduit entry

M2	M20x1.5 (standard)
	PG 11

Ambient temperature

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

Contact type

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

article | options | options

FD 874-E7GM2K50T6

Housing

FD	metal, one conduit entry
FL	metal, three conduit entries
FP	technopolymer, one conduit entry
FR	technopolymer, one conduit entry
FM	metal, one conduit entry
FX	technopolymer, two conduit entries
FZ	metal, two conduit entries

Actuating force

	standard
E7	initial 20 N...final 40 N

Contact type

	silver contacts (standard)
G	silver contacts with 1 µm gold coating
G1	silver contacts with 2.5 µm gold coating

Pre-installed cable glands or connectors

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

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

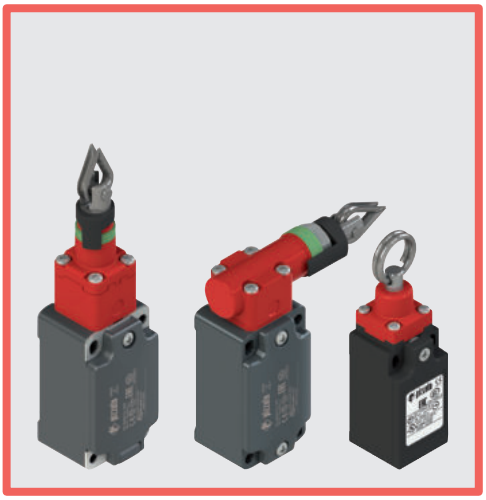
Threaded conduit entry

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

Ambient temperature

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

Safety **rope switch without reset** for simple stop



Main features
- Metal or plastic housing, from one to three conduit entries
- Protection degree IP67
- 7 contact blocks available
- Versions with vertical or horizontal actuation
- Versions with assembled M12 connector
- Versions with gold-plated silver contacts

Quality marks:

IMQ approval:	EG605 (FD-FL-FP-FC series) EG610 (FR-FX-FM-FZ series)
UL approval:	E131787
CCC approval:	2007010305230000 (FD-FP-FL-FC series) 2007010305230013 (FR-FX-FM-FZ series)
EAC approval:	RU C-IT.УТ03.B.00035/19

Technical data

Housing

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

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

General data

SIL (SIL CL) up to:	SIL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety parameters:	
B_{10D}:	2,000,000 for NC contacts
Mission time:	20 years
Ambient temperature:	-25°C … +80°C (standard) -40°C … +80°C (T6 option)
Max. actuation frequency:	1 cycle / 6 s
Mechanical endurance:	1 million operating cycles
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Tightening torques for installation:	see pages 339 and 341
Wire cross-sections and wire stripping lengths:	see page 357

In compliance with standards:
IEC 60947-5-1, IEC 60947-1, IEC 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 50581, UL 508, CSA 22.2 No.14 .
Approvals:
EN 60947-5-1, UL 508, CSA 22.2 No.14, GB/T14048.5-2017.

Compliance with the requirements of:
Low Voltage Directive 2014/35/EU, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU.
Positive contact opening in conformity with standards:
IEC 60947-5-1, EN 60947-5-1.

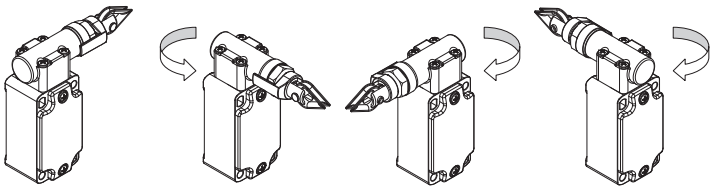
⚠ **If not expressly indicated in this chapter, for correct installation and utilization of all articles see the instructions given on pages 337 to 350.**

Electrical data			Utilization category
without connector	Thermal current (I_{th}):	10 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)	U_e (V) 250 400 500 I_e (A) 6 4 1
	Rated impulse withstand voltage (U_{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)	Direct current: DC13
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
	Protection against short circuits:	type aM fuse 10 A 500 V	
	Pollution degree:	3	
with M12 connector, 4 and 5-pole	Thermal current (I_{th}):	4 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	250 Vac 300 Vdc	U_e (V) 24 120 250 I_e (A) 4 4 4
	Protection against short circuits:	type gG fuse 4 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 125 250 I_e (A) 3 0.55 0.3
with M12 connector, 8-pole	Thermal current (I_{th}):	2 A	Alternating current: AC15 (50÷60 Hz)
	Rated insulation voltage (U_i):	30 Vac 36 Vdc	U_e (V) 24 I_e (A) 2
	Protection against short circuits:	type gG fuse 2 A 500 V	Direct current: DC13
	Pollution degree:	3	U_e (V) 24 I_e (A) 2

Description

These rope-operated safety switches are installed on machines or conveyor belts and facilitate the simple shut-down of the machine from any point and with any pull on the rope.
Provided with self-control function, they allow the constant monitoring of correct functioning, signalling with the opening of the contacts an eventual loosening or breaking of the rope.

Head with variable orientation



For all switches, the head can be adjusted in 90° steps after removing the four fastening screws.

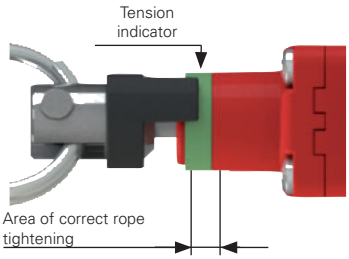
Protection degree IP67

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

Extended temperature range

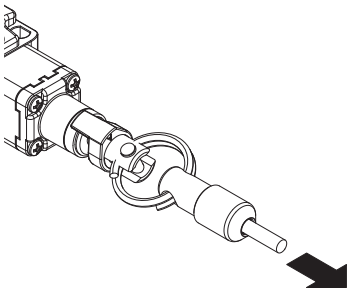
-40°C These devices are also available in a special version suitable for an ambient operating temperature range from -40°C up to +80°C.
They can therefore be used for applications in cold stores, sterilisers and other equipment with low temperature environments. The special materials used to produce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

Indicator for rope adjustment



The switches (head 79 and 80) are provided with a green ring that shows the area of the correct tightening of the rope. The installer has only to tighten the rope until the black indicator will be in the middle of the green area. If the tension (or loosening) on the rope is so high that the black indicator exits the green area, the electrical safety contacts will open.

Actuating forces



These switches can be supplied with reduced hardness internal springs on request. The force required to actuate the switch can thereby be reduced without changing the actuating path of the electrical contacts. This is particularly advantageous for smaller spans, but must, however, always make use of rope pulleys.

Features approved by IMQ

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

Forms of the contact element: Zb, Y+Y, Y+Y+X, Y+Y+Y, Y+X+X
Positive opening contacts on contact blocks 8, 9, 18, 20, 21, 22, 33, 34
In compliance with standards: EN 60947-1, EN 60947-5-1, fundamental requirements of the Low Voltage Directive 2014/35/EU.

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

Features approved by UL

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

Use 60 or 75°C copper (Cu) conductor and wire size range 12, 14 AWG, stranded or solid.

The terminal tightening torque of 7.1 lb in (0.8 Nm).

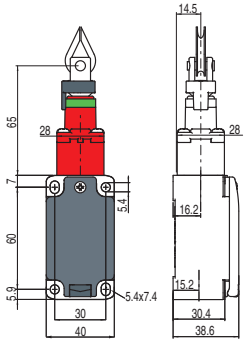
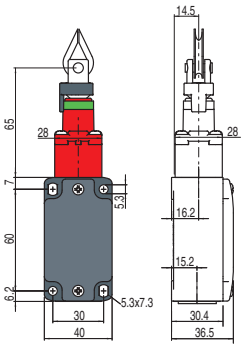
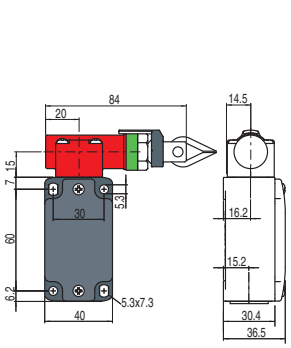
For FR, FP, FX series: the hub is to be connected to the conduit before the hub is connected to the enclosure.

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

Safety **rope switch without reset** for simple stop

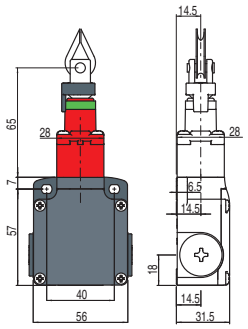
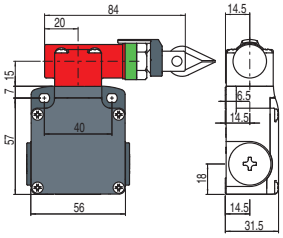
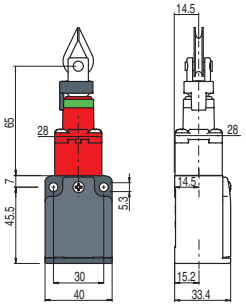
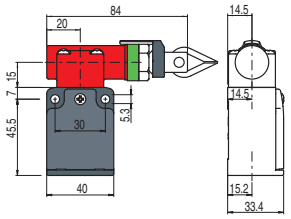
Contact type:
L = slow action

Contact blocks

		Technopolymer housing	Metal housing	Metal housing
				
9	L	FP 979-M2 → 2NC	FD 979-M2 → 2NC	FD 980-M2 → 2NC
18	L	FP 1879-M2 → 1NO+1NC	FD 1879-M2 → 1NO+1NC	FD 1880-M2 → 1NO+1NC
20	L	FP 2079-M2 → 1NO+2NC	FD 2079-M2 → 1NO+2NC	FD 2080-M2 → 1NO+2NC
21	L	FP 2179-M2 → 3NC	FD 2179-M2 → 3NC	FD 2180-M2 → 3NC
22	L	FP 2279-M2 → 2NO+1NC	FD 2279-M2 → 2NO+1NC	FD 2280-M2 → 2NO+1NC
33	L	FP 3379-M2 → 1NO+1NC	FD 3379-M2 → 1NO+1NC	FD 3380-M2 → 1NO+1NC
34	L	FP 3479-M2 → 2NC	FD 3479-M2 → 2NC	FD 3480-M2 → 2NC
Actuating force		Initial 63 N…final 83 N (90 N →)	Initial 63 N…final 83 N (90 N →)	Initial 147 N…final 235 N (250 N →)
Travel diagrams		Page 204 - group 1	Page 204 - group 1	Page 204 - group 2

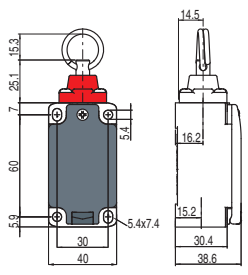
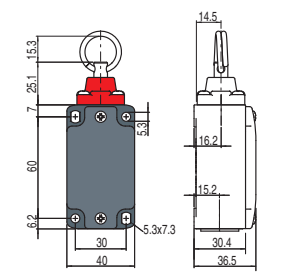
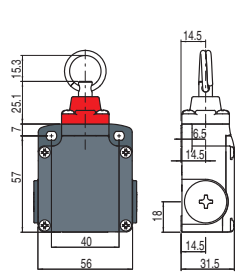
Contact type:
L = slow action

Contact blocks

		Metal housing	Metal housing	Metal housing	Metal housing
					
9	L	FL 979-M2 → 2NC	FL 980-M2 → 2NC	/	/
18	L	FL 1879-M2 → 1NO+1NC	FL 1880-M2 → 1NO+1NC	/	/
20	L	FL 2079-M2 → 1NO+2NC	FL 2080-M2 → 1NO+2NC	/	/
21	L	FL 2179-M2 → 3NC	FL 2180-M2 → 3NC	/	/
22	L	FL 2279-M2 → 2NO+1NC	FL 2280-M2 → 2NO+1NC	/	/
33	L	FL 3379-M2 → 1NO+1NC	FL 3380-M2 → 1NO+1NC	FC 3379-M2 → 1NO+1NC	FC 3380-M2 → 1NO+1NC
34	L	FL 3479-M2 → 2NC	FL 3480-M2 → 2NC	FC 3479-M2 → 2NC	FC 3480-M2 → 2NC
Actuating force		Initial 63 N…final 83 N (90 N →)	Initial 147 N…final 235 N (250 N →)	Initial 63 N…final 83 N (90 N →)	Initial 147 N…final 235 N (250 N →)
Travel diagrams		Page 204 - group 1	Page 204 - group 2	Page 204 - group 1	Page 204 - group 2

Contact type:
L = slow action

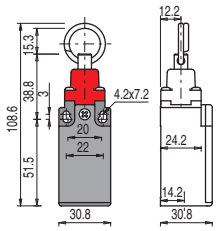
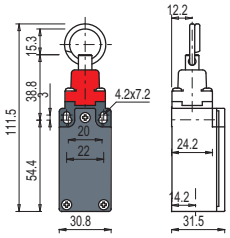
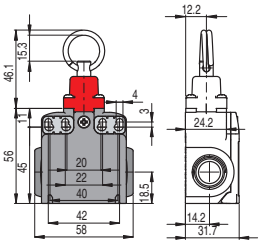
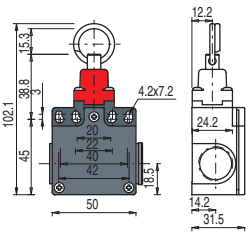
Contact blocks

		Technopolymer housing	Metal housing	Metal housing
				
8	L	FP 874-M2 → 1NC	FD 874-M2 → 1NC	FL 874-M2 → 1NC
Actuating force		Initial 63 N…final 83 N (90 N →)	Initial 63 N…final 83 N (90 N →)	Initial 63 N…final 83 N (90 N →)
Travel diagrams		Page 204 - group 3	Page 204 - group 3	Page 204 - group 3

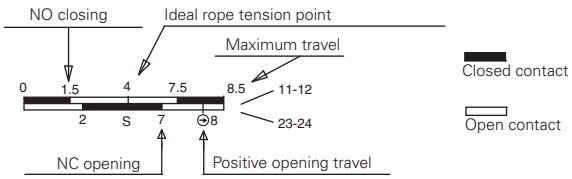
All values in the drawings are in mm

Accessories See page 321

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

Contact type: L = slow action	Technopolymer housing	Metal housing	Technopolymer housing	Metal housing
Contact blocks				
8 L	FR 874-M2 → 1NC	FM 874-M2 → 1NC	FX 874-M2 → 1NC	FZ 874-M2 → 1NC
Actuating force	Initial 63 N...final 83 N (90 N →)	Initial 63 N...final 83 N (90 N →)	Initial 63 N...final 83 N (90 N →)	Initial 63 N...final 83 N (90 N →)
Travel diagrams	Page 204 - group 3	Page 204 - group 3	Page 204 - group 3	Page 204 - group 3

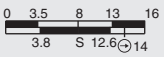
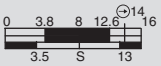
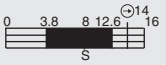
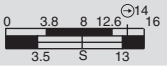
How to read travel diagrams

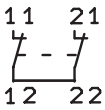


IMPORTANT:

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

Travel diagrams table

Contact blocks		Group 1	Group 2	Group 3
8 1NC				
9 2NC				
18 1NO+1NC				
20 1NO+2NC				
21 3NC				
22 2NO+1NC				
33 1NC+1NO				
34 2NC				



In the rest position (with rope correctly tightened) the two contacts of **contact block 8** are both closed and are activated respectively by tightening or loosening the rope. In order to use this contact block for safety applications it is necessary to connect the two contacts in series. For this reason, in the wiring diagrams the **contact block 8** is indicated as 1NC, whereas in travel diagrams both contacts are indicated.

All values in the drawings are in mm

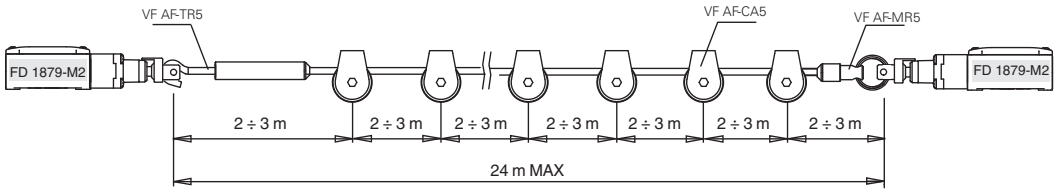
Accessories See page 321

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

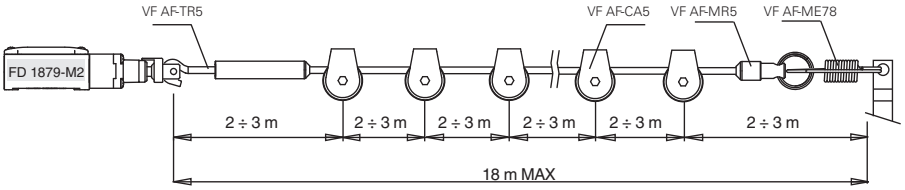
Safety **rope switch without reset** for simple stop

Application examples and max. rope length for switches with longitudinal head

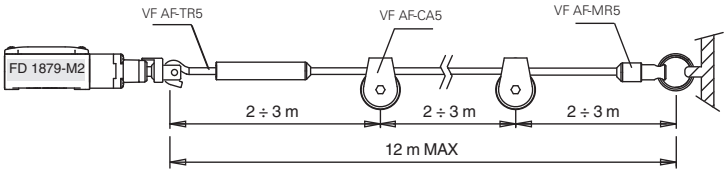
Example A



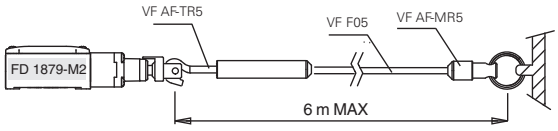
Example B



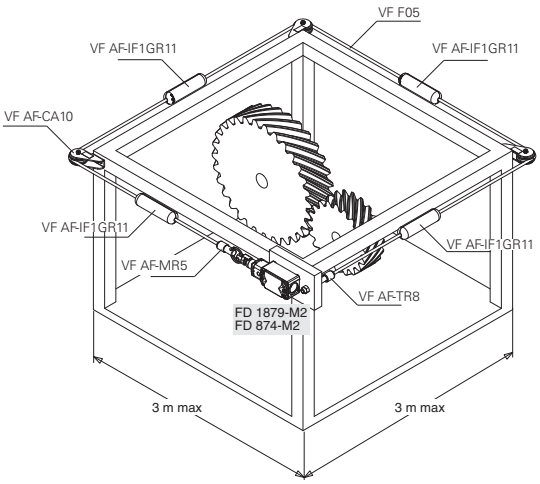
Example C



Example D

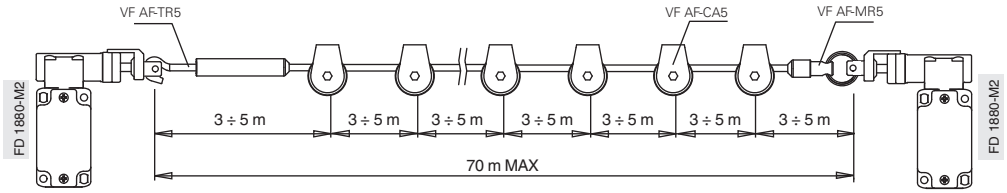


Example E

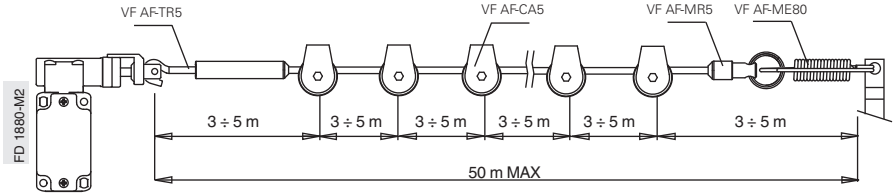


Application examples and max. rope length for switches with transversal head

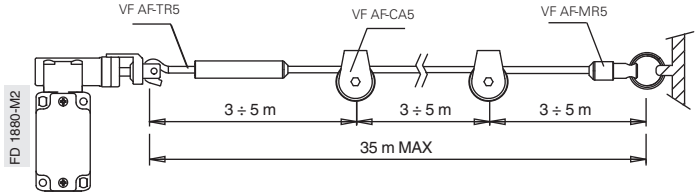
Example F



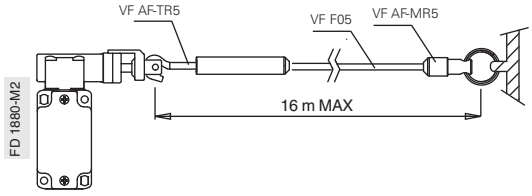
Example G



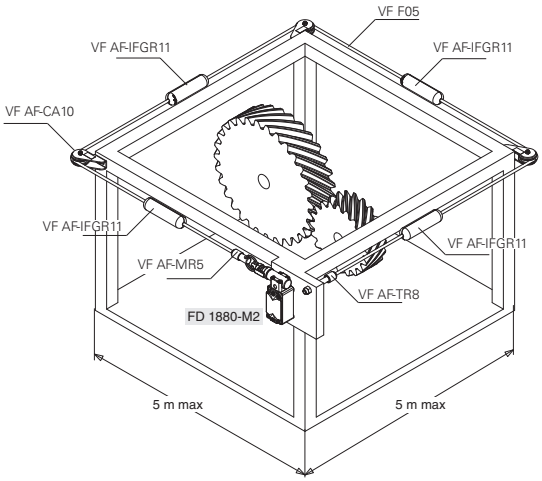
Example H



Example I

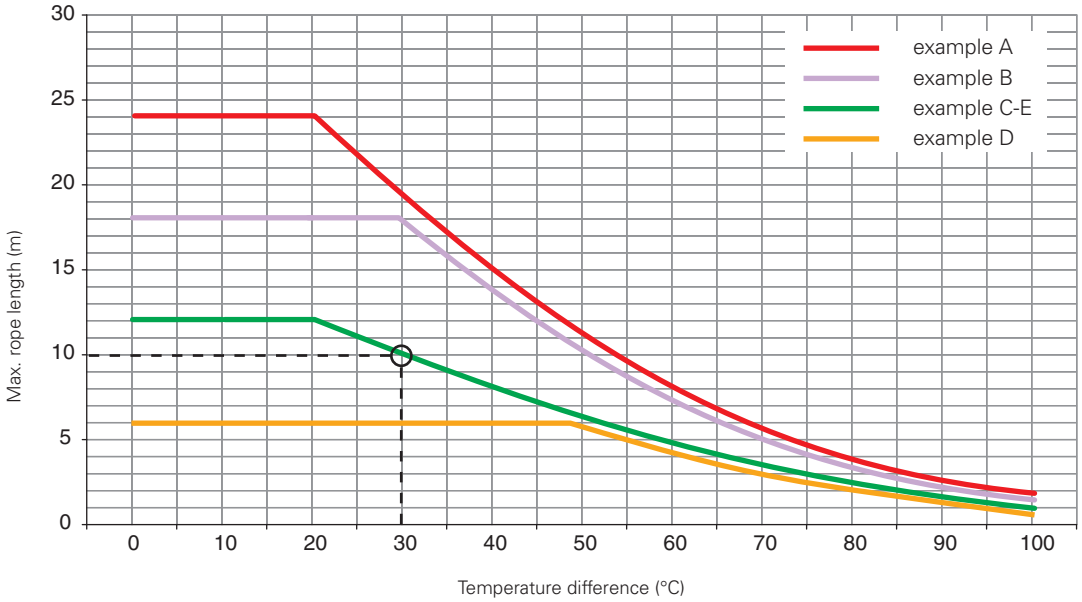


Example J



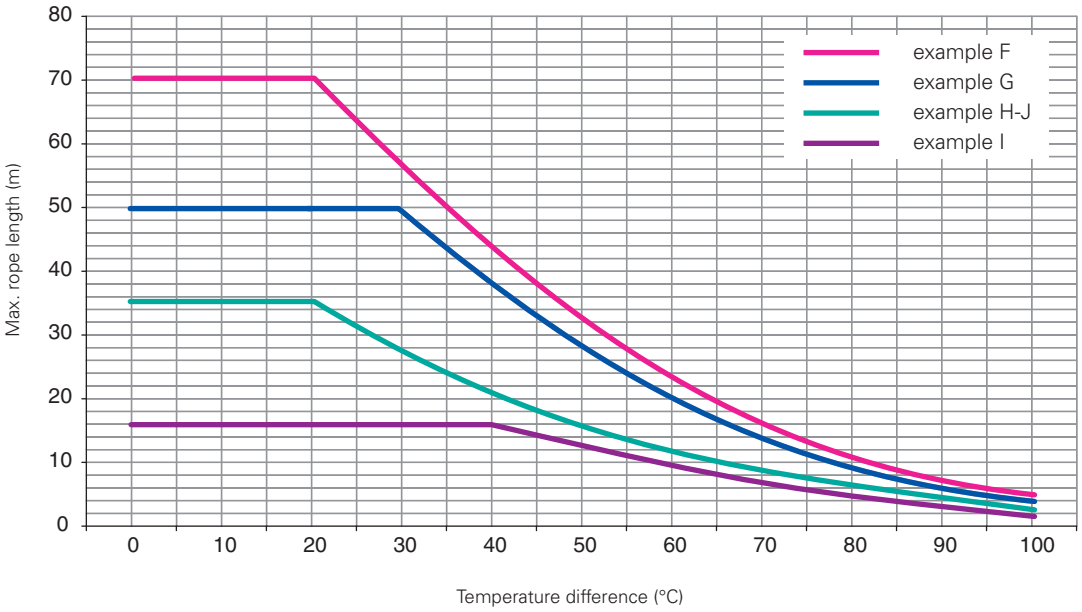
Maximum spans

Maximum spans for switches with longitudinal head



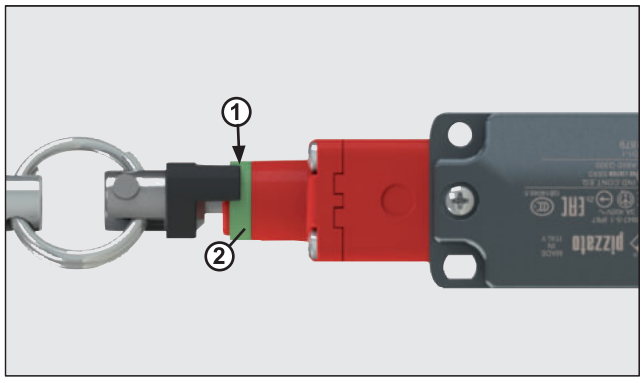
The max. recommended spans are indicated in the diagram as a function of the temperature fluctuations (temperature differences) to which the switch may be exposed at the point of use. For instance, with installation of type C and a temperature difference of 30°C, the max. recommended rope length is 10 metres.

Maximum spans for switches with transversal head

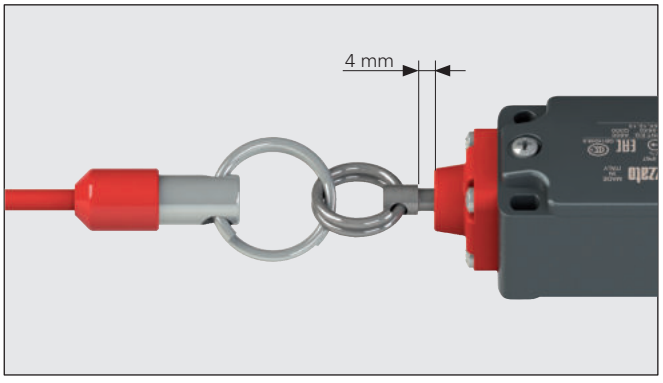


Important: The above data are guaranteed only using original rope and accessories. See page 207.

Adjustment of the switching point



For switches with head 79 and 80: Tighten the rope connected to the switch, until the end of the indicator (1) reaches about the middle of the green ring (2).

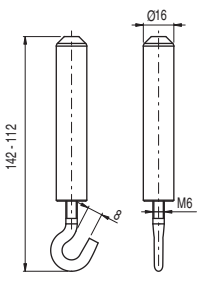


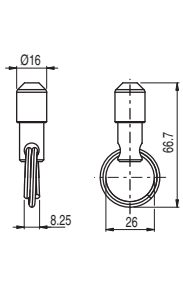
For switches with head 74: Tighten the rope connected to the switch until the thimble will be at about 4 mm from the head.

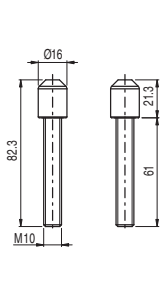
Accessories for **rope** safety switches

Accessories for rope installation - FAST line

Article	Description	Article	Description	Article	Description
VF AF-TR5	Adjustable stay bolt	VF AF-MR5	End clamp	VF AF-TR8	Stay bolt

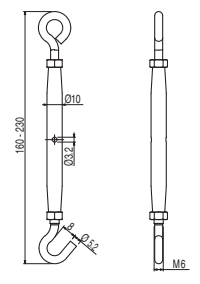



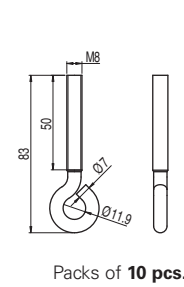



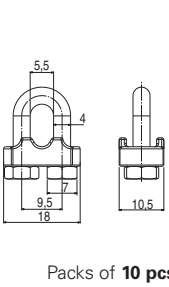
Accessories for rope installation

Article	Description	Article	Description	Article	Description	Article	Description
VF AF-TR2X	Adjustable stay bolt in stainless steel	VF T870	Stay bolt	VF M870	Terminal	VF C870	Jumper

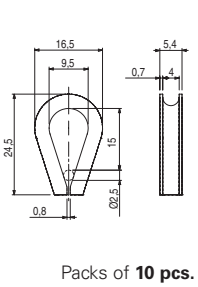



Packs of **10 pcs.**

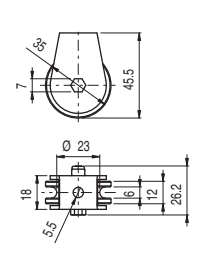
Packs of **10 pcs.**

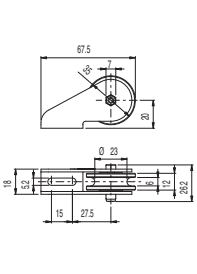



Packs of **10 pcs.**

Pulleys

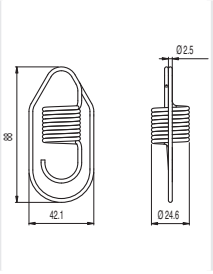
Article	Description	Article	Description
VF AF-CA5	Stainless steel pulley	VF AF-CA10	Angular pulley, stainless steel

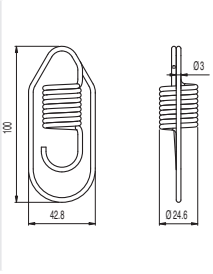



Safety springs

Article	Description	Article	Description
VF AF-ME78	Safety spring in stainless steel	VF AF-ME80	Safety spring in stainless steel

For switches with longitudinal head

For switches with transversal head

LED signalling lights

Article	Description
VF SL1A2PA1	White, 24 Vac/dc
VF SL1A3PA1	Red, 24 Vac/dc
VF SL1A4PA1	Green, 24 Vac/dc
VF SL1A5PA1	Yellow, 24 Vac/dc

These LED signalling lights are used for signalling that an electric contact has changed its state inside the switch. They can be installed on switches by screwing them on one of the conduit entries not used for electric cables. For details see page 334.

Function indicators

Article	Engraving	Language	Notes
VF AF-IF1GR00			
VF AF-IF1GR01	STOP EMERGENZA	ita	
VF AF-IF1GR02	EMERGENCY STOP	eng	
VF AF-IF1GR03	STOP	eng	
VF AF-IF1GR04	NOT - AUS	deu	
VF AF-IF1GR05	ARRET D'URGENCE	fra	
VF AF-IF1GR06	PARADA DE EMERGENCIA	esp	
VF AF-IF1GR07	NODSTOP	dan	
VF AF-IF1GR08	⏚ STOP ⏚	eng	
VF AF-IF1GR11	⏚ ⏚		In compliance with EN ISO 13850

Rope function indicators in conformity with standard EN ISO 13850.

All values in the drawings are in mm

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

Ropes and further accessories

Article	Description	Weight (Kg)
VF F05-100	100 m of rope on spool	5.1
VF F05-035	35 m of rope on spool	1.8
VF F05-020	20 m of rope, loose	1.0
VF F05-010	10 m of rope, loose	0.5

Zinc-plated steel rope coated with red plastic covering, 5 mm diameter.

Article	Description
VF F05-400	Rope

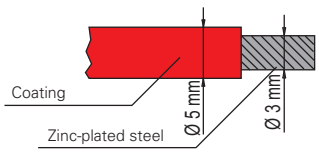
400 m spool of zinc-plated steel rope coated with red plastic covering, 5 mm diameter.

Weight 20.5 Kg.

Article	Description
VF F05-500B	Rope

500 m spool of zinc-plated steel rope coated with white plastic covering, 5 mm diameter.

Weight 25.6 Kg.



The rope is robust and has long-lasting protection against mechanical damage and corrosion.

Article	Description
VF SB400	Rope dispenser

Rope dispenser for 400 m and 500 m spools. This rope dispenser makes it easy to unroll the rope without tangles.

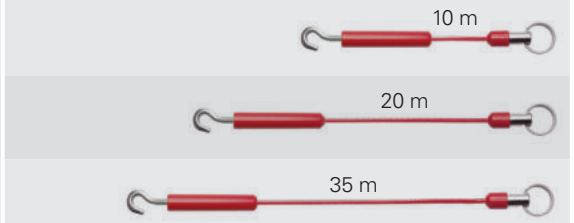
Article	Description
VF SFP2	Ceiling fixing plate

Metal fixing plate, for fixing rope switches on the ceiling.
The plate is provided with bore holes for fasting switches of the series. It is supplied without screws.

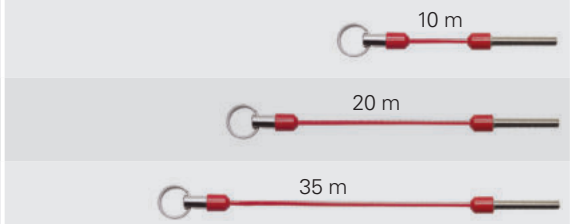
Accessory sets for rope installation - FAST line

Practical installation set containing stay bolts and rope in the same package.

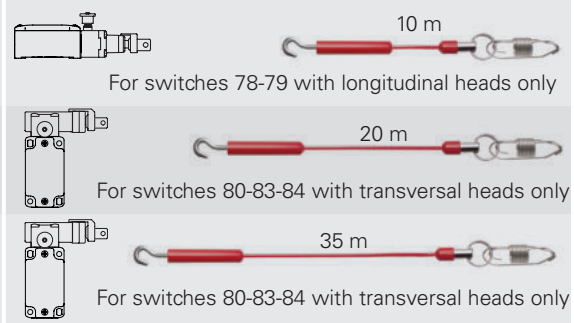
Article	Set content
VF AF-KT10M0	*1x* VF AF-TR5 *1x* VF AF-MR5 *1x* VF F05-010
VF AF-KT20M0	*1x* VF AF-TR5 *1x* VF AF-MR5 *1x* VF F05-020
VF AF-KT35M0	*1x* VF AF-TR5 *1x* VF AF-MR5 *1x* VF F05-035



Article	Set content
VF AF-KM10R0	*1x* VF AF-MR5 *1x* VF AF-TR8 *1x* VF F05-010
VF AF-KM20R0	*1x* VF AF-MR5 *1x* VF AF-TR8 *1x* VF F05-020
VF AF-KM35R0	*1x* VF AF-MR5 *1x* VF AF-TR8 *1x* VF F05-035



Article	Set content
VF AF-KT10M7	*1x* VF AF-TR5 *1x* VF AF-MR5 *1x* VF F05-010 *1x* VF AF-ME78
VF AF-KT20M8	*1x* VF AF-TR5 *1x* VF AF-MR5 *1x* VF F05-020 *1x* VF AF-ME80
VF AF-KT35M8	*1x* VF AF-TR5 *1x* VF AF-MR5 *1x* VF F05-035 *1x* VF AF-ME80

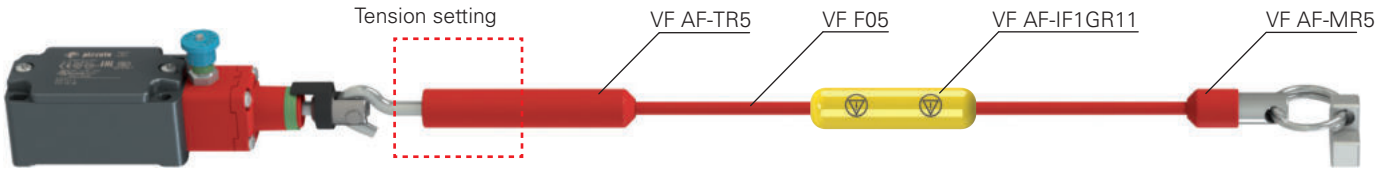


All values in the drawings are in mm

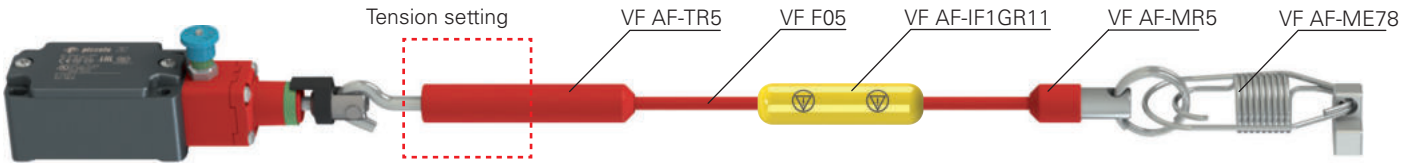
➔ The 2D and 3D files are available at **www.pizzato.com**

Accessories for **rope** safety switches

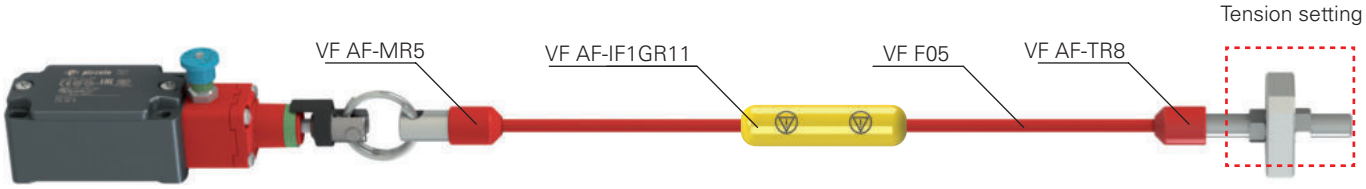
Combination examples



This combination of accessories is suitable for medium rope lengths, where the two rope ends are far away from each other.

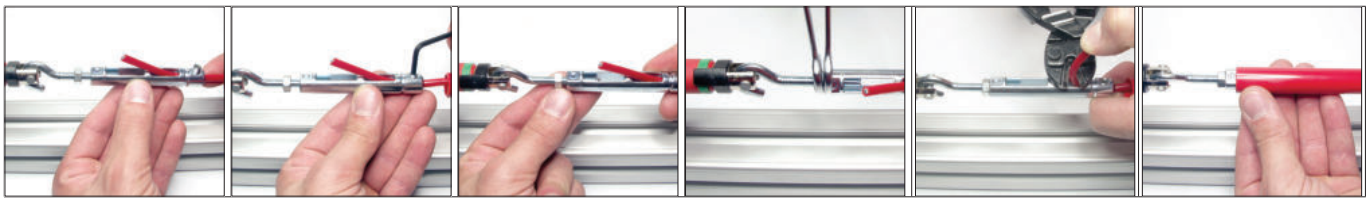


This combination of accessories is suitable for medium-high rope lengths (thanks to VF AF-ME78 safety spring) and where the two rope ends are far away from each other.



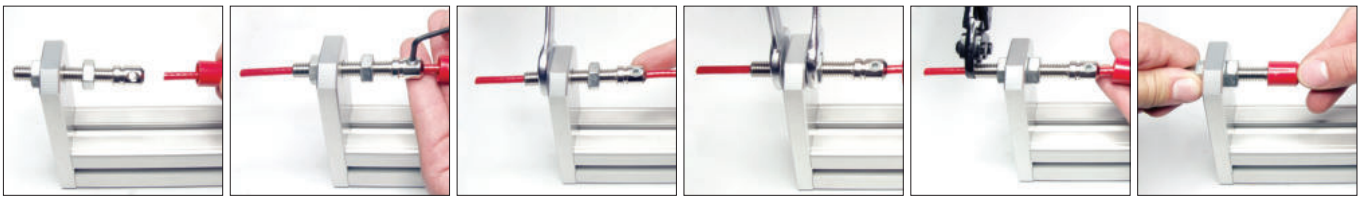
This combination of accessories is suitable for medium rope lengths or where the two rope ends are close to each other.

A Installation of adjustable stay bolt VF AF-TR5



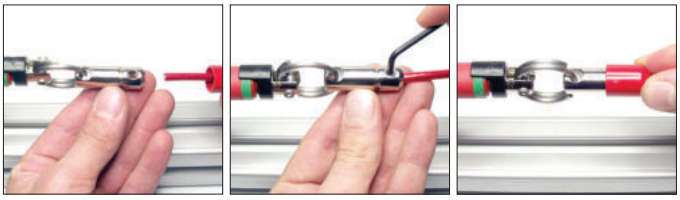
Rope insertion | Rope fixing | Rope tightening | Stay bolt blocking | Cutting of the rope in excess | Stay bolt covering

B Installation of adjustable stay bolt VF AF-TR8



Rope insertion | Rope fixing | Rope tightening | Stay bolt blocking | Cutting of the rope in excess | Stay bolt covering

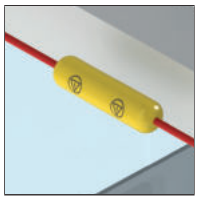
C Installation of end clamp VF AF-MR5



Rope insertion | Rope fixing | Clamp covering

Application example: possibility of emergency stop along the whole perimeter of the machine with rope supported by angular pulleys

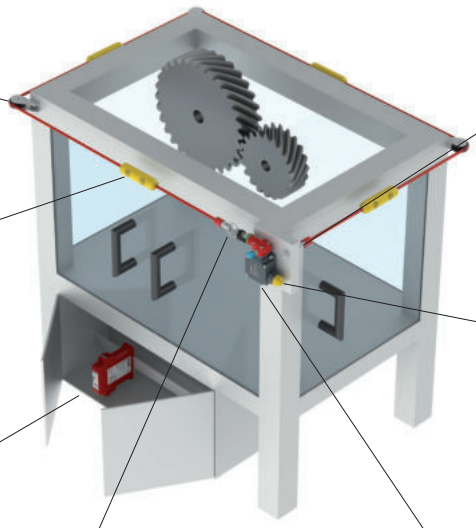
Angular pulley
Article: VF AF-CA10



Function indicator
Article: VF AF -IF1GR11

Safety module
Example: CS AR-20V024

End clamp
Article: VF AF-MR5



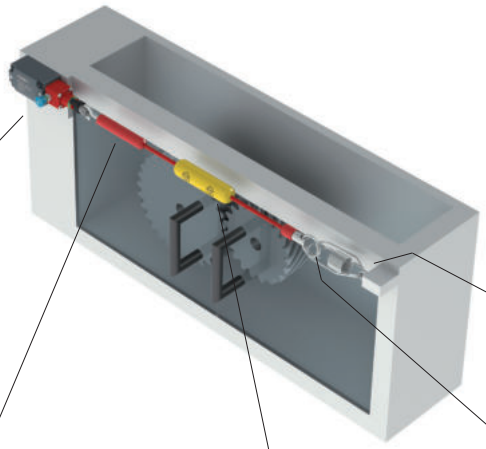
Stay bolt
Article: VF AF-TR8

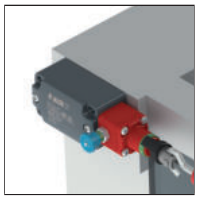
Signalling light
Article: VF SL1A5PA1

Safety rope switch

Article: FL 1883-M2

Application example: availability of emergency stop along the frontal section of the machine

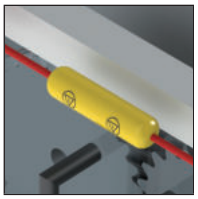




Safety rope switch

Article: FD 1878-M2

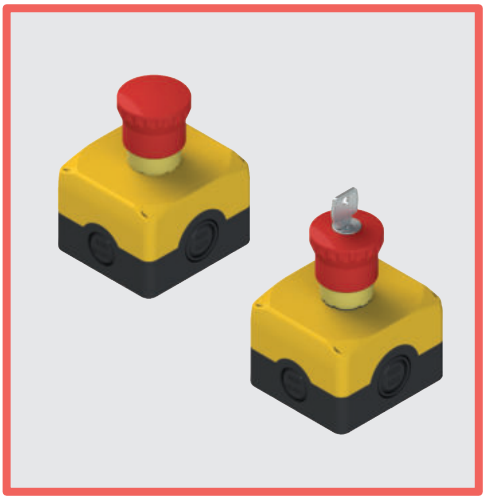
Adjustable stay bolt
Article: VF AF-TR5



Function indicator
Article:
VF AF -IF1GR11

End clamp
Article: VF AF-MR5

Safety spring
Article: VF AF-ME78



Main features
- Protection degrees IP67 and IP69K
- Stainless steel captive screws
- 4 side cable entries
- Screw caps included in the scope of supply

Quality marks:

EAC approval: RU C-IT.УТ03.B.00035/19

Technical data

Housing

Material:	Self-extinguishing shock-proof polycarbonate with double insulation, UV-resistant and glass fibre reinforced, high shock resistance.
Material of the screws:	Stainless steel
Conduit entries:	4x knock-out side entries: N°2 M20 - 1/2 NPT, N°2 M20 - 1/2NPT - M25 2x M16 knock-out base entries
Emergency stop button	
Mechanical endurance:	300,000 operating cycles
Max. actuation frequency:	3600 operating cycles/hour
Actuation travel:	4 mm (NO contact), 4 mm (NC contact)
Actuating force:	25 N
Actuating force at limit of travel:	Push-pull 18.5 N (without contacts) Rotary release, 35 N (without contacts)
Maximum travel:	9 mm
Tightening torque of the fixing ring:	2 … 2.5 Nm

General data

Protection degree:	IP67 acc. to EN 60529, (with cable gland of equal or higher protection degree) IP69K acc. to ISO 20653 (only for versions without luminous disc)
Ambient temperature:	-25°C … +80°C
Tightening torque of the cover screws:	1 … 1.4 Nm
Utilization requirements:	see page 149 of the General Catalogue HMI

In compliance with standards:
IEC 60947-1, IEC 60947-5-1, IEC 60204-1, EN 60947-1, EN 60947-5-1, EN 60204-1, EN 50581, EN ISO 13850, UL 508, CSA 22-2 N°14.

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

General data

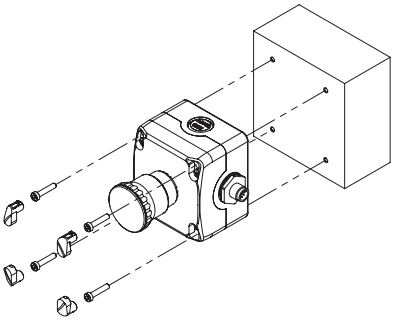
Protection degrees IP67 and IP69K

IP69K
IP67

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

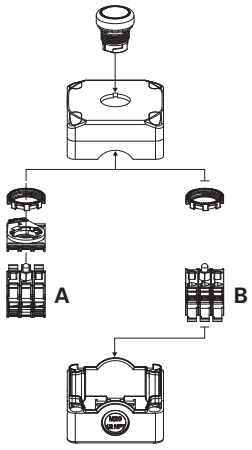
Fixing of EROUND housings

The housings of the EROUND line by Pizzato Elettrica have 4 additional holes on the cover. The holes enable wall fixing from the outside by means of insertion of the screws, without the need to open the cover to access the holes.



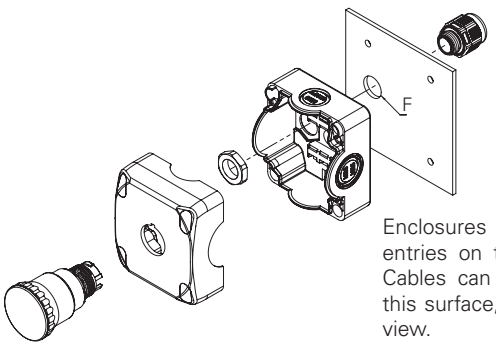
The wall fixing screws and the ones for closing the housing cover can be sealed with 4 caps (supplied with the housing). The caps not only give the housing a more pleasant look, but they also prevent the accumulation of dirt inside the recesses of the screws besides making tampering more difficult.
The external fixing of the housings is particularly valuable for already wired housings, since this simplifies the whole installation: you can simply fix the housing and connect the connector that, thanks to the presence of cable entries on the four sides of the housing, can be oriented in the preferred direction.

One housing, two solutions



The housing can fit up to 3 contact blocks/LED units (E2 CP, E2 LP) for panel mounting by means of a mounting adapter (A) or up to 3 contact blocks/LED units (E2 CF, E2 LF) for base mounting directly on the bottom of the housing (B).

Wiring through the lower surface



cable gland	F
M16	Ø 25
M20	Ø 28

Enclosures have 2 conduit entries on the lower surface. Cables can be connected via this surface, hiding them from view.

Complete housing units with emergency stop buttons



Housing cover colour	Actuator design and colour	Contacts pos. 2	Contacts pos. 3	Contacts pos. 1	Emergency stop button Push-Pull	Emergency stop button rotary release	Emergency stop button, key release
yellow RAL 1003	red	-	1NC	-	**ES AC31004** ES 31001 + E2 1PEPZ4531 + E2 CF01G2V1	**ES AC31003** ES 31001 + E2 1PERZ4531 + E2 CF01G2V1	**ES AC31022** ES 31001+ E2 1PEBZ4531 + E2 CF01G2V1
yellow RAL 1003	red	-	1NC SELF-MONITORED	-	**ES AC31081** ES 31001 + E2 1PEPZ4531 + E2 CF01S2V1	**ES AC31082** ES 31001 + E2 1PERZ4531 + E2 CF01S2V1	**ES AC31083** ES 31001+ E2 1PEBZ4531 + E2 CF01S2V1
yellow RAL 1003	red	1NC	-	1NC	**ES AC31009** ES 31001 + E2 1PEPZ4531 + E2 CF01G2V1 + E2 CF01G2V1	**ES AC31005** ES 31001 + E2 1PERZ4531 + E2 CF01G2V1 + E2 CF01G2V1	**ES AC31023** ES 31001+ E2 1PEBZ4531 + E2 CF01G2V1 + E2 CF01G2V1
yellow RAL 1003	red	1NC	-	1NO	**ES AC31010** ES 31001 + E2 1PEPZ4531 + E2 CF01G2V1 + E2 CF10G2V1	**ES AC31006** ES 31001 + E2 1PERZ4531 + E2 CF01G2V1 + E2 CF10G2V1	**ES AC31011** ES 31001+ E2 1PEBZ4531 + E2 CF01G2V1 + E2 CF10G2V1
yellow RAL 1003	red	1NC	1NC	1NO	**ES AC31146** ES 31001 + E2 1PEPZ4531 + E2 CF01G2V1 + E2 CF01G2V1 + E2 CF10G2V1	**ES AC31021** ES 31001 + E2 1PERZ4531 + E2 CF01G2V1 + E2 CF01G2V1 + E2 CF10G2V1	**ES AC31024** ES 31001+ E2 1PEBZ4531 + E2 CF01G2V1 + E2 CF01G2V1 + E2 CF10G2V1

Other combinations on request.
The standard colour of the base for the codes mentioned above is RAL 9005.
➔ For properties of contact blocks, see the General Catalogue HMI.



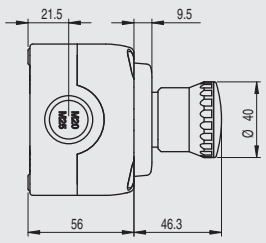
Housing cover colour	Actuator design and colour	Contacts pos. 2	Contacts pos. 3	Contacts pos. 1	Emergency stop button Push-Pull Yellow luminous disc, flashing Ø 60 mm, 24 Vac/dc	Emergency stop button rotary release Yellow luminous disc, flashing Ø 60 mm, 24 Vac/dc	Emergency stop button, key release Yellow luminous disc, flashing Ø 60 mm, 24 Vac/dc
grey RAL 7035	red	1NO	1NC	CONNECTION BLOCK	**ES AC31430** ES 31000 + E2 1PEPZ4531 + VE DL1A5L13 + E2 CP10G2V1 + E2 CP01G2V1 + VE BC2PV1	**ES AC31433** ES 31000 + E2 1PERZ4531 + VE DL1A5L13 + E2 CP10G2V1 + E2 CP01G2V1 + VE BC2PV1	**ES AC31436** ES 31000 + E2 1PEBZ4531 + VE DL1A5L13 + E2 CP10G2V1 + E2 CP01G2V1 + VE BC2PV1
grey RAL 7035	red	1NO	1NC SELF-MONITORED	CONNECTION BLOCK	**ES AC31431** ES 31000 + E2 1PEPZ4531 + VE DL1A5L13 + E2 CP10G2V1 + E2 CP01S2V1 + VE BC2PV1	**ES AC31434** ES 31000 + E2 1PERZ4531 + VE DL1A5L13 + E2 CP10G2V1 + E2 CP01S2V1 + VE BC2PV1	**ES AC31437** ES 31000 + E2 1PEBZ4531 + VE DL1A5L13 + E2 CP10G2V1 + E2 CP01S2V1 + VE BC2PV1
grey RAL 7035	red	1NO	2NC	CONNECTION BLOCK	**ES AC31432** ES 31000 + E2 1PEPZ4531 + VE DL1A5L13 + E2 CP10G2V1 + E2 CP02G2V1 + VE BC2PV1	**ES AC31435** ES 31000 + E2 1PERZ4531 + VE DL1A5L13 + E2 CP10G2V1 + E2 CP02G2V1 + VE BC2PV1	**ES AC31438** ES 31000 + E2 1PEBZ4531 + VE DL1A5L13 + E2 CP10G2V1 + E2 CP02G2V1 + VE BC2PV1

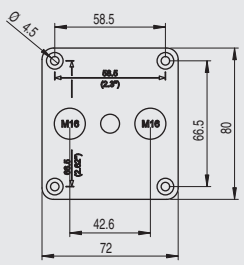
Other combinations on request.
The standard colour of the base for the codes mentioned above is RAL 9005.
➔ For the properties of contact blocks and luminous discs, please see the General Catalogue HMI.

Spare caps

Article		Description
	VE TS35RA1	4 spare caps for ES series housing cover. Colour: yellow
	VE TS39RA1	4 spare caps for ES series housing cover. Colour: grey

Dimensions





All values in the drawings are in mm

Accessories See page 319

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

Selection table for safety modules with single function

Product code	Supply voltage	For applications up to			Output contacts			Housing dimensions
		PL	SIL	Safety category	instantaneous	delayed	feedback	
Safety modules for emergency stops and end position monitoring for movable guards								
CS AR-01	24 Vac/dc; 120 Vac; 230 Vac: 10...30 Vdc	e	3	4	**2 NO + 1 NC**	-	-	22,5 x 114 mm
CS AR-02	24 Vac/dc; 120 Vac; 230 Vac: 10...30 Vdc	e	3	4	**3 NO**	-	-	22,5 x 114 mm
CS AR-04	24 Vac/dc; 120 Vac; 230 Vac	e	3	4	**3 NO + 1 NC**	-	-	22,5 x 114 mm
CS AR-05	24 Vac/dc; 120 Vac; 230 Vac	e	3	4	**3 NO + 1 NC**	-	-	22,5 x 114 mm
CS AR-06	24 Vac/dc; 120 Vac; 230 Vac	e	3	4	**3 NO + 1 NC**	-	-	22,5 x 114 mm
CS AR-07	24 Vac/dc	e	3	4	**4 NO + 1 NC**	-	-	22,5 x 129 mm
CS AR-08	12 Vdc, 24 Vac/dc; 120 Vac; 230 Vac	e	3	4	**2 NO**	-	-	22,5 x 114 mm
CS AR-20	24 Vac/dc; 120 Vac; 230 Vac	e	3	3	**2 NO**	-	-	22,5 x 114 mm
CS AR-21	24 Vac/dc; 120 Vac; 230 Vac	e	3	3	**2 NO**	-	-	22,5 x 114 mm
CS AR-22	24 Vac/dc; 120 Vac; 230 Vac	e	3	3	**3 NO + 1 NC**	-	-	22,5 x 114 mm
CS AR-23	24 Vac/dc; 120 Vac; 230 Vac	e	3	3	**3 NO + 1 NC**	-	-	22,5 x 114 mm
CS AR-24	24 Vac/dc	e	3	3	**4 NO + 1 NC**	-	-	22,5 x 114 mm
CS AR-25	24 Vac/dc	e	3	3	**4 NO + 1 NC**	-	-	22,5 x 114 mm
CS AR-40	24 Vac/dc	d	2	2	**2 NO**	-	-	22,5 x 91 mm
CS AR-41	24 Vac/dc	d	2	2	**2 NO**	-	-	22,5 x 91 mm
CS AR-46	24 Vac/dc	c	1	1	**1 NO**	-	-	22,5 x 91 mm
CS AR-91	24 Vac/dc	e	3	4	**2 NO + 1 OPT**	-	-	22,5 x 114 mm
Module for emergency stops, end position monitoring for movable guards, safety mats and safety bumpers with 4-wire technology								
CS AR-51	24 Vac/dc	e	3	4	**2 NO**	-	-	22,5 x 114 mm
Safety modules for emergency stop and end position monitoring for movable guards with delayed contacts upon opening of the inputs								
CS AT-0③	24 Vac/dc; 120 Vac; 230 Vac	e	3	4 (②)	**2 NO + 1 NC**	**2 NO**	-	45 x 114 mm
CS AT-1③	24 Vac/dc; 120 Vac; 230 Vac	e	3	4 (②)	**3 NO**	**2 NO**	-	45 x 114 mm
CS AT-3③	24 Vac/dc	e	3	4 (②)	**2 NO**	**1 NO**	-	45 x 114 mm
Safety timer modules								
CS FS-1③	24 Vac/dc; 120 Vac; 230 Vac	①	①	①	-	**1 NO + 2 NC**	-	45 x 114 mm
CS FS-2③	24 Vdc; 120 Vac	d	2	3	-	**1 NO +1 NC +1 CO**	-	45 x 114 mm
CS FS-3③	24 Vdc; 120 Vac	d	2	3	-	**1 NO +1 NC +1 CO**	-	45 x 114 mm
CS FS-5③	24 Vdc; 120 Vac	d	2	3	-	**1 NO +1 NC +1 CO**	-	45 x 114 mm
Safety modules for two-hand controls or synchronism monitoring								
CS DM-01	24 Vac/dc; 120 Vac; 230 Vac	III C acc. to EN 574			**3 NO + 1 NC**	-	-	22,5 x 114 mm
CS DM-02	24 Vac/dc; 120 Vac; 230 Vac	III C acc. to EN 574			**2 NO**	-	-	22,5 x 114 mm
CS DM-20	24 Vac/dc; 120 Vac; 230 Vac	III A acc. to EN 574			**2 NO**	-	-	22,5 x 114 mm
Safety modules for motor standstill monitoring								
CS AM-01	24 ... 230 Vac/dc	d	2	3	**2 NO + 1 NC**	-	-	45 x 114 mm
Expansion modules with instantaneous contacts or delayed contacts at de-energizing								
CS ME-01	24 Vac/dc	①	①	①	**5 NO + 1 NC**	-	**1 NC**	22,5 x 114 mm
CS ME-02	24 Vdc	①	①	①	**4 NO + 2 NC**		**1 NC**	22,5 x 114 mm
CS ME-03	24 Vdc	①	①	①	**3 NO**	-	**1 NC**	22,5 x 91 mm
CS ME-20VU24-⑤	24 Vdc	①	①	①	-	**4 NO + 2 NC**	**1 NC**	22,5 x 114 mm
CS ME-30VU24-⑥	24 Vdc	①	①	①	-	**4 NO + 2 NC**	**1 NC**	45 x 114 mm
CS ME-31VU24-TS12	24 Vdc	①	①	①	-	**4 NO + 2 NC**	**1 NC**	45 x 114 mm

■ Available for this article
- Not available for this article
① Depending on the base module
② Category 4 for instantaneous contacts, category 3 for delayed contacts

③ Release times for delayed contacts
0 fixed time
1 adjustable, 0.3 … 3 s, 0.3 s steps
2 adjustable, 1 … 10 s, 1 s steps
3 adjustable, 3 … 30 s, 3 s steps
4 adjustable, 30 … 300 s, 30 s steps

④ Connection type
V Screw terminals
M Connector with screw terminals
X Connector with spring terminals

⑤ Release time in absence of power supply
TF0.5 0.5 s fixed time
TF1 1 s fixed time
TF2 2 s fixed time
TF3 3 s fixed time

Product code	Autom. & manual start	Monitored start	Inputs of opposite potentials	Equipo-tential inputs	Parallel start (24 Vdc only)	Input type (⑦)				Connection type (④)			Page
										V	M	X	
CS AR-01	■	■	■	-	■	■	-	⑧	-	■	■	■	215
CS AR-02	■	■	■	-	■	■	-	⑧	-	■	■	■	217
CS AR-04	■	■	■	-	■	■	-	⑧	-	■	■	■	219
CS AR-05	■	-	■	■	■	■	■	■	-	■	■	■	221
CS AR-06	-	■	■	■	■	■	■	■	-	■	■	■	221
CS AR-07	■	■	■	-	■	■	-	-	-	-	■	■	223
CS AR-08	■	■	■	■	■	■	■	■	-	■	■	■	225
CS AR-20	■	-	-	-	-	■	-	-	-	■	■	■	227
CS AR-21	-	■	-	-	-	■	-	-	-	■	■	■	227
CS AR-22	■	-	-	-	-	■	-	-	-	■	■	■	229
CS AR-23	-	■	-	-	-	■	-	-	-	■	■	■	229
CS AR-24	■	-	-	-	-	■	-	-	-	■	■	■	231
CS AR-25	-	■	-	-	-	■	-	-	-	■	■	■	231
CS AR-40	■	-	-	-	-	■	-	-	-	■	■	■	233
CS AR-41	-	■	-	-	-	■	-	-	-	■	■	■	233
CS AR-46	■	-	■	-	-	■	-	■	-	■	■	■	235
CS AR-91	■	■	■	-	■	■	-	■	-	■	■	■	237
CS AR-51	■	■	■	-	-	■	-	-	■	■	■	■	239
CS AT-0③	■	■	■	■	■	■	■	■	-	■	■	■	241
CS AT-1③	■	■	■	■	■	■	■	■	-	■	■	■	243
CS AT-3③	■	■	■	-	-	■	-	■	-	■	■	■	245
CS FS-1③	-	-	-	-	-	■	-	-	-	■	■	■	247
CS FS-2③	-	-	-	-	-	■	-	-	-	■	■	■	249
CS FS-3③	-	-	-	-	-	■	-	-	-	■	■	■	251
CS FS-5③	■	■	-	■	-	■	-	■	-	■	■	■	253
CS DM-01	-	-	■	-	-	■	-	-	-	■	■	■	255
CS DM-02	-	-	■	-	-	■	-	-	-	■	■	■	257
CS DM-20	-	-	■	-	-	■	-	-	-	■	■	■	259
CS AM-01	-	-	-	-	-	■	-	-	-	■	■	■	261
CS ME-01	-	-	①	①	-	■	-	-	-	■	■	■	263
CS ME-02	-	-	①	①	-	■	-	-	-	■	■	■	265
CS ME-03	-	-	-	■	-	■	■	-	-	■	■	■	267
CS ME-20VU24-⑤	-	-	①	①	-	■	-	-	-	■	■	■	269
CS ME-30VU24-⑥	-	-	①	①	-	■	-	-	-	■	■	■	271
CS ME-31VU24-TS12	-	-	①	①	-	■	-	-	-	■	■	■	271

⑥ Release time in absence of power supply

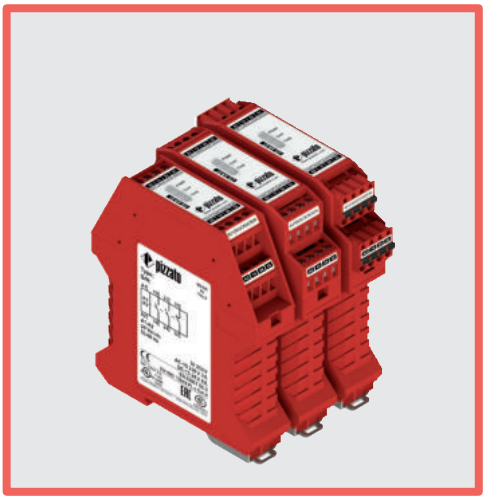
TF1	1 s fixed time
...	.....
TF12	12 s fixed time

⑦ Input type

- electromechanical contacts
- semiconductor outputs (e.g. light barriers)
- magnetic safety sensors
- 4-wire safety mats and safety bumpers

⑧ Modules compatible with magnetic sensors from June 2014

Safety module **CS AR-01**



Module for emergency stops, end position monitoring for movable guards and magnetic safety sensors

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start or monitored start
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- Output contacts:
  2 NO safety contacts,
  1 NC auxiliary contact
- Supply voltage:
  10 … 30 Vdc, 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	10 … 30 Vdc 24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	30 mA (typical)
Min. duration of start impulse t_{MIN}:	> 100 ms, > 50 ms (E02)
Response time t_A:	< 50 ms, < 150 ms (E02)
Release time t_{R1}:	< 20 ms
Release time in absence of power supply t_R:	< 70 ms, < 100 ms (E02)
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 NO safety contacts, 1 NC auxiliary contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	72 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-01V024

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc
120	120 Vac
230	230 Vac
E02	10 … 30 Vdc

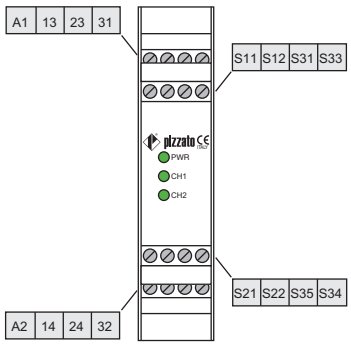
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

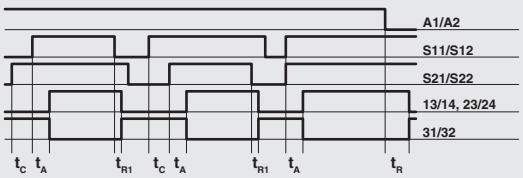
Safety module CS AR-01

Pin assignment

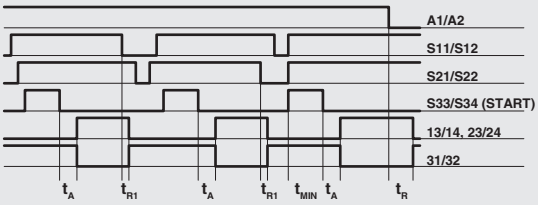


Function diagrams

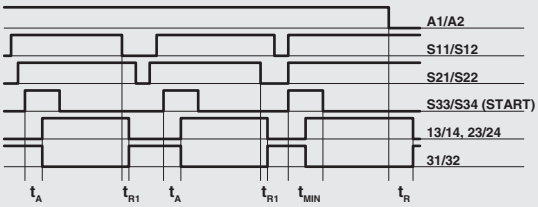
Configuration with automatic start



Configuration with monitored start



Configuration with manual start

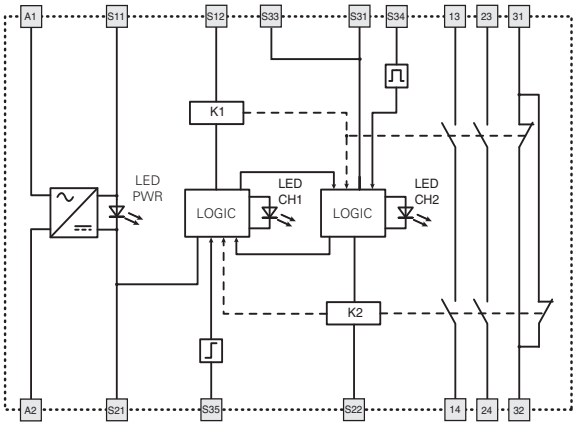


Legend:

t_{MIN}: Min. duration of start impulse
t_C: simultaneity time
t_A: response time
t_{R1}: release time
t_R: release time in absence of power supply

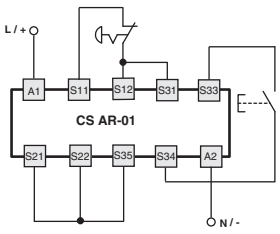
Notes:
The configurations with one channel are obtained taking into consideration the S11/S12 input only. In this case it is necessary to consider time t_{R1} referred to input S11/S12, time t_R referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

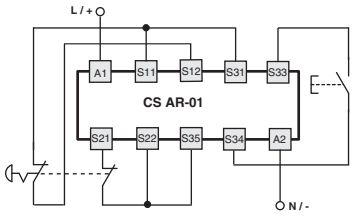
Internal block diagram



Input configuration

Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels

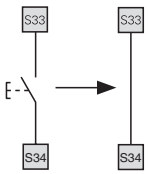




The diagram does not show the exact position of the terminals in the product

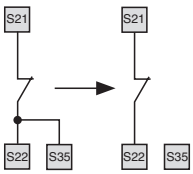
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



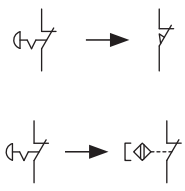
Monitored start

With regard to the indicated diagrams, remove the connection between S22 and S35 in order to activate the monitored start module.



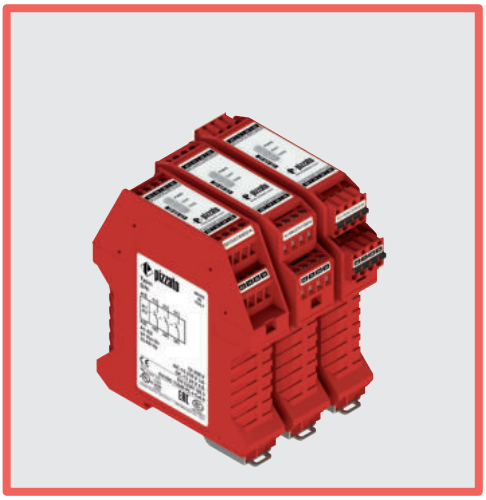
Monitoring of movable guards and magnetic safety sensors

The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts.
The sensors can only be used in 2-channel configuration.



Application examples See page 273

Safety module **CS AR-02**



Module for emergency stops, end position monitoring for movable guards and magnetic safety sensors

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start or monitored start
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- Output contacts: 3 NO safety contacts
- Supply voltage: 10 … 30 Vdc, 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	10 … 30 Vdc 24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	< 30 mA
Min. duration of start impulse t_{MIN}:	> 100 ms
Response time t_A:	< 50 ms
Release time t_{R1}:	< 20 ms
Release time in absence of power supply t_R:	< 70 ms
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	3 NO safety contacts,
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	72 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-02V024

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc
120	120 Vac
230	230 Vac
E02	10 … 30 Vdc

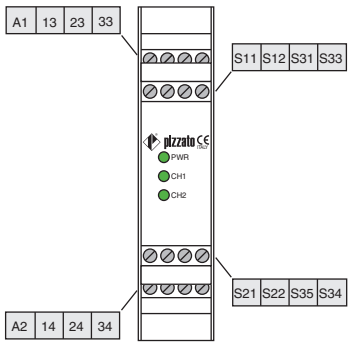
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

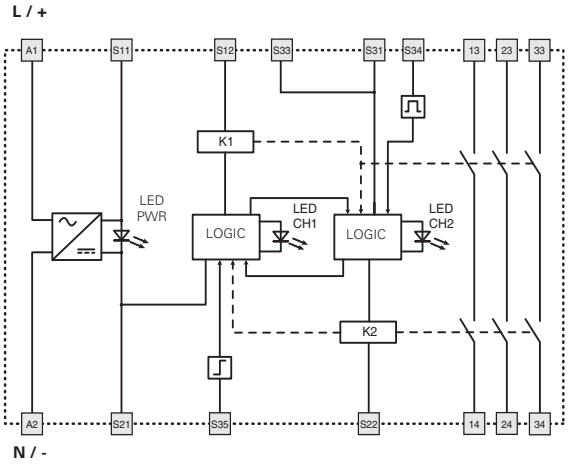
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS AR-02

Pin assignment

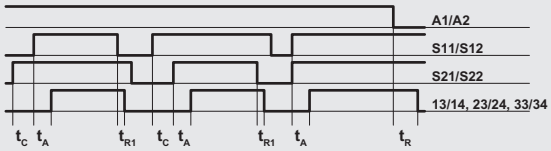


Internal block diagram

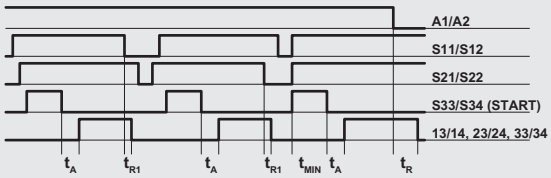


Function diagrams

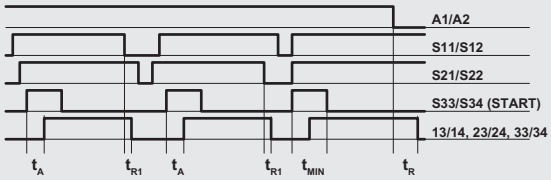
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



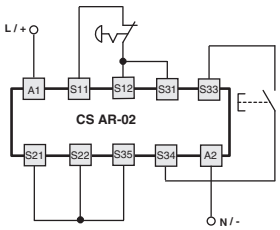
Legend:

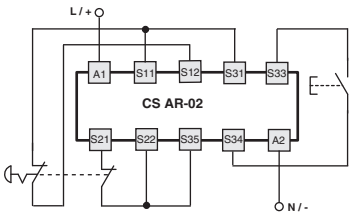
t_{MIN}:	Min. duration of start impulse	t_{R1}:	release time
t_C:	simultaneity time	t_R:	release time in absence of power supply
t_A:	response time		

Notes:
The configurations with one channel are obtained taking into consideration the S11/S12 input only. In this case it is necessary to consider time t_{R1} referred to input S11/S12, time t_R referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

Input configuration

Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels

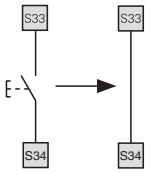




The diagram does not show the exact position of the terminals in the product

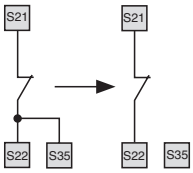
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



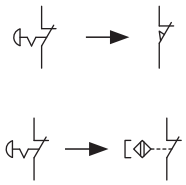
Monitored start

With regard to the indicated diagrams, remove the connection between S22 and S35 in order to activate the monitored start module.



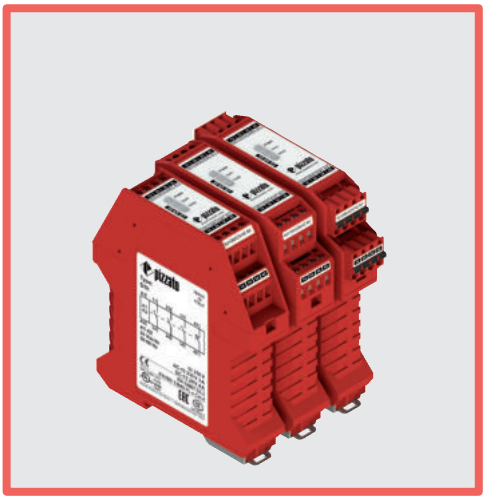
Monitoring of movable guards and magnetic safety sensors

The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts.
The sensors can only be used in 2-channel configuration.



Application examples See page 273

Safety module **CS AR-04**



Module for emergency stops, end position monitoring for movable guards and magnetic safety sensors

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start or monitored start
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- Output contacts:
  3 NO safety contacts,
  1 NC auxiliary contact
- Supply voltage:
  24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

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

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94	
Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	30 mA (typical)
Min. duration of start impulse t_{MIN}:	> 100 ms
Response time t_A:	< 50 ms
Release time t_{R1}:	< 20 ms
Release time in absence of power supply t_R:	< 70 ms
Simultaneity time t_C:	unlimited

In compliance with standards:
EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	3 NO safety contacts 1 NC auxiliary contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	64 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-04V024

Connection type		Supply voltage	
V	Screw terminals	**024**	24 Vac/dc
M	Connector with screw terminals	**120**	120 Vac
X	Connector with spring terminals	**230**	230 Vac

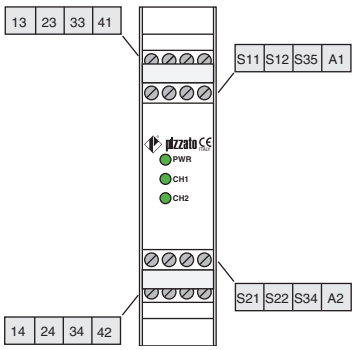
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

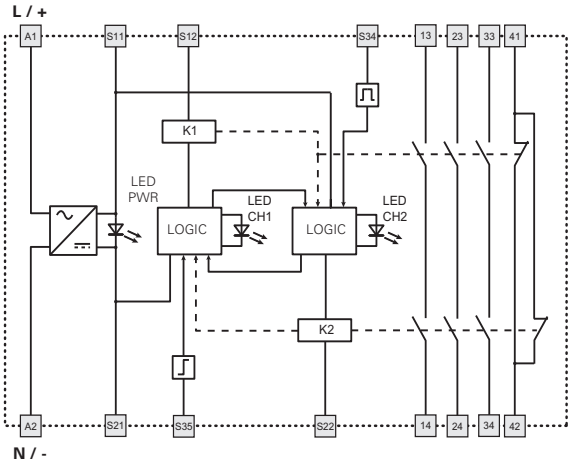
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS AR-04

Pin assignment

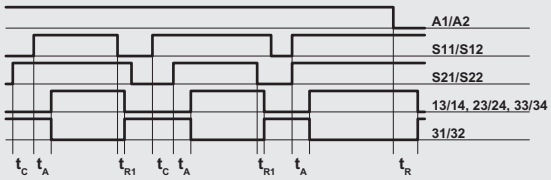


Internal block diagram

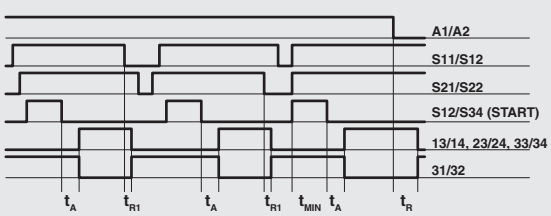


Function diagrams

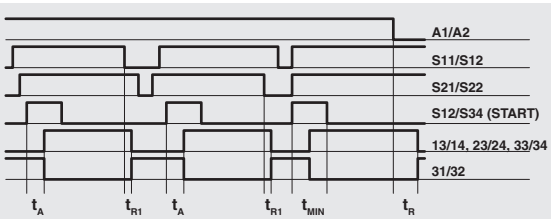
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



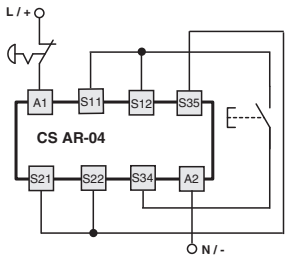
Legend:

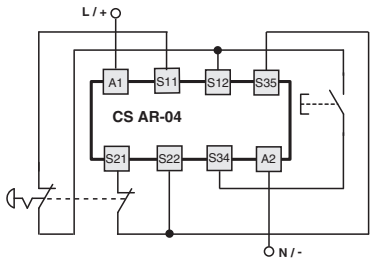
t_{MIN}:	Min. duration of start impulse	t_{R1}:	release time
t_C:	simultaneity time	t_R:	release time in absence of power supply
t_A:	response time		

Notes:
The configurations with one channel are obtained taking into consideration only the effect of the S11/S12 input on the supply. In this case it is necessary to consider time t_{R1} referred to input S11/S12, time t_R referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_{MIN}.

Input configuration

Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels

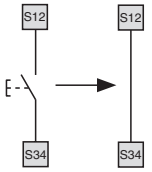




The diagram does not show the exact position of the terminals in the product

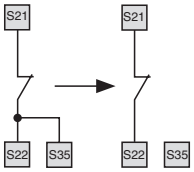
Automatic start

With regard to the indicated diagrams, bridge the start button between S12 and S34 in order to activate the automatic start module.



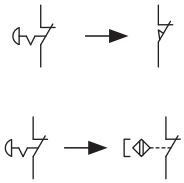
Monitored start

With regard to the indicated diagrams, remove the connection between S22 and S35 in order to activate the monitored start module.



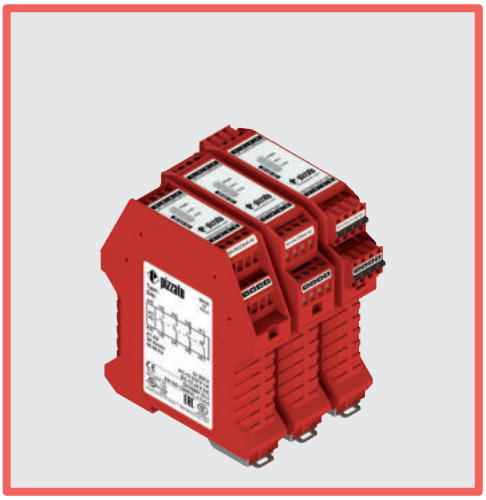
Monitoring of movable guards and magnetic safety sensors

The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts.
The sensors can only be used in 2-channel configuration.



Application examples See page 273

Safety module **CS AR-05 / CS AR-06**



Module for emergency stops, end position monitoring for movable guards, OSSD semiconductor outputs and magnetic safety sensors

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start (CS AR-05 only) or monitored start (CS AR-06 only)
- Can be connected to OSSD semiconductor outputs, to electromechanical contacts or to magnetic safety sensors
- Output contacts:
  3 NO safety contacts,
  1 NC auxiliary contact
- Supply voltage:
  24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	< 30 mA
Min. duration of start impulse t_{MIN}:	> 250 ms
Response time t_A:	< 200 ms
Release time t_{R1}:	< 15 ms
Release time in absence of power supply t_R:	< 70 ms
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	3 NO safety contacts 1 NC auxiliary contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	64 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-05V024

Start mode	
05	manual or automatic start
06	monitored start

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc
120	120 Vac
230	230 Vac

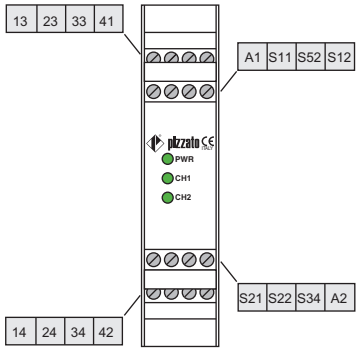
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

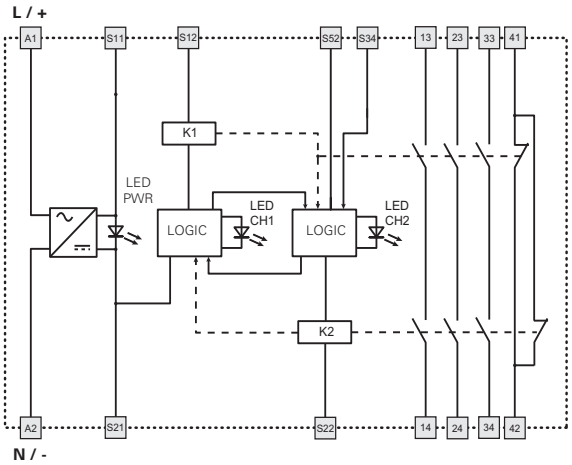
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS AR-05 / CS AR-06

Pin assignment

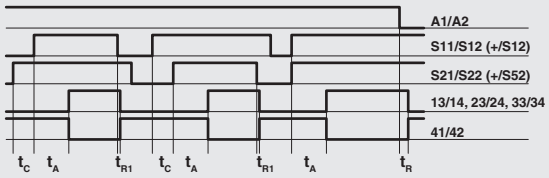


Internal block diagram

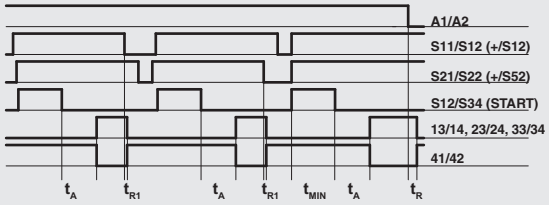


Function diagrams

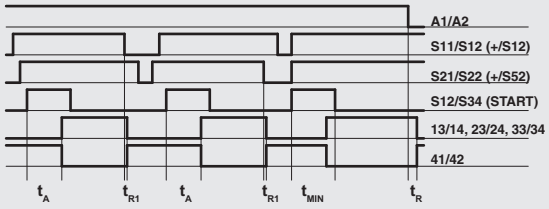
Configuration with automatic start (CS AR-05 only)



Configuration with monitored start (CS AR-06 only)



Configuration with manual start (CS AR-05 only)



Legend:

t_{MIN}:	Min. duration of start impulse	t_{R1}:	release time
t_C:	simultaneity time	t_R:	release time in absence of power supply
t_A:	response time		

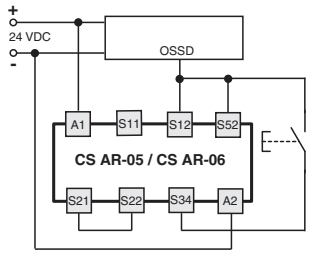
Notes:
The configurations with one channel are obtained taking into consideration the CH1 input only. In this case it is necessary to consider time t_{R1} referred to input CH1, time t_R referred to the supply, time t_A referred to input CH1 and to the start, and time t_{MIN} referred to the start.

Input configuration

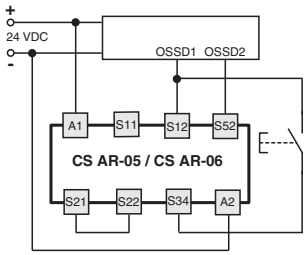
OSSD semiconductor outputs (e.g. ST, NS, NG series or light barriers)

Input configuration with manual start (CS AR-05)

1 channel



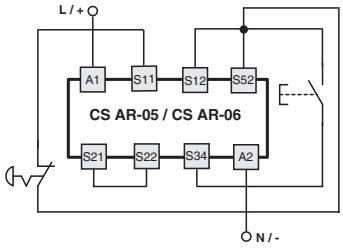
2 channels



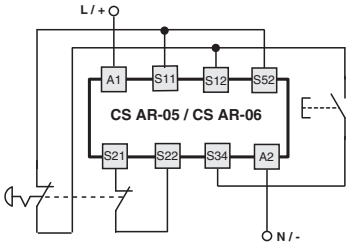
Emergency stop circuits

Input configuration with manual start (CS AR-05)

1 channel



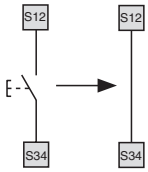
2 channels



The diagram does not show the exact position of the terminals in the product

Automatic start (CS AR-05 only)

Bridge the start button between S12 and S34 in order to activate the automatic start module.

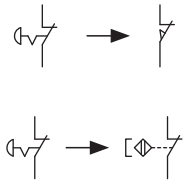


Monitored start

Use module CS AR-06 with the circuit diagrams for manual start.

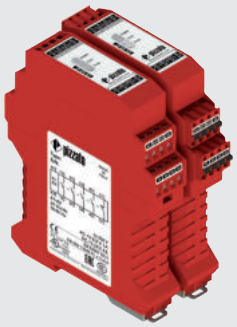
Monitoring of movable guards and magnetic safety sensors

The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. **The sensors can only be used in 2-channel configuration.**



Application examples See page 273

Safety module **CS AR-07**



Module for emergency stops and end position monitoring for movable guards

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start or monitored start
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- Output contacts:
  4 NO safety contacts,
  1 NC auxiliary contact
- Supply voltage:
  24 Vac/dc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design B

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	30 mA (typical)
Min. duration of start impulse t_{MIN}:	> 100 ms
Response time t_A:	< 70 ms
Release time t_{R1}:	< 40 ms
Release time in absence of power supply t_R:	< 80 ms
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	4 NO safety contacts 1 NC auxiliary contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 220 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	72 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-07M024

Connection type		Supply voltage	
M	Connector with screw terminals	**024**	24 Vac/dc
X	Connector with spring terminals		

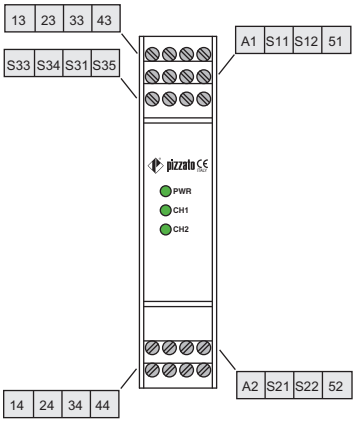
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

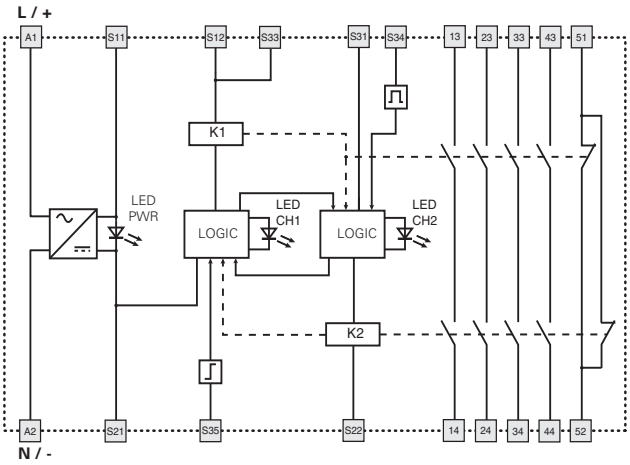
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS AR-07

Pin assignment

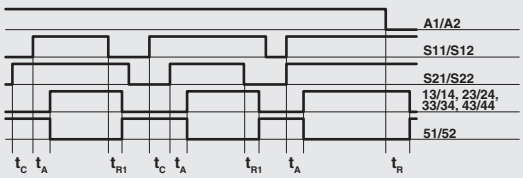


Internal block diagram

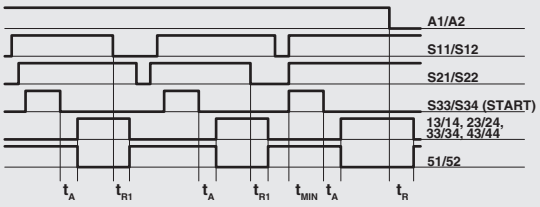


Function diagrams

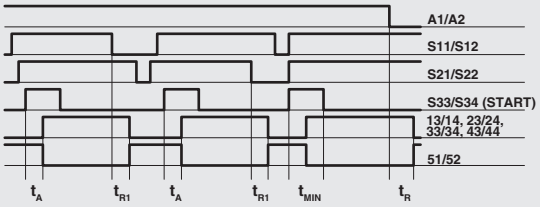
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



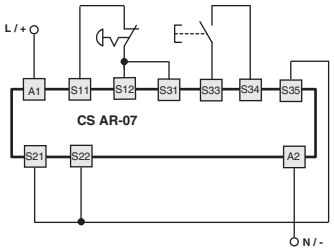
Legend:

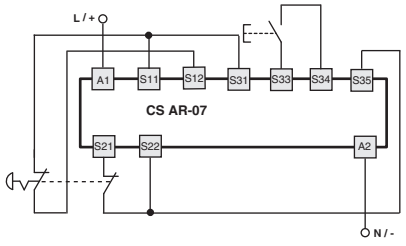
t_{MIN}:	Min. duration of start impulse	t_{R1}:	release time
t_C:	simultaneity time	t_R:	release time in absence of power supply
t_A:	response time		

Notes:
The configurations with one channel are obtained taking into consideration the S11/S12 input only. In this case it is necessary to consider time t_{R1} referred to input S11/S12, time t_R referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

Input configuration

Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels

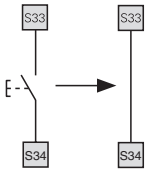




The diagram does not show the exact position of the terminals in the product

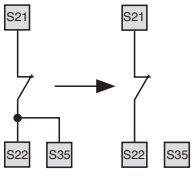
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



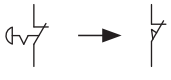
Monitored start

With regard to the indicated diagrams, remove the connection between S22 and S35 in order to activate the monitored start module.



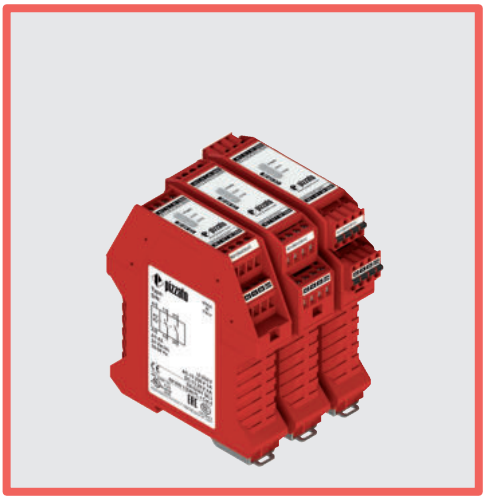
Movable guard monitoring

The safety module can monitor emergency stop circuits and control circuits for movable guards. Replace the emergency stop contacts with the switch contacts.



Application examples See page 273

Safety module **CS AR-08**



Module for emergency stops, end position monitoring for movable guards, OSSD semiconductor outputs and magnetic safety sensors

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start or monitored start
- Can be connected to OSSD semiconductor outputs, to electromechanical contacts or to magnetic safety sensors
- Output contacts: 2 NO safety contacts
- Supply voltage: 12 Vdc, 24 Vac/dc, 120 Vac, 230 Vac
- Possibility of parallel reset of several modules

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 18 05 75157 018
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	12 Vdc 24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance 24 Vac/dc, 120 Vac, 230 Vac:	±15% of U_n
Supply voltage tolerance 12 Vdc:	-10% … +15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω (15 Ω)*
Current per input:	30 mA (70 mA)* (typical)
Min. duration of start impulse t_{MIN}:	> 200 ms (100 ms)*
Response time t_A:	< 150 ms (220 ms)*
Release time t_{R1}:	< 20 ms (15 ms)*
Release time in absence of power supply t_R:	< 200 ms (50 ms)*
Simultaneity time t_C:	unlimited

* Version CS AR-08•U12

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 60947-5-3, EN 61508-1, EN 61508-2, EN 61508-4, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 NO safety contacts,
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz, 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac, 6 A general use, C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Features approved by TÜV SÜD

Rated supply voltage (U_n): 24 Vac/dc ± 15%, 120 Vac ± 15%, 230 Vac ± 15%
Power consumption: 5 VA max AC, 2 W max DC
Rated operating current (max.): 4 A
Maximum switching load (max.): 1380 VA
Ambient temperature: -25°C … +55°C
Storage temperature: -25 °C … + 70°C
Protection degree: IP40 (housing), IP20 (terminal strip)
In compliance with standards: 2006/42/EC Machinery Directive, EN ISO 13849-1:2015 (fino a Cat. 4 PL e), EN 60947-5-3:2013, EN 61508-1:2010 (fino a SIL 3), EN 61508-2:2010 (fino a SIL 3), EN 61508-4:2010 (fino a SIL 3), EN 62061:2005/A2:2015 (fino a SIL CL 3)

Code structure

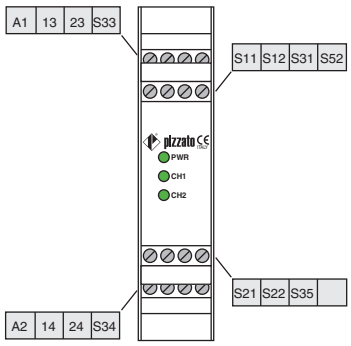
CS AR-08V024

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
U12	12 Vdc
024	24 Vac/dc
120	120 Vac
230	230 Vac

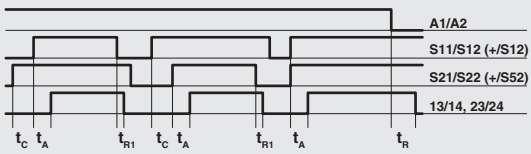
Safety module CS AR-08

Pin assignment

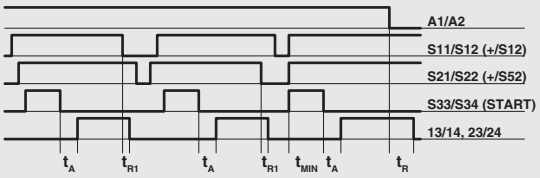


Function diagrams

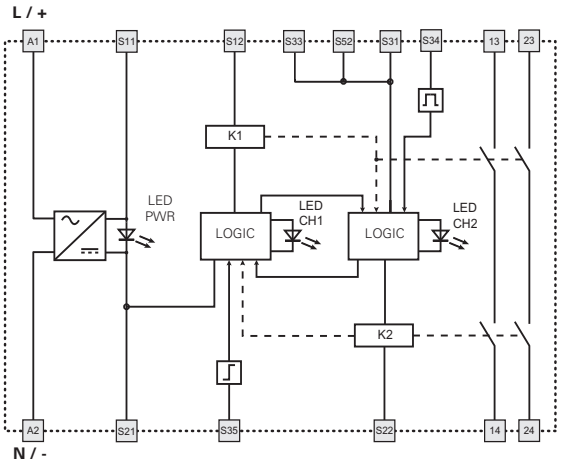
Configuration with automatic start



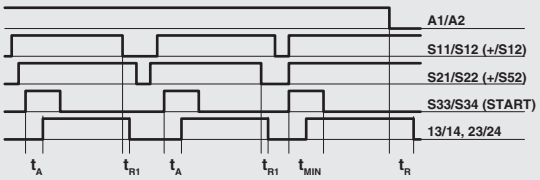
Configuration with monitored start



Internal block diagram



Configuration with manual start



Legend:

t_{MIN}:	Min. duration of start impulse	t_{R1}:	release time
t_c:	simultaneity time	t_R:	release time in absence of power supply
t_A:	response time		

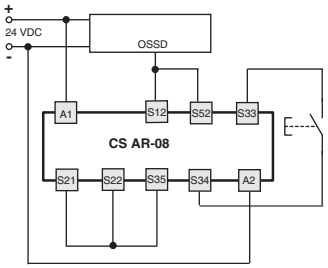
Notes:
The configurations with one channel are obtained taking into consideration the CH1 input only. In this case it is necessary to consider time t_{R1} referred to input CH1, time t_R referred to the supply, time t_A referred to input CH1 and to the start, and time t_{MIN} referred to the start.

Input configuration

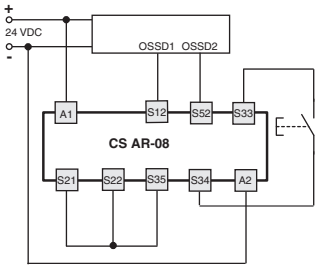
OSSD semiconductor outputs (e.g. ST, NS, NG series or light barriers)

Input configuration with manual start

1 channel



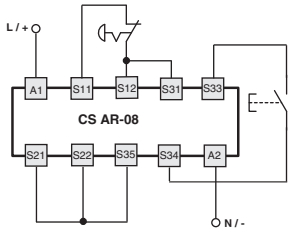
2 channels



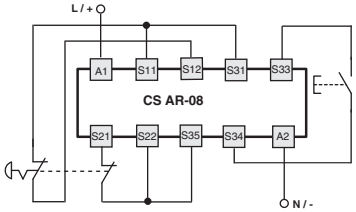
Emergency stop circuits

Input configuration with manual start

1 channel



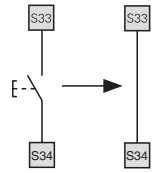
2 channels



The diagram does not show the exact position of the terminals in the product

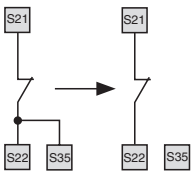
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



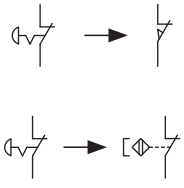
Monitored start

With regard to the indicated diagrams, remove the connection between S22 and S35 in order to activate the monitored start module.



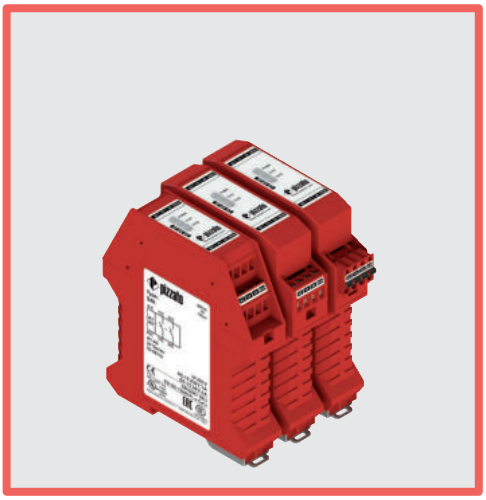
Monitoring of movable guards and magnetic safety sensors

The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts.
The sensors can only be used in 2-channel configuration.



Application examples See page 273

Safety module **CS AR-20 / CS AR-21**



Module for emergency stops and end position monitoring for movable guards

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start (CS AR-20 only) or monitored start (CS AR-21 only)
- Reduced housing width of 22.5 mm
- 2 NO safety contacts
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 3 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	70 mA (typical)
Min. duration of start impulse t_{MIN}:	> 100 ms
Response time t_A:	< 50 ms
Release time in absence of power supply t_R:	< 100 ms
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 NO safety contacts
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-20V024

Start mode	
20	manual or automatic start
21	monitored start

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc
120	120 Vac
230	230 Vac

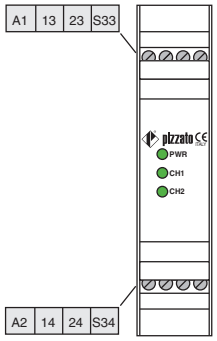
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

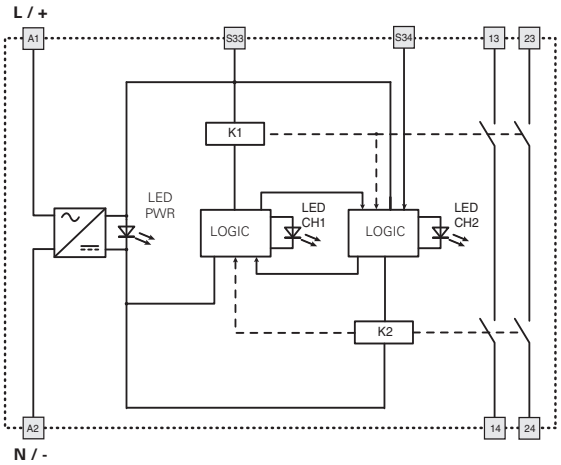
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS AR-20 / CS AR-21

Pin assignment

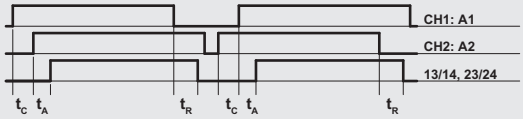


Internal block diagram

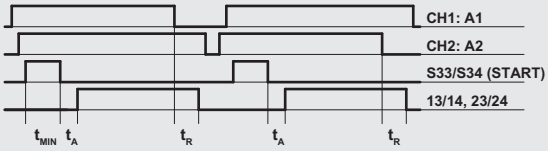


Function diagrams

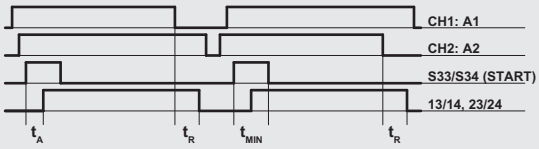
Configuration with automatic start (CS AR-20 only)



Configuration with monitored start (CS AR-21 only)



Configuration with manual start (CS AR-20 only)

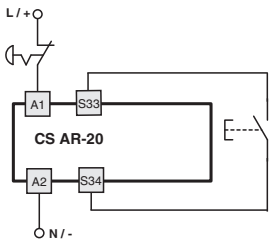


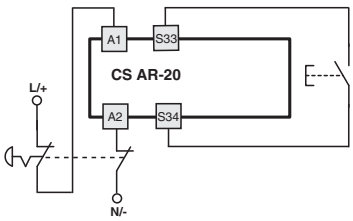
Legend:
t_{MIN}: Min. duration of start impulse
t_C: simultaneity time
t_A: response time
t_R: release time in absence of power supply

Notes:
The configurations with one channel are obtained taking into consideration the CH1:A1 input only. In this case it is necessary to consider time t_R referred to input CH1:A1, time t_A referred to input CH1:A1 and to the start, and time t_{MIN} referred to the start.

Input configuration

Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels

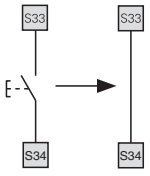




The diagram does not show the exact position of the terminals in the product

Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.

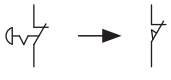


Monitored start

Use module CS AR-21 with the circuit diagrams for manual start.

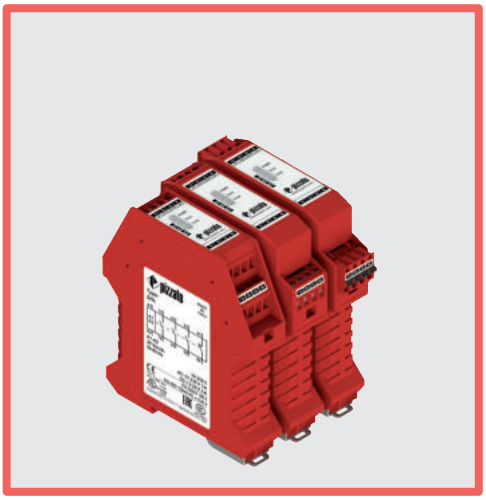
Movable guard monitoring

The safety module can monitor emergency stop circuits and control circuits for movable guards. Replace the emergency stop contacts with the switch contacts.



Application examples See page 273

Safety module **CS AR-22 / CS AR-23**



Module for emergency stops and end position monitoring for movable guards

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start (CS AR-22 only) or monitored start (CS AR-23 only)
- Reduced housing width of 22.5 mm
- 3 NO safety contacts, 1 NC auxiliary contact
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 3 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	70 mA (typical)
Min. duration of start impulse t_{MIN}:	> 100 ms
Response time t_A:	< 50 ms
Release time in absence of power supply t_R:	< 75 ms
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	3 NO safety contacts 1 NC auxiliary contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	80 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-22V024

Start mode	
22	manual or automatic start
23	monitored start

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc
120	120 Vac
230	230 Vac

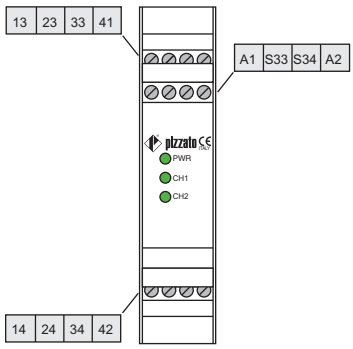
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

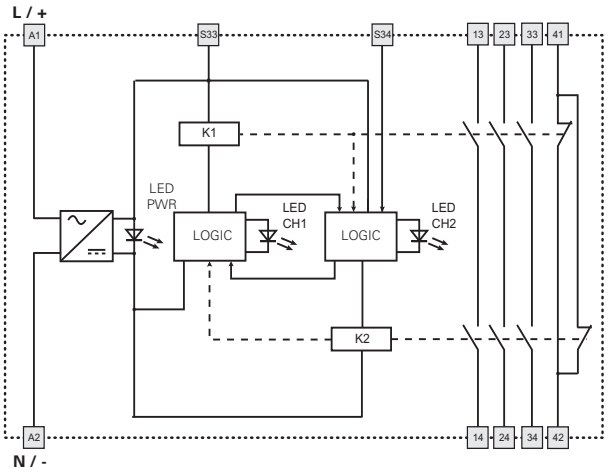
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS AR-22 / CS AR-23

Pin assignment

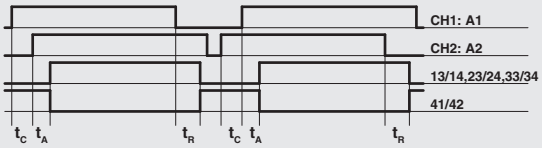


Internal block diagram

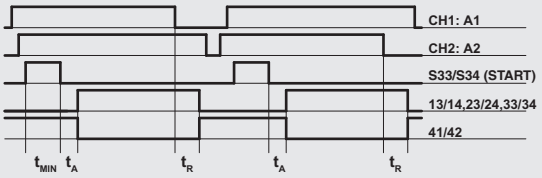


Function diagrams

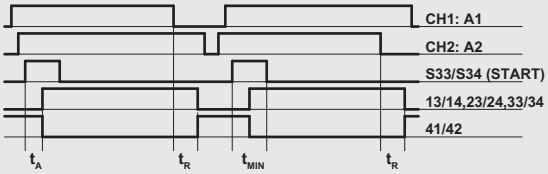
Configuration with automatic start (CS AR-22 only)



Configuration with monitored start (CS AR-23 only)



Configuration with manual start (CS AR-22 only)



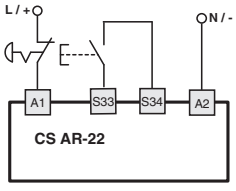
Legend:

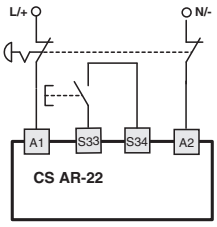
t_{MIN}: Min. duration of start impulse
t_c: simultaneity time
t_A: response time
t_R: release time in absence of power supply

Notes:
The configurations with one channel are obtained taking into consideration the CH1:A1 input only. In this case it is necessary to consider time t_R referred to input CH1:A1, time t_A referred to input CH1:A1 and to the start, and time t_{MIN} referred to the start.

Input configuration

Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels

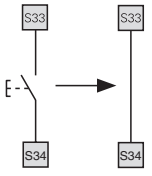




The diagram does not show the exact position of the terminals in the product

Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.

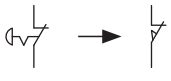


Monitored start

Use module CS AR-23 with the circuit diagrams for manual start.

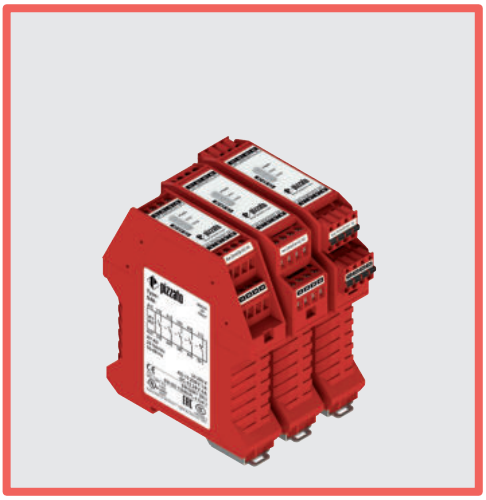
Movable guard monitoring

The safety module can monitor emergency stop circuits and control circuits for movable guards. Replace the emergency stop contacts with the switch contacts.



Application examples See page 273

Safety module **CS AR-24 / CS AR-25**



Module for emergency stops and end position monitoring for movable guards

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start (CS AR-24 only) or monitored start (CS AR-25 only)
- Reduced housing width of 22.5 mm
- 4 NO safety contacts
- 1 NC auxiliary contact
- Supply voltage: 24 Vac/dc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 3 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	30 mA (typical)
Min. duration of start impulse t_{MIN}:	> 100 ms
Response time t_A:	< 85 ms
Release time t_{R1}:	< 40 ms
Release time in absence of power supply t_R:	< 170 ms
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	4 NO safety contacts 1 NC auxiliary contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	72 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-24V024

Start mode	
24	manual or automatic start
25	monitored start

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc

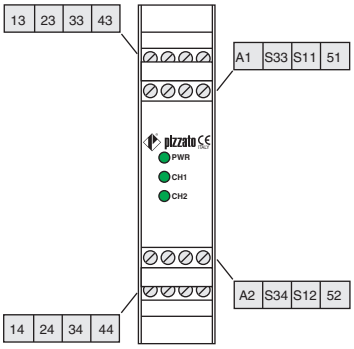
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

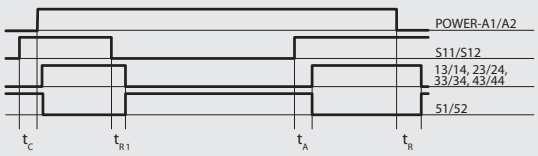
Safety module CS AR-24 / CS AR-25

Pin assignment

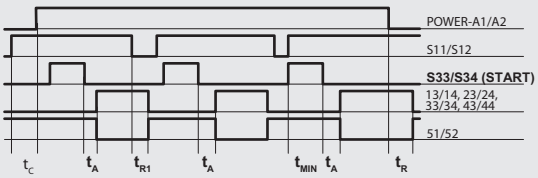


Function diagrams

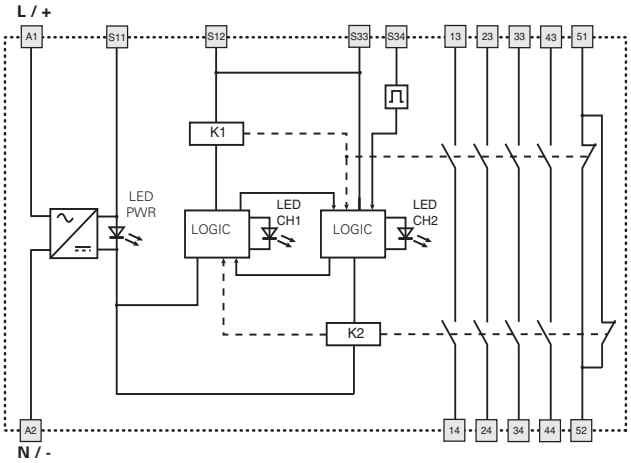
Configuration with automatic start (CS AR-24 only)



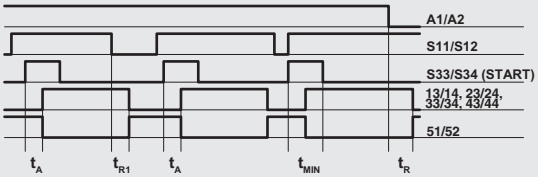
Configuration with monitored start (CS AR-25 only)



Internal block diagram



Configuration with manual start (CS AR-24 only)



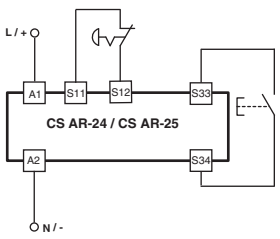
Legend:

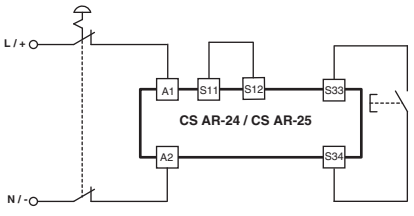
t_{MIN}:	Min. duration of start impulse	t_{R1}:	release time
t_C:	simultaneity time	t_R:	release time in absence of power supply
t_A:	response time		

Notes:
The configurations with one channel are obtained taking into consideration the S11/S12 input only. In this case it is necessary to consider time t_{R1} referred to input S11/S12, time t_R referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

Input configuration

Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels

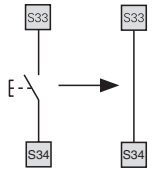




The diagram does not show the exact position of the terminals in the product

Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.

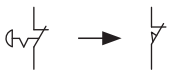


Monitored start

Use module CS AR-25 with the circuit diagrams for manual start.

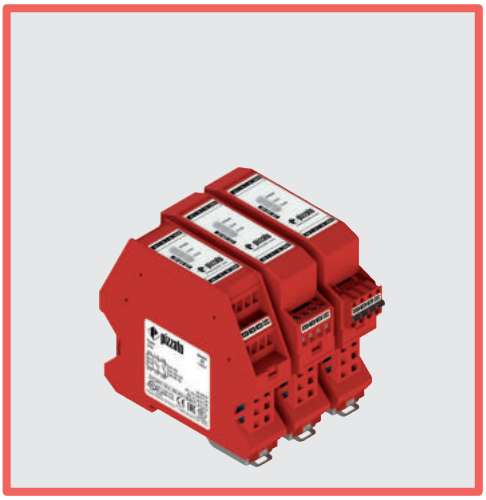
Movable guard monitoring

The safety module can monitor emergency stop circuits and control circuits for movable guards. Replace the emergency stop contacts with the switch contacts.



Application examples See page 273

Safety module **CS AR-40 / CS AR-41**



Module for emergency stops and end position monitoring for movable guards

Main features

- For safety applications up to SIL CL 2/PL d
- Choice between automatic start, manual start (CS AR-40 only) or monitored start (CS AR-41 only)
- Reduced housing width of 22.5 mm
- 2 NO safety contacts
- Supply voltage: 24 Vac/dc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design D

General data

SIL level (SIL CL) up to:	SIL CL 2 acc. to EN 62061
Performance Level (PL) up to:	PL d acc. to EN ISO 13849-1
Safety category up to:	cat. 2 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	70 mA (typical)
Min. duration of start impulse t_{MIN}:	> 100 ms
Response time t_A:	< 50 ms
Release time in absence of power supply t_R:	< 105 ms
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 NO safety contacts
Contact type:	forcibly guided
Material of the contacts:	silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-40V024

Start mode	
40	manual or automatic start
41	monitored start

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc

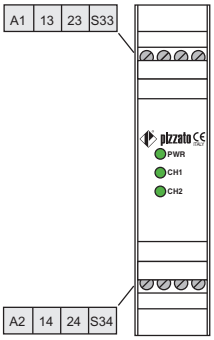
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

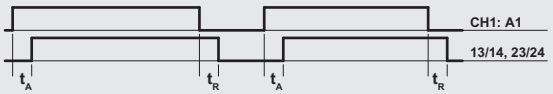
Safety module CS AR-40 / CS AR-41

Pin assignment

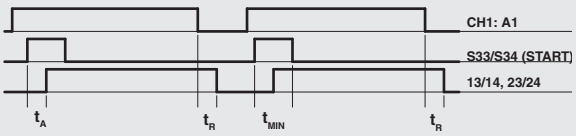


Function diagrams

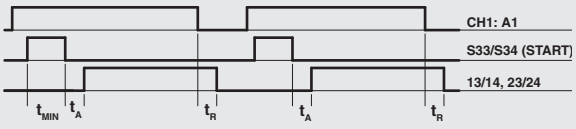
1-channel configuration with automatic start (CS AR-40 only)



1-channel configuration with manual start (CS AR-40 only)

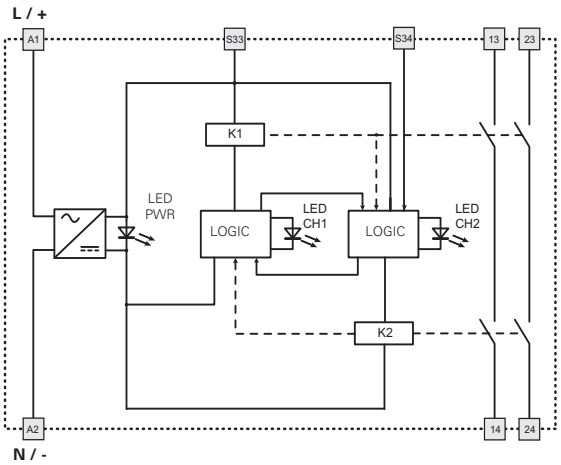


1-channel configuration with monitored start (CS AR-41 only)



Legend:
t_{MIN}: Min. duration of start impulse
t_A: response time
t_R: release time in absence of power supply

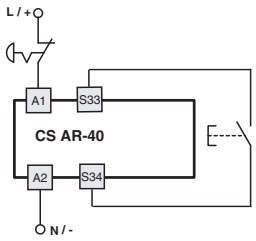
Internal block diagram



Input configuration

Emergency stop circuits

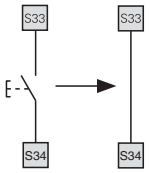
One channel input configuration with manual start



The diagram does not show the exact position of the terminals in the product

Automatic start

With regard to the indicated diagram, bridge the start button between S33 and S34 in order to activate the automatic start module.



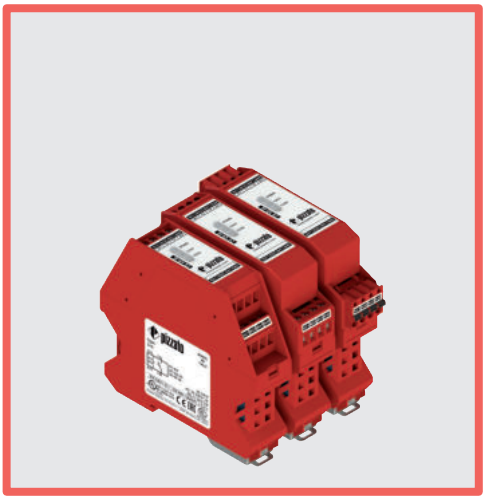
Monitored start

Use module CS AR-41 with the circuit diagrams for manual start.

Movable guard monitoring

The safety module can monitor emergency stop circuits and control circuits for movable guards. Replace the emergency stop contacts with the switch contacts.

Safety module **CS AR-46**



Module for emergency stop, end position monitoring for movable guards, and magnetic safety sensors and devices

Main features
- For safety applications up to SIL CL 1/PL c
- Reduced housing width of 22.5 mm
- 1 NO safety contact
- Supply voltage: 24 Vac/dc

Utilization categories
Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

UL approval:	E131787
CCC approval:	2013010305640211
EAC approval:	RU C-IT.УТ03.B.00035/19

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

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94	
Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design D

General data

SIL level (SIL CL) up to:	SIL CL 1 acc. to EN 62061
Performance Level (PL) up to:	PL c acc. to EN ISO 13849-1
Safety category up to:	cat. 1 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	20 mA (typical)
Response time t_A:	< 15 ms
Release time t_{R1}:	< 20 ms
Release time in absence of power supply t_R:	< 100 ms
Simultaneity time t_C:	unlimited

In compliance with standards:
EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	1 NO safety contact
Material of the contacts:	silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-46V024

Connection type		Supply voltage	
V	Screw terminals	**024**	24 Vac/dc
M	Connector with screw terminals		
X	Connector with spring terminals		

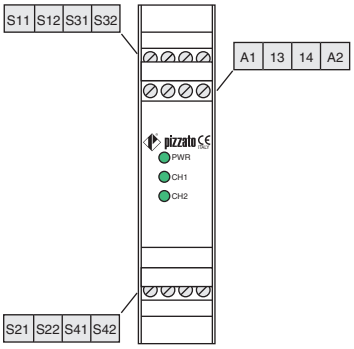
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

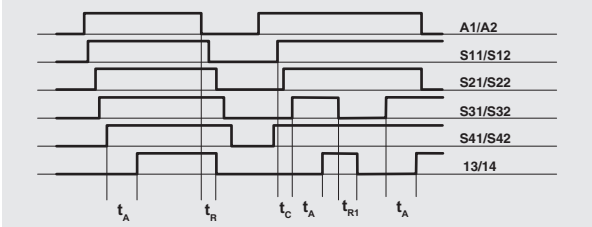
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS AR-46

Pin assignment

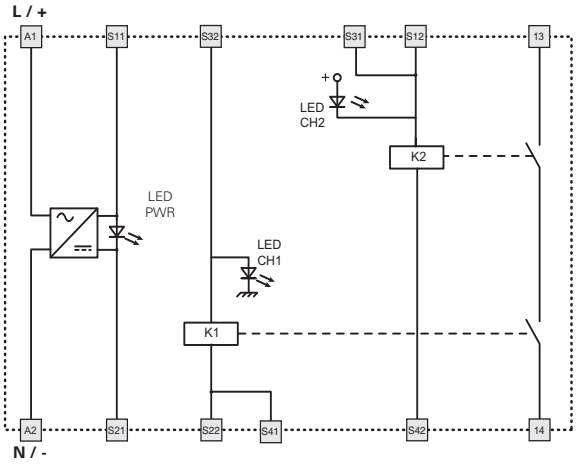


Function diagrams



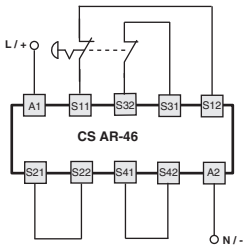
Legend:
t_C: simultaneity time
t_A: response time
t_{R1}: release time
t_R: release time in absence of power supply

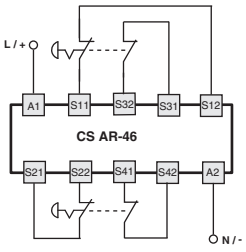
Internal block diagram

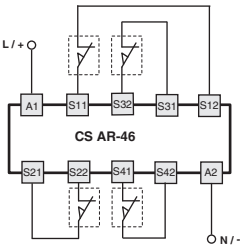


Input configuration

Emergency stop circuits		
Input configuration with automatic start		
2 channels and 1 emergency button	2 channels and 2 emergency buttons	2 channels and 4 switches

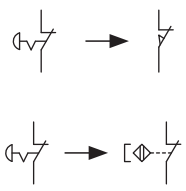




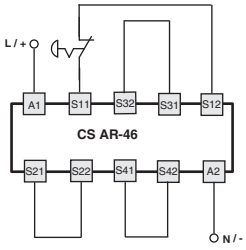


Monitoring of movable guards and magnetic safety sensors

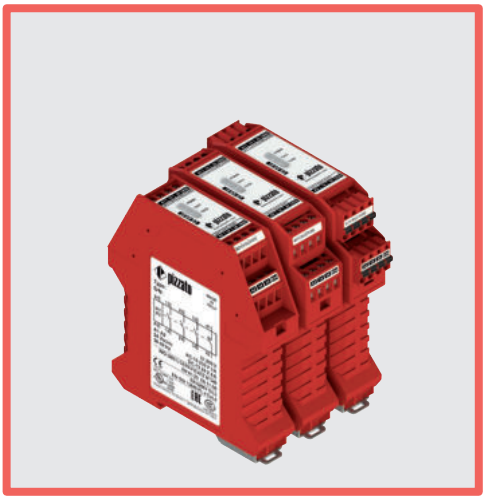
The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. **The sensors can only be used in 2-channel configuration.**



1 channel and 1 emergency button



Safety module **CS AR-91**



Module for emergency stops, end position monitoring for movable guards and magnetic safety sensors

Main features

- For safety applications up to SIL 3/PL e
- Choice between automatic start, manual start or monitored start
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- Output contacts:
  2 NO safety contacts, 1 NO opto-decoupled auxiliary contact
- Supply voltage: 24 Vac/dc
- Insensitive to voltage dips

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EU-type examination certificate: IMQ n. 340
(EN 81-20:2014; EN 81-50:2014; EN 81-1:1998+A3:2009; EN 81-2:1998+A3:2009)
EC type examination certificate: IMQ CP 432 DM
(Machinery Directive)

UL approval:	E131787
CCC approval:	2013010305640211
EAC approval:	RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU,
Lifts Directive 2014/33/EU

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; ±15%; 50…60 Hz
Max. DC residual ripple in DC:	10%
Power consumption AC:	< 5 VA
Power consumption DC:	< 2.5 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC response time:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	< 40 mA
Min. duration of start impulse t_{MIN}:	> 50 ms
Response time t_A:	< 120 ms
Release time t_{R1}:	< 15 ms
Release time in absence of power supply t_R:	< 65 ms
Simultaneity time t_C:	unlimited
Response time starting from application of the supply:	< 300 ms

Auxiliary signalling circuit

Auxiliary output (Y43-Y44):	1NO opto-decoupled
Rated operating voltage (U_e):	24 Vdc
Rated operating current (I_e):	25 mA
Rated impulse withstand voltage (U_{imp}):	4 kV
Release time t_{R2}:	< 1 ms

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 NO safety contacts,
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current Σ I_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A type F

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-91V024

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc

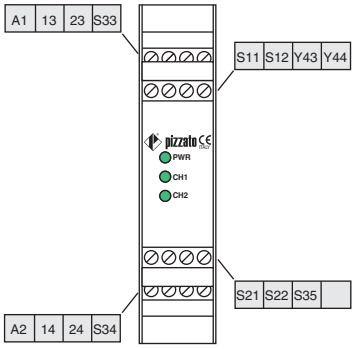
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS AR-91

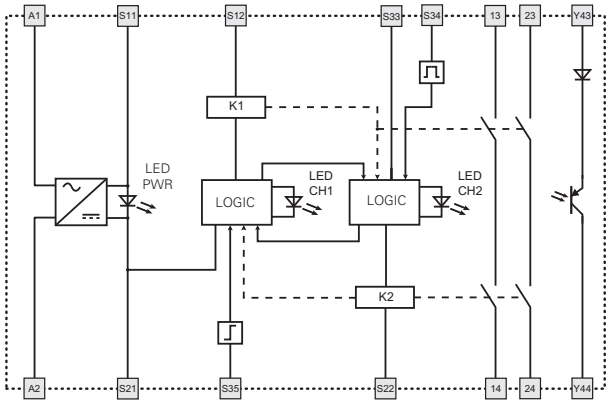
Pin assignment



Voltage dips, short interruptions and voltage variations

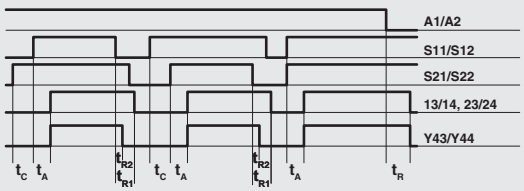
The CS AR-91 safety module has a built-in voltage drop sensor which serves to protect and safeguard the internal state of the safety relays, in the event of dips or short voltage interruptions. This is to prevent unwanted switching states in relation to the state of the inputs from occurring. When voltage is restored, the device continues to operate with a switching state that is consistent with the input signals. The safety module retains its normal function during voltage dips and brief interruptions; for longer voltage interruptions, the safety outputs open and reset themselves automatically during an automatic start if voltage is restored or – in the case of a manual or monitored start – require that the system be reset by the operator.

Internal block diagram

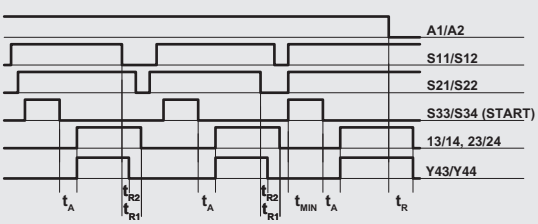


Function diagrams

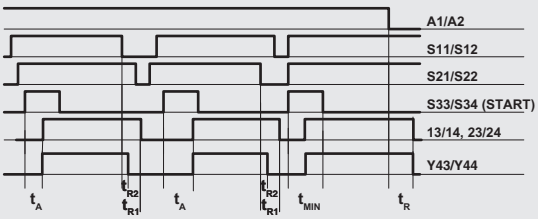
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



Legend:

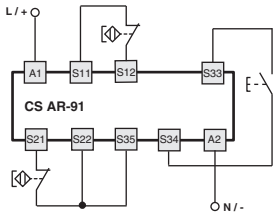
t_{MIN}:	Min. duration of start impulse	t_{R1}:	release time
t_c:	simultaneity time	t_R:	release time in absence of power supply
t_A:	response time		

Notes:
The configurations with one channel are obtained taking into consideration the S11/S12 input only. In this case it is necessary to consider time t_{R1} referred to input S11/S12, time t_R referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

Input configuration

Input configuration with magnetic sensors

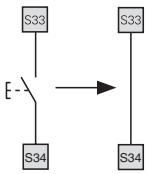
2 channels



The diagram does not show the exact position of the terminals in the product

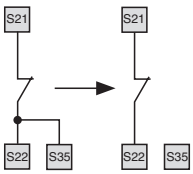
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



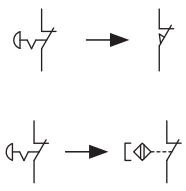
Monitored start

With regard to the indicated diagrams, remove the connection between S22 and S35 in order to activate the monitored start module.



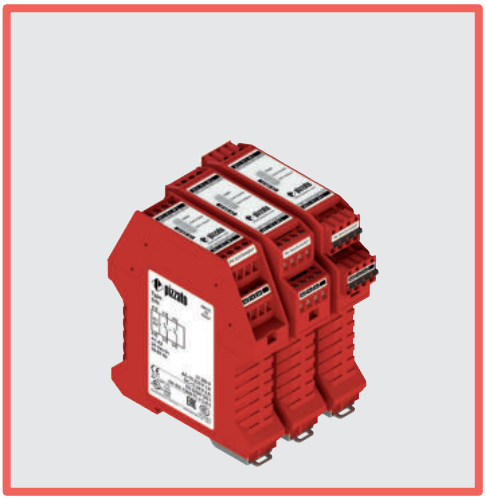
Monitoring of movable guards and magnetic safety sensors

The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts.
The sensors can only be used in 2-channel configuration.



Application examples See page 273

Safety module **CS AR-51**



Module for emergency stops, end position monitoring for movable guards, safety mats and safety bumpers with 4-wire technology

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 2 channels
- Choice between automatic start, manual start or monitored start
- Connection of input channels of opposite potentials
- Can be connected to electromechanical contacts, safety mats or safety bumpers with 4-wire technology
- Output contacts:
  2 NO safety contacts,
- Supply voltage:
  24 Vac/dc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2.5 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 200 Ω
Current per input:	10 mA (typical)
Min. duration of start impulse t_{MIN}:	> 150 ms
Response time t_A:	< 120 ms
Release time t_{R1}:	< 15 ms
Release time in absence of power supply t_R:	< 100 ms
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 NO safety contacts
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A²
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS AR-51V024

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc

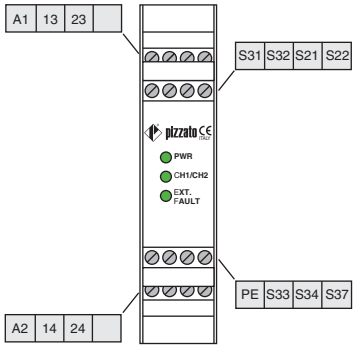
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS AR-51

Pin assignment

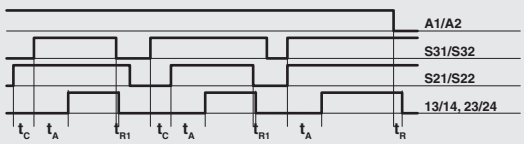


PE terminal connection
The PE terminal has to be connected to the equipotential circuit of machine protection if it is necessary.
This connection is made for functional reason, to reduce effects of an insulation fault on the machine operation.
In particular, ground faults in control circuits must not cause unwanted start-up or dangerous movements or prevent the machine from stopping.

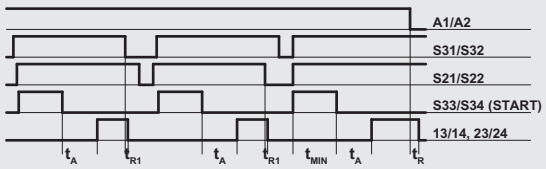
Function of "EXT. FAULT" LED
When a pressure is exerted on the surface of a safety bumper or safety mat, a short-circuit occurs between the two conductive elements, which constitute the apparatus and can be connected to the input channels of the safety module.
The signal thereby generated causes the EXT.FAULT LED to illuminate and signal the short-circuit and the opening of the output contacts, resulting in the blocking of the control circuit and causing the machine to switch to the safety setting. The EXT. FAULT LED does not switch on if the wires or internal connections of the safety mat or safety bumper are interrupted.

Function diagrams

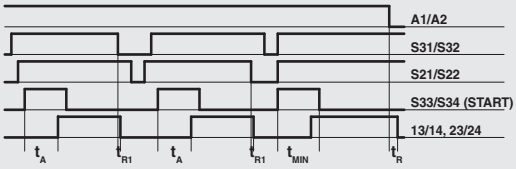
Configuration with automatic start



Configuration with monitored start

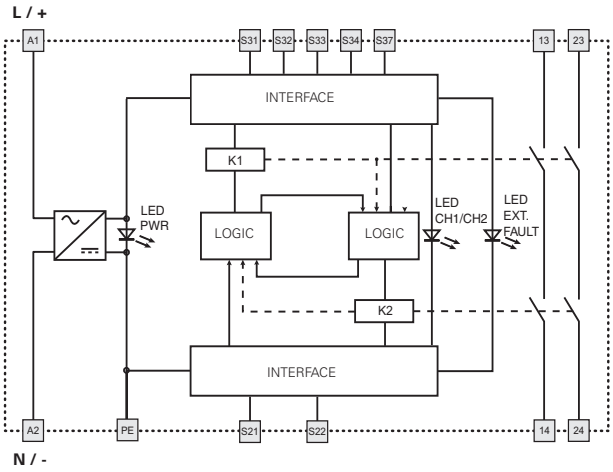


Configuration with manual start



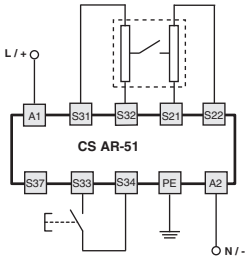
Legend:
t_{MIN}: Min. duration of start impulse
t_C: simultaneity time
t_A: response time
t_{R1}: release time
t_R: release time in absence of power supply

Internal block diagram

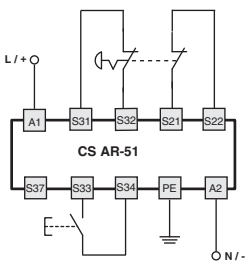


Input configuration

Safety mats and safety bumpers
Input configuration with manual start
2 channels

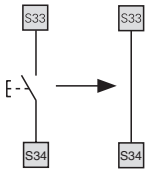


Emergency stop circuits
Input configuration with manual start
2 channels



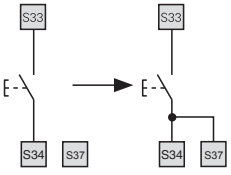
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



Monitored start

With regard to the indicated diagrams, establish the connection between S34 and S37 in order to activate the monitored start module.



Movable guard monitoring

The safety module can monitor emergency stop circuits and control circuits for movable guards. Replace the emergency stop contacts with the switch contacts.

The diagram does not show the exact position of the terminals in the product

Safety module **CS AT-0**

Module for emergency stops, end position monitoring for movable guards with delayed contacts at the opening of the input channels, OSSD semiconductor outputs and magnetic safety sensors

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start or monitored start
- Connection of input channels of opposite potentials
- Can be connected to OSSD semiconductor outputs, to electromechanical contacts or to magnetic safety sensors
- Standard housing width of 45 mm
- 2 instantaneous NO safety contacts, 1 instantaneous NC auxiliary contact, 2 delayed NO safety contacts.
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC, EMC Directive 2014/30/EC, RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design C

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	category 4 (instantaneous contacts), category 3 (delayed contacts) acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 10 VA
Power consumption DC:	< 5 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	30 mA (typical)
Min. duration of start impulse t_{MIN}:	> 200 ms
Response time t_A:	< 150 ms
Release time t_{R1}:	< 25 ms
Release time in absence of power supply t_R:	< 150 ms
Release time, delayed contacts t_{R2}:	see "Code structure"
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 instantaneous NO safety contacts, 1 instantaneous NC auxiliary contact, 2 delayed NO safety contacts.
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	72 (instant. contacts), 36 (del. contacts) A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

article | options

CS AT-00V024-TF1

Release time, delayed contacts (t_{R2})	
0	Fixed time (see TF)
1	0.3 … 3 s, 0.3 s steps
2	1 … 10 s, 1 s steps
3	3 … 30 s, 3 s steps
4	30 … 300 s, 30 s steps

Release time, delayed contacts (t_{R2})	
TF0.5	0.5 s fixed time
TF1	1 s fixed time
TF3	3 s fixed time
...	.....

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc
120	120 Vac
230	230 Vac

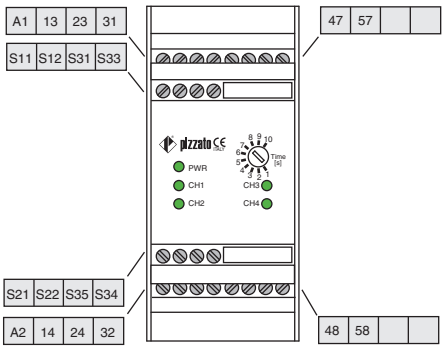
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 10 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

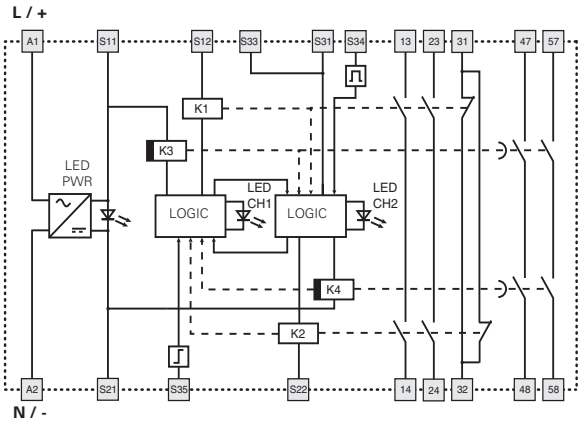
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.
- Surrounding air of 55°C.

Safety module CS AT-0

Pin assignment

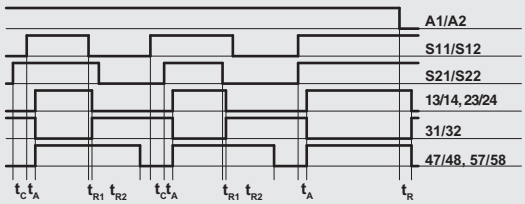


Internal block diagram

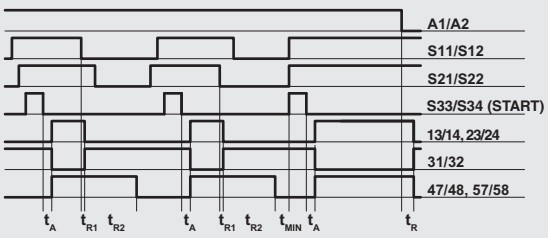


Function diagrams

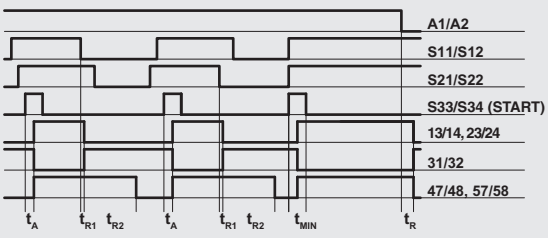
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



Legend:

- t_{MIN}: Min. duration of start impulse
- t_c: simultaneity time
- t_A: response time
- t_{R1}: release time
- t_R: release time in absence of power supply
- t_{R2}: release time, delayed contacts adjustable (see "Code structure")

Notes:

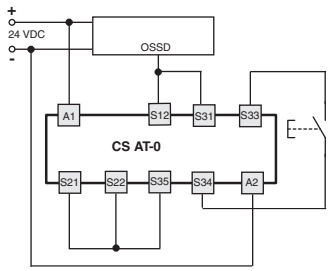
The configurations with one channel are obtained taking into consideration the S11/S12 input only. In this case it is necessary to consider time t_{R1} and t_{R2} referred to input S11/S12, time t_R referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

Input configuration

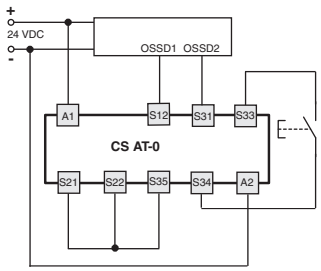
OSSD semiconductor outputs (e.g. ST, NS, NG series or light barriers)

Input configuration with manual start

1 channel



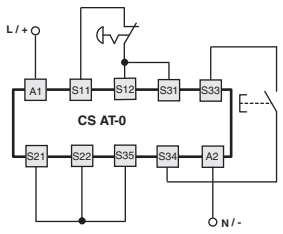
2 channels



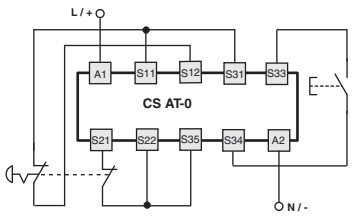
Emergency stop circuits

Input configuration with manual start

1 channel

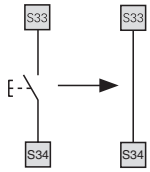


2 channels



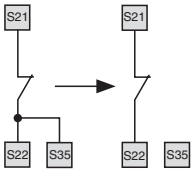
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



Monitored start

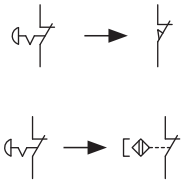
With regard to the indicated diagrams, remove the connection between S22 and S35 in order to activate the monitored start module.



Monitoring of movable guards and magnetic safety sensors

The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts.

The sensors can only be used in 2-channel configuration.



Application examples See page 273

The diagram does not show the exact position of the terminals in the product

Safety module **CS AT-1**

Module for emergency stops, end position monitoring for movable guards with delayed contacts at the opening of the input channels, OSSD semiconductor outputs and magnetic safety sensors

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start or monitored start
- Connection of input channels of opposite potentials
- Can be connected to OSSD semiconductor outputs, to electromechanical contacts or to magnetic safety sensors
- Standard housing width of 45 mm
- 3 instantaneous NO safety contacts, 2 delayed NO safety contacts.
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM

UL approval:	E131787
CCC approval:	2013010305640211
EAC approval:	RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC, EMC Directive 2014/30/EC, RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design C

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	category 4 (instantaneous contacts), category 3 (delayed contacts) acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 10 VA
Power consumption DC:	< 5 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	30 mA (typical)
Min. duration of start impulse t_{MIN}:	> 200 ms
Response time t_A:	< 150 ms
Release time t_{R1}:	< 25 ms
Release time in absence of power supply t_R:	< 150 ms
Release time, delayed contacts t_{R2}:	see "Code structure"
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	3 instantaneous NO safety contacts, 2 delayed NO safety contacts.
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	72 (instant. contacts), 36 (del. contacts) A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

article | options

CS AT-10V024-TF1

Release time, delayed contacts (t_{R2})	
0	Fixed time (see TF)
1	0.3 … 3 s, 0.3 s steps
2	1 … 10 s, 1 s steps
3	3 … 30 s, 3 s steps
4	30 … 300 s, 30 s steps

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc
120	120 Vac
230	230 Vac

Release time, delayed contacts (t_{R2})	
TF0.5	0.5 s fixed time
TF1	1 s fixed time
TF3	3 s fixed time
...	.....

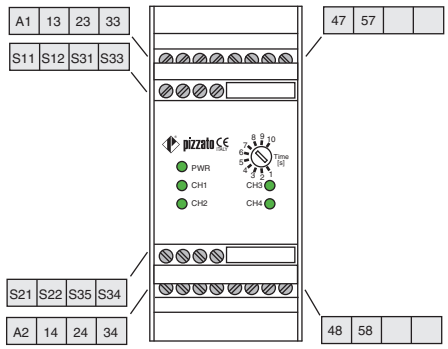
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 10 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.
- Surrounding air of 55°C.

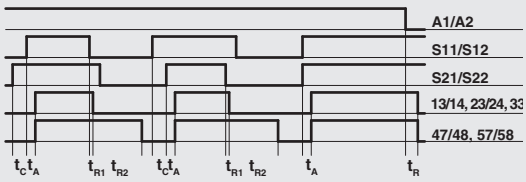
Safety module CS AT-1

Pin assignment

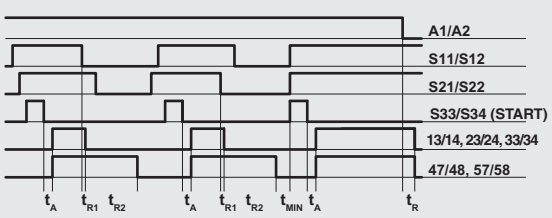


Function diagrams

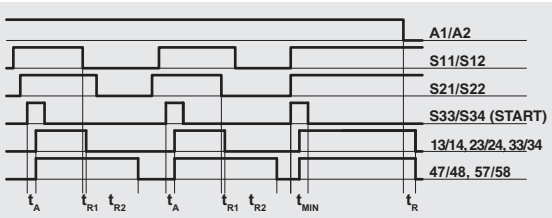
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



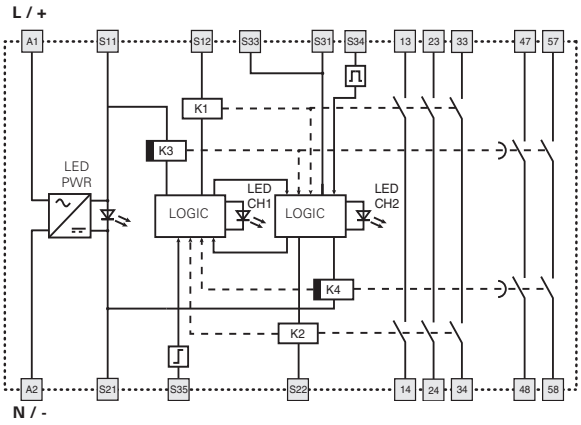
Legend:

t_{MIN}: Min. duration of start impulse
t_c: simultaneity time
t_A: response time
t_{R1}: release time
t_R: release time in absence of power supply
t_{R2}: release time, delayed contacts adjustable (see "Code structure")

Notes:

The configurations with one channel are obtained taking into consideration the S11/S12 input only. In this case it is necessary to consider time t_{R1} and t_{R2} referred to input S11/S12, time t_R referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

Internal block diagram

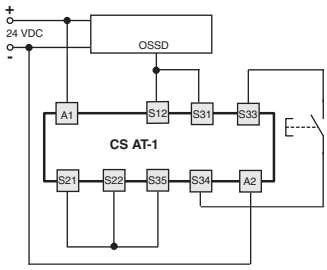


Input configuration

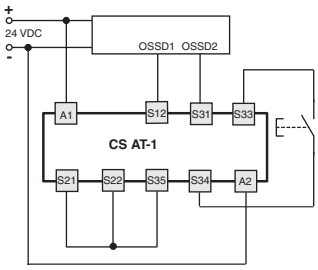
OSSD semiconductor outputs (e.g. ST, NS, NG series or light barriers)

Input configuration with manual start

1 channel



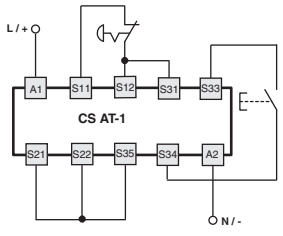
2 channels



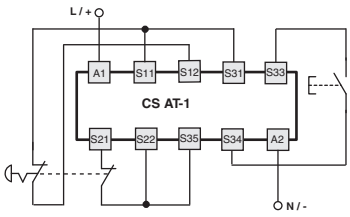
Emergency stop circuits

Input configuration with manual start

1 channel

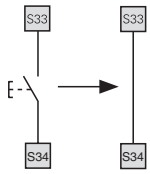


2 channels



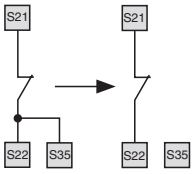
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



Monitored start

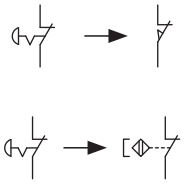
With regard to the indicated diagrams, remove the connection between S22 and S35 in order to activate the monitored start module.



Monitoring of movable guards and magnetic safety sensors

The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts.

The sensors can only be used in 2-channel configuration.



Application examples See page 273

The diagram does not show the exact position of the terminals in the product

Safety module **CS AT-3**

Module for emergency stop and end position monitoring for movable guards with delayed contacts at the opening of the input channels and magnetic safety sensors

Main features

- For safety applications up to SIL CL 3/PL e
- Input with 1 or 2 channels
- Choice between automatic start, manual start or monitored start
- Can be connected to electromechanical contacts or to magnetic safety sensors
- 45 mm housing
- 2 instantaneous NO safety contacts, 1 delayed NO safety contact.
- Supply voltage: 24 Vac/dc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC, EMC Directive 2014/30/EC, RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design C

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	category 4 (instantaneous contacts) category 3 (delayed contacts) acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 10 VA
Power consumption DC:	< 5 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	30 mA (typical)
Min. duration of start impulse t_{MIN}:	> 100 ms
Response time t_A:	< 120 ms
Release time t_{R1}:	< 15 ms
Release time in absence of power supply t_R:	< 150 ms
Release time, delayed contacts t_{R2}:	see "Code structure"
Simultaneity time t_C:	unlimited

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 instantaneous NO safety contacts, 1 delayed NO safety contact.
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

article | options

CS AT-30V024-TF1

Release time, delayed contacts (t_{R2})	
0	Fixed time (see TF)
1	0.3 … 3 s, 0.3 s steps
2	1 … 10 s, 1 s steps
3	3 … 30 s, 3 s steps
4	30 … 300 s, 30 s steps

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc

Release time, delayed contacts (t_{R2})	
TF0.5	0.5 s fixed time
TF1	1 s fixed time
TF3	3 s fixed time
...	.....

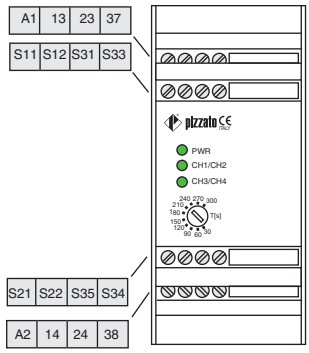
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Power consumption AC:	< 10 VA
Power consumption DC:	< 4 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.
- Surrounding air of 55°C.

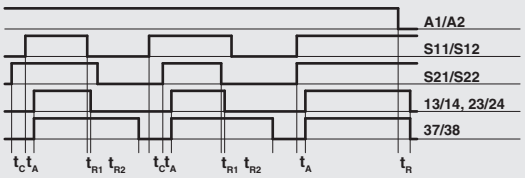
Safety module CS AT-3

Pin assignment

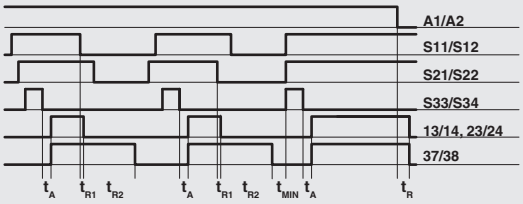


Function diagrams

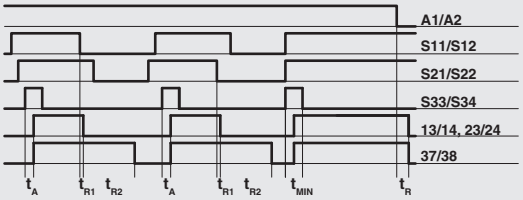
Configuration with automatic start



Configuration with monitored start



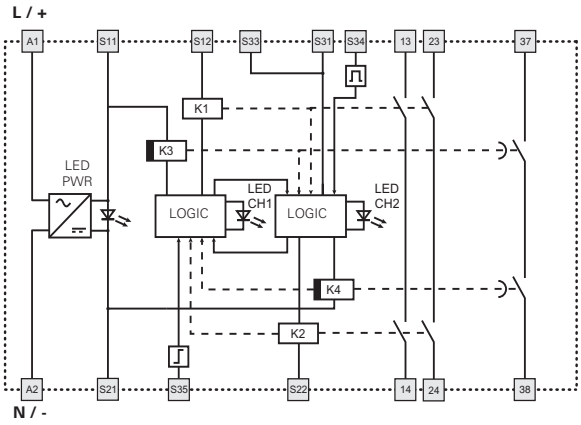
Configuration with manual start



Legend:
- t_{MIN}: Min. duration of start impulse
- t_C: simultaneity time
- t_A: response time
- t_{R1}: release time
- t_R: release time in absence of power supply
- t_{R2}: release time, delayed contacts adjustable (see "Code structure")

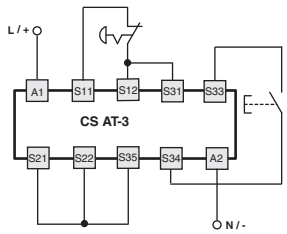
Notes:
The configurations with one channel are obtained taking into consideration the S11/S12 input only. In this case it is necessary to consider times t_{R1} and t_{R2} referred to input S11/S12, time t_R referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

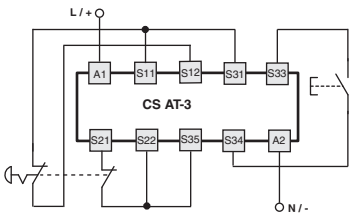
Internal block diagram



Input configuration

Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels

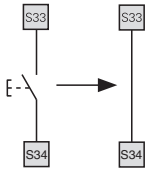




The diagram does not show the exact position of the terminals in the product

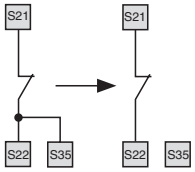
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



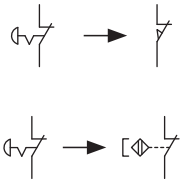
Monitored start

With regard to the indicated diagrams, remove the connection between S22 and S35 in order to activate the monitored start module.



Monitoring of movable guards and magnetic safety sensors

The safety module can monitor emergency stop circuits, control circuits for movable guards as well as magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. **The sensors can only be used in 2-channel configuration.**



Application examples See page 273

Safety module **CS FS-1**

Safety timer module with delayed contacts at energizing

Main features

- For safety applications up to SIL CL 3/PL e
- Timing circuits by means of safety system with self-monitoring and redundancy
- Release command for interlocked safety devices
- 45 mm housing
- Output contacts:
  1 NO safety contact,
  2 NC auxiliary contacts
- Supply voltage:
  24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

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

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design C

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1 (depending on circuit structure)
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	response time > 100 ms, release time > 3 s
Response time t_A:	see "Code structure"
Release time in absence of power supply t_R:	< 60 ms

In compliance with standards:
EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	1 NO safety contact, 2 NC auxiliary contacts
Contact type:	forcibly guided
Material of the contacts:	silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

article | options

CS FS-11V024-TF1

Response time (t_A)	
0	Fixed time (see Tfx)
1	0.3 … 3 s, 0.3 s steps
2	1 … 10 s, 1 s steps
3	3 … 30 s, 3 s steps
4	30 … 300 s, 30 s steps

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc
120	120 Vac
230	230 Vac

Response time (t_A)	
TF0.5	0.5 s fixed time
TF1	1 s fixed time
TF3	3 s fixed time
TF10	10 s fixed time

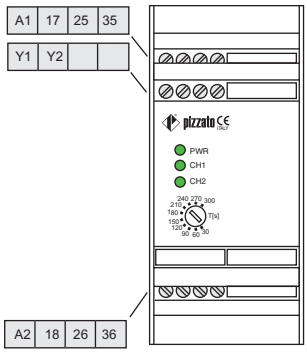
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

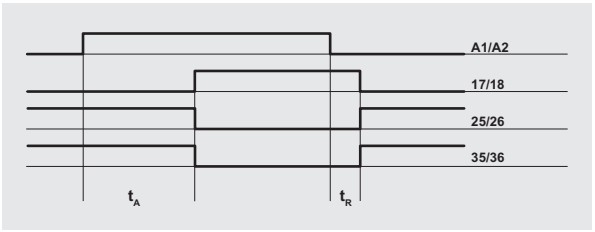
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS FS-1

Pin assignment

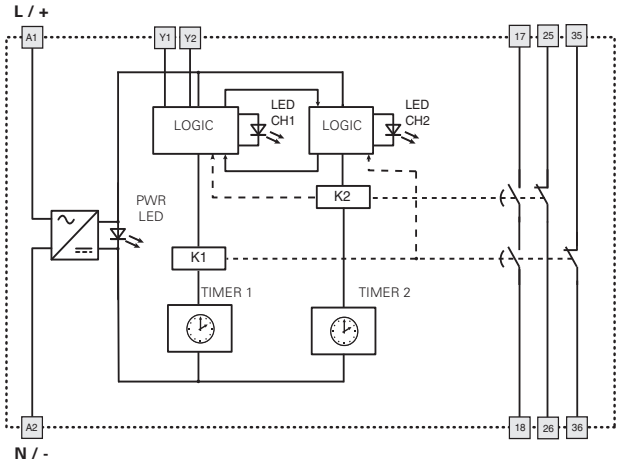


Function diagram



Legend:
t_A: adjustable response time (see "Code structure")
t_R: release time in absence of power supply

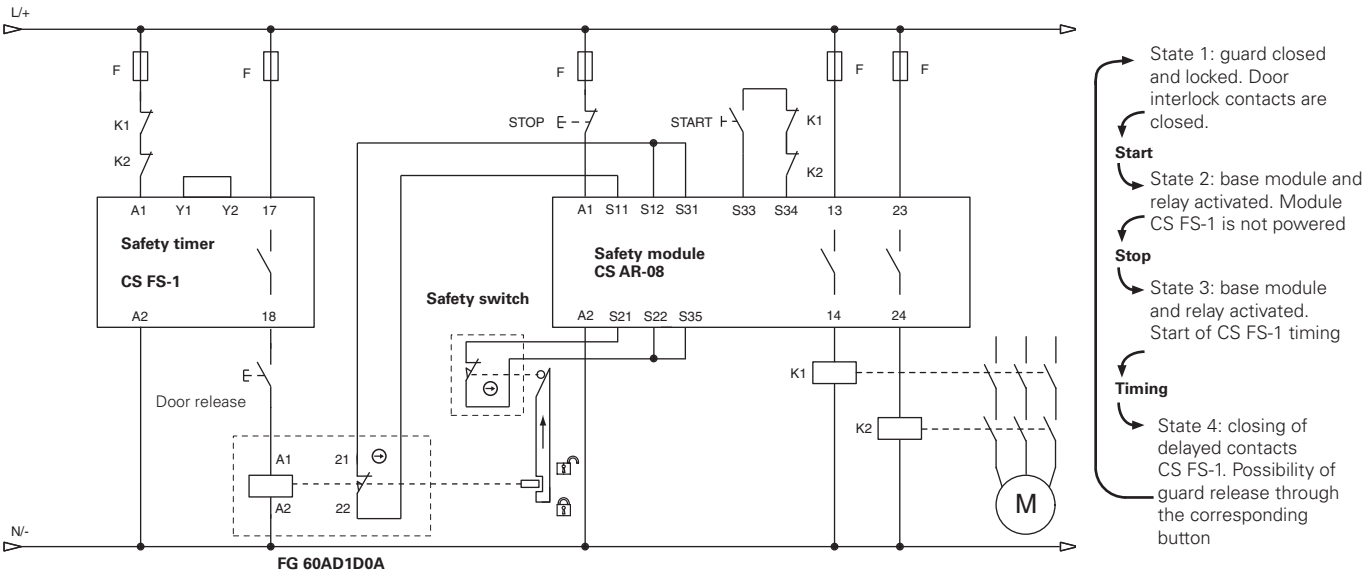
Internal block diagram



Y1-Y2: optional feedback inputs from any external contactors which are directly controlled by the module.

Circuit structure

Monitoring of a door-lock system with manual release



FG 60AD1D0A

The diagram illustrates the operating principle of a typical circuit for monitoring a door-lock system with interlock in the de-energised state and manual release of the individual doors.
For the complete electrical wiring diagrams with various types of electrical locking and release of the doors, please contact our technical office.

The diagram does not show the exact position of the terminals in the product

Safety module **CS FS-2**

Safety timer module with delayed contacts at energizing

Main features

- For safety applications up to SIL CL 2/PL d
- Timing circuits by means of safety system with self-monitoring and redundancy
- Release command for interlocked safety devices
- 45 mm housing
- Output contacts:
  1 NO safety contact, 1 NC auxiliary contact, 1 CO auxiliary contact
- Supply voltage:
  24 Vdc, 120 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: M6A 170575157017
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 17 05 75157 016
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC, EMC Directive 2014/30/EC, RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design C

General data

SIL level (SIL CL) up to:	SIL CL 2 acc. to EN 62061
Performance Level (PL) up to:	PL d acc. to EN ISO 13849-1
Safety category up to:	cat. 3 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vdc (A1-A2) 120 Vac; 50…60 Hz (B1-B2)
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	response time > 100 ms, release time > 3 s
Response time t_A:	see "Code structure"
Release time in absence of power supply t_R:	< 100 ms

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	1 NO safety contact, 1 NC auxiliary contact, 1 CO auxiliary contact,
Contact type:	forcibly guided
Material of the contacts:	silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A
Error signal output (Y14):	Type: PNP
Rated operating voltage (U_e):	24 Vdc
Rated operating current (Ie):	10 mA

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

article: **CS FS-20VU24** options: **-TFxx**

Response time (t_A)	
0	Fixed time (see Tfx)
1	0.3 … 3 s, 0.3 s steps
2	1 … 10 s, 1 s steps
3	3 … 30 s, 3 s steps
4	30 … 300 s, 30 s steps

Response time (t_A)	
TFxx	xx = s (fixed time)

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
U24	24 Vdc
120	24 Vdc (A1-A2) 120 Vac (B1-B2)

Features approved by UL

Rated supply voltage (U_n):	24 Vdc; 120 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

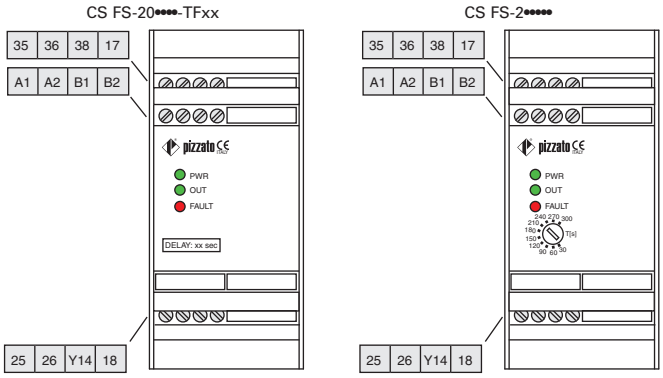
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Features approved by TÜV SÜD

Rated supply voltage (U_n): 24 Vdc; ± 15%, 120 Vac ± 15%
Power consumption: 5 VA max AC, 2 W max DC
Rated operating current (max.): 4 A
Maximum switching load (max.): 1380 VA
Ambient temperature: -25°C … +55°C
Storage temperature: -25 °C … + 70°C
Protection degree: IP40 (housing), IP20 (terminal strip)
In compliance with standards: 2006/42/EC Machinery Directive, EN ISO 13849-1:2015 (fino a Cat. 3 PL d), EN 61508-1:2010 (SIL 2), EN 61508-2:2010 (SIL 2), EN 61508-3:2010 (SIL 2), EN 61508-4:2010 (SIL 2), EN 62061:2005/A2:2015 (SIL CL 2).

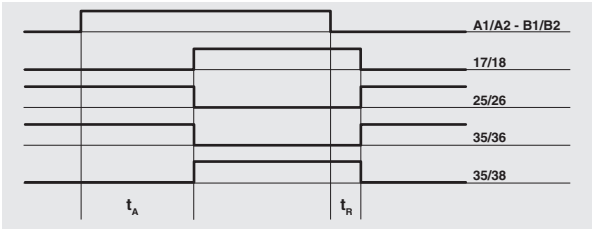
Safety module CS FS-2

Pin assignment



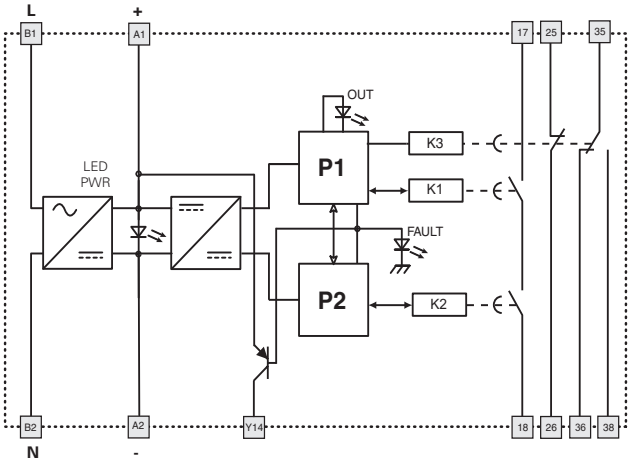
Function diagram

CS FS-2••••• Delay on
Normal operation without faults



Legend:
t_A: adjustable response time (see "Code structure")
t_R: release time in absence of power supply

Internal block diagram



A1-A2: 24 Vdc
B1-B2: 120 Vac

Y14: auxiliary output, activated when the module enters fault state.

Safety module **CS FS-3**

Safety timer modules with response delay

Main features

- For safety applications up to SIL CL 2/PL d
- Timing circuits by means of safety system with self-monitoring and redundancy
- Release command for interlocked safety devices
- 45 mm housing
- Output contacts:
  1 NO safety contact, 1 NC auxiliary contact, 1 CO auxiliary contact
- Supply voltage:
  24 Vdc, 120 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: M6A 170575157017
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 17 05 75157 016
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design C

General data

SIL level (SIL CL) up to:	SIL CL 2 acc. to EN 62061
Performance Level (PL) up to:	PL d acc. to EN ISO 13849-1
Safety category up to:	cat. 3 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vdc (A1-A2) 120 Vac; 50…60 Hz (B1-B2)
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	response time > 100 ms, release time > 3 s
Release time t_A:	see "Code structure"
Release time in absence of power supply t_R:	< 100 ms
Start-up time t_S:	< 200 ms

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	1 NO safety contact, 1 NC auxiliary contact, 1 CO auxiliary contact,
Contact type:	forcibly guided
Material of the contacts:	silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A
Error signal output (Y14):	Type: PNP
Rated operating voltage (U_e):	24 Vdc
Rated operating current (I_e):	10 mA

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

article: **CS FS-30VU24** options: **-TFxx**

Release time (t_A)	
0	Fixed time (see Tfx)
1	0.3 … 3 s, 0.3 s steps
2	1 … 10 s, 1 s steps
3	3 … 30 s, 3 s steps
4	30 … 300 s, 30 s steps

Release time (t_A)	
TFxx	xx = s (fixed time)

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
U24	24 Vdc
120	24 Vdc (A1-A2) 120 Vac (B1-B2)

Features approved by UL

Rated supply voltage (U_n):	24 Vdc; 120 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

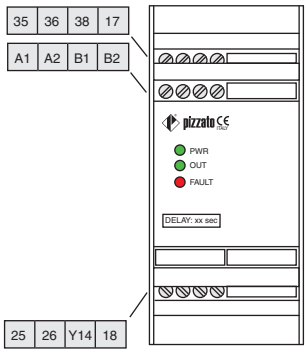
Features approved by TÜV SÜD

Rated supply voltage (U_n): 24 Vdc; ± 15%, 120 Vac ± 15%
Power consumption: 5 VA max AC, 2 W max DC
Rated operating current (max.): 4 A
Maximum switching load (max.): 1380 VA
Ambient temperature: -25°C … +55°C
Storage temperature: -25 °C … + 70°C
Protection degree: IP40 (housing), IP20 (terminal strip)
In compliance with standards: 2006/42/EC Machinery Directive, EN ISO 13849-1:2015 (fino a Cat. 3 PL d), EN 61508-1:2010 (SIL 2), EN 61508-2:2010 (SIL 2), EN 61508-3:2010 (SIL 2), EN 61508-4:2010 (SIL 2), EN 62061:2005/A2:2015 (SIL CL 2).

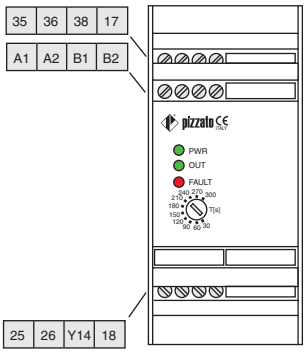
Safety module CS FS-3

Pin assignment

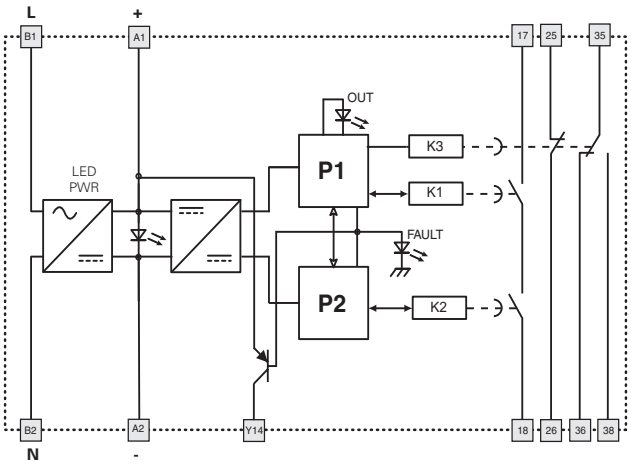
CS FS-30••••-TFxx



CS FS-3•••••



Internal block diagram

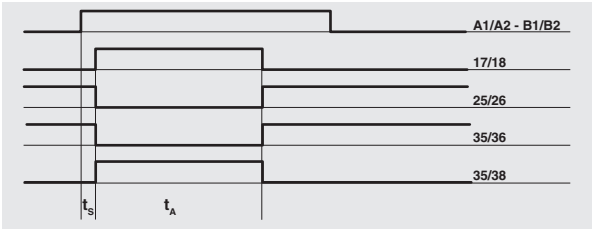


A1-A2: 24 Vdc
B1-B2: 120 Vac

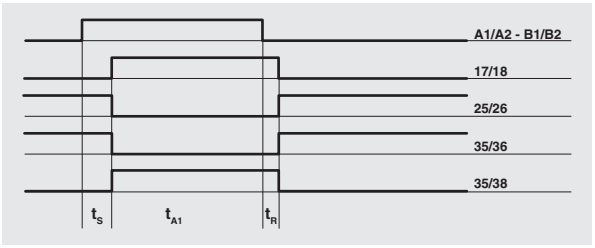
Y14: auxiliary output, activated when the module enters fault state.

Function diagram

CS FS-3••••• Delay off
Normal operation without faults



Operation without power supply



Legend:
t_A: release time (see "Code structure")
t_{A1}: release time if duration of power supply is less than t_A
t_R: release time in absence of power supply
t_S: start-up time

Safety module **CS FS-5**

Safety timer module with delayed contacts upon opening of the inputs

Main features

- For safety applications up to SIL CL 2/PL d
- Timing circuits by means of safety system with self-monitoring and redundancy
- Release command for interlocked safety devices
- 45 mm housing
- Output contacts:
  1 NO safety contact, 1 NC auxiliary contact, 1 CO auxiliary contact,
- Supply voltage:
  24 Vdc, 120 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: M6A 170575157017
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 17 05 75157 016
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design C

General data

SIL level (SIL CL) up to:	SIL CL 2 acc. to EN 62061
Performance Level (PL) up to:	PL d acc. to EN ISO 13849-1
Safety category up to:	cat. 3 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vdc (A1-A2) 120 Vac; 50…60 Hz (B1-B2)
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	response time > 100 ms, release time > 3 s
Release time t_A:	see "Code structure"
Release time in absence of power supply t_R:	< 100 ms

Input circuit

Maximum resistance per input:	≤ 50 Ω
Current per input:	< 8 mA
Response time t_S:	< 150 ms
Min. duration input signal t_{MIN}:	> 100 ms

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	1 NO safety contact, 1 NC auxiliary contact, 1 CO auxiliary contact,
Contact type:	forcibly guided
Material of the contacts:	silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A
Error signal output (Y14):	Type: PNP
Rated operating voltage (U_e):	24 Vdc
Rated operating current (I_e):	10 mA

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

article: **CS FS-50VU24** options: **-TFxx**

Release time (t_A)	
0	Fixed time (see Tfx)
1	0.3 … 3 s, 0.3 s steps
2	1 … 10 s, 1 s steps
3	3 … 30 s, 3 s steps
4	30 … 300 s, 30 s steps

Release time (t_A)	
TFxx	xx = s (fixed time)

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
U24	24 Vdc
120	24 Vdc (A1-A2) 120 Vac (B1-B2)

Features approved by UL

Rated supply voltage (U_n):	24 Vdc; 120 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

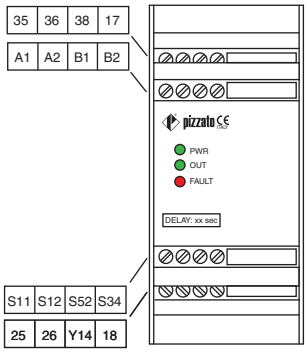
Features approved by TÜV SÜD

Rated supply voltage (U_n): 24 Vdc; ± 15%, 120 Vac ± 15%
Power consumption: 5 VA max AC, 2 W max DC
Rated operating current (max.): 4 A
Maximum switching load (max.): 1380 VA
Ambient temperature: -25°C … +55°C
Storage temperature: -25 °C … + 70°C
Protection degree: IP40 (housing), IP20 (terminal strip)
In compliance with standards: 2006/42/EC Machinery Directive, EN ISO 13849-1:2015 (fino a Cat. 3 PL d), EN 61508-1:2010 (SIL 2), EN 61508-2:2010 (SIL 2), EN 61508-3:2010 (SIL 2), EN 61508-4:2010 (SIL 2), EN 62061:2005/A2:2015 (SIL CL 2).

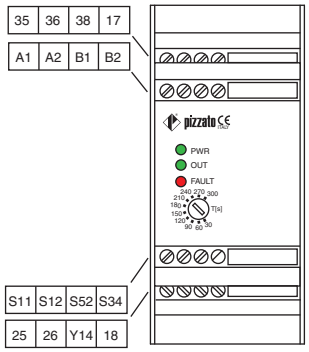
Safety module CS FS-5

Pin assignment

CS FS-50••••-TFxx

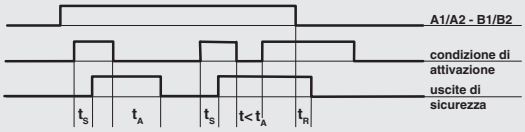


CS FS-5•••••

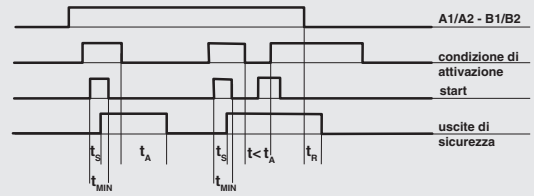


Function diagram

Configuration with automatic start

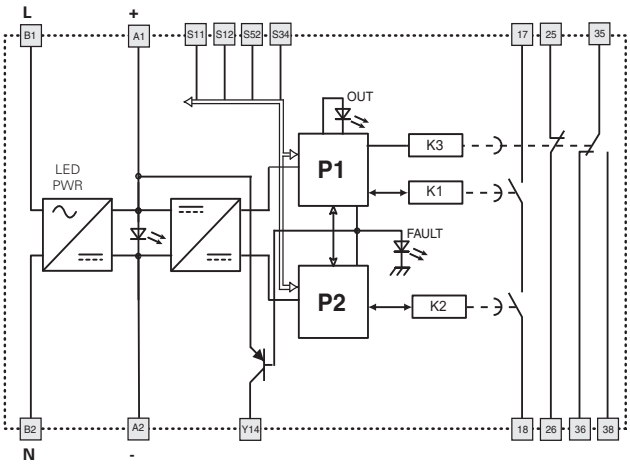


Configuration with manual start



Legend:
t_A: release time (see "Code structure")
t_R: release time in absence of power supply
t_S: response time
t_{MIN}: min. duration input signal

Internal block diagram

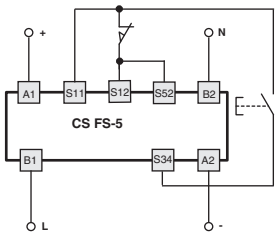


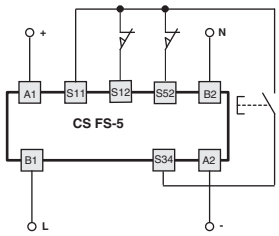
A1-A2: 24 Vdc
B1-B2: 120 Vac

Y14: auxiliary output, activated when the module enters fault state.

Input configuration

Movable guard monitoring	
Input configuration with manual start	
1 channel	2 channels

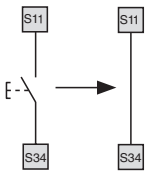




The diagram does not show the exact position of the terminals in the product

Automatic start

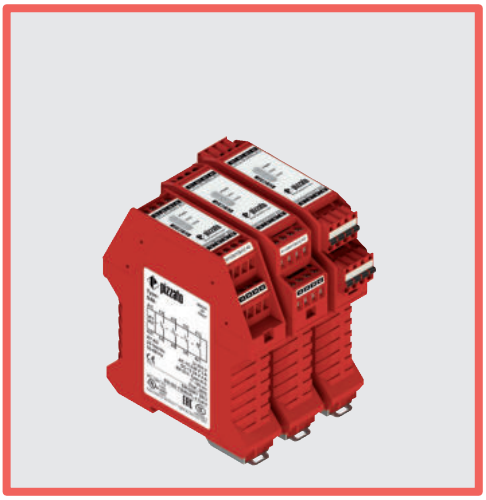
With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



Monitoring of movable guards and magnetic safety sensors

The safety module can monitor control circuits for movable guards as well as magnetic safety sensors. To do this, the switch contacts must be replaced with sensors.
The sensors can only be used in 2-channel configuration.

Safety module **CS DM-01**



Two-hand control device according to EN 574: type III C or safety module with synchronism control

Main features

- For safety applications up to SIL CL 3/PL e
- Two-channel inputs for two-hand control device or movable guards
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- 3 NO safety contacts, 1 NC auxiliary contact
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ BP 210 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Type of two-hand control device:	EN 574: type III C
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	30 mA (typical)
Response time t_A:	< 50 ms
Release time t_{R1}:	< 20 ms
Release time in absence of power supply t_R:	< 70 ms
Time range for synchronised actuation t_{SN}:	< 0.5 s

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	3 NO safety contacts, 1 NC auxiliary contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current Σ I_{th}^2:	64 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS DM-01V024

Connection type		Supply voltage	
V	Screw terminals	**024**	24 Vac/dc
M	Connector with screw terminals	**120**	120 Vac
X	Connector with spring terminals	**230**	230 Vac

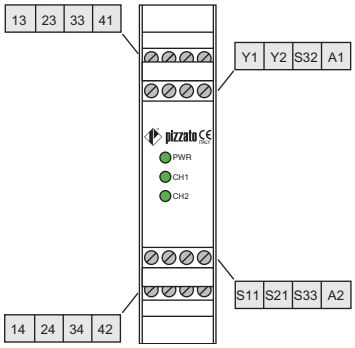
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

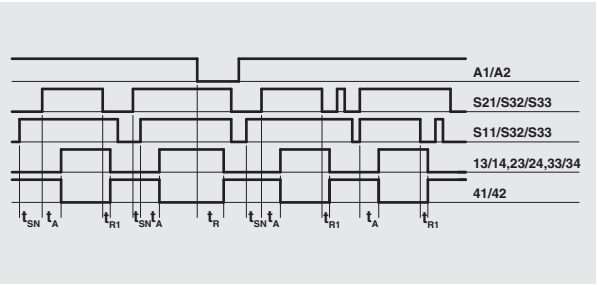
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS DM-01

Pin assignment

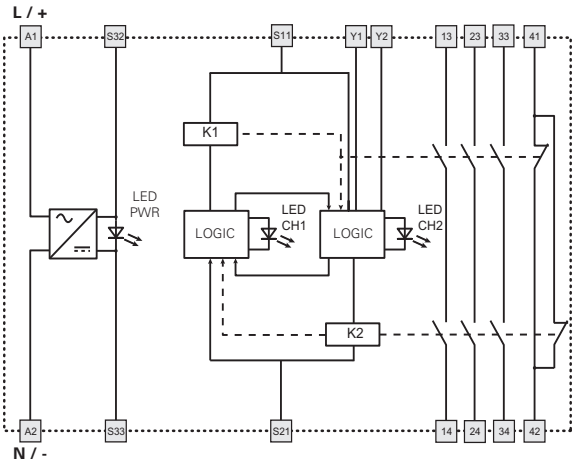


Function diagram



Legend:
t_{SN}: time range for synchronised actuation
t_A: response time
t_{R1}: release time
t_R: release time in absence of power supply

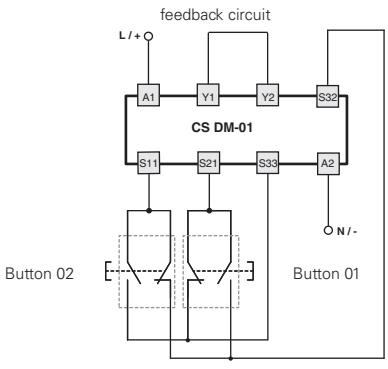
Internal block diagram



Application example on page 276.

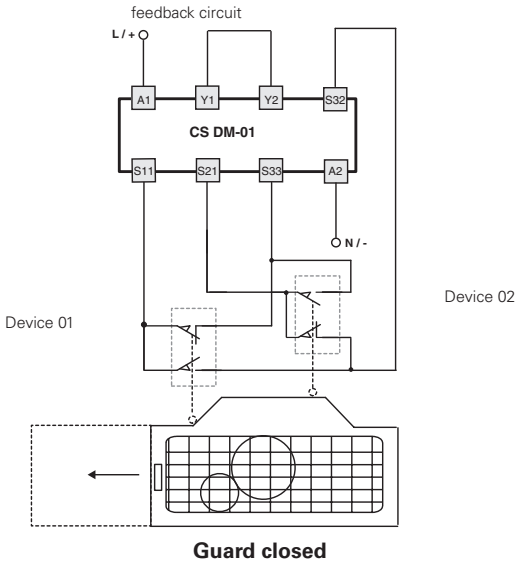
Input configuration

Circuit with two-hand control device type III C according to EN 574



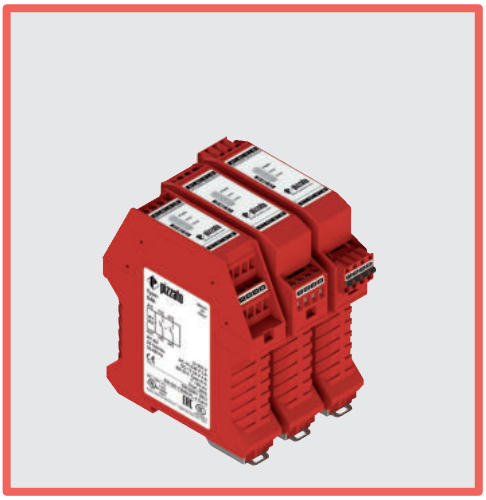
The diagram does not show the exact position of the terminals in the product

Movable guard monitoring with automatic start and simultaneity between channels < 0.5 s (safety category 4)



Guard closed

Safety module **CS DM-02**



Two-hand control device according to EN 574: type III C or safety module with synchronism control

Main features

- For safety applications up to SIL CL 3/PL e
- Two-channel inputs for two-hand control device or movable guards
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- 2 NO safety contacts
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ BP 210 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1
Type of two-hand control device:	EN 574: type III C
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Current per input:	30 mA (typical)
Response time t_A:	< 30 ms
Release time t_{R1}:	< 25 ms
Release time in absence of power supply t_R:	< 90 ms
Time range for synchronised actuation t_{SN}:	< 0.5 s

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 NO safety contacts,
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS DM-02V024

Connection type		Supply voltage	
V	Screw terminals	**024**	24 Vac/dc
M	Connector with screw terminals	**120**	120 Vac
X	Connector with spring terminals	**230**	230 Vac

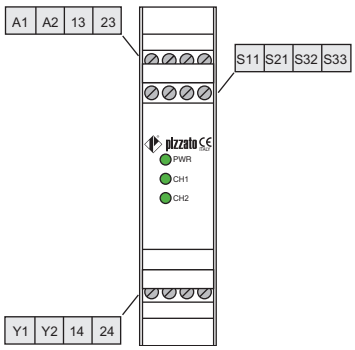
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

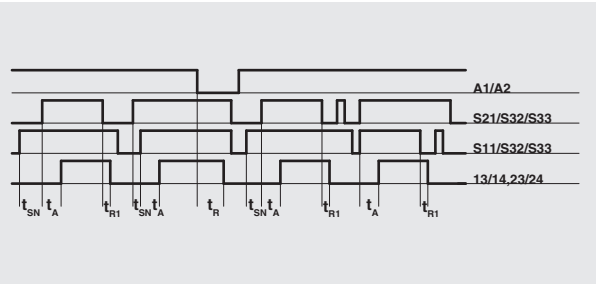
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS DM-02

Pin assignment

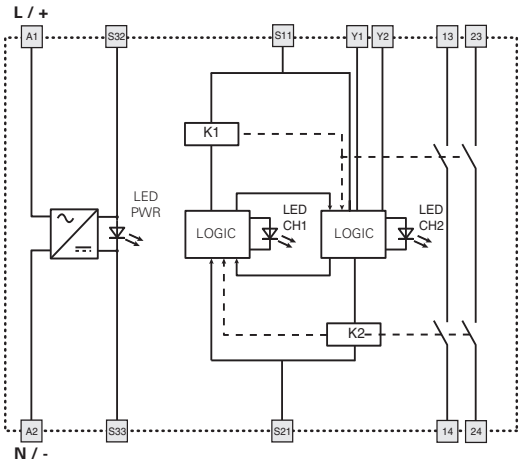


Function diagram



Legend:
t_{SN}: time range for synchronised actuation
t_A: response time
t_{R1}: release time
t_R: release time in absence of power supply

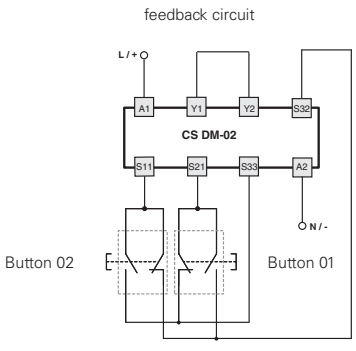
Internal block diagram



Application example on page 276.

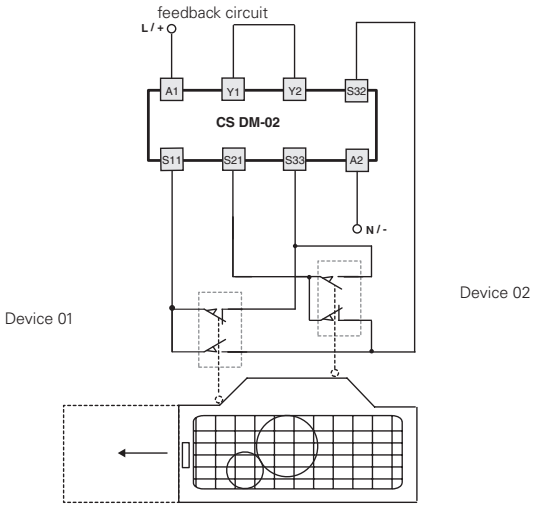
Input configuration

Circuit with two-hand control device type III C according to EN 574



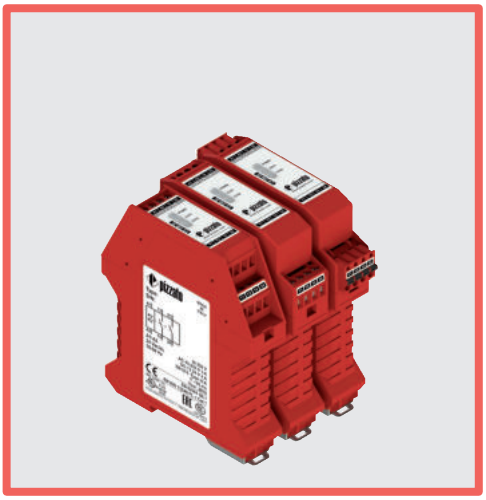
The diagram does not show the exact position of the terminals in the product

Movable guard monitoring with automatic start and simultaneity between channels < 0.5 s (safety category 4)



Guard closed

Safety module **CS DM-20**



Two-hand control device according to EN 574: type III A or safety module with synchronism control

Main features

- For safety applications up to SIL CL 1/PL c
- Two-channel inputs for two-hand control device or movable guards
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- 2 NO safety contacts,
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

UL approval:	E131787
CCC approval:	2013010305640211
EAC approval:	RU C-IT. YT03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 1 acc. to EN 62061
Performance Level (PL) up to:	PL c acc. to EN ISO 13849-1
Safety category up to:	cat. 1 acc. to EN ISO 13849-1
Type of two-hand control device:	EN 574: type III A
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 100 Ω
Current per input:	32 mA (typical)
Response time t_A:	< 12 ms
Release time t_{R1}:	< 10 ms
Release time in absence of power supply t_R:	< 200 ms
Time range for synchronised actuation t_{SN}:	< 0.5 s

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 NO safety contacts,
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current Σ I_{th}^2:	36 A²
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

CS DM-20V024

Connection type		Supply voltage	
V	Screw terminals	**024**	24 Vac/dc
M	Connector with screw terminals	**120**	120 Vac
X	Connector with spring terminals	**230**	230 Vac

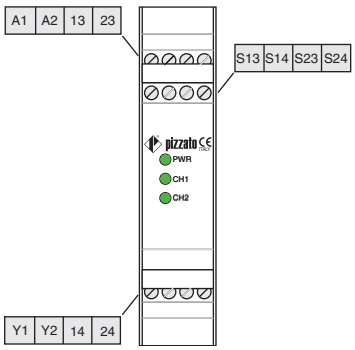
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz 120 Vac; 50…60 Hz 230 Vac; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

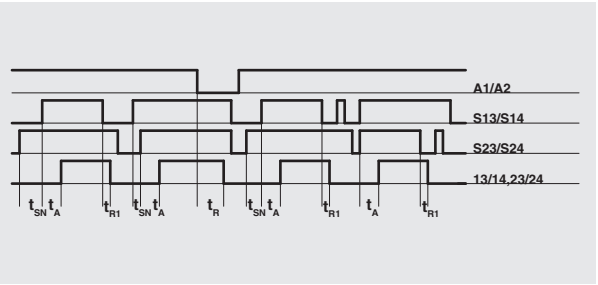
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Safety module CS DM-20

Pin assignment

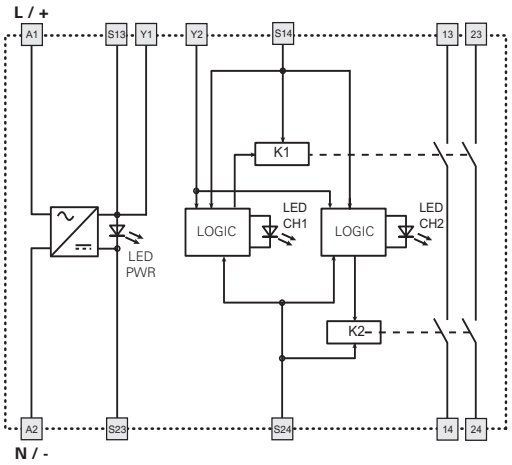


Function diagram



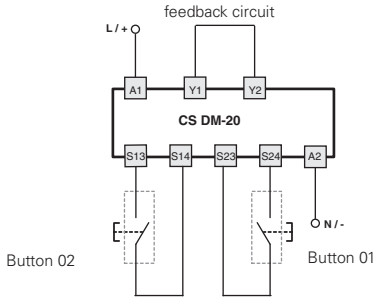
Legend:
t_{SN}: time range for synchronised actuation
t_A: response time
t_{R1}: release time
t_R: release time in absence of power supply

Internal block diagram



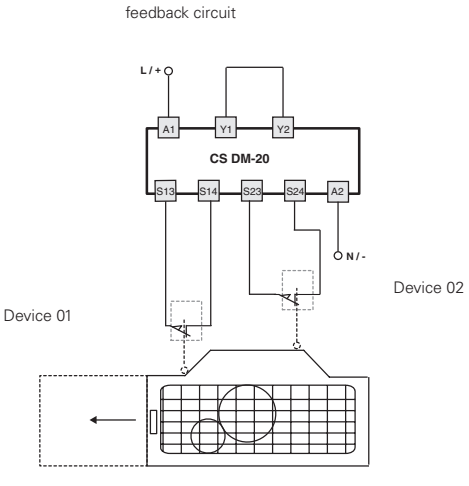
Input configuration

Circuit with two-hand control device type III A according to EN 574



The diagram does not show the exact position of the terminals in the product

Movable guard monitoring with automatic start and simultaneity between channels < 0.5 s



Guard closed

Safety module **CS AM-01**

Safety modules for motor standstill monitoring

Main features

- For safety applications up to SIL CL 2/PL d
- Select from 10 different residual voltages on motor standstill.
- Galvanic separation between control circuit and measurement circuit.
- 45 mm housing
- 2 NO safety contacts
  1 NC auxiliary contact
- 2 semiconductor outputs:
  - - 1 signalling output for failure state
  - - 1 signalling output for switching state of safety relays
- Possibility to connect single-phase or three-phase motors to measuring circuits.
- Supply voltages: 24 … 230 Vac/dc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate:IMQ CS 487 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design C

General data

SIL level (SIL CL) up to:	SIL CL 2 acc. to EN 62061
Performance Level (PL) up to:	PL d acc. to EN ISO 13849-1
Safety category up to:	cat. 3 acc. to EN ISO 13849-1
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 … 230 Vac/dc; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 6 VA
Power consumption DC:	< 2 W

Input circuit

Voltage between terminals L1-L2-L3:	0 … 690 V
Frequency:	0 … 3 kHz
Input impedance:	>1 MΩ
Started motor threshold voltage:	from 20 mV to 500 mV adjustable in 10 increments
Stopped motor threshold voltage:	half the motor threshold voltage with motor in operation
Maximum input impedance Y1-Y2:	< 20 Ω
Current in START Y1-Y2 circuit:	70 mA (typical)
RESET input voltage:	24 Vdc ± 20%
RESET input current:	10 mA (typical)

Control circuit

Response time t_A:	< 3 s
Release time t_{R1}:	< 200 ms
Release time in absence of power supply t_R:	< 3 s
Simultaneity time t_{C1}, t_{C2}:	3 s
Test:	Self-test upon activation of the supply voltage and after activation of the RESET input.
Test duration:	2.5 s(During the test, the voltage in the measurement circuits must be less than the threshold voltage of the motor while at a standstill)

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	2 NO safety contacts, 1 NC auxiliary contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A²
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A
Semiconductor outputs:	PNP outputs galvanically separated, overvoltage and short-circuit protected
Switching voltage:	24 Vdc
Switching current:	50 mA
External supply voltage:	24 Vdc ±20%

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 263-272.

Code structure

article: **CS AM-01VE01** options: **-TC00UR1**

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Simultaneity time (t_C)	
	3s (standard)
TC00	infinite at standstill (t_C)
TA00	infinite on startup and standstill(t_C)
TD0	infinite on standstill and minimum activation time (t_A)

Threshold voltage for motor at standstill	
	20-500 mV (standard)
UR1	45-750 mV

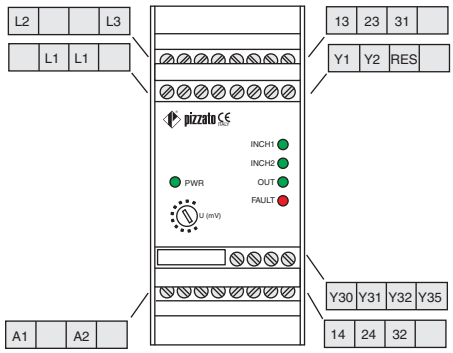
Features approved by UL

Rated supply voltage (U_n):	24 ... 230 Vac/dc; 50 … 60 Hz
Power consumption AC:	< 9 VA
Power consumption DC:	< 2 W
Relay output:	
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty
Semiconductor output:	24 Vdc, 50 mA
Motor input:	up to 600 V

Notes:
- For use in pollution degree 2 environment
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.

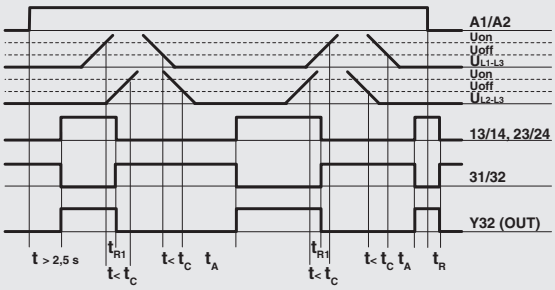
Safety module CS AM-0

Pin assignment

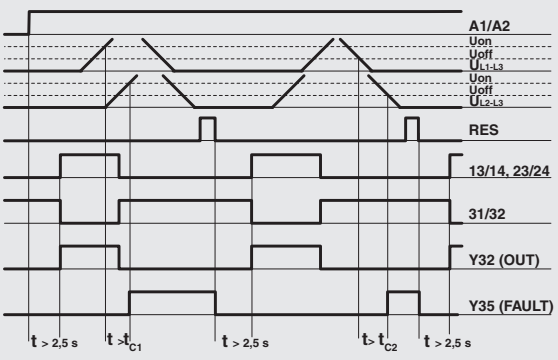


Function diagrams

Normal operation

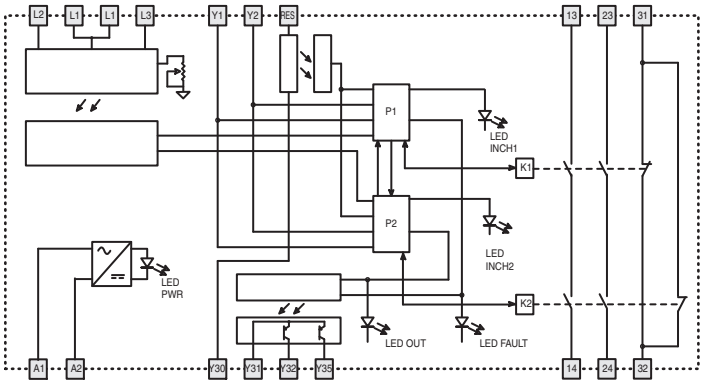


Reset (RES) operation



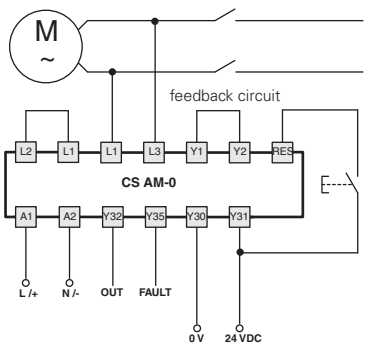
Legend:
- t_C: simultaneity time
- t_A: response time
- t_{R1}: release time
- t_R: release time in absence of power supply

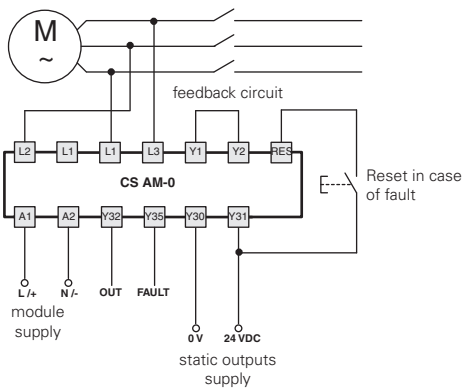
Internal block diagram



Input configuration

Single-phase motor	Three-phase motor





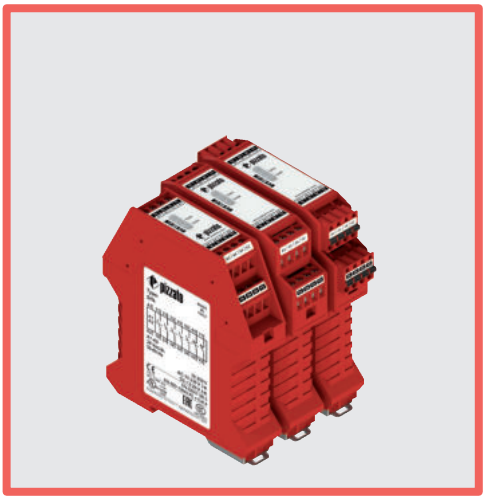
In case of star/delta starting, connect the module to the ends of a single winding

For dc motors connect + with L1 and - with L3.

The diagram does not show the exact position of the terminals in the product

Application example on page 275.

CS ME-01 expansion module



Expansion module with output contacts

Main features

- For safety applications up to SIL CL 3/PL e
- Possibility of control with one or two channels
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- Output contacts:
  5 NO safety contacts,
  1 NC auxiliary contact,
  1 NC feedback contact
- Supply voltage: 24 Vac/dc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks and certificates:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1 (see base module category)
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Response time t_A:	< 40 ms
Release time in absence of power supply t_R:	< 50 ms

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:	5 NO safety contacts, 1 NC auxiliary contact, 1 NC feedback contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	72 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

Code structure

CS ME-01V024

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Supply voltage	
024	24 Vac/dc

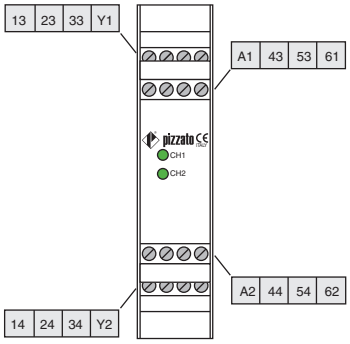
Features approved by UL

Rated supply voltage (U_n):	24 Vac/dc; 50…60 Hz
Power consumption AC:	< 5 VA
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

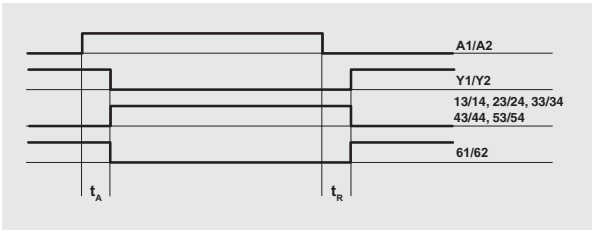
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

CS ME-01 expansion module

Pin assignment

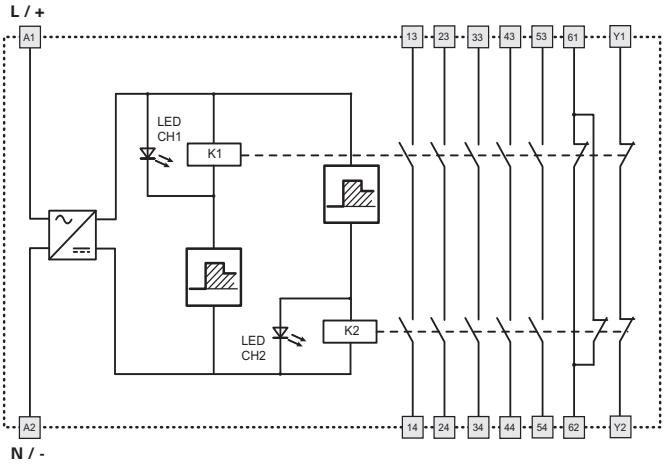


Function diagram



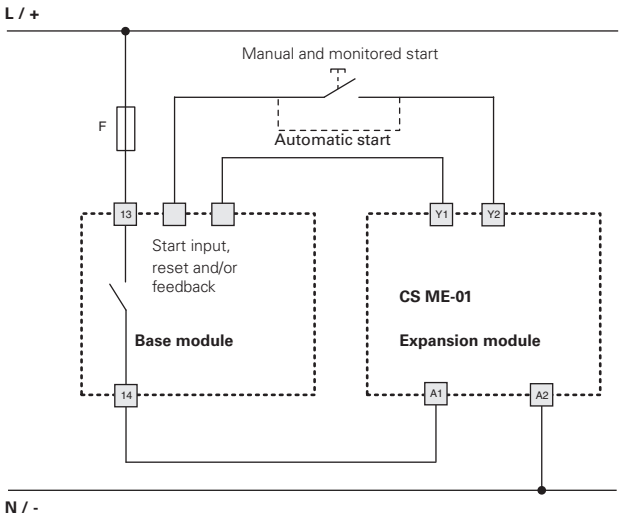
Legend:
t_A: response time
t_R: release time in absence of power supply

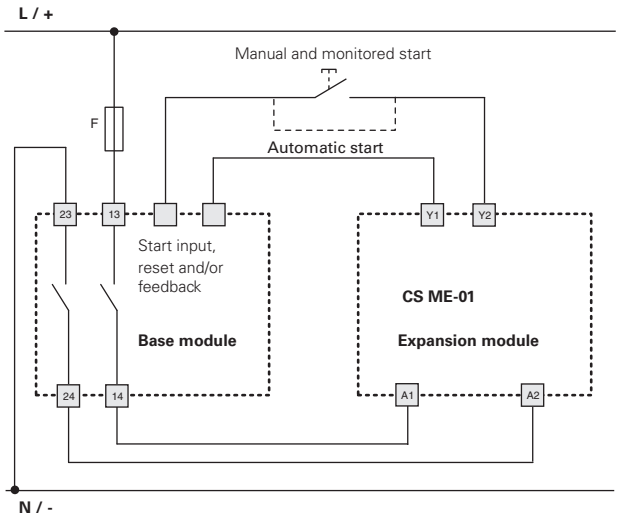
Internal block diagram



Input configuration

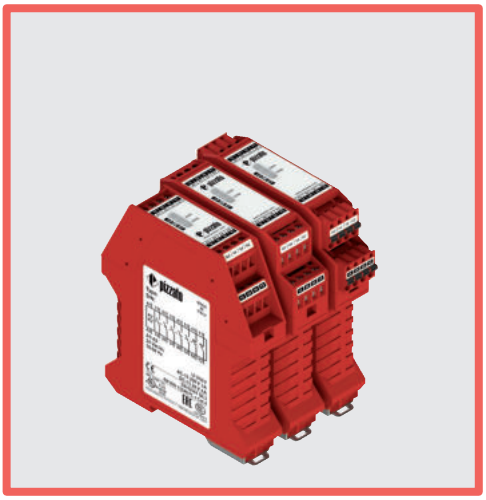
Single channel control	Double channel control





The diagram does not show the exact position of the terminals in the product

CS ME-02 expansion module



Expansion module with output contacts

Main features

- For safety applications up to SIL CL 3/PL e
- Possibility of control with one or two channels
- Connection of input channels of opposite potentials
- Reduced housing width of 22.5 mm
- Output contacts:
  4 NO safety contacts,
  2 NC auxiliary contacts,
  1 NC feedback contact
- Supply voltage: 24 Vdc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1 (see base module category)
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vdc
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption DC:	< 2 W

Control circuit

Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC times:	Response time > 100 ms, release time > 3 s
Maximum resistance per input:	≤ 50 Ω
Response time t_A:	< 100 ms
Release time in absence of power supply t_R:	< 60 ms

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	4 NO safety contacts, 2 NC auxiliary contacts, 1 NC feedback contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	64 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

Code structure

CS ME-02VU24

Connection type		Supply voltage	
V	Screw terminals	**U24**	24 Vdc
M	Connector with screw terminals		
X	Connector with spring terminals		

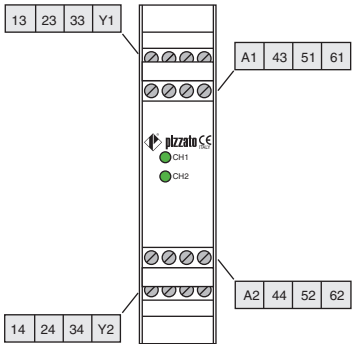
Features approved by UL

Rated supply voltage (U_n):	24 Vdc
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

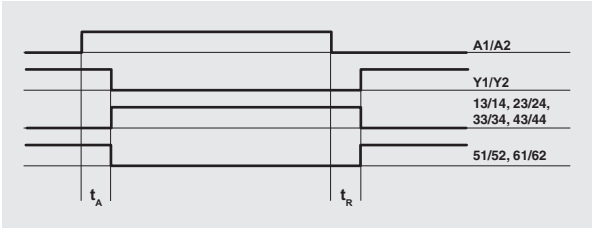
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

CS ME-02 expansion module

Pin assignment

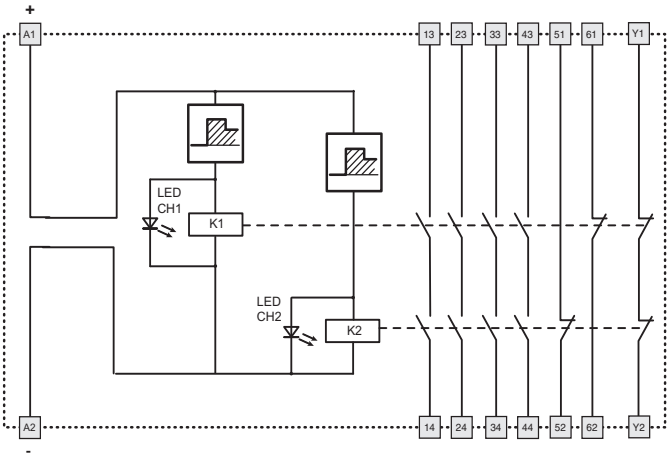


Function diagram



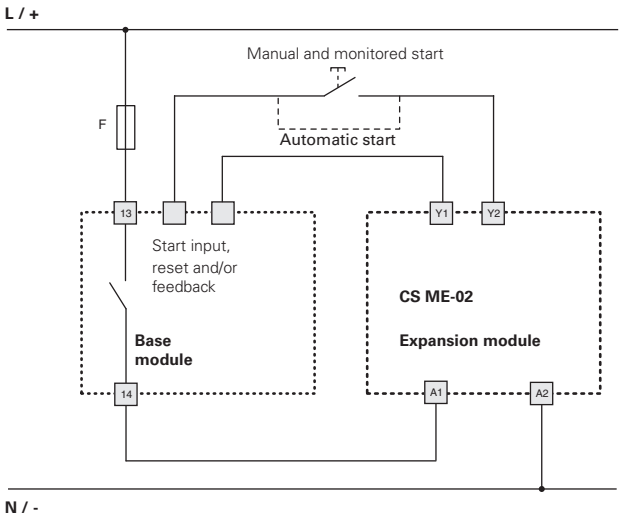
Legend:
t_A: response time
t_R: release time in absence of power supply

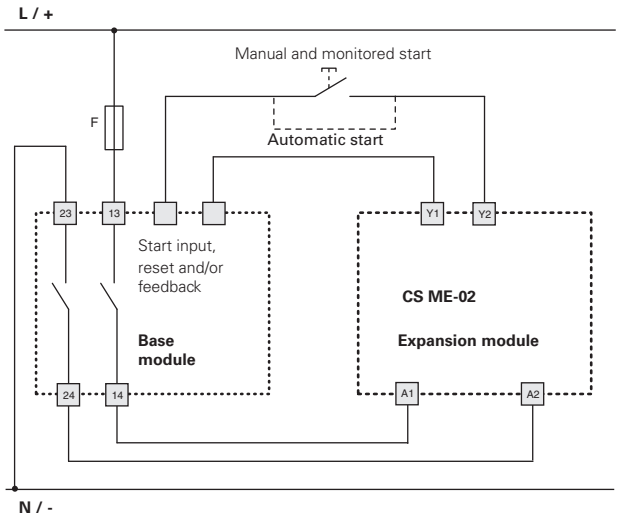
Internal block diagram



Input configuration

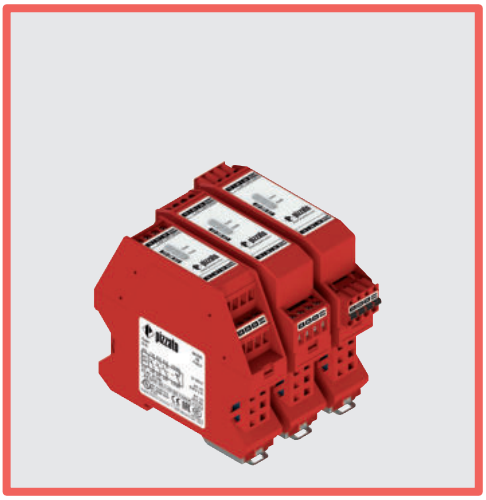
Single channel control	Double channel control





The diagram does not show the exact position of the terminals in the product

CS ME-03 expansion module



Expansion module with output contacts

Main features

- For safety applications up to SIL CL 3/PL e
- Module for OSSD semiconductor outputs
- 2 OSSD inputs
- Reduced housing width of 22.5 mm
- Output contacts:
  3 NO safety contacts,
  1 NC feedback contact/EDM
- Supply voltage: 24 Vdc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design D

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1 (dependent on semiconductor outputs)
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vdc
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption DC:	< 2 W
Consumption at start:	< 3 W

Control circuit

Response time t_A:	< 40 ms
Release time t_{R1}:	< 20 ms

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	3 NO safety contacts, 1 NC feedback contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	36 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

Code structure

CS ME-03VU24

Connection type		Supply voltage	
V	Screw terminals	**U24**	24 Vdc
M	Connector with screw terminals		
X	Connector with spring terminals		

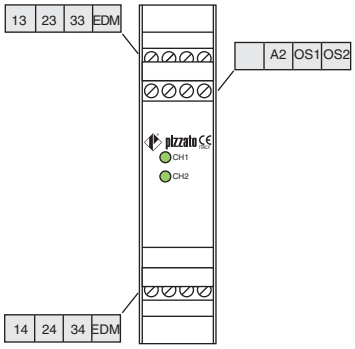
Features approved by UL

Rated supply voltage (U_n):	24 Vdc
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

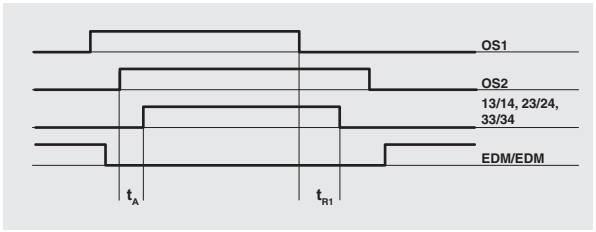
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

CS ME-03 expansion module

Pin assignment

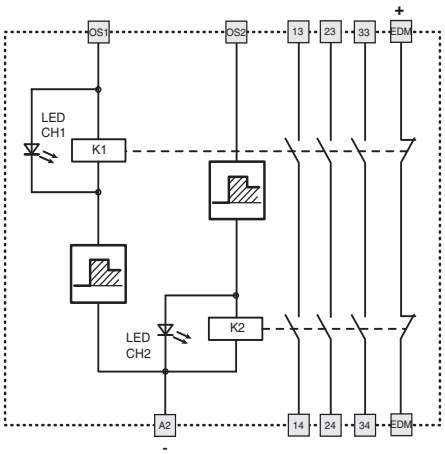


Function diagram



Legend:
t_A: response time
t_{R1}: release time

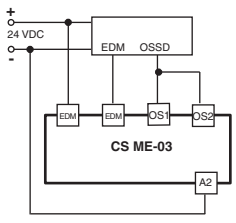
Internal block diagram

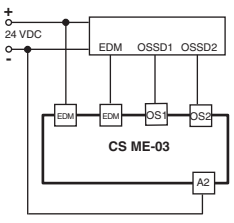


Application example on page 275.

Input configuration

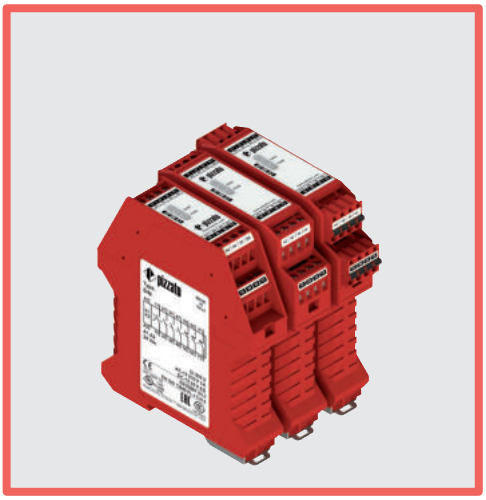
OSSD semiconductor outputs (e.g. ST, NS, NG series or light barriers)	
1 channel	2 channels





The diagram does not show the exact position of the terminals in the product

CS ME-20 expansion module



Expansion module with delayed output contacts at de-energizing

Main features

- For safety applications up to SIL CL 3/PL e
- Possibility of control with one or two channels
- 4 delay times 0.5 - 1 - 2 and 3 s
- Reduced housing width of 22.5 mm
- Output contacts:
  4 NO safety contacts,
  2 NC auxiliary contacts,
  1 NC feedback contact
- Supply voltage: 24 Vdc

Utilization categories

Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

Compliance with the requirements of:

Machinery Directive 2006/42/EC,
EMC Directive 2014/30/EC,
RoHS Directive 2011/65/EU.

Technical data

Housing

Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design A

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1 (see base module category)
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vdc
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption DC:	< 2 W

Control circuit

Maximum resistance per input:	≤ 50 Ω
Response time t_A:	< 120 ms
Release time in absence of power supply t_R:	see Code structure

In compliance with standards:

EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Output circuit

Output contacts:	4 NO safety contacts, 2 NC auxiliary contacts, 1 NC feedback contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	64 A^2
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

Code structure

article: **CS ME-20VU24** options: **-TF1**

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Release time in absence of power supply (t_R)	
TF0.5	0.5 s fixed time
TF1	1 s fixed time
TF2	2 s fixed time
TF3	3 s fixed time

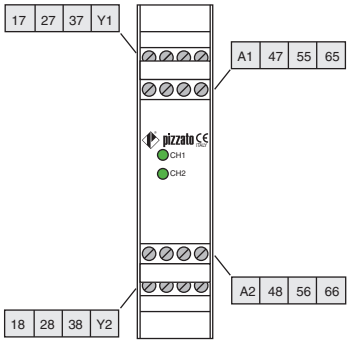
Features approved by UL

Rated supply voltage (U_n):	24 Vdc
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

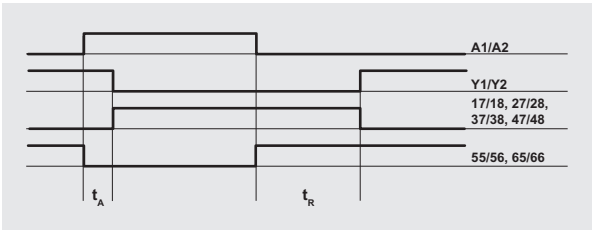
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

CS ME-20 expansion module

Pin assignment

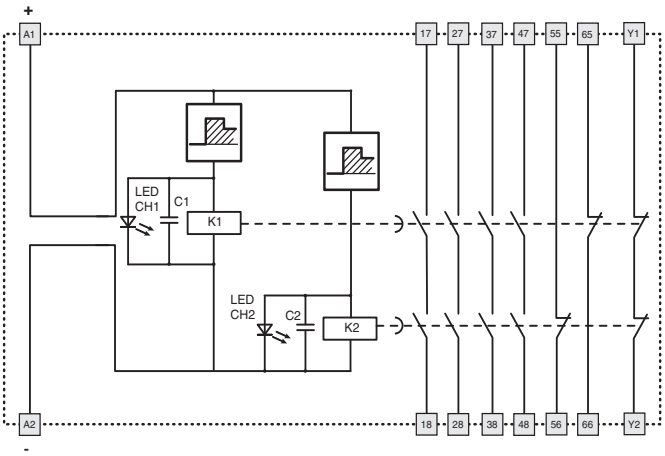


Function diagram



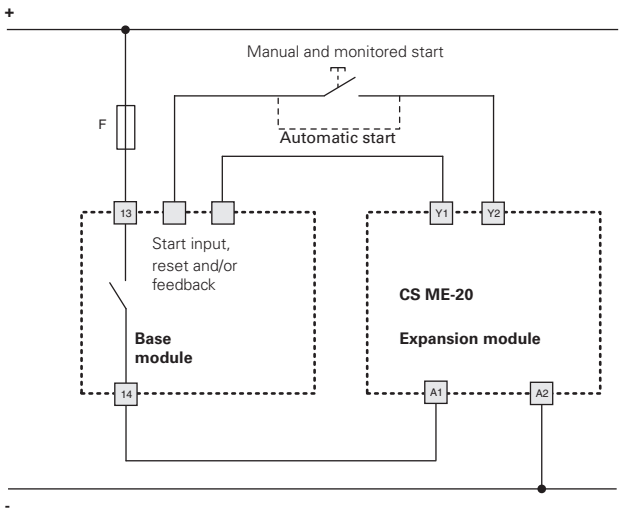
Legend:
t_A: response time
t_R: release time in absence of power supply (see "Code structure")

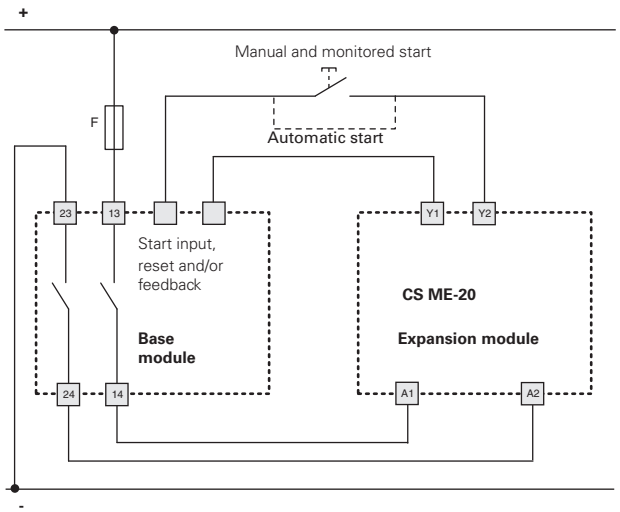
Internal block diagram



Input configuration

Single channel control	Double channel control





The diagram does not show the exact position of the terminals in the product

CS ME-30 / CS ME-31 expansion module

Expansion module with delayed output contacts at de-energizing

Main features
- For safety applications up to SIL CL 3/PL e
- Possibility of control with one or two channels
- Fixed or adjustable delay times
- 45 mm housing
- Output contacts:
  4 NO safety contacts,
  2 NC auxiliary contacts,
  1 NC feedback contact
- Supply voltage: 24 Vdc

Utilization categories
Alternating current: AC15 (50…60 Hz)
Ue (V) 230
Ie (A) 3
Direct current: DC13 (6 oper. cycles/min.)
Ue (V) 24
Ie (A) 4

Quality marks:

EC type examination certificate: IMQ CP 432 DM
UL approval: E131787
CCC approval: 2013010305640211
EAC approval: RU C-IT.УТ03.B.00035/19

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

Technical data

Housing
Polyamide housing PA 66, self-extinguishing V0 acc. to UL 94

Protection degree acc. to EN 60529:	IP40 (housing), IP20 (terminal strip)
Dimensions:	see page 317, design C

General data

SIL level (SIL CL) up to:	SIL CL 3 acc. to EN 62061
Performance Level (PL) up to:	PL e acc. to EN ISO 13849-1
Safety category up to:	cat. 4 acc. to EN ISO 13849-1 (see base module category)
Safety parameters:	see page 375
Ambient temperature:	-25°C…+55°C
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Pollution degree:	external 3, internal 2
Rated impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	250 V
Overvoltage category:	II

Supply

Rated supply voltage (U_n):	24 Vdc
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Power consumption DC:	< 2 W

Control circuit

Maximum resistance per input:	≤ 50 Ω
Response time t_A:	< 200 ms
Release time in absence of power supply t_R:	see Code structure

In compliance with standards:
EN 60204-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 60664-1, EN 60947-1, EN 50581, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017.

Output circuit

Output contacts:	4 NO safety contacts, 2 NC auxiliary contacts, 1 NC feedback contact
Contact type:	forcibly guided
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230/240 Vac; 300 Vdc
Max. current per contact:	6 A
Conventional free air thermal current I_{th}:	6 A
Max. total current ΣI_{th}^2:	64 A²
Minimum current:	10 mA
Contact resistance:	≤ 100 mΩ
External protection fuse:	4 A

Code structure

article: **CS ME-30VU24** options: **-TF1**

Fixed or adjustable time	
0	fixed time
1	adjustable time

Connection type	
V	Screw terminals
M	Connector with screw terminals
X	Connector with spring terminals

Release time in absence of power supply (t_R)	
TF1	1 s fixed time (CS ME-30 only)
...	.....
TF12	12 s fixed time (CS ME-30 only)
TS12	Time adjustable from 1 to 12 s in increments of 1 s (CS ME-31 only)

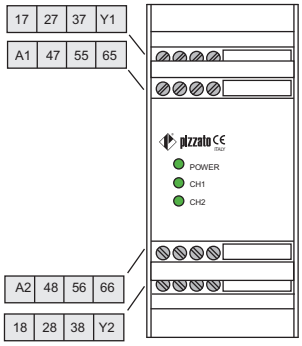
Features approved by UL

Rated supply voltage (U_n):	24 Vdc
Power consumption DC:	< 2 W
Electrical ratings:	230/240 Vac 6 A general use C300 pilot duty

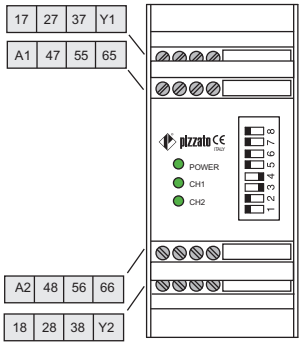
Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

CS ME-30 / CS ME-31 expansion module

Pin assignment

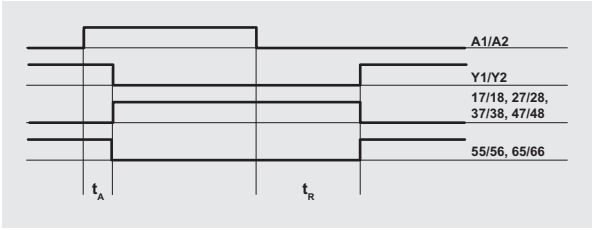


CS ME-30



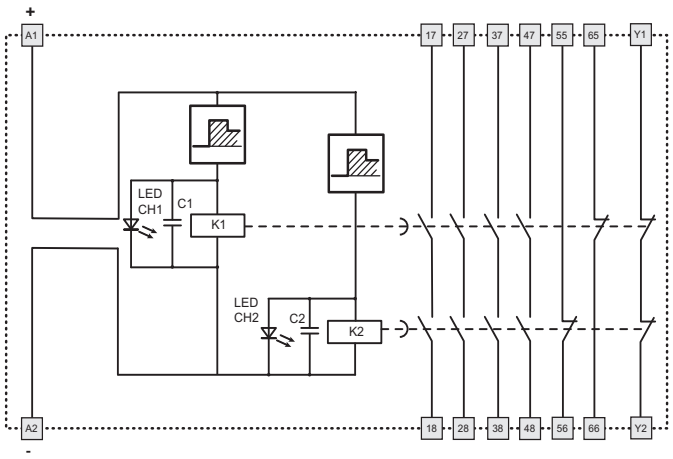
CS ME-31

Function diagram



Legend:
t_A: response time
t_R: release time in absence of power supply (see "Code structure")

Internal block diagram

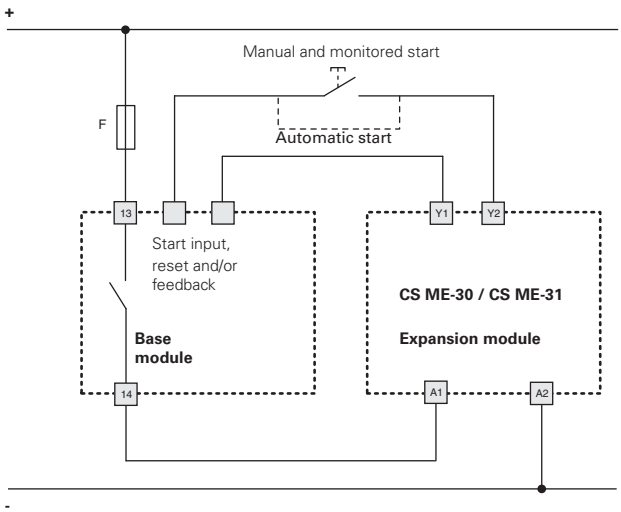


Release time selection t_R (CS ME-31 only)

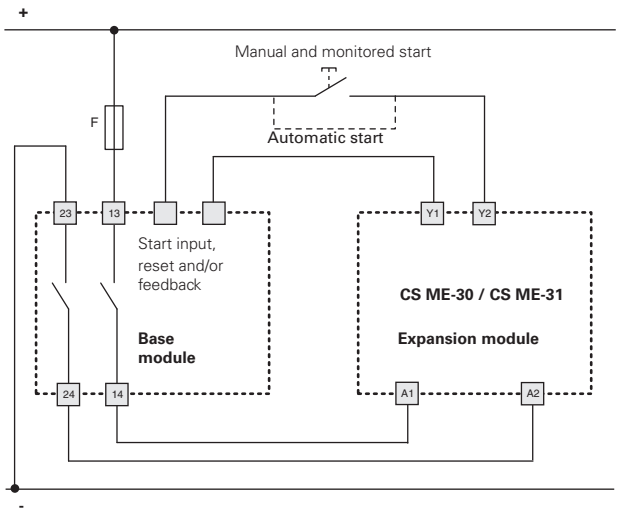
DIP SWITCH	t_R (s)
ON / OFF	1
ON / OFF	2
ON / OFF	3
ON / OFF	4
ON / OFF	5
ON / OFF	6
ON / OFF	7
ON / OFF	8
ON / OFF	9
ON / OFF	10
ON / OFF	11
ON / OFF	12

Input configuration

Single channel control

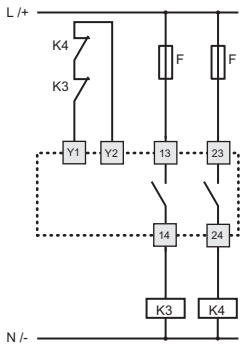


Double channel control



The diagram does not show the exact position of the terminals in the product

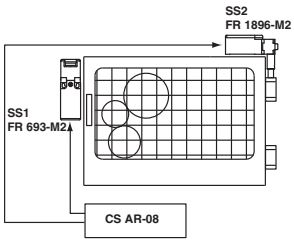
External contactors for increasing the number and the load capacity of the contacts

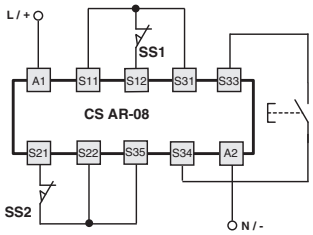


If necessary the number and the load capacity of output contacts can be increased by using expansion modules or contactors with forcibly guided contacts. For control of the external contactors, a NC contact of each relay is connected to the safety module feedback circuit between the start button terminals.

The following installation examples make use of the CS AR-08•••• module. For the use of other modules, see features, compatibility and internal block diagram of each single module.

Application examples: monitoring of movable guards, up to category 4 according to EN ISO 13849-1

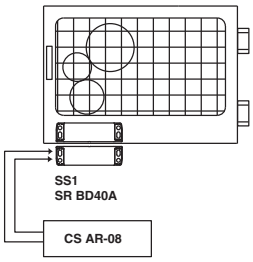


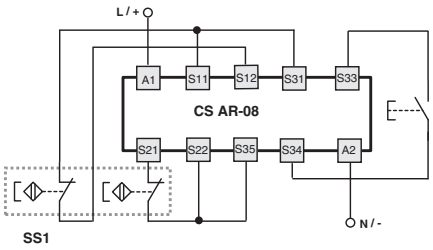


Compatible modules
CS AR-01•••• CS AR-02••••
CS AR-04•••• CS AR-05••••
CS AR-06•••• CS AR-07••••
CS AR-08•••• CS AT-0•••••
CS AT-1••••• CS AT-3•••••
CS AR-91•024

Monitoring of one movable guard through two switches with different technology. System in safety category 4.

Application examples: monitoring of safety magnetic sensors, up to category 4 according to EN ISO 13849-1

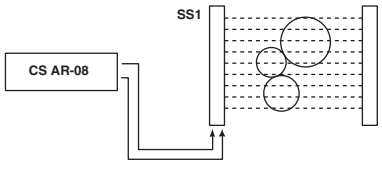


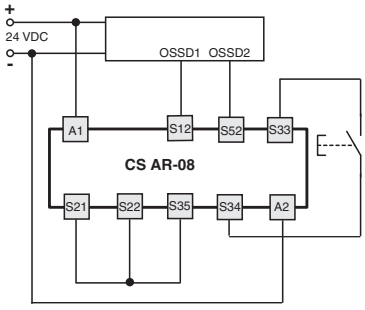


Compatible modules
CS AR-01•E02 CS AR-02•E02
CS AR-04•024 CS AR-05••••
CS AR-06•••• CS AR-08••••
CS AT-0••••• CS AT-1•••••
CS AT-3••••• CS AR-91•024

Monitoring of one movable guard through one coded magnetic sensor. System in safety category 4.

Application examples: light barrier monitoring, up to category 4 according to EN ISO 13849-1

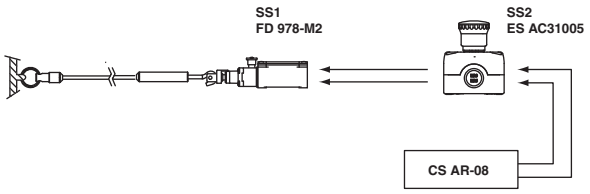


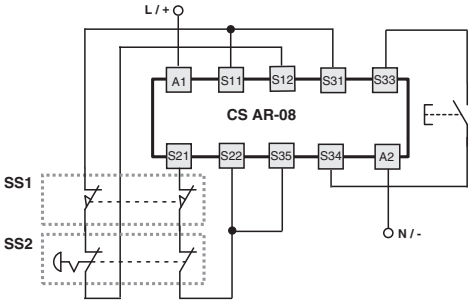


Compatible modules
CS AR-05•••• CS AR-06••••
CS AR-08•••• CS AT-0•••••
CS AT-1•••••

Semiconductor outputs (e.g. light barriers) with two OSSD outputs. System in safety category 2 or 4 according to the barrier.

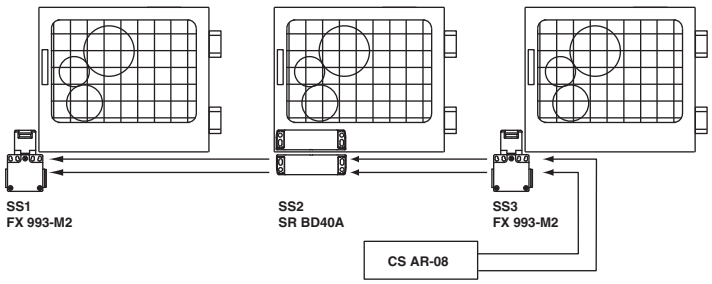
Application examples: monitoring of a switch and a button for emergency stop, up to cat. 3 according to EN ISO 13849-1

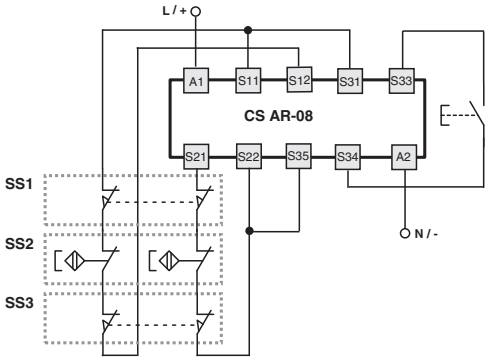




Compatible modules
CS AR-01•••• CS AR-02•••• CS AR-04•••• CS AR-05••••
CS AR-06•••• CS AR-07•••• CS AR-08•••• CS AR-20••••
CS AR-21•••• CS AR-22•••• CS AR-23•••• CS AR-24••••
CS AR-25•••• CS AT-0••••• CS AT-1••••• CS AT-3•••••
CS AR-91•024

Application examples: monitoring of a series of switches and magnetic sensors, up to cat. 3 according to EN ISO 13849-1



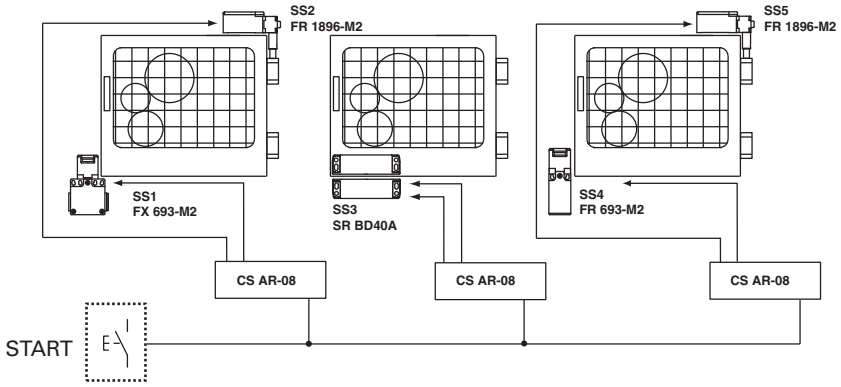


Compatible modules
CS AR-01•E02 CS AR-02•E02 CS AR-04•024 CS AR-05••••
CS AR-06•••• CS AR-08•••• CS AT-0••••• CS AT-1•••••
CS AT-3••••• CS AR-91•024

Monitoring of several guards through switches and magnetic sensors. System in category 3. For the calculation of the diagnostic coverage, see ISO TR24119.

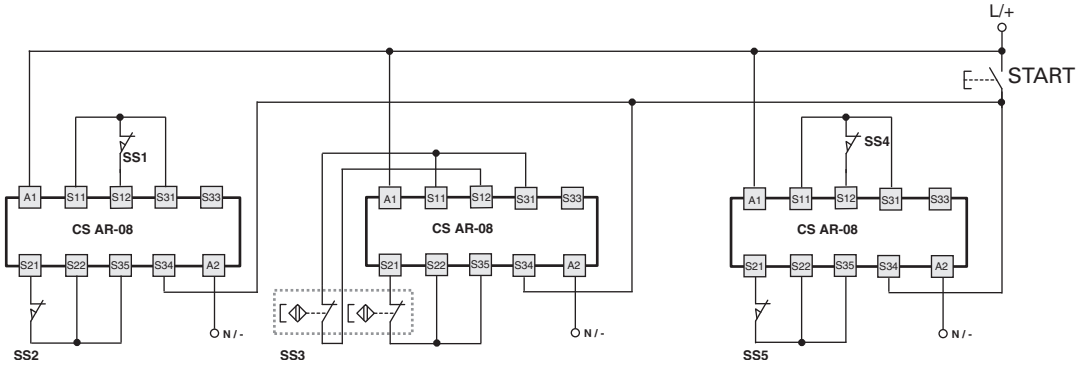
- The use of just one switch per guard requires that it be possible to exclude the possibility of mechanical breakage of the switch during the risk assessment.
- The sensor must have two channels and be coded.
- If available, verify the provisions of the Type C standard for your own machine.

Application examples: possibility of parallel module reset, up to category 4 according to EN ISO 13849-1

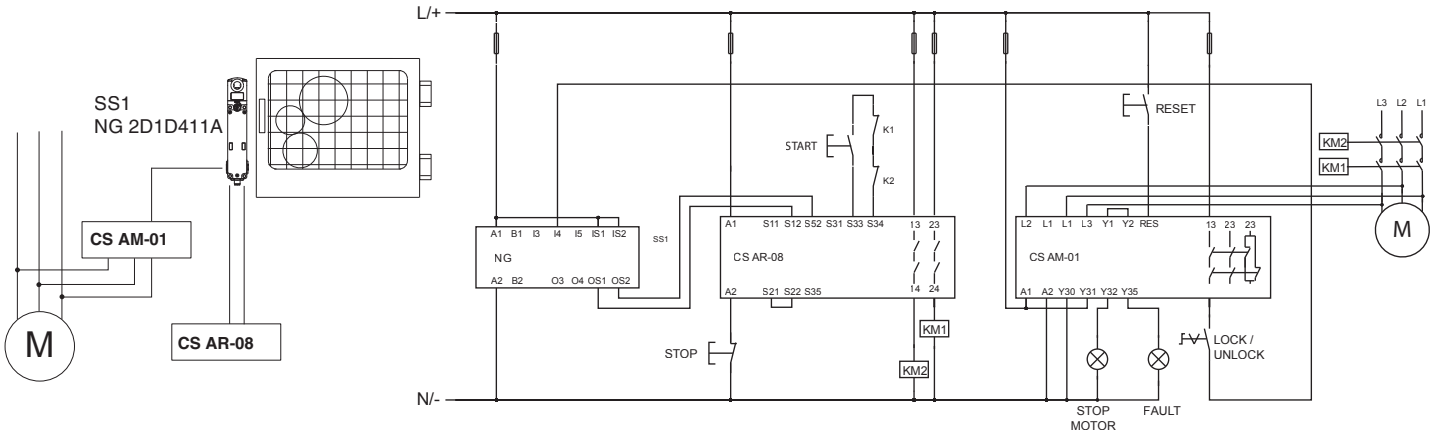


Monitoring of several guards through different technologies. System in safety category 4. The example shows the possibility of a contemporaneous reset of several modules via a single contact of a button.

Compatible modules
CS AR-04•024 CS AR-05•024 CS AR-06•024
CS AR-08•024 CS AR-91•024

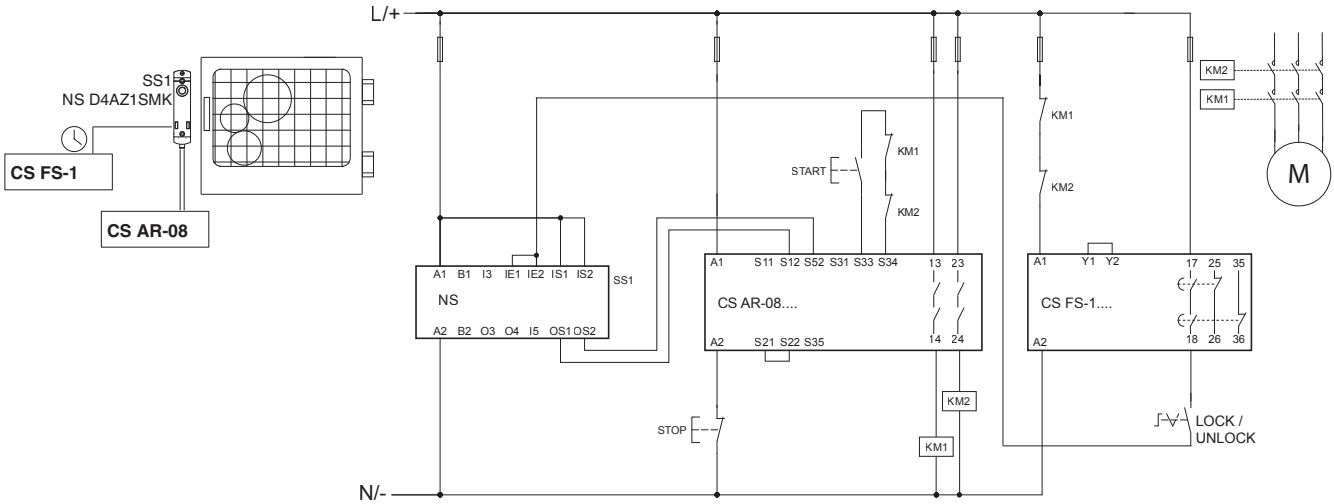


Movable guard monitoring in category 4 up to PL e acc. to EN ISO 13849-1
Guard interlock in category 2 up to PL d acc. to EN ISO 13849-1



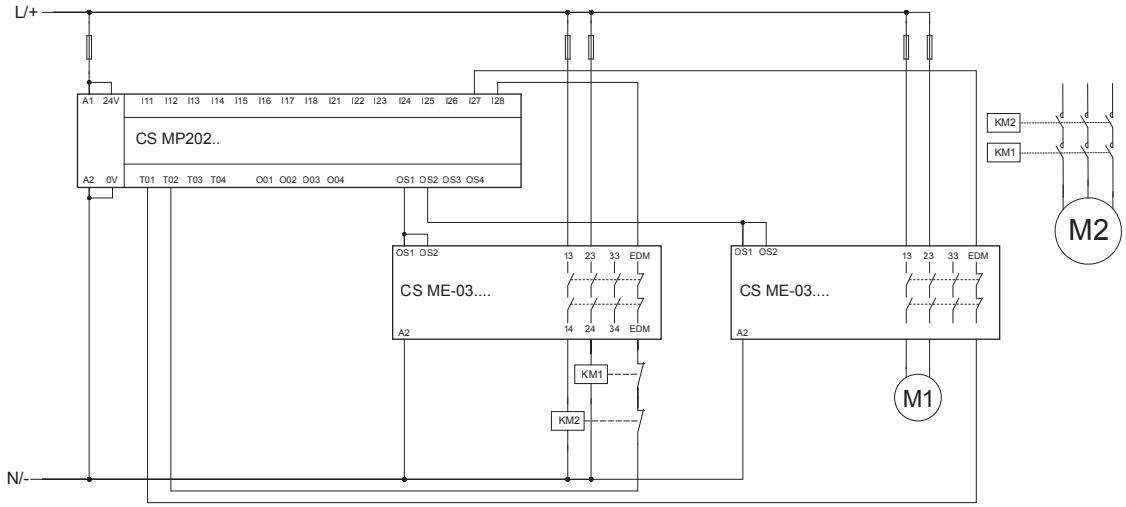
Guard monitoring and interlock by means of interlocking device with RFID technology in category 4, PL e and SIL3.
Release command enabled by the safety module for standstill monitoring.

Movable guard monitoring in category 4 up to PL e acc. to EN ISO 13849-1
Guard interlock in category 2 up to PL d acc. to EN ISO 13849-1



Guard monitoring and interlock by means of interlocking device with RFID technology in category 4, PL e and SIL3.
Release command enabled by the safety timer.

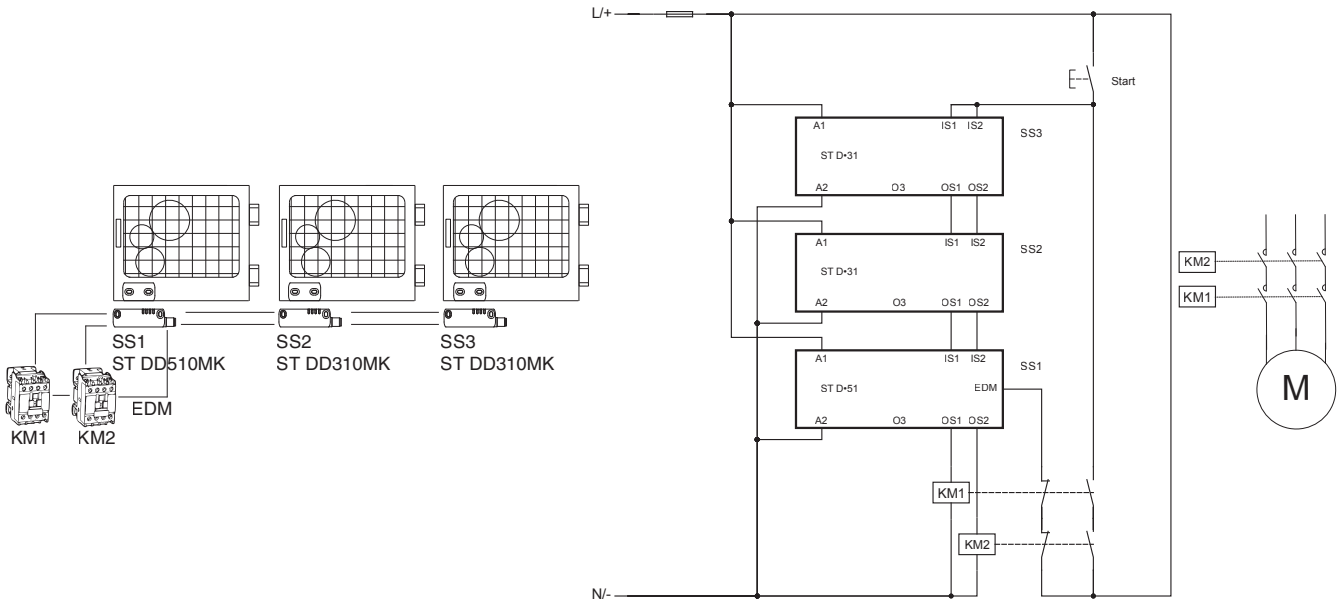
Connection of two expansion modules to the PNP safety outputs of a programmable module of the GEMNIS series



The circuit diagram only shows the connection of the expansion modules; the connection of inputs and other outputs was intentionally omitted.
Note: Motor M1 with load according to the utilisation categories of the contacts of the CS ME-03 module.
Note: The connection between OS1 of module CS MP-202 and inputs OS1 and OS2 of module CS ME-03 can be regarded as fault-excluded since both are located in the same housing. See table D.4, item D.5.2 of EN ISO 13849-2.

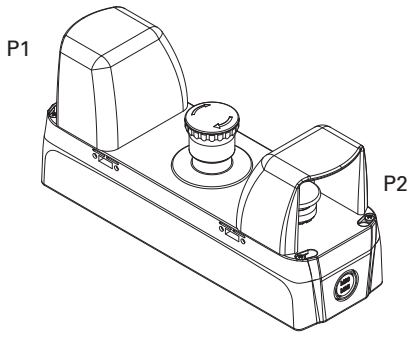
NOTE: The NC contacts of KM1 and KM2 are mechanically guided (EN 60947-4-1, Annex F)

Monitoring of guards by means of sensors with RFID technology in series connection

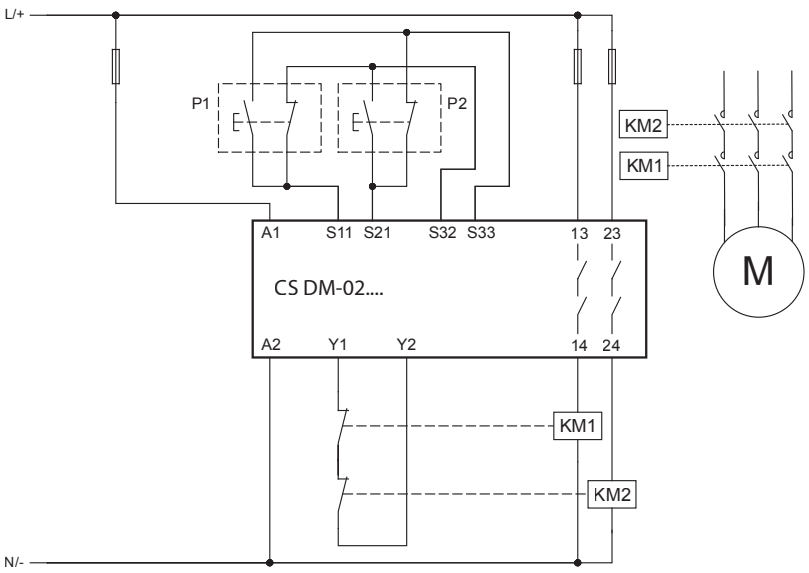


Direct monitoring of the status of the contactors via the EDM input of the last sensor in the series connection

Category IIIC two-hand control acc. to EN574



EA AC37041



CS MP programmable multifunction safety modules

Introduction

GEMNIS

A **Gemnis** series module is a programmable safety device, which allows several safety functions to be carried out simultaneously. This product series has been developed specifically to meet the needs of machinery manufacturers for machines with a low to average number of safety functions. As an indication, these modules can manage small applications which are equivalent to the functions carried out by 3 to 4 traditional electromechanical safety modules, up to circuits with dozens of inputs.

Gemnis series safety modules can implement safety circuits with a safety category of up to SIL 3 acc. to EN 62061, PL e and category 4 acc. to EN ISO 13849-1.

The **Gemnis** series of safety modules has been updated to **version 11.7** which introduces new functions and improved hardware- and software-level performance. This update considerably increases the application potential of these products.

The **Gemnis Studio** program is a graphic development environment for the creation, simulation and debugging of programs that are uploaded to the corresponding modules of the Gemnis family.

This software is licensed to users wishing to program these modules, subject to prior registration at **www.gemnis.com**.

You can download the new **Gemnis Studio** software version (**Gemnis Studio 11.7**) from the site, which will allow you to program both current, **Gemnis K11**-designated modules, as well as previous ones.

General features of safety modules

Gemnis series modules can manage all of the following safety device types.

- Mechanical safety switches
- Switches with solenoid for guard interlock
- Magnetic safety sensors
- Safety light barriers or optical safety sensors (category 4)
- Safety sensors
- Mushroom buttons for emergency stop
- Rope switches for emergency stop
- Safety mats or safety bumpers with 4-wire technology
- Category IIIA or IIIC two-hand controls
- Safety selector switches
- Enabling devices
- Analogue sensors 4-20 mA (Gemnis Studio 11)
- 0-4 kHz frequency signals (Gemnis Studio 11)
- Dual-beam muting systems (Gemnis Studio 11).

This modules are also equipped with functionality allowing you to also implement:

- safety timers;
- detection of various types of faults in safety devices or their connections;
- verification of the module's internal temperature limit values;
- status communication via USB port.

Finally, Gemnis series modules can:

- manage up to eight different electronic safety outputs or four relay outputs;
- manage various signalling outputs (not safety-related);
- status information and data settings via the USB communication port.

Gemnis design safety modules can implement safety circuits with up to SIL CL3 acc. to EN ISO 62061, PL e and category 4 acc. to EN ISO 13849-1.

Website

This product line is supported online via the **www.gemnis.com** website, where you can:

- download the Gemnis Studio installation package (following registration);
- download support files;
- get the most up to date version of the instruction manual;
- get examples and other support information which will be added over time;
- watch videos illustrating Gemnis Studio program operation.

Hardware structure of the modules

Gemnis design modules are created with increased flexibility - even at the hardware level. These products are made up of various electronic circuit boards which are sold in various combinations, but which are always contained in a single housing and with one unique product code.
The Gemnis series modules have a general redundant and self monitoring type structure, they are controlled by a pair of processors which simultaneously run the application program and constantly monitor their operation and system integrity in parallel.

Each module is supplied in a single housing, of the minimum width required to house the boards which make up the module. 45 mm to 90 mm wide housings are available. The customer does not need to worry therefore about wiring the various parts.

The USB port integrated within the module is used for programming and debugging of the Gemnis Studio software module. Once a module is programmed, you can also use the USB port for communicating with a PC installed on the machine, and for the exchange of information relating to the module state.

The main hardware innovations introduced to version 11 by the safety module update are the following:

- ability to manage programs up to 4 times larger;
- the ability, with new dedicated modules, to manage analogue and/or speed inputs;
- models with 8 electronic safety outputs;
- new module configurations available (see following table).

Module	Inputs type I	Inputs type J	Inputs type C	Inputs type F	Test signals T	OS safety outputs	O signalling outputs	Port	Width (mm)	Page
CS MP201M0	8	-	-	-	8	3NO	4	USB	45	283
CS MP202M0	16	-	-	-	4	4 PNP	4	USB	45	284
CS MP203M0	12	-	-	-	4	3NO + 1NO	4	USB	45	285
CS MP204M0	12	-	-	-	4	3NO	4	USB	45	286
CS MP205M0	4	4	-	4	4	4 PNP	4	USB	45	287
CS MP206M0	8	-	-	-	4	4 PNP	12	USB	45	288
CS MP207M0	4	-	2	-	4	4 PNP	4	USB	45	289
CS MP208M0	16	-	-	-	4	8 PNP	-	USB	45	290
CS MP301M0	24	-	-	-	8	3NO	4	USB	67.5	291
CS MP302M0	24	-	-	-	12	4 PNP	4	USB	67.5	292
CS MP303M0	32	-	-	-	4	4 PNP	4	USB	67.5	293
CS MP304M0	28	-	-	-	4	3NO + 1NO	4	USB	67.5	294
CS MP305M0	24	-	-	-	4	4 PNP	12	USB	67.5	295
CS MP306M0	20	-	-	-	4	3NO + 1NO	12	USB	67.5	296
CS MP307M0	8	4	2	4	4	4 PNP	4	USB	67.5	297
CS MP308M0	24	-	-	-	4	8 PNP	8	USB	67.5	298
CS MP309M0	32	-	-	-	4	8 PNP	-	USB	67.5	299
CS MP401M0	40	-	-	-	4	4 PNP	12	USB	90	300
CS MP402M0	32	-	-	-	12	8 PNP	8	USB	90	301
CS MP403M0	40	-	-	-	4	8 PNP	8	USB	90	302

I = Digital inputs
J = Digital inputs, decoupled
C = Inputs for 4-20 mA analogue signals
F = Inputs for 0 ... 4 kHz frequency signals

T = Test signals
OS = OSSD safety outputs (PNP)
nn = Relay safety outputs
O = signalling outputs (PNP)

Software Gemnis Studio

Gemnis Studio is software designed to allow the user to program a module belonging to the Gemnis line. This software has a graphical interface to visually display, in a natural and intuitive way, the assembly of operations that the application program will execute, once loaded to the module. Gemnis Studio allows you to attach supporting information and useful notes to the configuration information, for overall understanding of the program. Gemnis Studio also allows you to check correct application program operation prior to sending it to the module via the simulation.

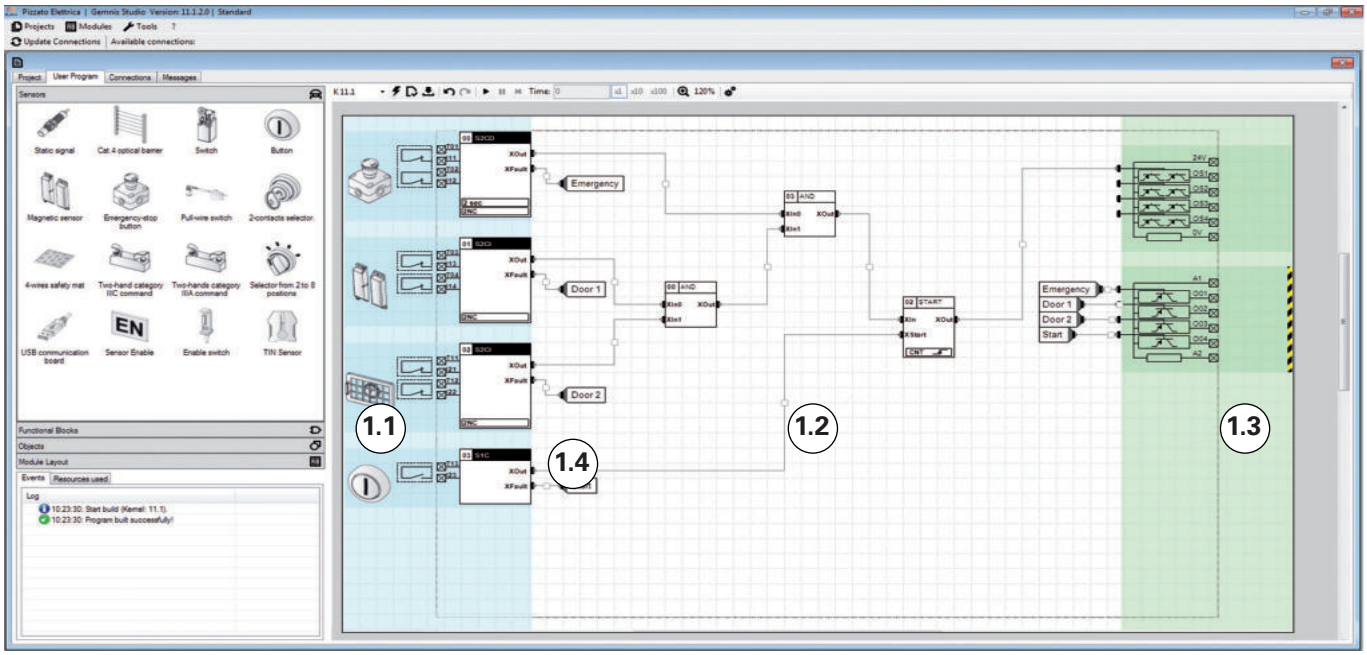
Finally, Gemnis Studio allows you to carry out monitoring and detection operations, and to graphically represent the state of an active operational device in real time.

New release 11.7 available

In the latest version of Gemnis Studio 11.7.1.0 the following new features have been introduced:

- "SERIAL" function block for communication with PLC;
- program migration tool;
- new settings available in the "MUTING" and "EDM" function blocks;
- new parameters available in the "Display" object;
- new graphic features (colouring of the terminals of the function blocks according to the connection; option of setting the "minimal" display of the connections; updated images of the safety devices and sensors available in the library);
- possibility to export in PDF format the printouts of the program and of the report.

Desktop



The Gemnis Studio software has been designed with the objective of making Gemnis series module operation as immediate and visual as possible. With this aim, we decided to create a work environment – the Desktop – where, as far as possible, the user can amass all the information required to actually "view" and not just "imagine" the behaviour of the project under development. This is the reason we have made room for graphical object representations, of the physical characteristics of the module in use, and immediate interaction, by means of simulation, with the created program.

The desktop is the main user work area, the zone where the flow and processing to be applied to the data detected by the module are defined using the graphical program interface.

The desktop is divided into three parts:
1.1) the sensor zone
1.2) the functional block zone
1.3) the output zone

In the sensor zone (1.1) the user indicates the external device types connected to the module terminals, and all the parameters needed to define them.

In the output zone (1.3) all the output devices present in the selected module (relays, transistors etc.) are immediately shown.

In the function block zone (1.2) the user will enter all the logical functions needed to process the flow of data coming from the sensors, and will proceed to make the connections to transfer this data between the objects in the desktop and finally to the outputs.

The desktop includes a dotted box (1.4) which represents the area "occupied by the module", or, everything enclosed within the physical module, from terminals to code. The area outside this box, meanwhile, is occupied by images of the physical devices external to the module (switches, buttons, etc.), illustrating their expected internal structure and any description.

At the user's request, the desktop content is compiled and, provided there are no errors, it is translated into the application program. If a module is connected to the computer, you can immediately transfer the application program to it, and thereby check its effective operation in the field.

Otherwise it is possible to simulate application program operation directly on the desktop, by interacting with the sensors and evaluating their effects graphically.

Project

The collection of information required to configure a module and describe its activities is called a "Project". Using Gemnis Studio, the user can assemble the textual and graphical information required to elaborate and comment the functions which will be carried out by the program, once installed on a Gemnis line module.

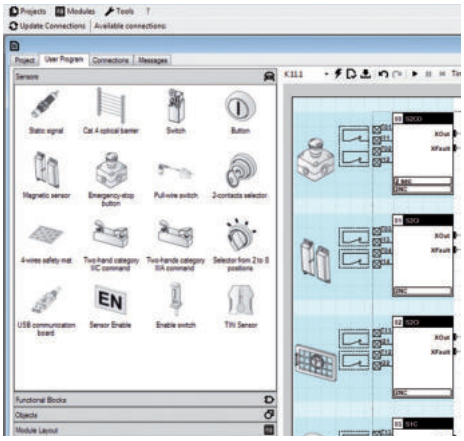
Printing

Gemnis Studio can generate a Connection Report, which includes all connections to the module terminals, and a user Program Report, allowing you to print the Application Program.

Password

The password gives the option of protecting a module's interaction capacity, and the ability to modify the project file.

Sensors



The sensor zone indicates the external device types which can be connected to the module terminals, and all the parameters needed to define them.

Each sensor created displays a view of the internal contact configuration and of how the contacts are connected to the module terminals, a box with the associated safety function, and the parameters selected for the function.

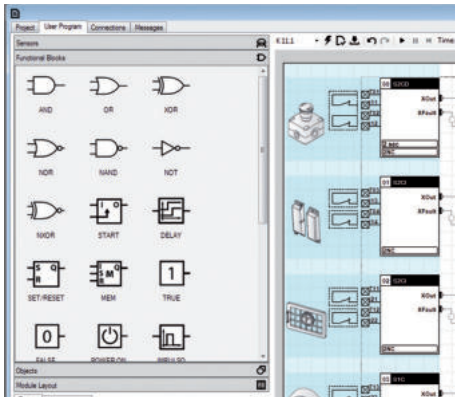
From the sensor panel, you can select a sensor using the mouse and drag it into the dedicated desktop area.

A full list of the available sensors is shown on the side.

Sensor list

Sensor type	Diagram	Examples
Sensor with 1 not testable channel		
Sensor with 2 not testable channels, with interdependent signals		
Sensor with 1 tested channel		
Sensor with 2 independent tested channels		
Sensor with 2 dependent tested channels		
Sensor with 2 always-closed tested channels, short circuit permitted between the channels		
Sensor with 2 tested channels which can be crossed		
Sensor with 2 tested channels which cannot be crossed		
Sensor with 2 to 8 tested channels which cannot be crossed and which may only be active one at a time		
Sensor with 2 tested channels which cannot be crossed and which must follow a very precise activation/deactivation sequence made up of three states: rest, work, stop		
Dual temperature sensor integrated in module		
Monitoring of a pair of analogue sensors with 4-20 mA output in both 2-wire and 3-wire versions		
Monitoring of a pair of signals with frequencies up to 4 KHz		

Function blocks



The function blocks represent all the logic functions required to process the data flow between sensors and outputs.

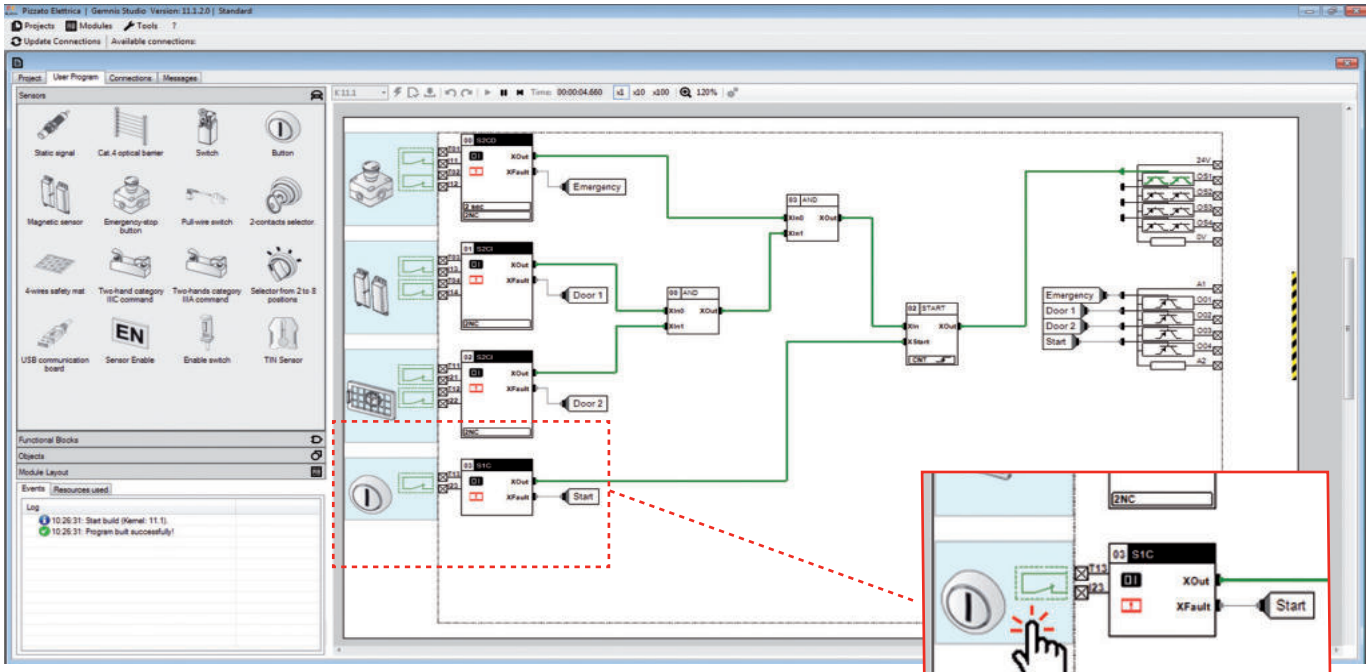
From the function block panel, a block can be selected using the mouse and dragged into the dedicated desktop area.

A full list of the available function blocks is shown on the side.

List of available function blocks

- AND — Basic Boolean function
- OR — Basic Boolean function
- XOR — Basic Boolean function
- NOR — Basic Boolean function
- NAND — Basic Boolean function
- NOT — Basic Boolean function
- NXOR — Basic Boolean function
- START — Control function
- DELAY — Returns a signal of type Delay Off or Delay On
- SET/RESET — Basic logical memory function
- TRUE / FALSE — Basic Boolean function
- POWER ON — Active signal at first execution cycle
- PULSE — Returns a signal of type Delay Off on the preselected input edge
- CLOCK — Generates pulses at pre-established fixed intervals
- ERROR — Puts the module into Error State
- LKTBL — Conversion table between data of the same type
- GEQ/EQU/LEQ — Carries out a numerical comparison between two values of type B or W and displays the result in boolean format (X)
- MESSAGE — Transmits a message on the USB and COM ports
- COUNTER — Pulse counter
- TRIGGER — Detects the edge, either rising or falling, of an input signal
- FILTER — Filters a signal from interference for a duration lower than set time
- LDC — Upstream function block for monitoring of a door-locking system
- WAVE — Generates a waveform with variable period and ON time
- MUTE2 — Upstream function block for monitoring of a 2-beam muting system
- SERIAL — Allows a telegram with a length of up to 32 bits to be transmitted to any output of the module. NEW

Simulation

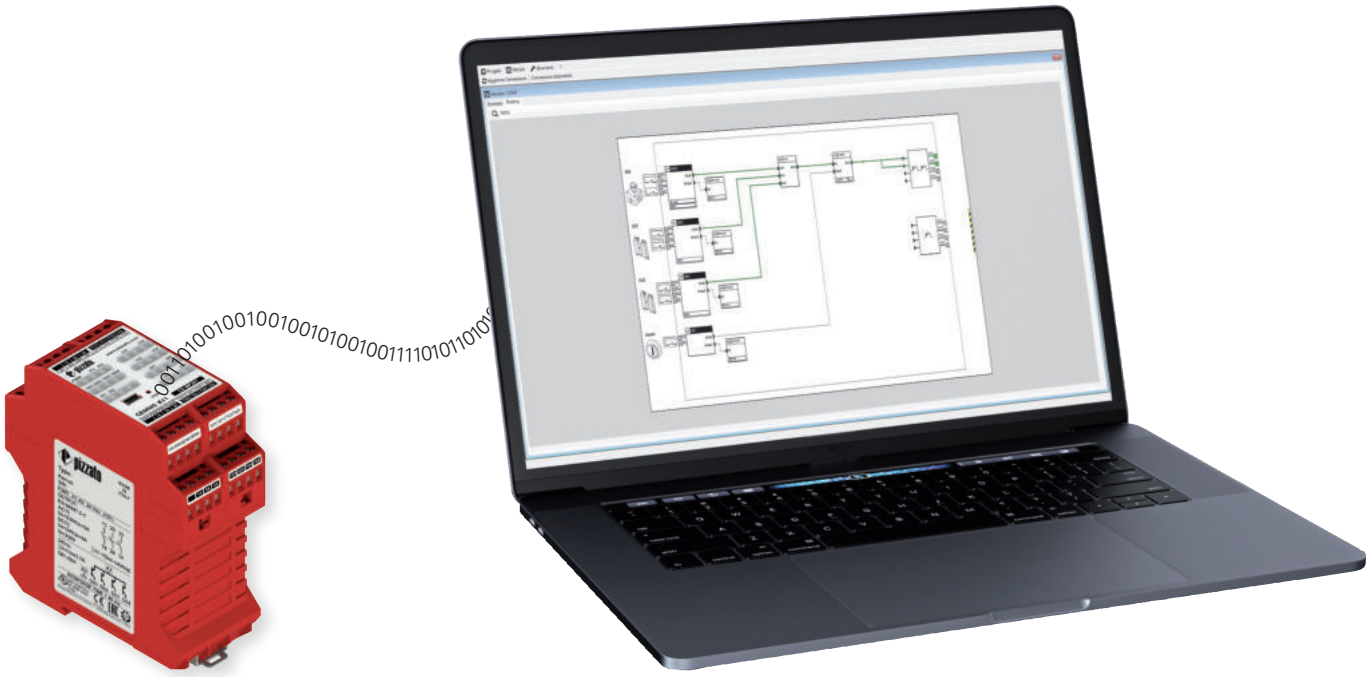


Gemnis Studio is equipped with a useful simulation environment, which allows you to carry out tests on your application program under development and check its correct operation before you install it in a module. To run an application program simulation during the development phase, simply press the Start button on the toolbar at the top of the desktop. If the application program cannot be compiled, the simulation will not run.

Upon start of the simulation phase, the desktop and the way you interact with it change. During this phase you can simulate module operation by interacting with the sensors and simulating real world conditions or operations. Clicking on the sensors will make them execute, in sequence, the standard events for each sensor. Each of these interactions modifies the state of the sensor output variables which, via the connectors, will become the input variables of the function blocks, which will evaluate them and so on, until the data arrives at the outputs that will or will not activate. This simulates exactly what will happen in the module.

Transmission of the information via the connectors is visible via colour change of the connectors.

Monitor



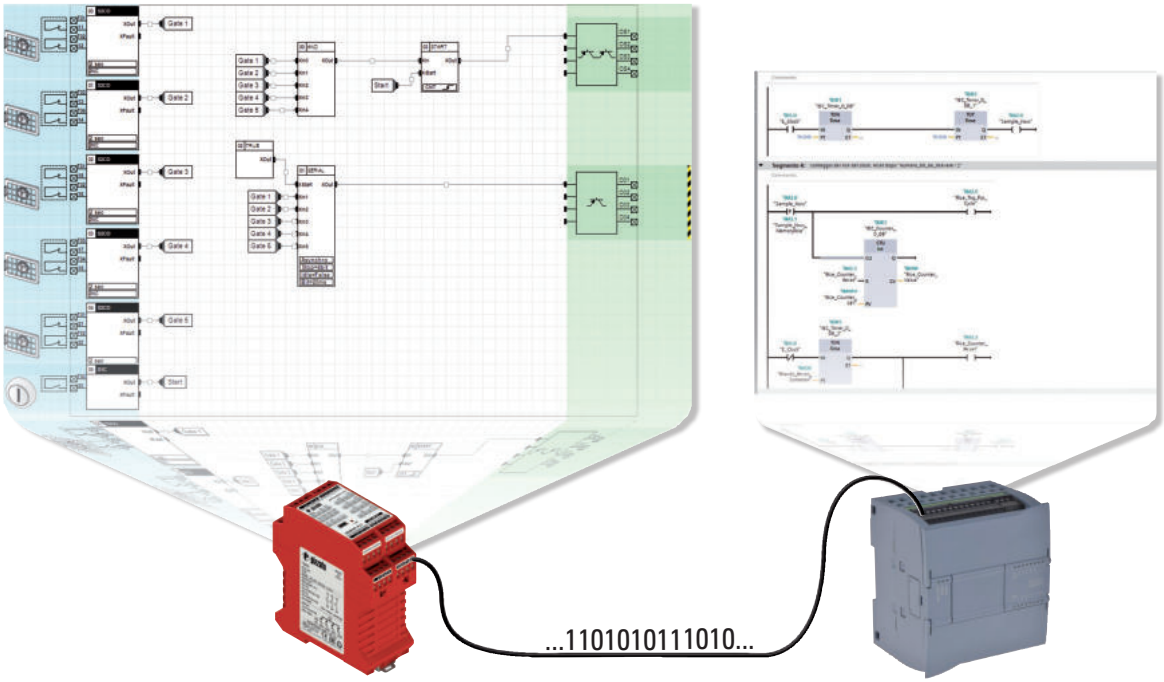
You can monitor operation of one or more Gemnis modules in real time using the Monitor function.

You can observe the overall operation state of the module and various data relating to the program being executed, including a list of most recently saved programs. The execution status of the program as well as the status of the module inputs and outputs can be viewed in real time. In Gemnis Studio 11 the video data update has been made faster and graphical pan & zoom functions are also available for the analysis of large projects.

New SERIAL function block

NEW

The **SERIAL function block** was introduced with the **11.7.1.0** release of **GEMNIS STUDY**, allowing a telegram with a length of up to 32 bits to be transmitted to any output of the module.
With the SERIAL function block it is therefore possible to export "bit" type information from a Gemnis safety module (typically the open or closed state of the guard, but also the locked or unlocked state of the guard, or results of logical combinations between other GEMNIS STUDIO function blocks) using a maximum of 2 cables and 2 module outputs.



Transmission parameters

The function block allows a wide range of transmission parameters to be set:

- number of bits to be transmitted (2 to 32): any digital signal, including function block outputs;
- 2 types of transmission: synchronous (uses two outputs: signal and clock) or asynchronous (one self-synchronizing output, bit with Manchester coding);
- adjustable bit duration from 10 to 500 ms;
- IDLE status of the output cable (0, 1);
- number of fill bits between two consecutive transmissions (2 to 10);
- max. transmission speed: 100 bit/s in synchronous transmission, 50 bit/s in asynchronous transmission.

Advantages for the user

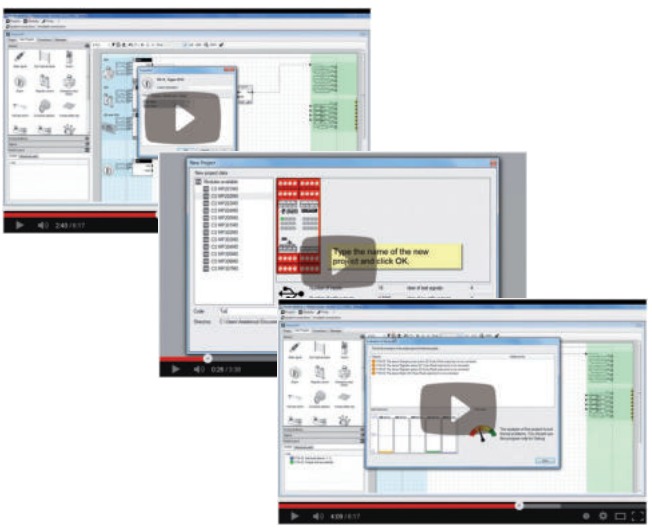
- The new SERIAL function block can be**used on all Gemnis modules**, even on previously purchased ones.
- **No hardware upgrade costs**.
- Simply download the **new release of Gemnis Studio 11.7.1.0**
- Less outputs occupied in the module: 1 single output for transmitting up to 32 bits.
- Less wiring: only 1 or 2 wires are required.
- No need for a PC with USB connection to the safety module.
- The pulse sequence can be decoded with any type of PLC.

Technical support

Pizzato Elettrica provides technical support free of charge to users who have registered on the website and downloaded Gemnis Studio.
The information requested must be relevant to the functionality of the module. We do not provide a consulting service based on the customer's application.

Online support

The site www.gemnis.com contains video tutorials illustrating Gemnis Studio program operation.



CS MP201M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

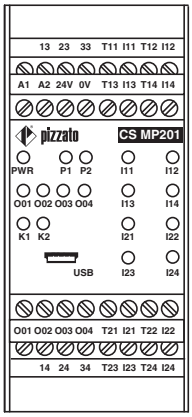
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	135	
PFH_D	1.44E-09	
Mission time	20 years	
System response time	< 40 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	8	303 part 6
Test outputs (Tx)	8	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Safety relay circuits	3NO	303 part 14

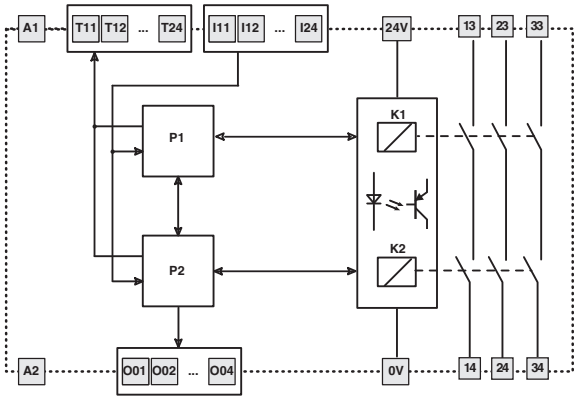
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP201M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP202M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

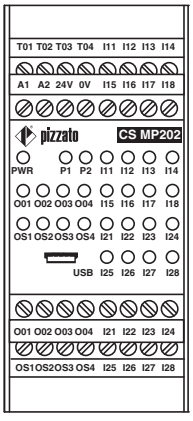
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	614	
PFH_D	1.32E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	16	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Semiconductor safety output circuits (OSx)	4 PNP	303 part 12

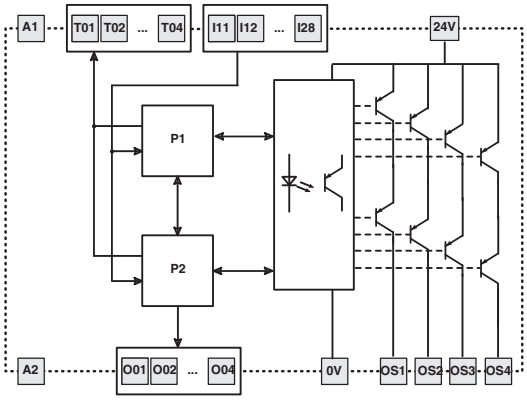
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP202M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP203M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

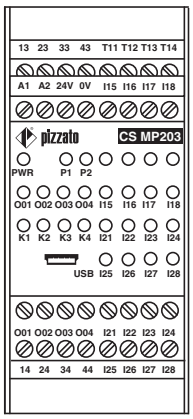
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	103	
PFH_D	1.61E-09	
Mission time	20 years	
System response time	< 40 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	12	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Safety relay circuits	3NO+1NO	303 part 14

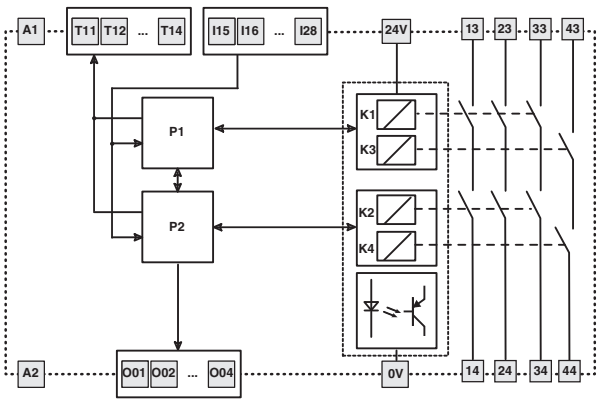
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP203M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP204M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

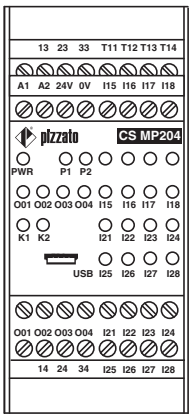
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	134	
PFH_D	1.52E-09	
Mission time	20 years	
System response time	< 40 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	12	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Safety relay circuits	3NO	303 part 14

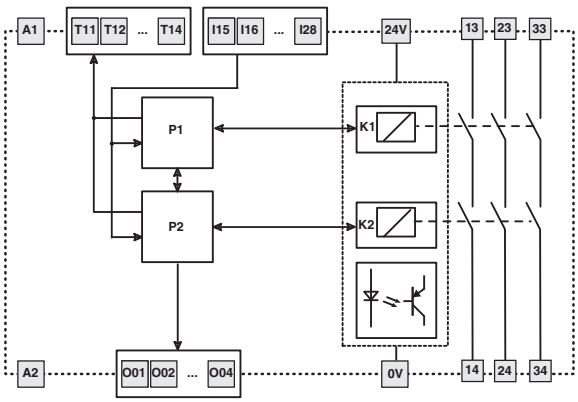
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP204M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP205M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

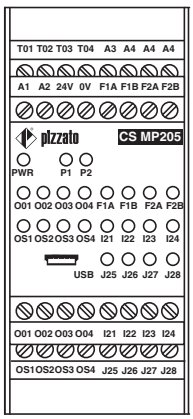
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

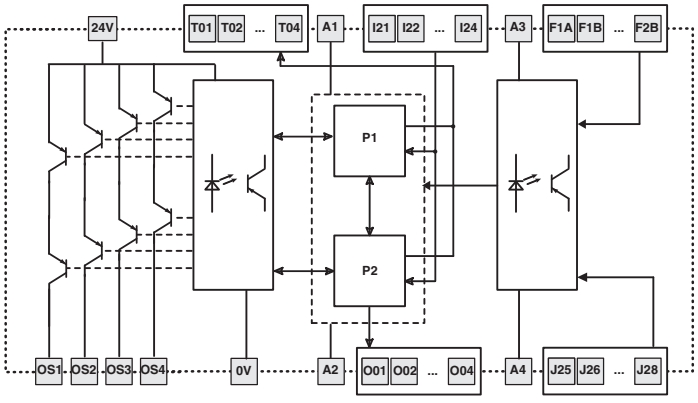
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	373	
PFH_D	2.19E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	4	303 part 6
Decoupled digital inputs (Jx)	4	303 part 7
Inputs for frequency signals from 0 to 4 kHz (Fx)	4	303 part 9
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Semiconductor safety output circuits (OSx)	4 PNP	303 part 12

Pin assignment



Internal block diagram



Code structure

CS MP205M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP206M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

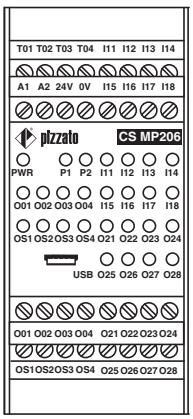
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	3314	
PFH_D	1.09E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	8	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	12	303 part 11
Semiconductor safety output circuits (OSx)	4 PNP	303 part 12

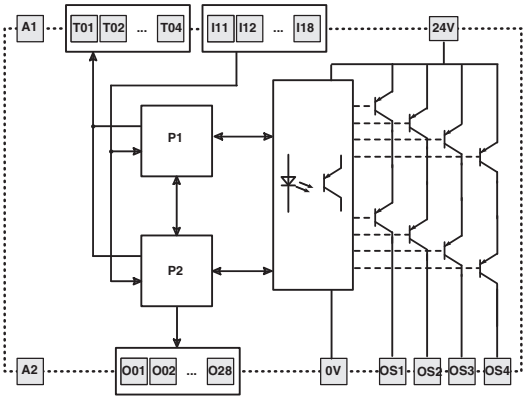
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP206M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP207M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General data

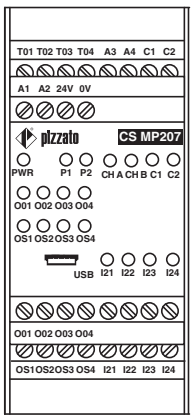
Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	431	
PFH_D	7.08E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	4	303 part 6
Inputs for 4-20 mA analogue signals (Cx)	2	303 part 8
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Semiconductor safety output circuits (OSx)	4 PNP	303 part 12

Quality marks:

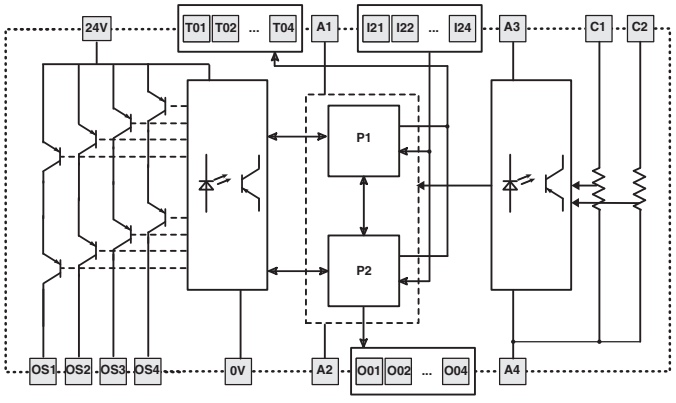
0123

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.YT03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP207M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP208M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General data

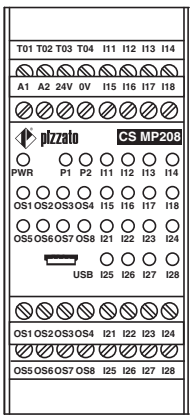
Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	633	
PFH_D	7.02E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	16	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor safety output circuits (OSx)	8 PNP	303 part 13

Quality marks:

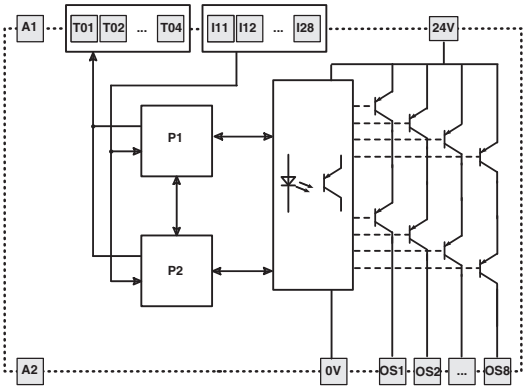
0123

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP208M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP301M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

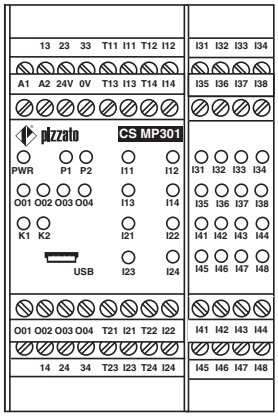
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	128	
PFH_D	1.88E-09	
Mission time	20 years	
System response time	< 40 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	24	303 part 6
Test outputs (Tx)	8	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Safety relay circuits	3NO	303 part 14

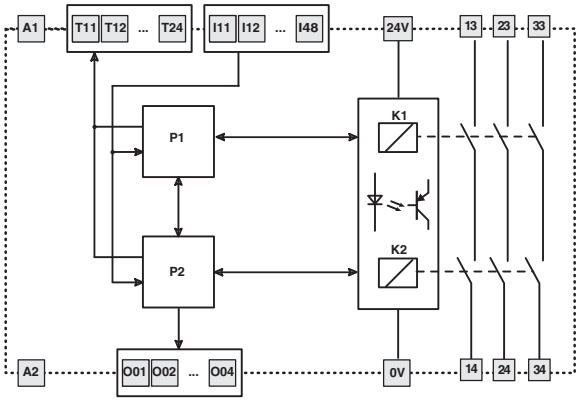
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP301M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP302M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

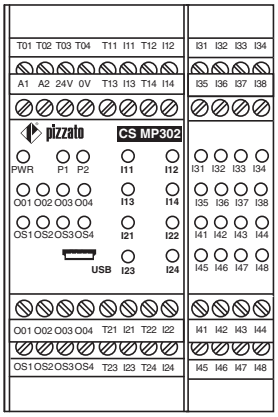
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	535	
PFH_D	1.57E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	24	303 part 6
Test outputs (Tx)	12	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Semiconductor safety output circuits (OSx)	4 PNP	303 part 12

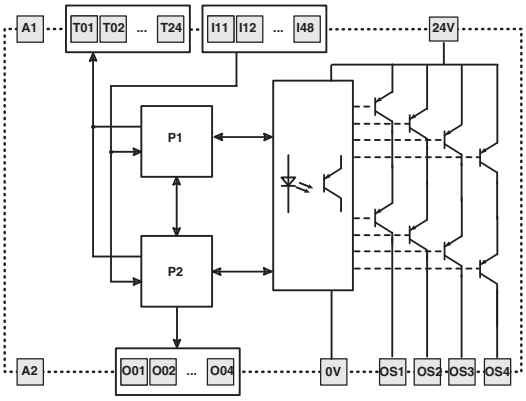
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP302M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP303M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

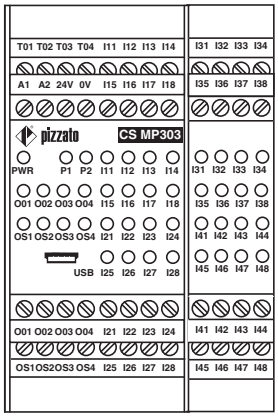
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	485	
PFH_D	1.76E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	32	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Semiconductor safety output circuits (OSx)	4 PNP	303 part 12

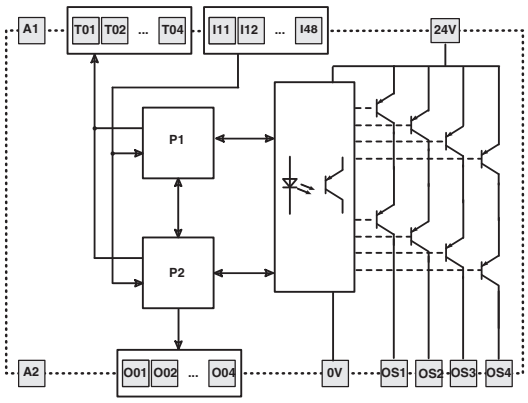
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP303M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP304M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

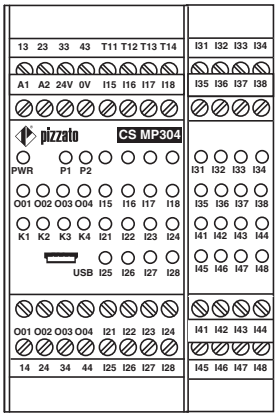
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	98	
PFH_D	2.05E-09	
Mission time	20 years	
System response time	< 40 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	28	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Safety relay circuits	3NO+1NO	303 part 14

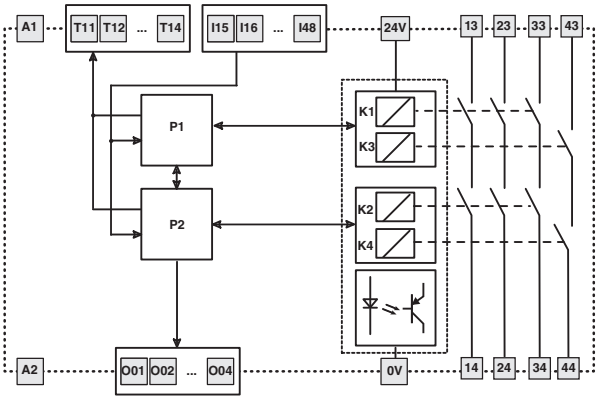
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP304M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP305M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

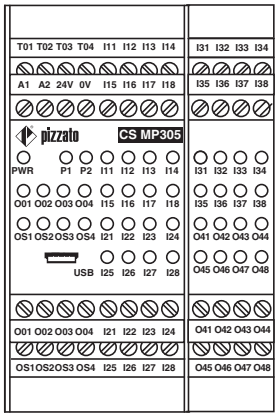
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	535	
PFH_D	1.57E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	24	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	12	303 part 11
Semiconductor safety output circuits (OSx)	4 PNP	303 part 12

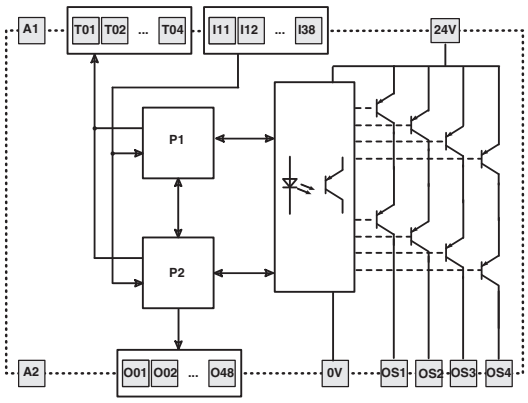
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.YT03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP305M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP306M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General data

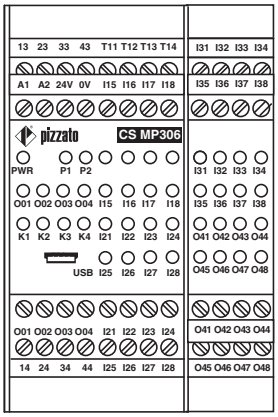
Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	100	
PFH_D	1.86E-09	
Mission time	20 years	
System response time	< 40 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	20	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	12	303 part 11
Safety relay circuits	3NO+1NO	303 part 14

Quality marks:

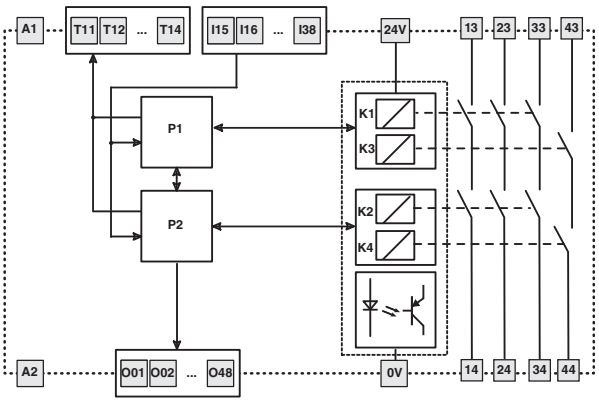
0123

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP306M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP307M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

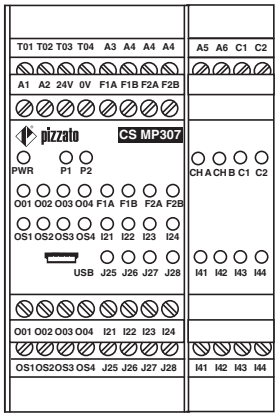
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

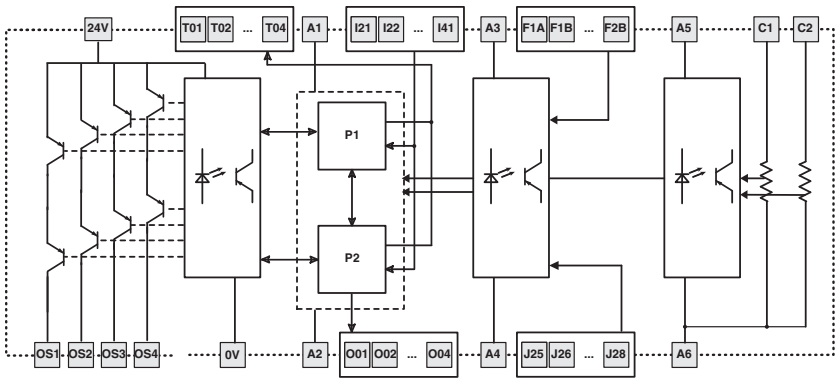
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	289	
PFH_D	8.38E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	8	303 part 6
Decoupled digital inputs (Jx)	4	303 part 7
Inputs for 4-20 mA analogue signals (Cx)	2	303 part 8
Inputs for frequency signals from 0 to 4 kHz (Fx)	4	303 part 9
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	4	303 part 11
Semiconductor safety output circuits (OSx)	4 PNP	303 part 12

Pin assignment



Internal block diagram



Code structure

CS MP307M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP308M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

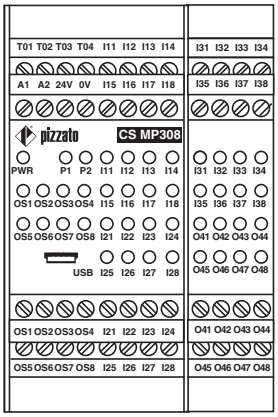
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	548	
PFH_D	7.27E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	24	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	8	303 part 11
Semiconductor safety output circuits (OSx)	8 PNP	303 part 13

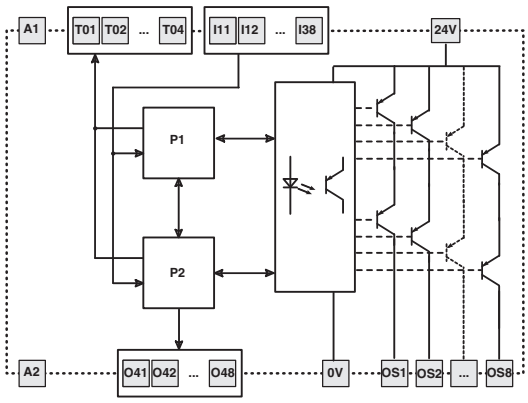
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP308M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP309M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

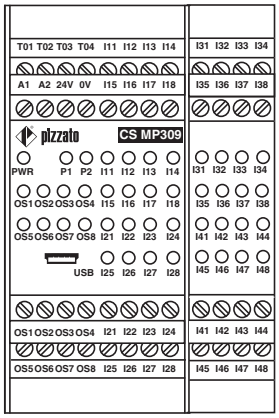
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	496	
PFH_D	7.46E-09	
Mission time	20 years	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	32	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor safety output circuits (OSx)	8 PNP	303 part 13

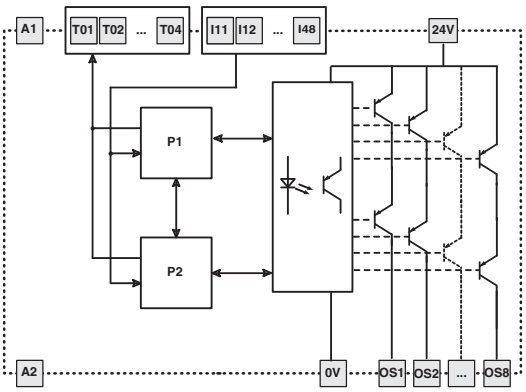
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram

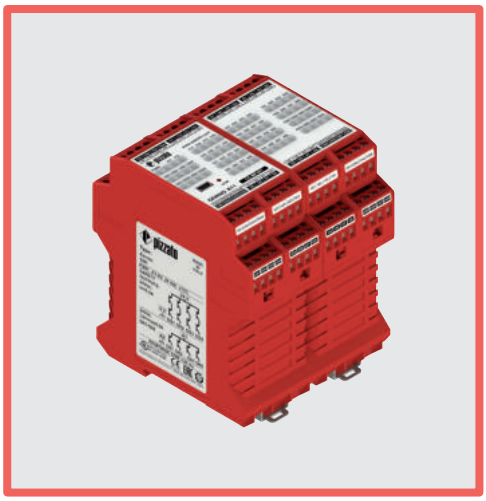


Code structure

CS MP309M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP401M0 programmable multifunction safety module



Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

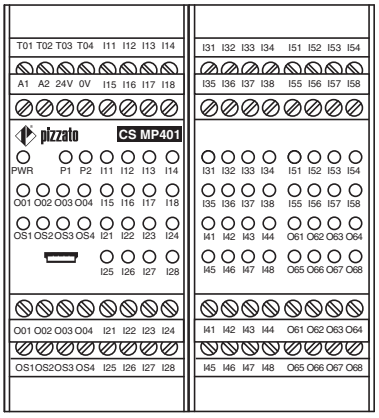
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	434	
PFH_D	1.73E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x90x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	40	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	12	303 part 11
Semiconductor safety output circuits (OSx)	4 PNP	303 part 12

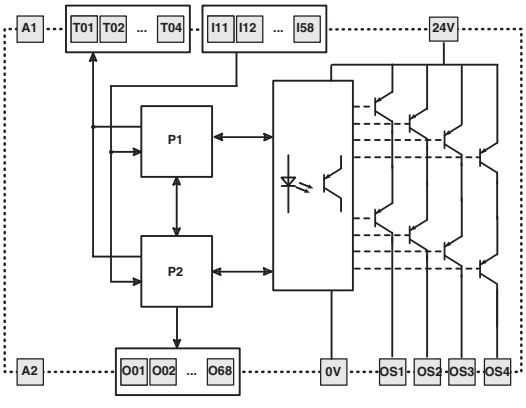
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP401M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP402M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

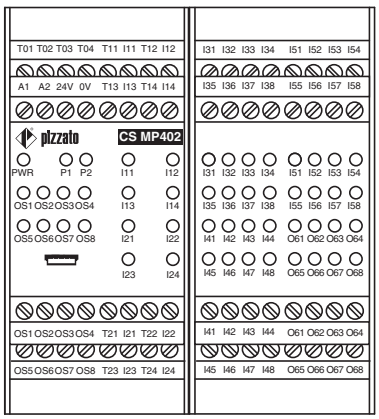
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	478	
PFH_D	7.24E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x90x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	32	303 part 6
Test outputs (Tx)	12	303 part 10
Semiconductor signalling output circuits (Ox)	8	303 part 11
Semiconductor safety output circuits (OSx)	8 PNP	303 part 13

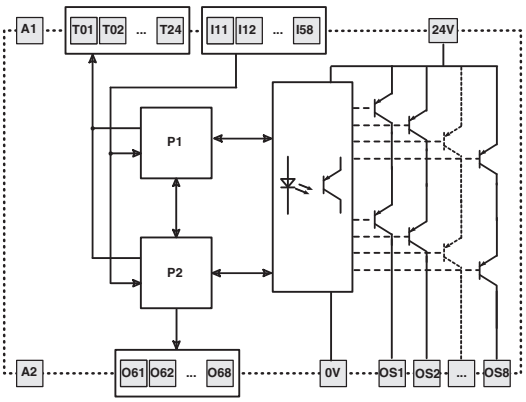
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.YT03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP402M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

CS MP403M0 programmable multifunction safety module

Main features

- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Large selection of logical blocks for the management of external devices and programs
- Custom configured versions available on request

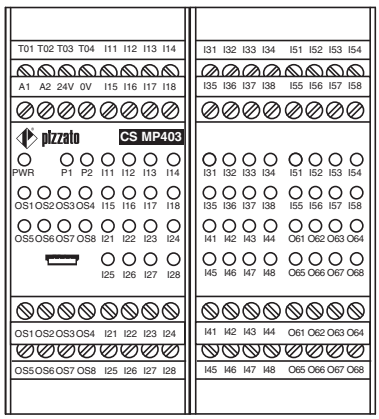
General data

Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
$MTTF_D$	438	
PFH_D	7.42E-09	
Mission time	20 years	
System response time	< 30 ms	
Dimensions (HxLxW)	111.5x90x99 mm	
Housing data		303 part 1
Environmental data		303 part 2
Supply		303 part 3
In compliance with standards		303 part 4
Programming software	Gemnis Studio	303 part 5
USB port	Yes	
Safety inputs (Ix)	40	303 part 6
Test outputs (Tx)	4	303 part 10
Semiconductor signalling output circuits (Ox)	8	303 part 11
Semiconductor safety output circuits (OSx)	8 PNP	303 part 13

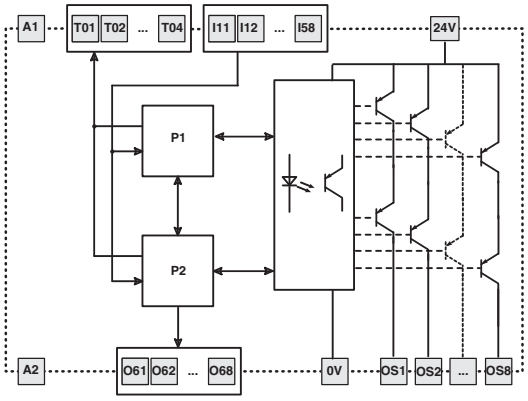
Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Pin assignment



Internal block diagram



Code structure

CS MP403M0

Connection type	
M	Connector with screw terminals
X	Connector with spring terminals

Technical data

1) Housing

Housing:	polyamide PA 6.6, self-extinguishing V0 acc. to UL 94
Protection degree:	IP40 (housing) IP20 (terminal strip)
Dimensions, cable cross sections, terminal tightening torque:	page 317, design C/E

2) Environmental

Operating temperature:	0°C … +55°C
Storage temperature:	-20°C … +70°C
Pollution degree:	external 3, internal 2
Overvoltage category:	II

3) Power supply

Rated voltage A1-A2 (U_n):	24 Vdc
Max. DC residual ripple in DC:	10%
Supply voltage tolerance:	±15% of U_n
Rated consumption (w/o load):	< 3 W
Protection against short circuits:	PTC resistance, Ih=0.5 A
PTC response time:	Response time > 100 ms, release time > 3 s
Internal protection against short circuits on outputs (Tx, Ox):	Electronic
Maximum current output of the module as the total current of the Ox and Tx outputs:	0.5 A
Self-test duration on startup:	< 2 s

4) Compliance with standards

EN 60947-1, EN 60947-5-1, EN 60204-1, EN ISO 13849-1, EN ISO 13855, EN 1037, EN ISO 12100, EN ISO 13850, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61326-1, EN 61326-3-1, EN 60664-1, EN 62061, EN 50581, UL 508, CSA C22.2 n° 14-95, GB/T14048.5-2017

Compliance with the requirements of:

Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU.

Features approved by UL

Electrical ratings:	
Input:	4-48 inputs rated 24 V dc, 5 mA
Relay output:	230/240 Vac, 4 A general use, C300 pilot duty
Semiconductor output (when relay is not available):	up to 4 outputs rated 24 V dc, 500 mA or up to 8 outputs rated 24 Vdc, 400 mA
Semiconductor auxiliary output:	up to 32 outputs rated 24 V dc, 500 mA max
Auxiliary analogic outputs:	up to 4 rated 24 V dc, 20 mA max

Notes:
- Use 60 or 75°C copper (Cu) conductor and wire size No. 30-12 AWG, stranded or solid.
- The terminal tightening torque of 5-7 lb in.
- Only for 24 Vac/dc versions: supply from remote Class 2 source or limited voltage limited energy.

Features approved by TÜV SÜD

Rated supply voltage U_n:	24 Vdc (-15% … +15%)
Ambient temperature:	0°C … +55°C
Response time:	< 30 ms < 40 ms for versions with relay outputs

In compliance with standards: EN ISO 13849-1:2015 (Cat.4, PL e), EN 61508-1:2010 (SIL 3), EN 61508-2:2010 (SIL 3), EN 61508-3:2010 (SIL 3), EN 61508-4:2010 (SIL 3), EN 62061:2005/A1:2013/A2:2015 (SIL CL 3)

5) Gemnis Studio

The **Gemnis Studio** software is the graphic development environment for the creation, simulation and debugging of programs designed for upload to Gemnis line modules.
The software is licensed to users wishing to program these modules, subject to prior registration at **www.gemnis.com**.
From our website you can download the latest version of the software, which allows you to program the safety modules of the Gemnis family.

Gemnis Studio software minimum download requirements

Computer and processor:	X86 with clock frequency of 1 GHz
Memory:	512 MB
Hard disk:	200 MB
Monitor:	Monitor with 1024x768 resolution or higher
Operating system:	Microsoft Windows 7 or Microsoft Windows 10 Microsoft Framework .NET 3.5 or higher Microsoft Report Viewer Acrobat Reader

6) Input circuits (Ix)

Voltage and current in the input circuits:	24 V, 5 mA
Input signals:	0-8 V (Off), 12-24 V (On)
Galvanic separation:	No
Minimum duration of input signal:	10 ms
Input signal filtering:	Yes, maximum interference period 0.4 ms
Maximum input resistance:	100 Ω
Maximum input capacitance:	470 nF to ground 470 nF between two conductors

7) Decoupled input circuits (Jx)

Voltage and current in the input circuits:	24 V, 5 mA
Input signals:	0-8 V (Off), 12-24 V (On)
Galvanic separation:	Yes
Insulation voltage (U_i):	500 V
Minimum duration of input signal:	10 ms
Input signal filtering:	Yes, maximum interference period 0.4 ms
Maximum input resistance:	100 Ω
Maximum input capacitance:	470 nF to ground 470 nF between two conductors

NB: Voltage and current values indicated refer to the power supply terminals (Ax, see each module individually) of the board where the Jx type terminals are present

8) Analogue input circuits (Cx)

Rated supply voltage:	24 Vdc ± 15 %
Analogue input type:	4-20 mA current loop
Measurement range:	0 … 25 mA
Accuracy over entire measurement range:	1 % ± 1 digit
Resolution:	0.01 mA
Input resistance:	100 Ohm
Maximum applicable current:	30 mA
Managed sensors:	"source" type with 2/3 wires
Galvanic separation:	Yes
Insulation voltage (U_i):	500 V

NB: Voltage and current values indicated refer to the power supply terminals (Ax, see each module individually) of the board where the Cx type terminals are present

9) Frequency input circuits (Fx)

Rated supply voltage:	24 Vdc ± 15 %
Input circuit voltage and current:	24 Vdc, 7 mA
Check of the supply voltage of the connected proximity sensors:	24 Vdc ± 20%
Maximum detectable frequency:	4 kHz
Minimum detectable frequency:	1 Hz
Frequency detection accuracy:	1 % ± 1 digit
Resolution:	0.1 Hz
Minimum time for standstill detection:	1 s
Galvanic separation:	Yes
Insulation voltage (U_i):	500 V

NB: Voltage and current values indicated refer to the power supply terminals (Ax, see each module individually) of the board where the Fx type terminals are present

10) Circuits with Test signals (Tx)

Signal type:	Pulsed 100 Hz 24V/0V, duty cycle 50%
Max. total current:	See Supply
Protected against short circuit:	Yes

11) Semiconductor signalling output circuits (Ox)

Output type:	PNP
Maximum current per output:	0.5 A
Max. total current:	see Supply
Impulse withstand voltage (U_{imp}):	0.8 kV
Rated insulation voltage (U_i):	32 V
Protected against short circuit:	Yes
Galvanic separation:	No

12) Semiconductor safety output circuits (OSx) with 4 safety outputs

Rated voltage 24V-0V:	24 Vdc
Number of outputs:	4
Output type:	PNP
Maximum current per output:	0.5 A
Max. total output current:	2 A
Minimum current:	10 mA
Maximum capacitive load to ground per output:	400 nF
Maximum inductive load per output:	500 mH
Protection fuse:	2 A type gG
Galvanic separation:	Yes
Impulse withstand voltage (U_{imp}):	0.8 kV
Rated insulation voltage (U_i):	32 V
Short circuit detection between outputs:	Yes
Duration of the deactivation impulses at the safety outputs:	< 300 µs

13) Semiconductor safety output circuits (OSx) with 8 safety outputs

Rated voltage 24V-0V:	24 Vdc
Number of outputs:	8
Output type:	PNP
Maximum current per output:	0.4 A
Max. total output current:	3 A
Minimum current:	10 mA
Maximum capacitive load to ground per output:	400 nF
Maximum inductive load per output:	500 mH
Protection fuse:	4 A type gG
Galvanic separation:	Yes
Impulse withstand voltage (U_{imp}):	0.8 kV
Rated insulation voltage (U_i):	32 V
Short circuit detection between outputs:	Yes
Duration of the deactivation impulses at the safety outputs:	< 300 µs

14) Safety relay circuits

Rated voltage 24V-0V:	24 Vdc
Contact type:	Forcibly guided contacts acc. to EN 50205
Material of the contacts:	gold-plated silver alloy
Maximum switching voltage:	230 Vac; 300 Vdc
Maximum current per contact:	6 A
Max. total current ΣI_{th2}:	36 A^2
Minimum current:	10 mA
Protection fuse:	4 A type gG
Maximum load:	1380 VA/W
Impulse withstand voltage (U_{imp}):	4 kV
Rated insulation voltage (U_i):	500 V
Utilization category (EN 60947-5-1):	AC15 (Ue=230V, Ie=3A); DC13 (Ue=24V, Ie=4A) (6 op. cycl./min.)
Utilization category (UL 508):	C300
Contact resistance:	< 100 mΩ
Mechanical endurance:	>10 million operating cycles
Electrical endurance:	>100,000 operating cycles
Galvanic separation:	Yes

The number and the load capacity of output contacts can be increased by using expansion modules or contactors.
See page 263-272.

CS MF pre-programmed multifunction safety modules

Introduction

GEMNIS

An increasing number of users requires products which carry out several safety functions without needing the complex management of a safety PLC or the complex wiring of many traditional safety modules. Such problems arise mainly when the safety functions are typically greater than 3 or 4, and/or when managing a safety PLC software (software purchase, training courses, programming of all modules, software management and filing, updates etc.) turns out to be too great an overhead in relation to problem complexity.
Pizzato Elettrica introduces Gemnis, a series of electronic modules which are pre-programmed for specific customer applications or for generic safety macro-functions commonly used in industrial contexts. The following pages list some of the pre-programmed products for generic macro-functions commonly used in the industrial sector. These products are also available for individual purchase. Any customer requiring a product pre-programmed to their particular specification can contact the Pizzato Elettrica technical department (minimum volumes are requested).
The resulting advantages for customers typically include simplified product management (purchase of finished components) and reduced general costs (no software to be installed and managed, products are immediately operational).
All Gemnis series products are able to provide circuit solutions at SIL 3 (EN 62061), PL e (EN ISO 13849-1) or category 4 (EN ISO 13849-1) levels.

Quality marks:

EC type examination certificate: M6A 16 06 75157 010
UL approval: E131787
CCC approval: 2013010305640211
TÜV SÜD approval: Z10 16 05 75157 009
EAC approval: RU C-IT.УТ03.B.00035/19

Code structure

CS MF201M0-P••

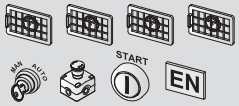
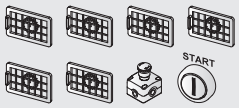
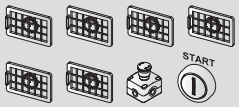
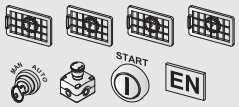
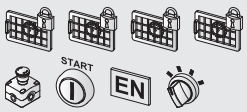
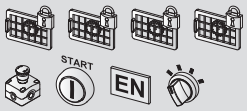
Hardware code	
•••	hardware code

Program code	
P••	program code

Connection type	
M	Connector with screw terminals

Supply voltage	
0	24 Vdc

Product list

Product code	Functions executed		Safety outputs	Signalling outputs	Page
CS MF201M0-P1	Monitoring of 2 guards in AND and 1 emergency stop with automatic start or manual monitored start.		3 NO	4 PNP	307
CS MF202M0-P2	Monitoring of 4 guards in AND, 1 bypass selector, 1 emergency stop, automatic start or manual monitored start, general enabling signal.		4 PNP	4 PNP	308
CS MF202M0-P3	Monitoring of 6 guards in AND (2NC contacts), 1 emergency stop, automatic start or manual monitored start.		4 PNP	4 PNP	309
CS MF202M0-P4	Monitoring of 6 guards in AND (1NO+1NC contacts), 1 emergency stop, automatic start or manual monitored start.		4 PNP	4 PNP	310
CS MF202M0-P5	Monitoring of 4 guards with independent outputs, 1 bypass selector, 1 emergency stop, automatic start or manual monitored start, general enabling signal.		4 PNP	4 PNP	311
CS MF202M0-P6	Monitoring of 2 guards, 1 bypass selector, 1 emergency stop, automatic start or manual monitored start, general enabling signal. Three instantaneous outputs and one delayed output with selector switch with 4 times. Selectable On/Off delay.		4 PNP	4 PNP	312
CS MF202M0-P7	Monitoring of 4 guards (AND linked) with switches with guard locking, operating principle "D", 1 emergency stop, monitored start. Two instantaneous outputs and two delayed outputs with selector switch with 4 times.		4 PNP	4 PNP	313
CS MF202M0-P8	Monitoring of 4 guards in AND with switches with guard locking, operating principle "E", 1 emergency stop, monitored start. Two instantaneous outputs and two delayed outputs with selector switch with 4 times.		4 PNP	4 PNP	314

Legend

 Movable guard monitoring

 Monitoring of a movable guard with lock

 Emergency stop

 Start function

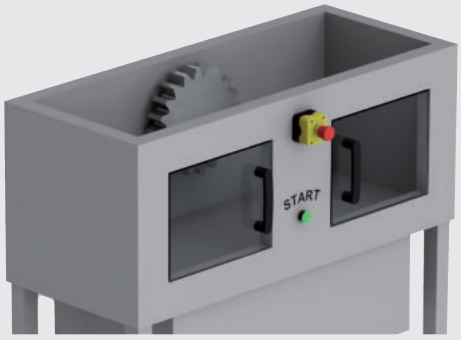
 Bypass selector

 Time selector

 Enabling input

CS MF201M0-P1 pre-programmed module

Product code
CS MF201M0-P1



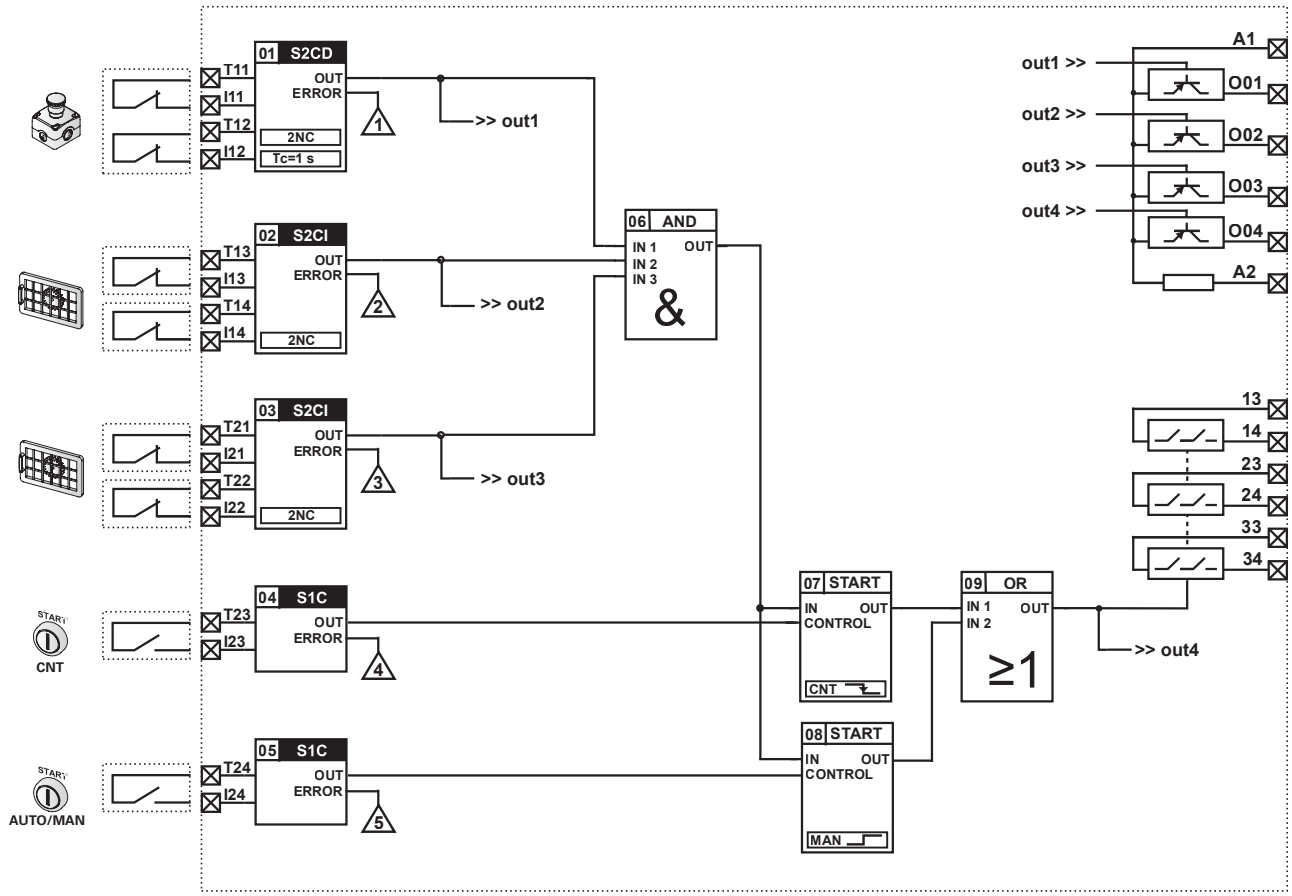
Main functions
- Monitoring of 2 guards
- Monitoring of 1 emergency stop
- Automatic start or monitored manual start

Outputs
- 3 NO safety outputs
- 4 PNP signalling outputs

Technical data: see CS MP201M0
Dimensions, cable cross sections, terminal tightening torque: page 317, design C
Internal block diagram: page 320
Terminal layout: page 320

Application program: P1

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:



CS MF202M0-P2 pre-programmed module

Product code
CS MF202M0-P2

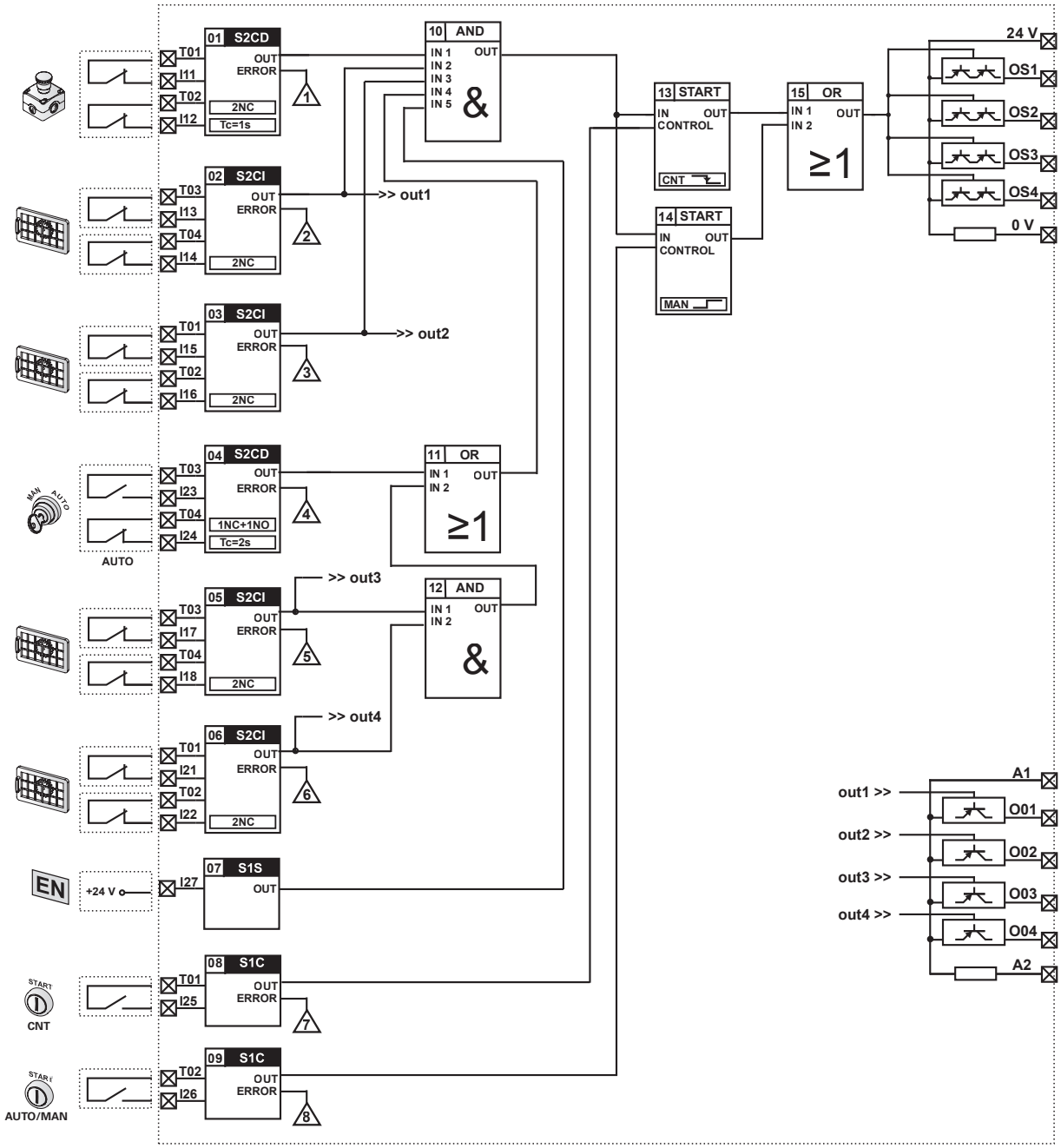
Main functions
- Monitoring of 4 guards
- 1 bypass selector
- 1 emergency stop
- Automatic start or monitored manual start
- General enabling signal

Outputs
- 4 PNP safety outputs
- 4 PNP signalling outputs

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 317, design C
Internal block diagram: page 320
Terminal layout: page 320

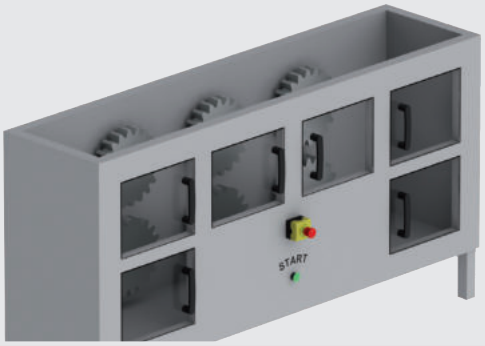
Application program: P2

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:



CS MF202M0-P3 pre-programmed module

Product code
CS MF202M0-P3



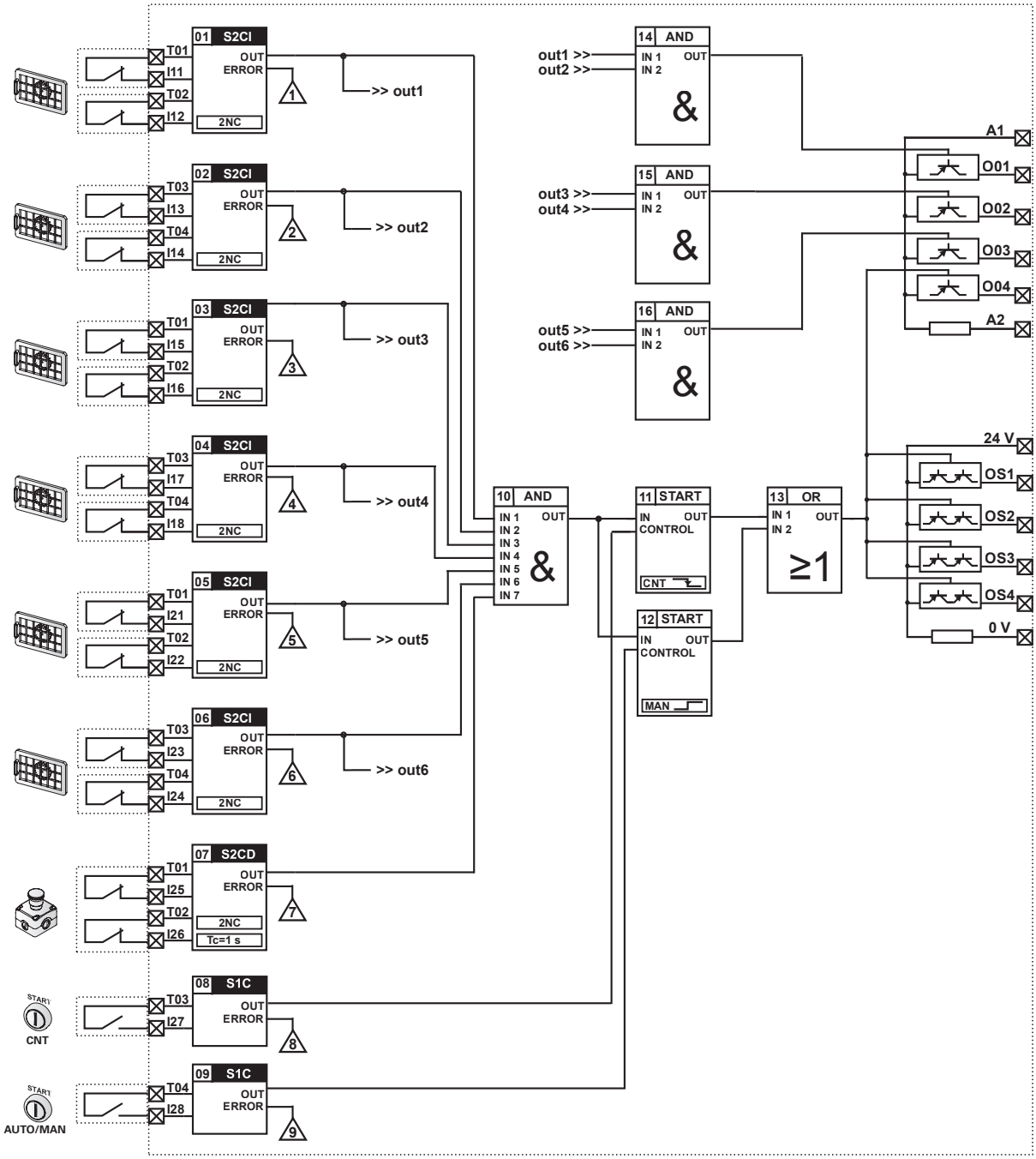
Main functions
- Monitoring of 6 guards (2NC contacts)
- 1 emergency stop
- Automatic start or monitored manual start

Outputs
- 4 PNP safety outputs
- 4 PNP signalling outputs

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 317, design C
Internal block diagram: page 320
Terminal layout: page 320

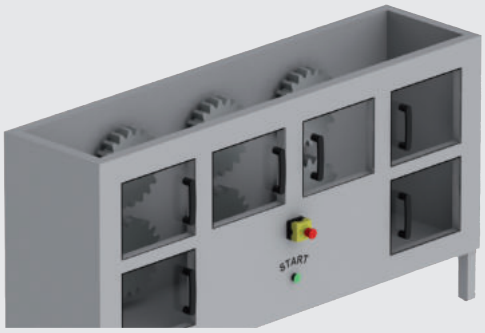
Application program: P3

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:



CS MF202M0-P4 pre-programmed module

Product code
CS MF202M0-P4



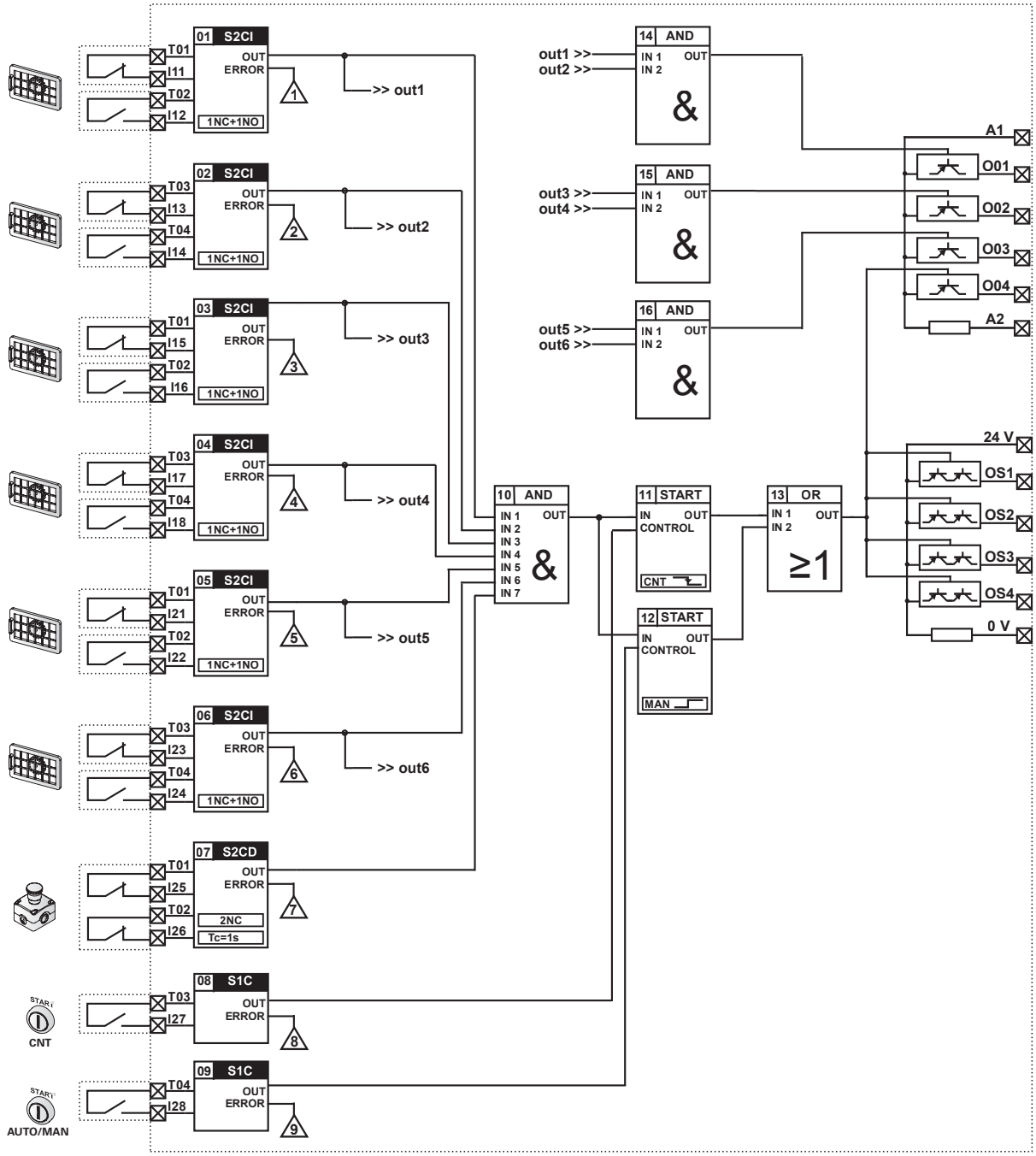
Main functions
- Monitoring of 6 guards (1NC+1NO contacts)
- 1 emergency stop
- Automatic start or monitored manual start

Outputs
- 4 PNP safety outputs
- 4 PNP signalling outputs

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 317, design C
Internal block diagram: page 320
Terminal layout: page 320

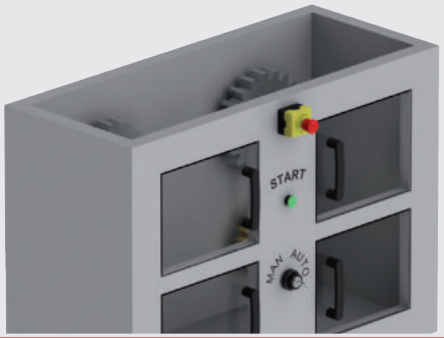
Application program: P4

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:



CS MF202M0-P5 pre-programmed module

Product code
CS MF202M0-P5



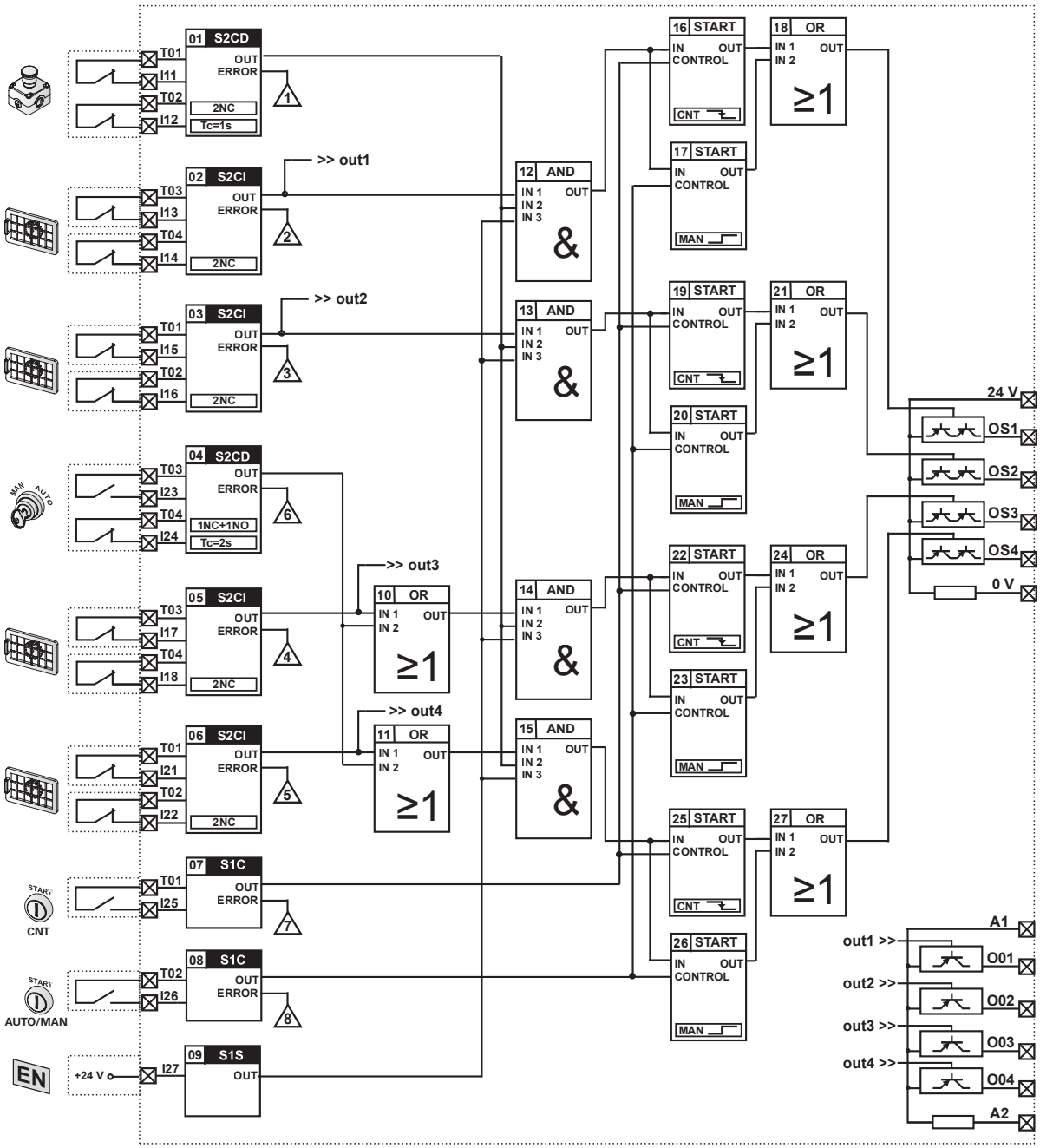
Main functions
- Monitoring of 4 guards with independent outputs
- 1 bypass selector
- 1 emergency stop
- Automatic start or monitored manual start
- General enabling signal

Outputs
- 4 PNP safety outputs
- 4 PNP signalling outputs

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 317, design C
Internal block diagram: page 320
Terminal layout: page 320

Application program: P5

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:

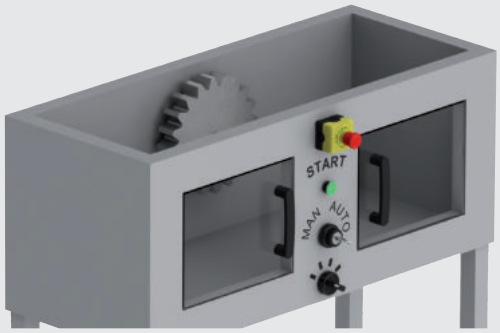


Application program: P5

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:

CS MF202M0-P6 pre-programmed module

Product code
CS MF202M0-P6



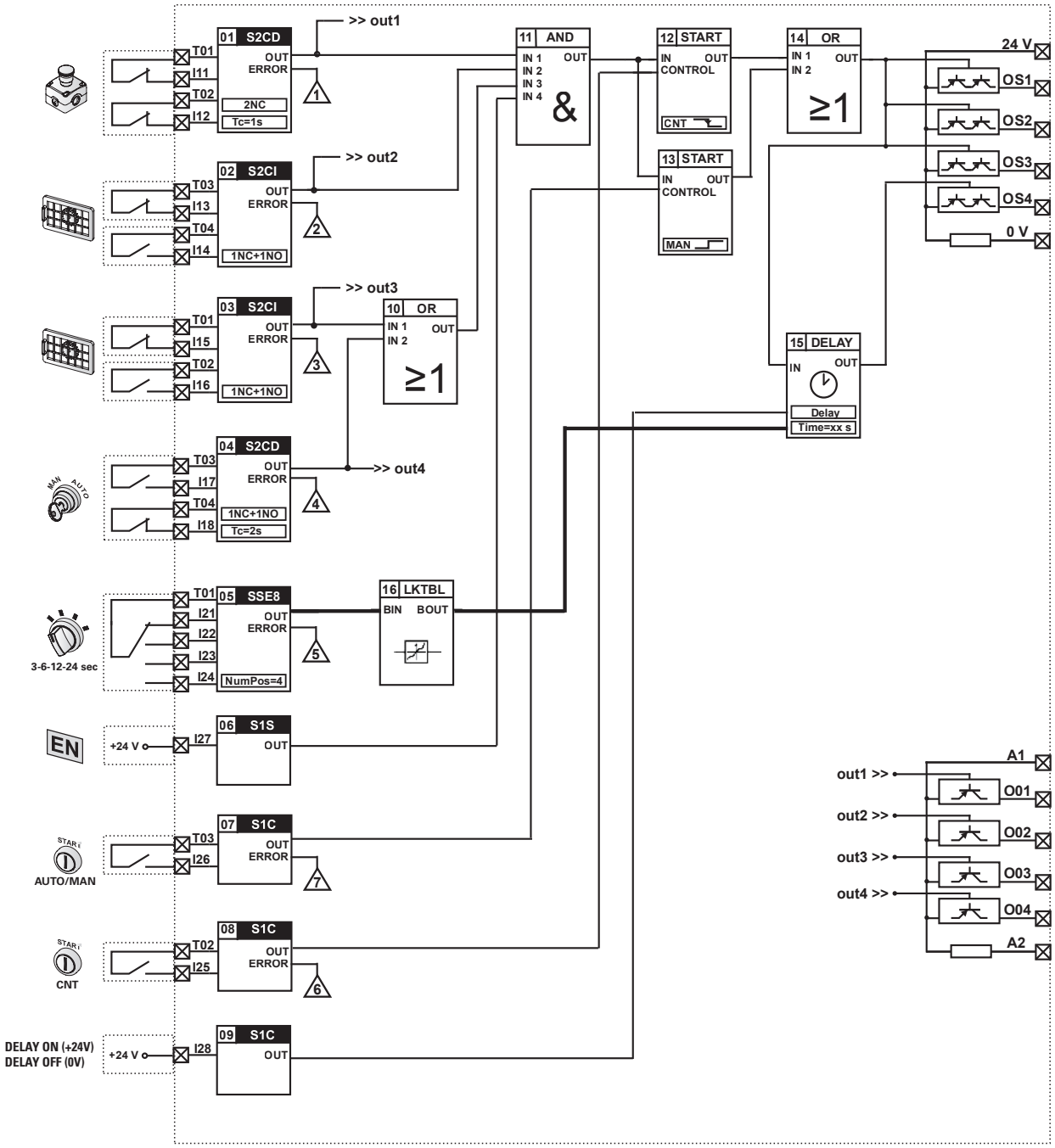
Main functions
- Monitoring of 2 guards
- 1 bypass
- 1 emergency stop
- Automatic start or monitored manual start
- General enabling signal
- Selectable On/Off delay
- Selector switch with 4 times

Outputs
- Three instantaneous outputs and one delayed PNP safety output
- 4 PNP signalling outputs

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 317, design C
Internal block diagram: page 320
Terminal layout: page 320

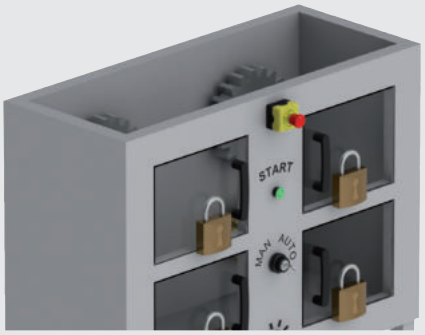
Application program: P6

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:



CS MF202M0-P7 pre-programmed module

Product code
CS MF202M0-P7



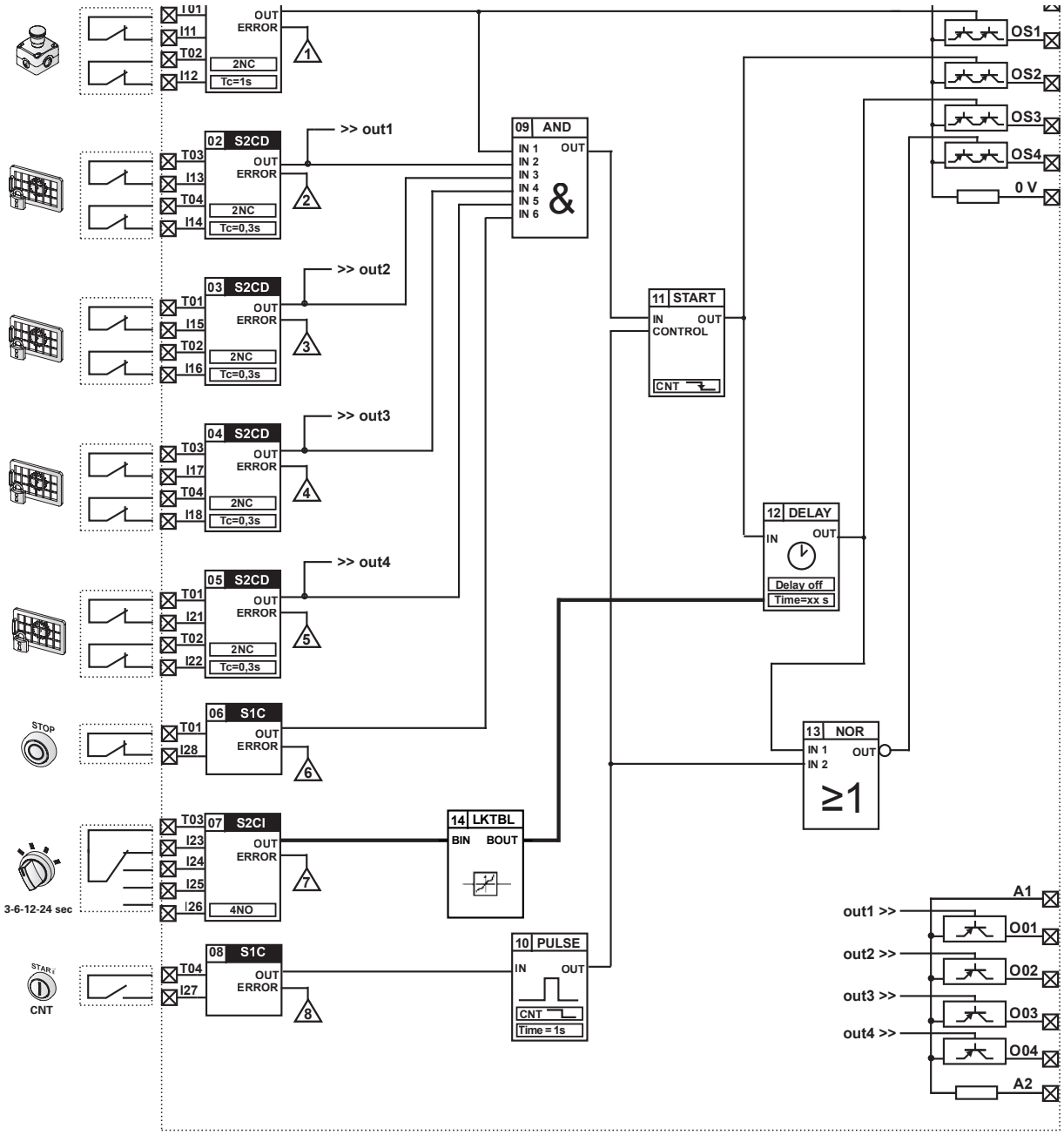
Main functions
- Monitoring of 4 guards with switches with guard locking, operating principle "D" (guard locked if solenoid is de-energised)
- 1 emergency stop
- Monitored start

Outputs
- 2 instantaneous outputs and 2 delayed PNP safety outputs with selector switch with 4 times
- 4 PNP signalling outputs
- OS4 output for door locking control

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 317, design C
Internal block diagram: page 320
Terminal layout: page 320

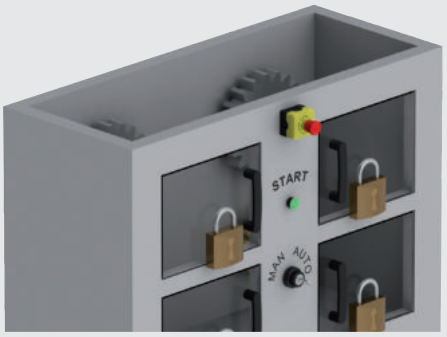
Application program: P7

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:



CS MF202M0-P8 pre-programmed module

Product code
CS MF202M0-P8



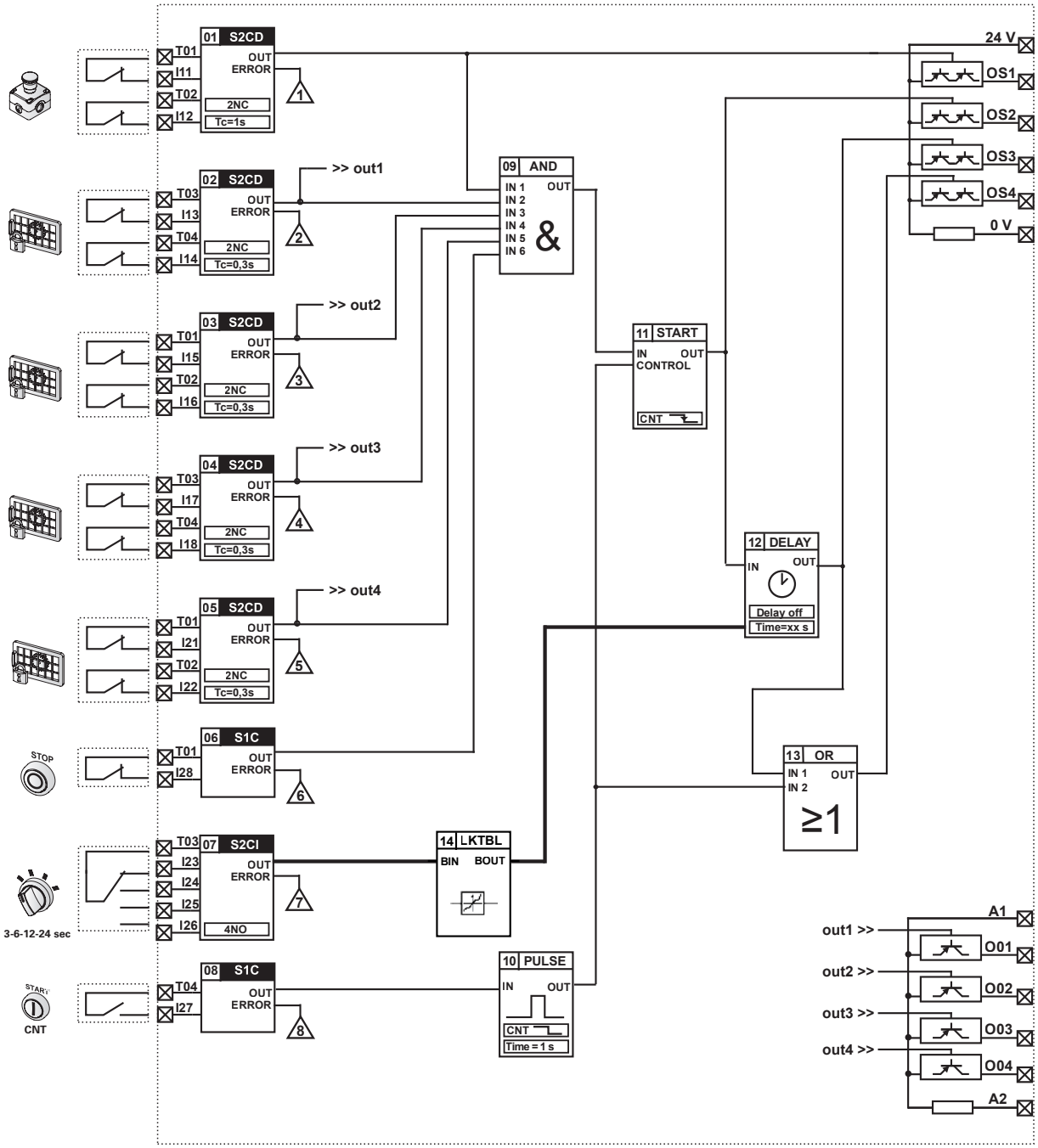
Main functions
- Monitoring of 4 guards with switches with guard locking, operating principle "E" (guard locked if solenoid is energised)
- 1 emergency stop
- Monitored start

Outputs
- 2 instantaneous outputs and 2 delayed PNP safety outputs with selector switch with 4 times
- 4 PNP signalling outputs
- OS4 output for door locking control

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 317, design C
Internal block diagram: page 320
Terminal layout: page 320

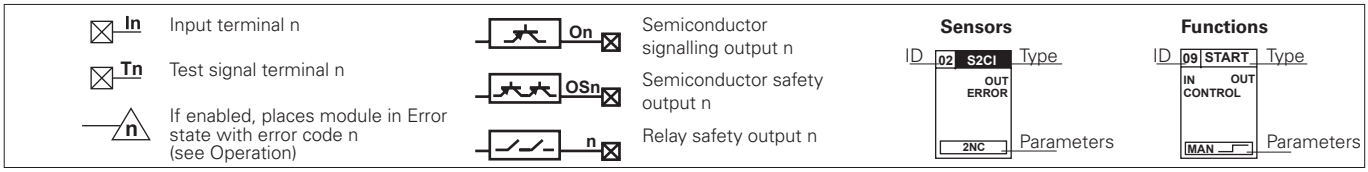
Application program: P8

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:



Notes: The positions of the contacts shown in the diagram are shown only as examples, and they refer to expected working conditions, with machinery in operation, guards closed, and safety devices not activated. For further explanations, please see documentation relating to each specific safety function (page 303).

Legend



Definitions

Application program: The internal software component of this module which is aimed at the application.
"Power On" state: The device state, which lasts from the time it is switched on until the end of the internal controls.
"Run" state: The device state on completion of the "Power-On" phase (if no errors have been detected) in which the Application program is run.
"Error" state: The device state when a fault is detected. In this state, the module switches to the safe state, i.e., all safety outputs are open.
Fault: A fault can be internal or external to the safety module. Internal faults are autonomously detected by the module thanks to its redundant and self-monitored structure. An external fault can be detected by the application program. It follows that the definition of external fault is strictly dependent on the application (see note A).

Operation

When supplied with power, the module enters the Power-On state and runs an internal self-diagnosis. In this phase, the two processor LEDs (P1, P2) remain illuminated red for about 1 second. If the internal tests are completed without malfunction, the two LEDs are switched off, the module enters the Run state, and runs the application program. If the start tests are not passed, the module enters the Error state and the malfunction is indicated by the processor LEDs remaining illuminated red.
The green LEDs relating to the power supply and the module inputs are not controlled by processors, and they immediately begin indicating the states of the respective inputs/outputs.
When the module is in the RUN state, and no faults are detected, the two LEDs (P1, P2) remain switched off.
In the Run state, the module can detect faults external to the module, for example caused by short circuits, or invalid input states (see note A). Depending on the fault type detected, the application program may place the module in error state, to indicate the malfunction. In this case, the application program can communicate an error code by making the LEDs (P1, P2) flash in sequence.
During the Run state, simultaneously with application program execution, the module constantly runs a series of internal tests to check for correct hardware operation. If a malfunction is detected, the module state changes to Error.
Once in Error state, the module is placed in a safe condition, that is with all the safety outputs open; the application program is no longer evaluated, and neither are the system inputs. Furthermore, the semiconductor signalling outputs are left unaltered (changes in inputs do not affect them) at the value imposed by the application program before entering the error state. To reset the module, just switch it off for the required duration (see technical data) and then switch it on again.

Note A: A short circuit is not always a fault. For example, in the case of an ordinary push button for emergency stops equipped with two NC contacts, contact opening is the signal to be evaluated and a short circuit between the two contacts is a fault. In contrast, in the case of a safety mat with 4-wire technology, the opposite is true, i.e. a short circuit between the wires is the signal to be evaluated whereas wire interruption is a fault.

Fault signalling

LED PWR		LED P1 and P2		Possible fault cause
Off	○	Off	○	No power supply, incorrect connections, power wires cut, external fuses broken. Module fault.
Green	●	Off	○	Normal operation.
Green	●	Red	●	Non-restorable fault. Recommended action: Send module for repair.
Green	●	Red x 1 Blue x 1	●))) 1 ●))) 1	Restorable fault: Overcurrent on Tx or Ox outputs. Recommended action: Disconnect the semiconductor signalling outputs (Ox) and the test outputs (Tx) to check whether an external short circuit is present.
Green	●	Red x 1 Blue x 2	●))) 1 ●))) 2	Restorable fault. Problem detected on OSx (short circuit towards earth or positive pole, or else short circuit between two OSx). Suggested action: Disconnect the safety outputs to check if there are any problems on the external connections of the OSx outputs.
Green	●	Red x 1 Blue x 3	●))) 1 ●))) 3	Restorable fault. Module temperature outside the limits. Recommended action: Restore module temperature to within permissible limits.
Green	●	Blue x N	●))) N	Module entered Error state at the request of the application program. Error code N. Typically due to incorrect input conditions (external short circuits, status not permitted). Recommended action: Disconnect the inputs to find any short circuits. Check the documentation supplied with the application program for further details.

Quick description of the main safety functions (CS MF•••••)

SENSORS

Sensor	S1C	Monitoring of one contact
Outputs	OUT	The OUT output is active when the input is closed and there is no error
	ERROR	The ERROR output is active in the case where an electrical malfunction is detected in the input signal
Parameters	None	
Examples		Start button; Stop button; Simple contact

Sensor	S1S	Monitoring of one static signal
Outputs	OUT	The OUT output is active if 24 Vdc is applied to the input
Parameters	None	
Examples		Generic sensors with PNP output; Enabling signals

Sensor	S2CD	Monitoring of two dependent contacts
Outputs	OUT	The OUT output is active when both inputs are in normal or safety state and there is no error
	ERROR	The ERROR output is active in the case where simultaneity times are not respected, or in the case where an electrical malfunction is detected at the input signals
Parameters	2NC / 1NO+1NC	Contact position in normal or safety state
	Tc	Max. time of simultaneity in seconds
Examples		Emergency stop button; Rope switch; Switch with two linked contacts; Mode selector with two settings, changeover; Two individual switches with a time dependency

Sensor	S2CI	Monitoring of two independent contacts
Outputs	OUT	The OUT output is active when both inputs are in normal or safety state and there is no error
	ERROR	The ERROR output is active in the case where an electrical malfunction is detected in the input signals
Parameters	2NC / 1NO+1NC	Contact position in normal or safety state
Examples		Two switches; Magnetic sensor

Sensor	SSE8	Mode selector with 2 to 8 positions
Outputs	OUT	The output gives a numerical value of 1 to 8 corresponding to the active input, 0 in case of error
	ERROR	The ERROR output is active if multiple inputs are active or if no input is active, or if an electrical failure is detected in the input signals
Parameters	NumPos	Number of input signals (2 to 8)
Examples		Mode selectors with a common contact and between 2 and 8 outputs

FUNCTIONS

Function	AND	AND logical function
Outputs	OUT	The OUT output is only active if all IN input signals are present

Function	DELAY	Delayed process activation/deactivation
Outputs	OUT	The OUT output is activated if a signal is present at the IN input with a delay of Td (parameter type Don) If the signal at the IN input drops out, the OUT output is deactivated with a delay of Td (parameter type Doff)
Parameters	Don / Doff	Delay type, Don (delay on) on activation or Doff (delay-off) on cut-off
	Td	Length of delay on activation or cut-off

Function	NOR	NOR logical function
Outputs	OUT	The OUT output is only active in the absence of all IN input signals

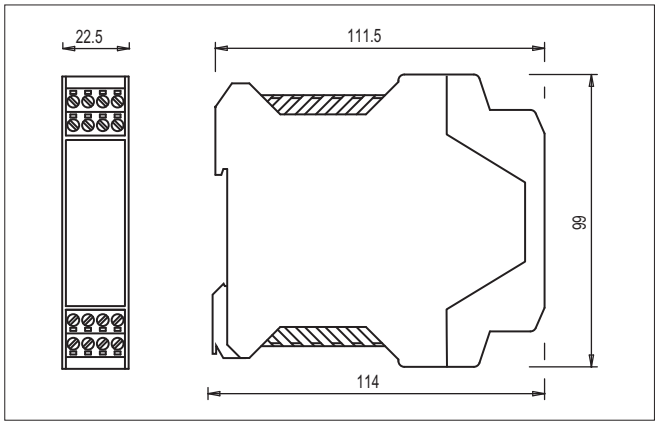
Function	OR	OR logical function
Outputs	OUT	The OUT output is only active if at least one IN input signal is present
Function	PULSE	Activation of a process for a short time
Outputs	OUT	The OUT output is activated on the IN signal falling edge and remains active for the time set by Tp
Parameters	Tp	Pulse duration

Function	START	Activation of a process
Outputs	OUT	The OUT output is activated by the edge (see parameters) of the CONTROL signal if the IN input signal is present. Thus, it remains active as long as the signal is present at IN
Parameters	MAN / CNT	MAN = activation on rising edge, CNT = activation on falling edge
Function	LKTBL	Lookup table; Conversion table between data of the same type
Outputs	BOUT	Converted data at output. Initial value = 0.
Parameters	Number of data	Number of data present in the table

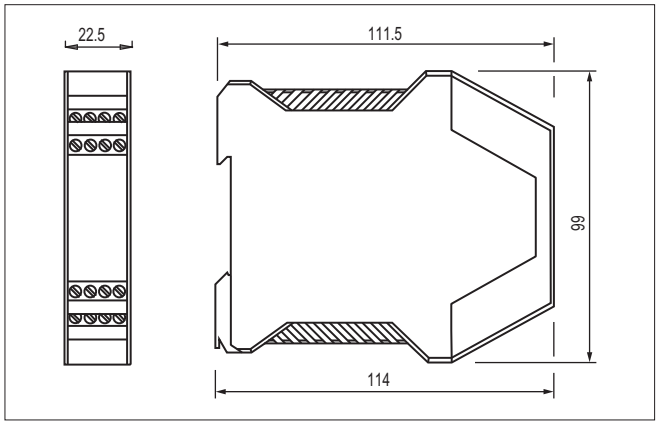
Design A, housing thickness 22.5 mm

Connection data
Terminal tightening torque: 0.5 … 0.6 Nm
Cable cross section: 0.2…2.5 mm²
24…12 AWG

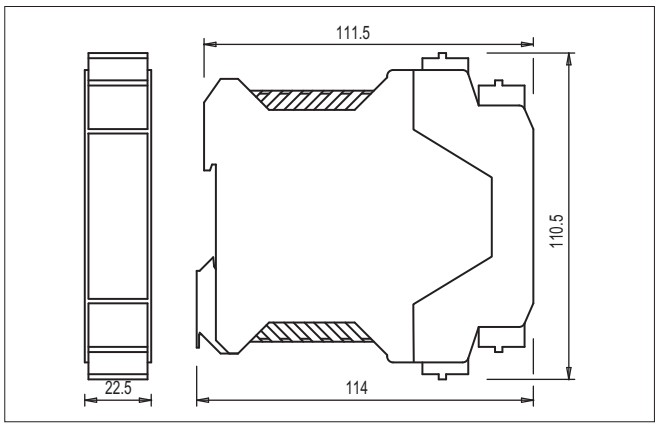
Installation
Snap-mounting on DIN rails



Connector with screw terminals



Screw terminals

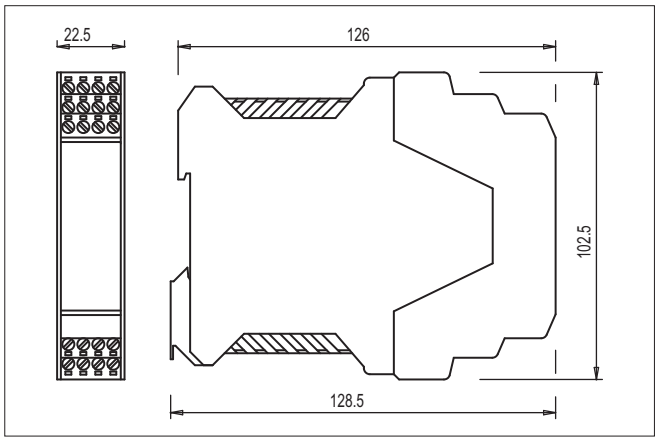


Connector with spring terminals

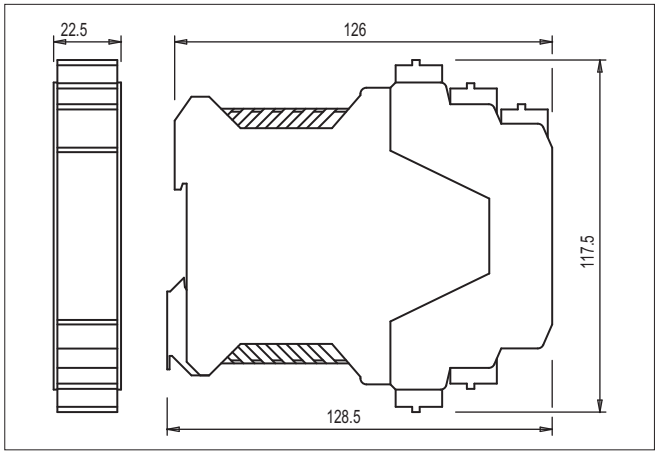
Design B, housing thickness 22.5 mm

Connection data
Terminal tightening torque: 0.5 … 0.6 Nm
Cable cross section: 0.2…2.5 mm²
24…12 AWG

Installation
Snap-mounting on DIN rails



Connector with screw terminals



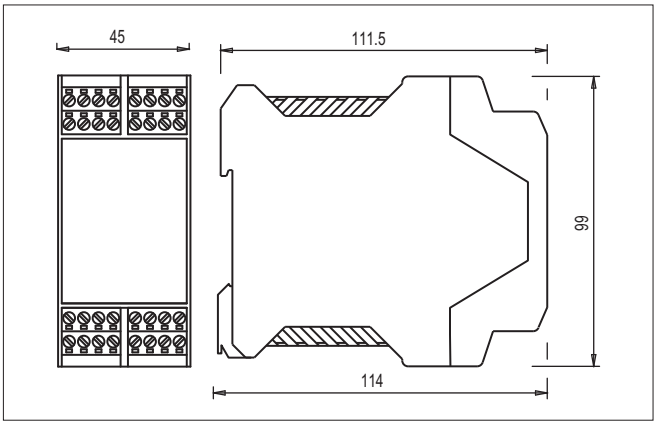
Connector with spring terminals

All values in the drawings are in mm

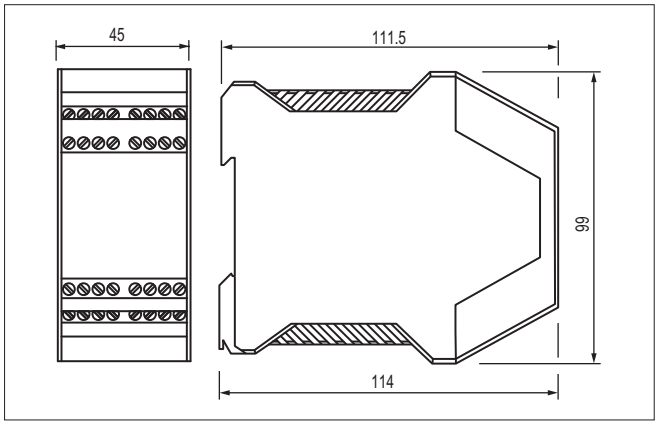
Design C, housing thickness 45 mm

Connection data
Terminal tightening torque: 0.5 … 0.6 Nm
Cable cross section: 0.2…2.5 mm²
24…12 AWG

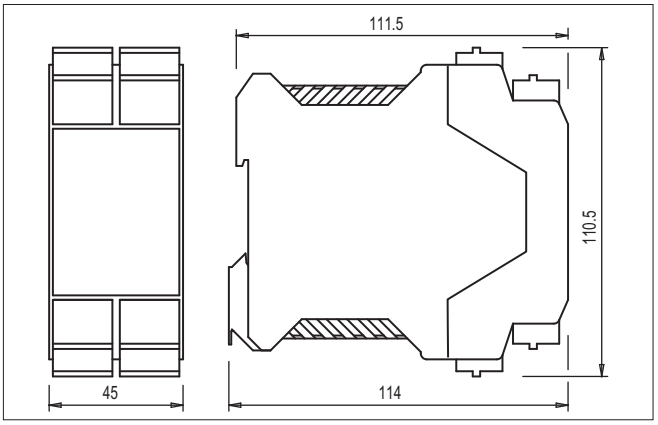
Installation
Snap-mounting on DIN rails



Connector with screw terminals



Screw terminals

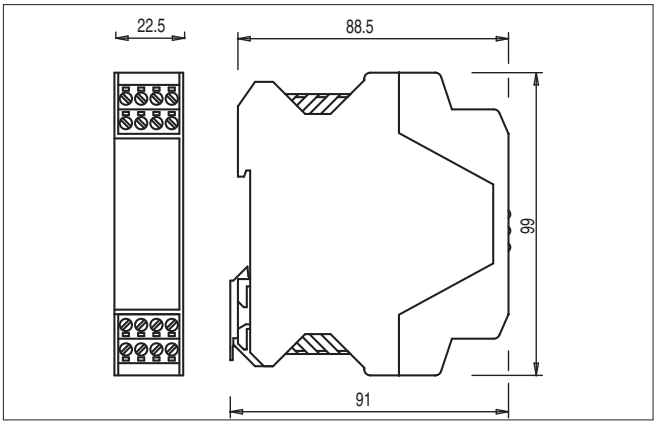


Connector with spring terminals

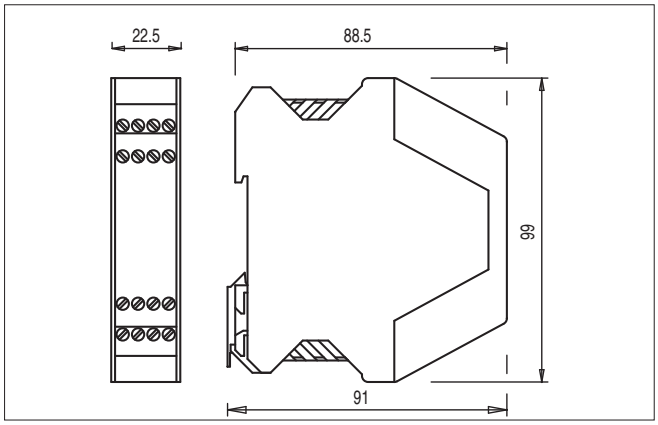
Design D, housing thickness 22.5 mm

Connection data
Terminal tightening torque: 0.5 … 0.6 Nm
Cable cross section: 0.2…2.5 mm²
24…12 AWG

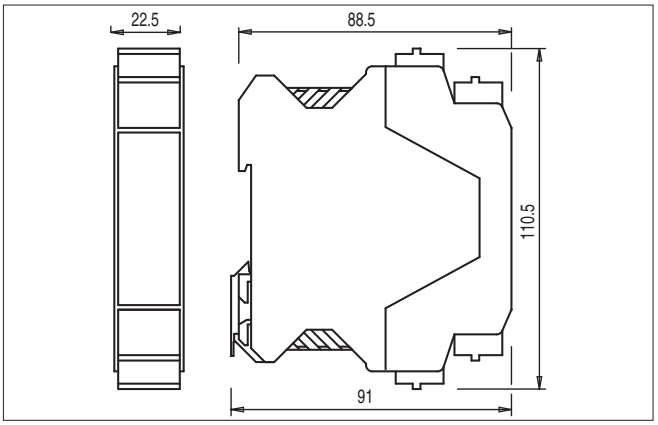
Installation
Snap-mounting on DIN rails



Connector with screw terminals



Screw terminals



Connector with spring terminals

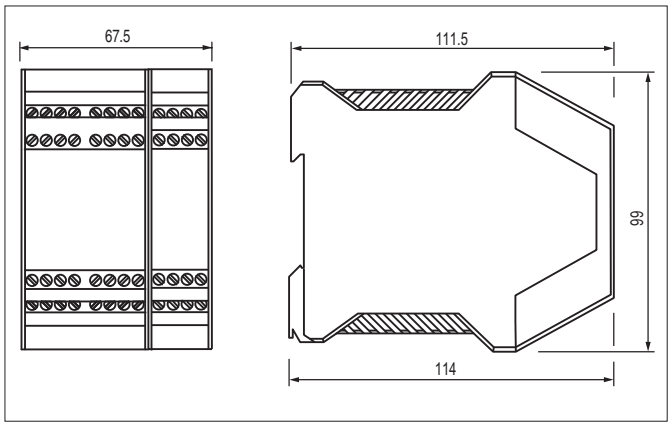
All values in the drawings are in mm

Design E, housing thickness 67.5 mm

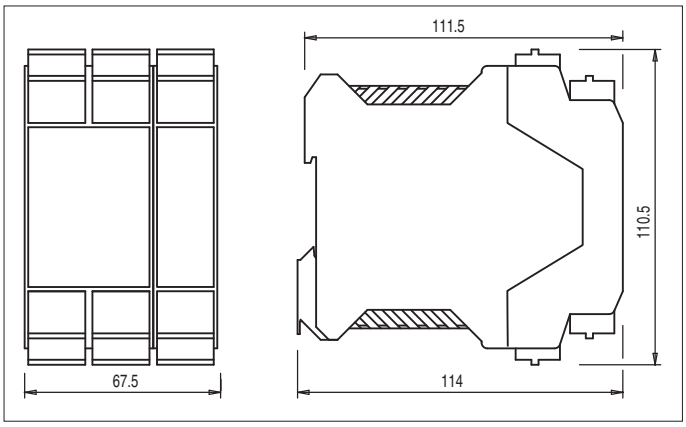
Connection data

Terminal tightening torque:	0.5 … 0.6 Nm
Cable cross section:	0.2…2.5 mm²
	24…12 AWG

Installation
Snap-mounting on DIN rails



Screw terminals



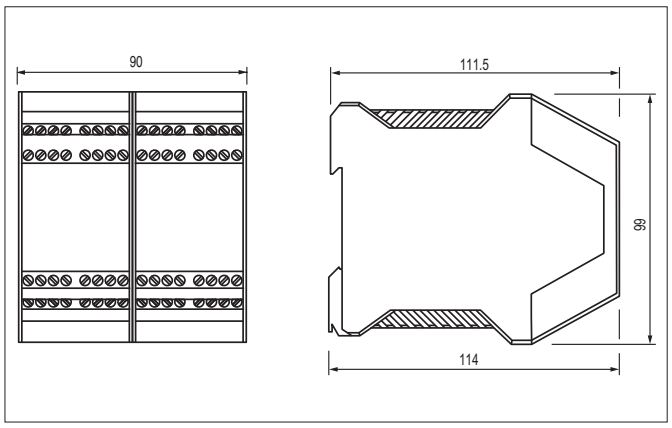
Connector with spring terminals

Design F, housing thickness 90 mm

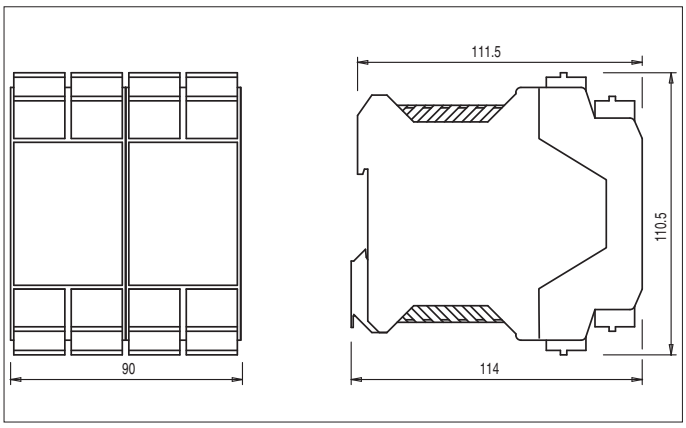
Connection data

Terminal tightening torque:	0.5 … 0.6 Nm
Cable cross section:	0.2…2.5 mm²
	24…12 AWG

Installation
Snap-mounting on DIN rails



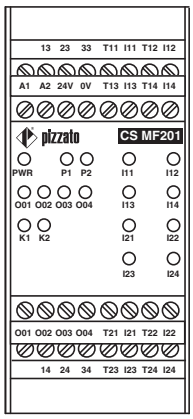
Screw terminals



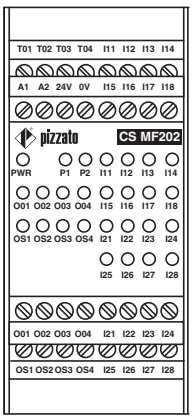
Connector with spring terminals

All values in the drawings are in mm

Pin assignment CS MF series

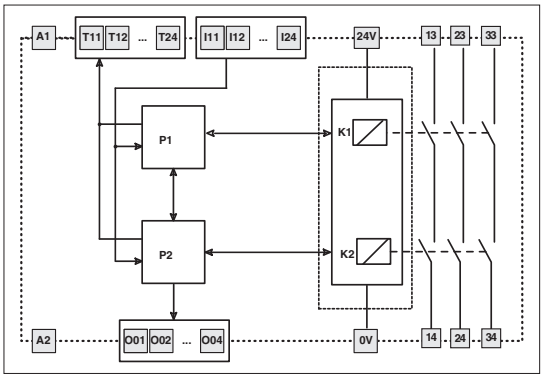


CS MF201

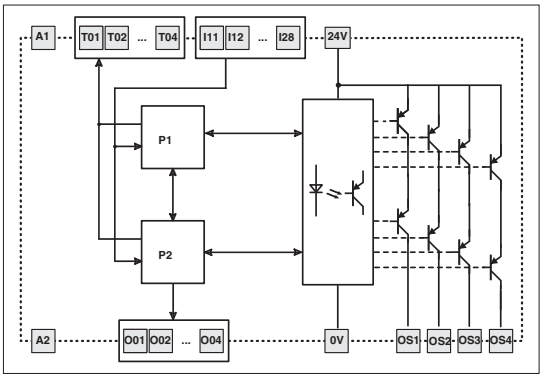


CS MF202

CS MF series internal block diagram



CS MF201



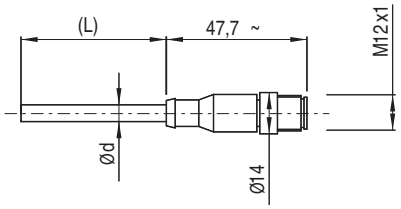
CS MF202

M12 male connectors with cable

Features:

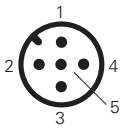
- Polyurethane connector body
- Class 6 copper conductors acc. to IEC 60228 - mobile installation
- Gold-plated contacts
- Self-locking ring nut
- High flexibility cable with oil-resistant PVC sheath suitable to be used in drag chains, acc. to IEC 60332-1-2 and CEI 20-22II. With polyurethane sheath on request

Max. operating voltage:	250 Vac / 300 Vdc (5-pole) 30 Vac / 36 Vdc (8-pole)
Max. operating current:	4 A (5-pole) 2 A (8-pole)
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)
Ambient temperature:	-25°C … +80°C for fixed installation -15°C … +80°C for mobile installation
Wire cross-sections:	0.25 mm2 (23 AWG)
Minimum bending radius:	> cable diameter x 15

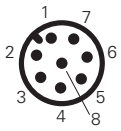


ø d: 5 mm for 5-pole
6 mm for 8-pole

Pin assignment



5 poles		8 poles	
Pin	Colour	Pin	Colour
1	Brown	1	White
2	White	2	Brown
3	Blue	3	Green
4	Black	4	Yellow
5	Grey	5	Grey
		6	Pink
		7	Blue
		8	Red



Code structure

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

VF CF5PD3M

No. of poles	
5	5 poles
8	8 poles

Connection type	
M	M12x1

Cable length (L)	
3	3 metres (standard)
5	5 metres
0	10 metres

Other lengths on request

Cable sheath	
P	PVC (standard)
U	PUR

Connector type	
D	straight

Stock items

VF CF5PD3M
VF CF8PD3M

Attention! For items not in stock the minimum order quantity is 100 pcs.

ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.

All values in the drawings are in mm

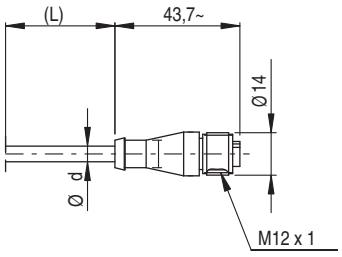
→ The 2D and 3D files are available at **www.pizzato.com**

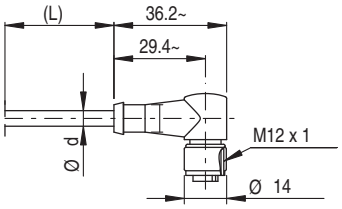
M12 female connectors with cable

Features:

- Polyurethane connector body
- Class 6 copper conductors acc. to IEC 60228 - mobile installation
- Gold-plated contacts
- Self-locking ring nut
- High flexibility cable with PVC sheath suitable to be used in drag chains, acc. to IEC 60332-3 and CEI 20-22II. With polyurethane sheath on request

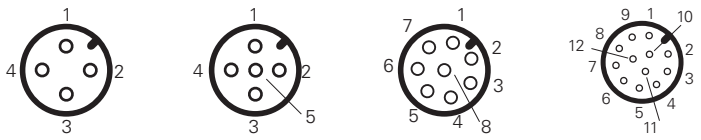
Max. operating voltage:	250 Vac / 300 Vdc (4/5-pole) 30 Vac / 36 Vdc (8/12-pole)
Max. operating current:	4 A (4-5 poles) 2 A (8-pole) 1.5 A (12-pole)
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)
Ambient temperature:	-25°C … +80°C for fixed installation -15°C … +80°C for mobile installation
Wire cross-sections:	0.34 mm² (22 AWG) for 4-pole 0.25 mm² (23 AWG) for 5/8-pole 0.14 mm² (26 AWG) for 12-pole
Minimum bending radius:	> cable diameter x 15





ø d: 5 mm for 4 and 5-pole
6 mm for 8 and 12 poles

Pin assignment



4 poles		5 poles		8 poles		12 poles	
Pin	Colour	Pin	Colour	Pin	Colour	Pin	Colour
1	Brown	1	Brown	1	White	1	Brown
2	White	2	White	2	Brown	2	Blue
3	Blue	3	Blue	3	Green	3	White
4	Black	4	Black	4	Yellow	4	Green
		5	Grey	5	Grey	5	Pink
				6	Pink	6	Yellow
				7	Blue	7	Black
				8	Red	8	Grey
						9	Red
						10	Purple
						11	Grey-Pink
						12	Red-Blue

Code structure

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

VF CA4PD3M

No. of poles	
4	4 poles
5	5 poles
8	8 poles
12	12 poles

Cable sheath	
P	PVC (standard)
U	PUR

Connector type	
D	straight (standard)
G	angled

Connection type	
M	M12x1

Cable length (L)		No. of poles 4	5	8	12
1	1 metre				
2	2 metres				
3	3 metres (standard)	•	•		
4	4 metres				
5	5 metres (standard)	•	•	•	•
...					
0	10 metres (standard)	•	•	•	•

Other lengths on request

Stock items

VF CA4PD3M
VF CA4PD5M
VF CA4PD0M
VF CA5PD3M
VF CA5PD5M
VF CA5PD0M
VF CA8PD5M
VF CA8PD0M
VF CA12PD5M
VF CA12PD0M

Attention! For items not in stock the minimum order quantity is 100 pcs.

ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.

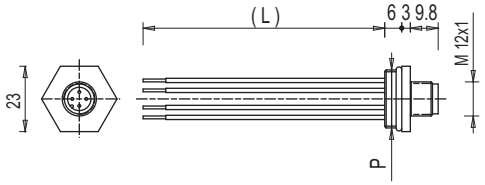
All values in the drawings are in mm

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

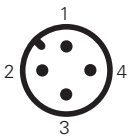
M12 male connectors

Features:
These standard M12 male connectors are ready for the installation on the switches.
Their wires have the right length for the connection to the contact blocks and are provided with wire-end sleeves. On request they can be delivered already wired to the switch. The connectors are used where a very short machine down time is required (e.g. in big plants). The connector-provided switch can be replaced very quickly with an identical one with no chance of incorrect wiring.

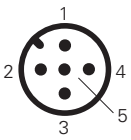
Max. operating voltage:	250 Vac / 300 Vdc (4/5-pole) 30 Vac / 36 Vdc (8/12-pole)
Max. operating current:	4 A (4/5-pole) 2 A (8-pole) 1.5 A (12-pole)
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653
Ambient temperature:	-25°C … +80°C
Tightening torque:	1 … 1.5 Nm
Wire cross-sections:	0.5 mm² (20 AWG) for 4/5-pole 0.25 mm² (23 AWG) for 8-pole 0.14 mm² (26 AWG) for 12-pole
Contact type:	gold-plated



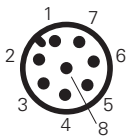
Pin assignment



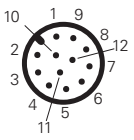
Pin	Colour
1	Brown
2	White
3	Blue
4	Black



Pin	Colour
1	Brown
2	White
3	Blue
4	Black
5	Grey



Pin	Colour
1	White
2	Brown
3	Green
4	Yellow
5	Grey
6	Pink
7	Blue
8	Red



Pin	Colour
1	Brown
2	Blue
3	White
4	Green
5	Pink
6	Yellow
7	Black
8	Grey
9	Red
10	Purple
11	Grey-Pink
12	Red-Blue

Code structure

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

article: **VF CNM5MM** — options: **-L100**

Body material	
M	metal
P	plastic

No. of poles	
4	4 poles
5	5 poles
8	8 poles
12	12 poles

Connection type	
M	M12x1

Connector thread (P)	
M	M20 x 1.5 (standard)
P	PG 13.5

Wire length (L)	
	8.5 cm (standard)
L16	16 cm
L100	100 cm
L200	200 cm

Stock items

VF CNP4MM
VF CNP4PM
VF CNP5MM
VF CNP5PM
VF CNP8MM
VF CNM4MM
VF CNM4PM
VF CNM5MM
VF CNM5PM
VF CNM8MM
VF CNM8PM
VF CNM12MM-L16

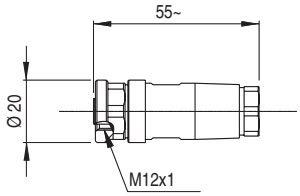
ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.
Note: the 12-pole connector is only available in metal with M20x1.5 thread and 16 cm wires.

All values in the drawings are in mm

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

Field wireable M12 female connectors

Features:
- Technopolymer connector body
- Gold-plated contacts
- Screw terminals for cable screw fittings

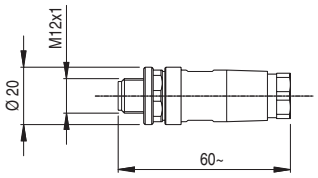


Max. operating voltage:	250 Vac/dc (4 and 5-pole) 30 Vac/dc (8-pole)
Max. operating current:	4 A (4 and 5-pole) 2 A (8-pole)
Protection degree:	IP67 acc. to EN 60529
Ambient temperature:	-25°C … +85°C
Wire cross-sections:	0.25 mm² (23 AWG) … 0.5 mm² (20 AWG)

Article	Description	no. of poles
VF CBMP4DM04	Field wireable M12 female connector, straight, for Ø 4 … 6.5 mm multipolar cables	4
VF CBMP5DM04	Field wireable M12 female connector, straight, for Ø 4 … 6.5 mm multipolar cables	5
VF CBMP8DM04	Field wireable M12 female connector, straight, for Ø 4 … Ø 7 mm multipolar cables	8

Field wireable M12 male connectors

Features:
- Technopolymer connector body
- Gold-plated contacts
- Screw terminals for cable screw fittings



Max. operating voltage:	250 Vac/dc (5-pole) 30 Vac/dc (8-pole)
Max. operating current:	4 A (5-pole) 2 A (8-pole)
Protection degree:	IP67 acc. to EN 60529
Ambient temperature:	-25°C … +85°C
Wire cross-sections:	0.25 mm² (23 AWG) … 0.5 mm² (20 AWG)

Article	Description	no. of poles
VF CCMP5DM04	Field wireable M12 male connector, straight, for Ø 4 ... Ø 6.5 mm multipolar cables	5
VF CCMP8DM04	Field wireable M12 male connector, straight, for Ø 4 ... Ø 7 mm multipolar cables	8

ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.

All values in the drawings are in mm

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

Series connection with Y-shaped M12 connectors

To facilitate and simplify the series wiring of the safety devices, a variety of accessories designed specifically for this purpose are available. With the help of the proven M12 round connector, safety equipment of Category 4, SIL3 and PL e with up to 32 elements connected in series is possible. All of which is possible without the risk of connection errors and with a high IP67 protection degree.
The safety circuits consist of a 24 Vdc power supply unit, a number of extensions to the installed devices, Y connectors for branching out from the chain to each individual device and a terminating plug.
In addition to the power supply unit, a suitable safety module is used to assess the state of the safety outputs within the safety chain.

Devices suitable for series connection

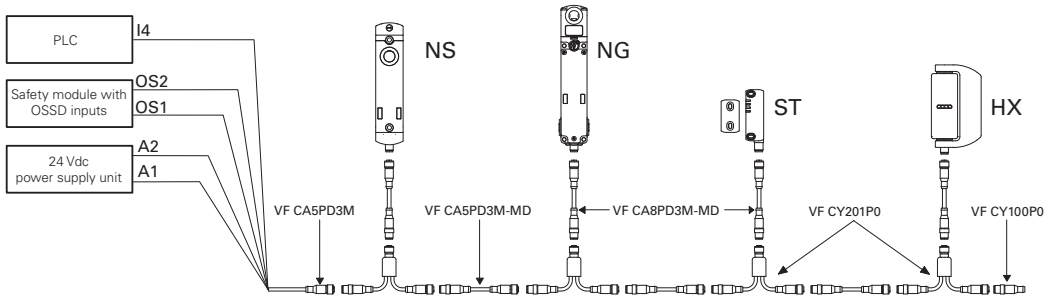
The series may consist both of devices that are identical to one another (homogeneous series) or that belong to different series (mixed series).
The following Pizzato Elettrica devices may be connected in series using the Y connectors:

- ST series safety sensors with RFID technology: ST D•31•M•, ST D•71•M•.
- NG series safety switches with lock and RFID technology: NG ••••••••-K950, NG ••••••••-K951, NG ••••••••-K952.
- NS series safety switches with lock and RFID technology: NS ••••••Q•.
- HX series safety hinge switches: HX BEE1-••M.

Electrical connection of the chain

Pin	Colour	Connection	
1	Brown	A1	Supply input +24 Vdc
2	White	OS1	Safety output
3	Blue	A2	Supply input 0 V
4	Black	OS2	Safety output
5	Grey	I4	Solenoid activation input

Note: By activating/deactivating input I4, all switches of the NG and NS series in the chain simultaneously block/open all guards. Activation and deactivation of input I4 has no effect on the ST sensors and HX hinges in the chain.



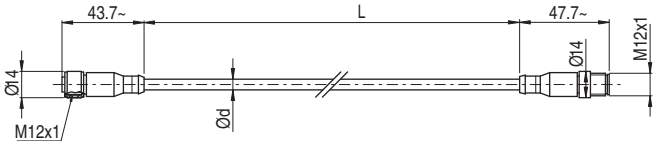
- **Attention!** For proper operation of the devices connected in series via cables or Y connectors, it is necessary to pay particular attention to the voltage drop that occurs in the circuit. Pay particular attention to the currents and cross-sections/lengths of the used cables to ensure that the supply voltage of the components at the end of the series connection remains within the specified limit values during effective operation.

M12 extension cable

Features:

- Polyurethane connector body
- Class 6 copper conductors acc. to IEC 60228
- Gold-plated contacts
- Self-locking ring nut
- High flexibility cable with PVC sheath suitable to be used in drag chains, acc. to IEC 60332-3 and CEI 20-22II.

Max. operating voltage:	250 Vac / 300 Vdc (5-pole) 30 Vac / 36 Vdc (8-pole)
Max. operating current:	4 A (5-pole) 2 A (8-pole)
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 2653 (Protect the cables from direct high-pressure and high-temperature jets)
Ambient temperature:	-25°C … +80°C for fixed installation -15°C … +80°C for mobile installation
Wire cross-sections:	0.5 mm² (20 AWG) (5-pole) 0.25 mm² (23 AWG) (8-pole)
Minimum bending radius:	> cable diameter x 15



ø d: 6.4 mm for 5-pole
6 mm for 8-pole

Code structure

VF CA5PD3M-MD

No. of poles	
5	5 poles
8	8 poles

Connection type	
M	M12x1

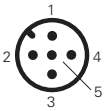
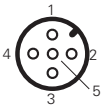
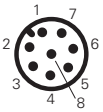
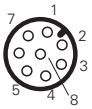
Cable length (L)	No. of poles 5	8
3	3 metres (standard)	•	•
5	5 metres (standard)	•	•
0	10 metres (standard)	•	

Other lengths on request

Cable sheath	
P	PVC

Connector type	
D	straight

Pin assignment

5-pole male	5-pole female	8-pole male	8-pole female
			

Stock items

VF CA5PD3M-MD
VF CA5PD5M-MD
VF CA5PD0M-MD
VF CA8PD3M-MD
VF CA8PD5M-MD

Attention! For items not in stock the minimum order quantity is 100 pcs

ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.

All values in the drawings are in mm

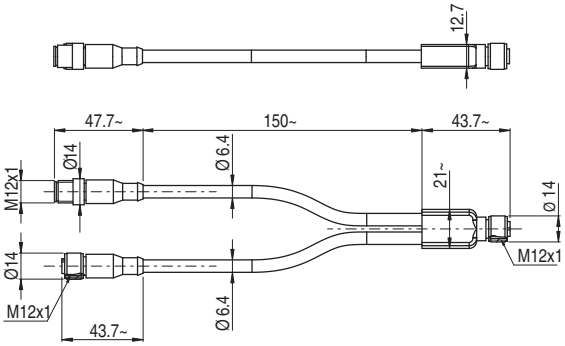
→ The 2D and 3D files are available at **www.pizzato.com**

M12 connectors, Y-shaped, for series connections

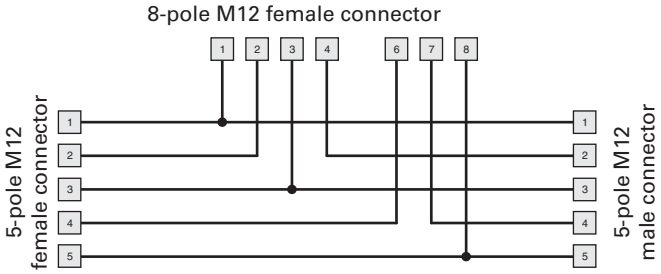
Features:

- Polyurethane connector body
- Class 6 copper conductors acc. to IEC 60228
- Gold-plated contacts
- Self-locking ring nut
- High flexibility cable with PVC sheath suitable to be used in drag chains, acc. to IEC 60332-3 and CEI 20-22II.

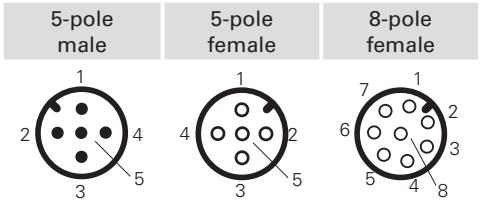
Max. operating voltage:	30 Vac / 36 Vdc
Max. operating current:	4 A (5-pole) 2 A (8-pole)
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 2653 (Protect the cables from direct high-pressure and high-temperature jets)
Ambient temperature:	-25°C … +80°C for fixed installation -15°C … +80°C for mobile installation
Wire cross-sections:	0.5 mm² (20 AWG)
Minimum bending radius:	> cable diameter x 15



Internal block diagram, Y-shaped connector



Pin assignment



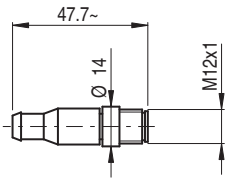
Article	Description
VF CY201P0	M12 connectors, Y-shaped, for series connections

ATTENTION: when used in safety applications, the Y-shaped connectors must be installed in a place that is not directly accessible, in order to avoid shocks or tampering.

M12 terminating plugs for series connections

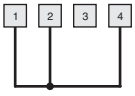
Features:

- Polyurethane connector body
- Gold-plated contacts
- Self-locking ring nut

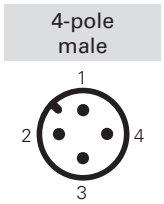


Max. operating voltage:	250 Vac / 300 Vdc
Max. operating current:	4 A
Protection degree:	IP67 acc. to EN 60529

Internal block diagram of the terminating plug



Pin assignment



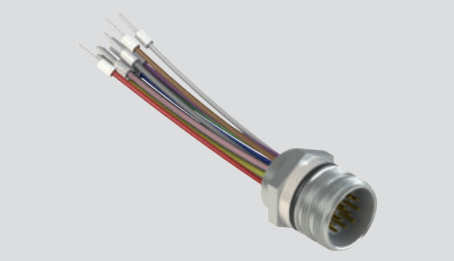
Article	Description
VF CY100P0	M12 terminating plugs for series connections, 4-pole

ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.

All values in the drawings are in mm

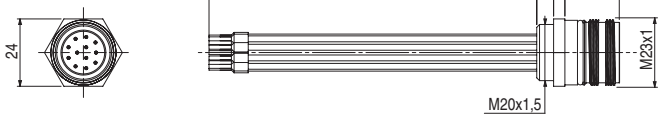
➔ The 2D and 3D files are available at **www.pizzato.com**

M23 male connectors



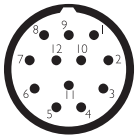
Features:
These standard M23 male connectors are ready for the installation on the switches with M20 cable input (e.g.: FG series and NG series).
Their wires have the right length for the connection to the contact blocks and are provided with wire-end sleeves. On request they can be delivered already wired to the switch. The connectors are used where a very short machine down time is required (e.g. in big plants). The connector-provided switch can be replaced very quickly with an identical one with no chance of incorrect wiring.

Max. operating voltage:	250 Vac (12-pole) 100 Vac (19-pole)
Max. operating current:	1.5 A
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653
Ambient temperature:	-25°C … +80°C
Tightening torque:	1 … 1.5 Nm
Wire cross-section:	0.34 mm² (22 AWG)
Contact type:	gold-plated



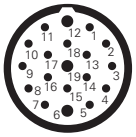
Pin assignment

12 poles



Pin	Colour
1	White
2	Brown
3	Green
4	Yellow
5	Grey
6	Pink
7	Blue
8	Red
9	Black
10	Purple
11	Grey-Pink
12	Red-Blue

19-pole



Pin	Colour
1	White
2	Brown
3	Green
4	Yellow
5	Grey
6	Pink
7	Blue
8	Red
9	Black
10	Purple
11	Grey-Pink
12	Red-Blue

Pin	Colour
13	White-Green
14	Brown-Green
15	White-Yellow
16	Yellow-Brown
17	White-Grey
18	Grey-Brown
19	White-Pink

Code structure

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

VF CNM12MT-L12

Body material	
M	metal

No. of poles	
12	12 poles
19	19-pole

Wire length (L)	
L12	12 cm
L16	16 cm

Note
For applications with NG series switches, use connectors with L12 wire length.
For applications with FG series switches, use connectors with L16 wire length.

ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.

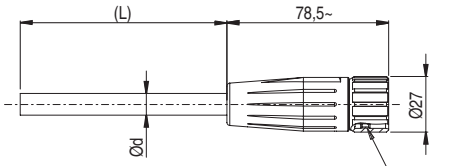
All values in the drawings are in mm

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

M23 female connectors with cable

Features:
- Polyurethane connector body
- Class 5 copper conductors acc. to VDE 0295 (12-pole)
- Class 2 copper conductors acc. to VDE 0295 (19-pole)
- Gold-plated contacts
- Self-locking ring nut
- Cable with PVC sheath acc. to IEC 60332-3, CEI 20-22 II e CEI 20-35/1-2 (flame retarding)

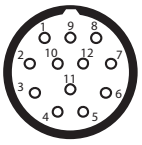
Max. operating voltage:	250 Vac (12-pole) 100 Vac (19-pole)
Max. operating current:	4 A
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)
Ambient temperature:	-5°C … +70°C
Wire cross-sections:	0.5 mm² (20 AWG) (12-pole) 0.34 mm² (22 AWG) (19-pole)
Minimum bending radius:	> cable diameter x 15



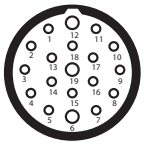
ø d: 8.2 mm for 12-pole
8.6 mm for 19 poles

Pin assignment

12 poles



19-pole



Pin	Colour	Pin	Colour	Pin	Colour
1	White	1	White	13	White-Green
2	Brown	2	Brown	14	Brown-Green
3	Green	3	Green	15	White-Yellow
4	Yellow	4	Yellow	16	Yellow-Brown
5	Grey	5	Grey	17	White-Grey
6	Pink	6	Pink	18	Grey-Brown
7	Blue	7	Blue	19	White-Pink
8	Red	8	Red		
9	Black	9	Black		
10	Purple	10	Purple		
11	Grey-Pink	11	Grey-Pink		
12	Red-Blue	12	Red-Blue		

Code structure

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

VF CA12PD20S

No. of poles	
12	12 poles
19	19-pole

Cable sheath	
P	PVC

Connector type	
D	straight

Connection type	
S	M23x1

Cable length (L)	
0	10 metres
20	20 metres

Other lengths on request

Stock items

VF CA12PD0S
VF CA12PD20S
VF CA19PD0S
VF CA19PD20S

Attention! For items not in stock the minimum order quantity is 50 pcs.

ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.

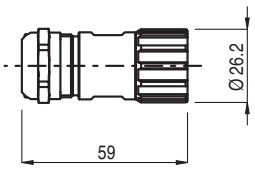
All values in the drawings are in mm

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

Field wireable M23 female connectors

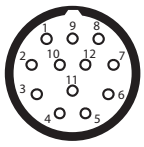
Features:
- Nickel-plated metal connector body
- Gold-plated contacts
- 12-pole or 19-pole versions

Max. operating voltage:	250 Vac (12-pole) 100 Vac (19-pole)
Max. operating current:	8 A
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653
Ambient temperature:	-40°C … +125°C
Tightening torque:	1 … 1.5 Nm
Pollution degree:	3
Switching cycles:	> 1000

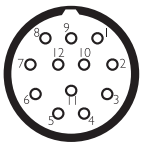


Pin configuration

12 poles

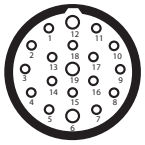


clockwise numbering



counterclockwise numbering

19-pole



clockwise numbering

Article	Description
VF AC2205	Mounting key

Note: Article required for opening and wiring the connector

Code structure

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

VF CBSM12TC07

Connection type	
S	M23x1

Body material	
M	metal

No. of poles	
12	12 poles
19	19-pole

Connector type	
T	clockwise numbering (standard)
D	counterclockwise numbering

Cable diameter	
07	Ø 7 … 12 mm

Pin connection type	
C	crimp connection (standard) 0.34 … 1 mm²
S	solder connection 0.34 … 1 mm²

Note: Use appropriate crimp pliers for crimp connections (e.g., Knipex, article number 97 52 63).

Stock items

VF CBSM12TC07
VF CBSM19TC07
VF CBSM12TS07

ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.

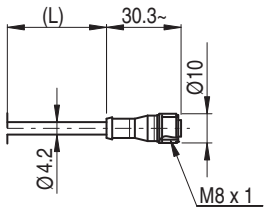
All values in the drawings are in mm

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

M8 female connectors with cable

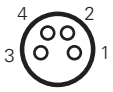
Features:
- Polyurethane connector body
- Class 6 copper conductors acc. to IEC 60228
- Gold-plated contacts
- Self-locking ring nut
- High flexibility cable with PVC sheath suitable to be used in drag chains, acc. to IEC 60332-3 and CEI 20-22II. With polyurethane sheath on request.

Max. operating voltage:	60 Vac / 75 Vdc
Max. operating current:	4 A
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653 (Protect the cables from direct high-pressure and high-temperature jets)
Ambient temperature:	-25°C … +80°C for fixed installation -15°C … +80°C for mobile installation
Wire cross-sections:	0.25 mm2 (23 AWG)
Minimum bending radius:	> cable diameter x 15



Pin assignment

4 poles



Pin	Colour
1	Brown
2	White
3	Blue
4	Black

Code structure

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

VF CA4PD3K

No. of poles	
4	4 poles

Cable sheath	
P	PVC (standard)
U	PUR

Connector type	
D	straight

Connection type	
K	M8x1

Cable length (L)	
1	1 metre
2	2 metres
3	3 metres (standard)
4	4 metres
5	5 metres (standard)
...	
0	10 metres

Other lengths on request

Stock items

VF CA4PD3K
VF CA4PD5K

Attention!
For items not in stock the minimum order quantity is 100 pcs.

ATTENTION: always disconnect the power supply before removing the connector. The connector is not suitable for separation of electrical loads.

All values in the drawings are in mm

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

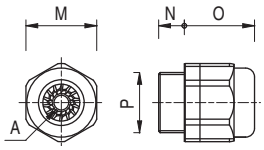
Strain relief cable glands

Packs of **10 pcs.**

This particular design ensures high resistance to traction of the cable glands. All cable glands are also suitable for a wide range of cable diameters.
Suitable for circular cross-section cables only.

Features:

Body and ring material:	technopolymer without halogen
Protection degree:	IP67 acc. to EN 60529
Tightening torque:	3 … 4 Nm (PG 13.5/M20) 2 … 2.5 Nm (PG 11/M16)



	Article	Description	A	⬡M	N	O	P
Metric threads	VF PAM25C7N	M25x1.5 cable gland for one cable Ø 10 … 17 mm	○	30	10	28	M25x1.5
	VF PAM20C6N	M20x1.5 cable gland for one cable Ø 6 … 12 mm	○	24	9	24	M20x1.5
	VF PAM20C5N	M20x1.5 cable gland for one cable from Ø 5 … 10 mm	●	24	9	24	M20x1.5
	VF PAM20C3N	M20x1.5 cable gland for one cable Ø 3 … 7 mm	●	24	9	24	M20x1.5
	VF PAM16C5N	M16x1.5 cable gland for one cable Ø 5 … 10 mm	○	22	7.5	23	M16x1.5
	VF PAM16C4N	M16x1.5 cable gland for one cable Ø 4 … 8 mm	●	22	7.5	23	M16x1.5
	VF PAM16C3N	M16x1.5 cable gland for one cable Ø 3 … 7 mm	●	22	7.5	23	M16x1.5
	VF PAM20CBN	M20x1.5 multi-hole cable gland for 2 cables Ø 3 … 5 mm	●	24	9	23	M20x1.5
	VF PAM20CDN	M20x1.5 multi-hole cable gland for 3 cables Ø 1 … 4 mm	●	24	9	23	M20x1.5
	VF PAM20CEN	M20x1.5 multi-hole cable gland for 3 cables Ø 3 … 5 mm	●	24	9	23	M20x1.5
	VF PAM20CFN	M20x1.5 multi-hole cable gland for 4 cables Ø 1 … 4 mm	●	22	9	23	M20x1.5
PG threads	VF PAP13C6N	PG 13.5 cable gland for one cable from Ø 6 … 12 mm	○	24	9	24	PG 13.5
	VF PAP13C5N	PG 13.5 cable gland for one cable from Ø 5 … 10 mm	●	24	9	24	PG 13.5
	VF PAP13C3N	PG 13.5 cable gland for one cable from Ø 3 … 7 mm	●	24	9	24	PG 13.5
	VF PAP11C5N	PG 11 cable gland for one cable from Ø 5 … 10 mm	○	22	7.5	23	PG 11
	VF PAP11C4N	PG 11 cable gland for one cable from Ø 4 … 8 mm	●	22	7.5	23	PG 11
	VF PAP11C3N	PG 11 cable gland for one cable from Ø 3 … 7 mm	●	22	7.5	23	PG 11

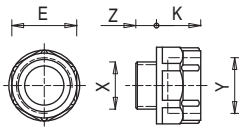
Thread adapters

Packs of **100 pcs.**

Thread adapters make it possible to fulfil requests for switches with a different thread to those generally found in stock. This means it is possible to offer customers a single product type with various threaded connections, while only having to stock the product itself and many kinds of adapters.

Features:

Body material:	glass fibre reinforced technopolymer
Tightening torque:	3 … 4 Nm



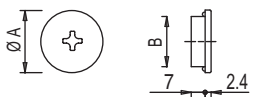
Article	Description	X	Y	Z	K	⬡E
VF ADPG13-PG11	Adapter from PG 13.5 to PG 11	PG 13.5	PG 11	9	12	22
VF ADPG13-M20	Adapter from PG 13.5 to M20x1.5	PG 13.5	M20x1.5	9	14	24
VF ADPG13-1/2NPT	Adapter from PG 13.5 to 1/2 NPT	PG 13.5	1/2 NPT	9	14	24
VF ADPG11-1/2NPT	Adapter from PG 11 to 1/2 NPT	PG 11	1/2 NPT	7	14	24
VF ADPG11-PG13	Adapter from PG 11 to PG 13.5	PG 11	PG 13.5	7	14	24
VF ADM20-1/2NPT	Adapter from M20 x 1.5 to 1/2 NPT	M20 x 1.5	1/2 NPT	9	14	24

Protection caps

Packs of **10 pcs.**

Features:

Body material:	technopolymer, self-extinguishing
Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653
Tightening torque:	1.2 … 1.6 Nm
Cross-recessed screw:	PH3



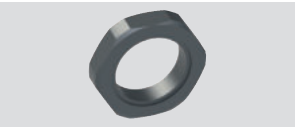
Article	Description	A	B
VF PTM20	Protection cap M20x1.5	24	M20x1.5
VF PTG13.5	Protection cap PG13.5	24	PG 13.5

All values in the drawings are in mm

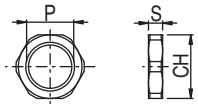
→ The 2D and 3D files are available at **www.pizzato.com**

Threaded nuts

Packs of **10 pcs.**



Features:
Tightening torque: 1.2 … 2 Nm



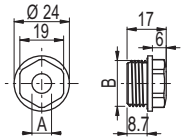
	Article	Description	S	CH	P
Plastic	VF DFPM25	M25x1.5 threaded technopolymer nut	6	32	M25x1.5
	VF DFPM20	M20x1.5 threaded technopolymer nut	6	27	M20x1.5
	VF DFPM16	M16x1.5 threaded technopolymer nut	5	22	M16x1.5
	VF DFPP13	PG13.5 threaded technopolymer nut	6	27	PG 13.5
Metal	VF DFMM20	M20x1.5 threaded nut in nickel-plated brass	3	23	M20x1.5

Chock plugs

Packs of **100 pcs.**

Features:
Body material: technopolymer
Protection degree: IP54 acc. to EN 60529
Tightening torque: 0.8 … 1 Nm

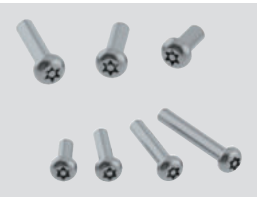
Notes: Use a socket wrench for tightening.



Article	Description	A	B
VF PFM20C8N	Chock plug for one cable Ø 8 … 12 mm, threaded, M20x1.5	7.5	M20x1.5
VF PFM20C4N	Chock plug for one cable Ø 4 … 8 mm, threaded, M20x1.5	3.5	M20x1.5

Torx safety screws

Packs of **10 pcs.**



Pan head screws with Torx fitting and pin, stainless steel.
Use a thread locker where required for applications acc. to. EN ISO 14119.

Article	Description
VF VAM4X10BX-X	M4x10 screw, with Torx T20 fitting, AISI 304
VF VAM4X15BX-X	M4x15 screw, with Torx T20 fitting, AISI 304
VF VAM4X20BX-X	M4x20 screw, with Torx T20 fitting, AISI 304
VF VAM4X25BX-X	M4x25 screw, with Torx T20 fitting, AISI 304
VF VAM4X30BX-X	M4x30 screw, with Torx T20 fitting, AISI 304
VF VAM5X10BX-X	M5x10 screw, with Torx T25 fitting, AISI 304
VF VAM5X15BX-X	M5x15 screw, with Torx T25 fitting, AISI 304
VF VAM5X20BX-X	M5x20 screw, with Torx T25 fitting, AISI 304
VF VAM5X25BX-X	M5x25 screw, with Torx T25 fitting, AISI 304
VF VAM5X35BX-X	M5x35 screw, with Torx T25 fitting, AISI 304
VF VAM5X45BX-X	M5x45 screw, with Torx T25 fitting, AISI 304

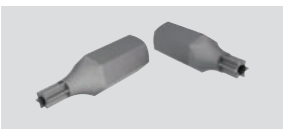
OneWay safety screws

Packs of **10 pcs.**

Pan head screws with OneWay fitting in stainless steel.
This screw type cannot be removed or tampered with using common tools. Ideal for fixing safety device actuators in accordance with EN ISO 14119.

Article	Description
VF VAM4X10BW-X	M4x10 screw, with OneWay fitting, AISI 304
VF VAM4X15BW-X	M4x15 screw, with OneWay fitting, AISI 304
VF VAM4X20BW-X	M4x20 screw, with OneWay fitting, AISI 304
VF VAM4X25BW-X	M4x25 screw, with OneWay fitting, AISI 304
VF VAM5X10BW-X	M5x10 screw, with OneWay fitting, AISI 304
VF VAM5X15BW-X	M5x15 screw, with OneWay fitting, AISI 304
VF VAM5X20BW-X	M5x20 screw, with OneWay fitting, AISI 304
VF VAM5X25BW-X	M5x25 screw, with OneWay fitting, AISI 304

Bits for Torx safety screws



Bits for Torx safety screws with pin, with ¼" hexagonal connection.

Article	Description
VF VAIT1T20	Bits for M4 screws with Torx T20 fitting
VF VAIT1T25	Bits for M5 screws with Torx T25 fitting
VF VAIT1T30	Bits for M6 screws with Torx T30 fitting

All values in the drawings are in mm

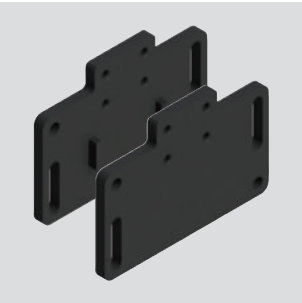
➔ The 2D and 3D files are available at **www.pizzato.com**

Fixing plates

Metal fixing plate, for fixing rope switches on the ceiling.
The plate is provided with bore holes for fasting switches of the FD, FL, FC, FP, FR, FM, FZ, FX, FK series. It is supplied without screws.

Article	Description
VF SFP2	Ceiling fixing plate

Fixing plates



Fixing plate (complete with fastening screws) provided with long slots for adjusting the operating point.
Each plate is provided with two pairs of fixing holes, one for standard switches and one for switches with reset device. The actuator thus always has the same actuating point.

Article	Description
VF SFP1	Fixing plate (FR series)
VF SFP3	Fixing plate (FX series)

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

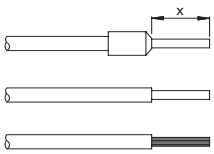
LED signalling lights

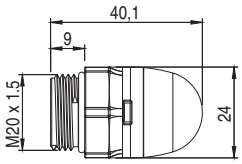
Packs of **5 pcs.**

These signalling lights with high luminosity LEDs are used for signalling that an electric contact has changed its state inside the switch. They can be installed on switches of the FL, FX, FZ, FW, FG, NG or FS series by screwing them on one of the conduit entries not used for electric cables. They can be used for many different purposes: for example, to signal, from a distance, whether the switch has been actuated; whether the guard has closed correctly; or whether the guard is locked or unlocked.
The inner part can rotate in such a way that it can be wired and screwed on the switch without any risk of twisting the wires.

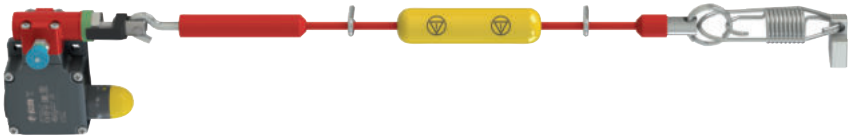
Features:

Protection degree:	IP67 acc. to EN 60529 IP69K acc. to ISO 20653
Ambient temperature:	-25°C … +70°C
Operating voltage U_n:	24 Vac/dc (10 mA) 120 Vac (20 mA) 230 Vac (20 mA)
Tolerance on the supply voltages:	±15% of U_n
Operating current:	10 mA
Connection system:	PUSH-IN spring type
Cross-section of rigid/flexible wires w. wire-end sleeve:	min. 1 x 0.34 mm² (1 x AWG 24) max. 1 x 1.5 mm² (1 x AWG 16)
Wire cross-section with pre-insulated wire-end sleeve:	min. 1 x 0.34 mm² (1 x AWG 24) max. 1 x 0.75 mm² (1 x AWG 18)
Tightening torque.	1.2 … 2 Nm
Wire stripping length (x):	min.: 8 mm max.: 12 mm

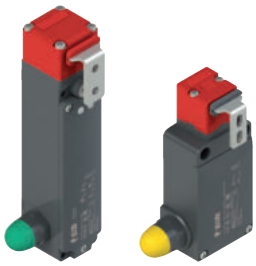




Application examples



Status indicator for safety rope switches



Indication of unlocked door

Code structure

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

VF SL1A3PA1

Operating voltage	
1	24 Vac/dc
3	120 Vac
4	230 Vac

Body design	
A	Total height 40 mm, spherical lens, threading M20x1.5mm

Type of light source	
A	standard LED with continuous light

Connection type	
P	PUSH-IN terminal strip

Lens colour	
2	White
3	Red
4	Green
5	Yellow

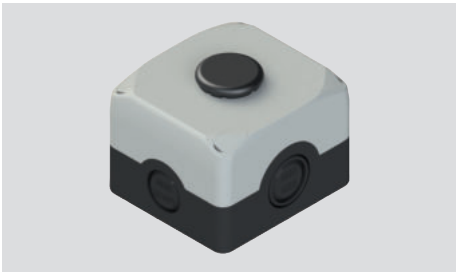
Stock items

VF SL1A3PA1
VF SL1A5PA1

All values in the drawings are in mm

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

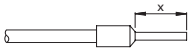
Junction box for series connection of up to 4 devices



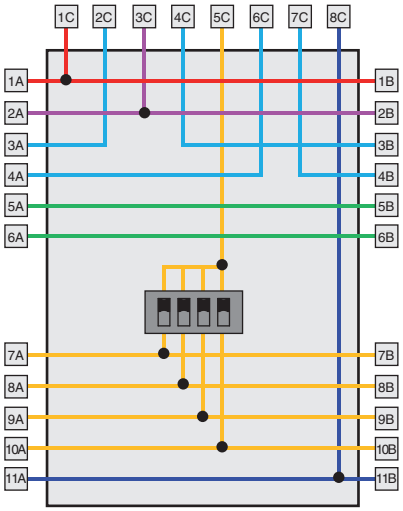
This accessory allows easy and precise series connection of up to 4 devices. Thanks to the numbered terminals and to the internal circuit, it is sufficient to connect the conductors in the slots provided with the practical and fast PUSH-IN spring connections.
Thanks to the four internal microswitches, it is possible to easily and immediately direct the device signalling outputs (open or closed, locked or unlocked) to one of the four available auxiliary channels and then manage the information independently for each channel through a PLC.

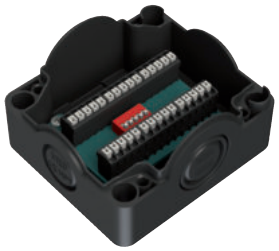
Features:

Material:	Self-extinguishing shock-proof polycarbonate with double insulation, UV-resistant and glass fibre reinforced
Material of the screws:	Stainless steel
Protection degree:	IP67 acc. to EN 60529, IP69K acc. to ISO 20653, with cable gland of equal or higher protection degree
Conduit entries:	2x M20 - 1/2 NPT knock-out side entries 2x M20 - 1/2 NPT - M25 knock-out side entries 2x M16 knock-out base entries
Ambient temperature:	-40°C … +80°C
Tightening torque of the cover screws:	1 … 1.4 Nm
Connection system:	PUSH-IN spring type
Cross-section of rigid/flexible wires w. wire-end sleeve:	min. 1 x 0.34 mm² (1 x AWG 24) max. 1 x 1.5 mm² (1 x AWG 16)
Wire cross-section with pre-insulated wire-end sleeve:	min. 1 x 0.34 mm² (1 x AWG 24) max. 1 x 0.75 mm² (1 x AWG 18)
Wire stripping length (x):	min.: 8 mm max.: 12 mm



Pin assignment



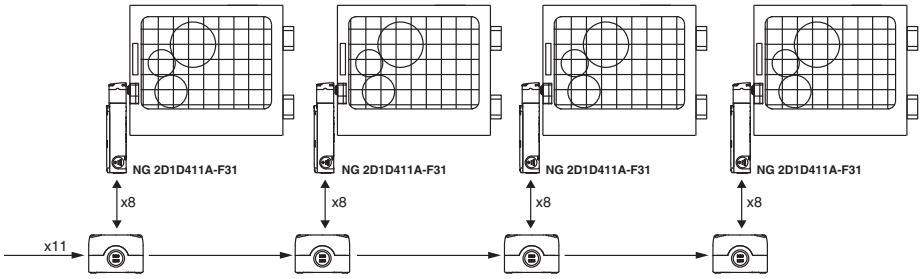


Article	Description
VF CY302P0	Junction box for series connection of up to 4 devices

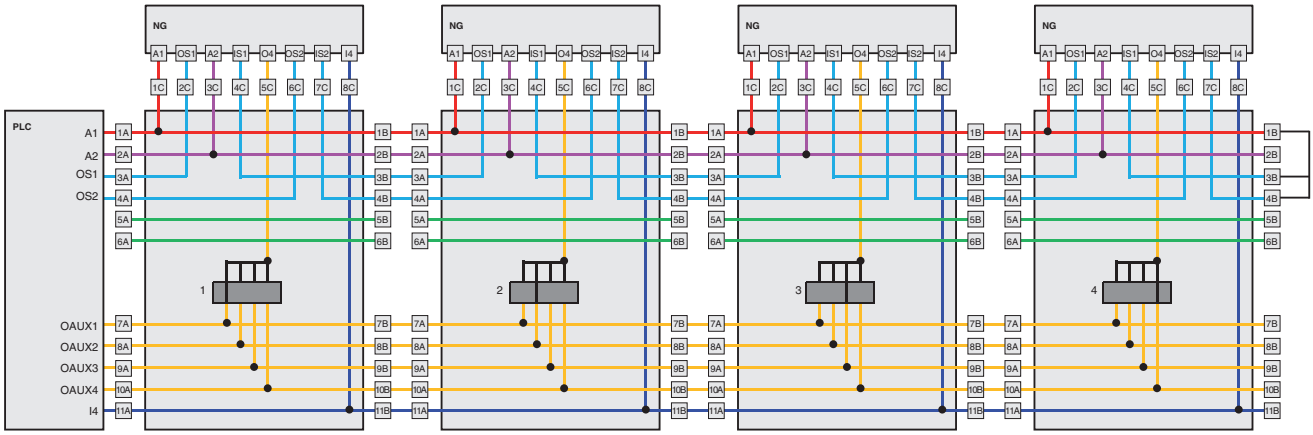
Terminal box	Connection	
1A / 1B	A1	Supply input +24 Vdc
2A / 2B	A2	Supply input 0 V
3A / 3B	OS1 / IS1	Safety output / safety input
4A / 4B	OS2 / IS2	Safety output / safety input
5A / 5B		Auxiliary connection
6A / 6B		Auxiliary connection
7A / 7B	OAUX1	Auxiliary output Oaux1
8A / 8B	OAUX2	Auxiliary output Oaux2
9A / 9B	OAUX3	Auxiliary output Oaux3
10A / 10B	OAUX4	Auxiliary output Oaux4
11A / 11B	I4	Solenoid activation input

Terminal box	Connection	
1C	A1	Supply input +24 Vdc
2C	OS1	Safety output
3C	A2	Supply input 0 V
4C	IS1	Safety input
5C	O3	Signalling output, actuator inserted
	O4	Signalling output, actuator inserted and locked
6C	OS2	Safety output
7C	IS2	Safety input
8C	I4	Solenoid activation input

Example of series connection of 4 NG series switches



Wiring diagram



Notes

Installation of single switches with safety functions

- Use **only** switches with the symbol ⊖ (see figure on the side).
- Connect the safety circuit to **the NC normally closed contacts (11-12, 21-22 or 31-32).**
- **The NO normally open contacts (13-14, 23-24, 33-34)** should be used **only for signalling**; these contacts are not to be connected with the safety circuit. However, if two or more switches are used on the same guard, a connection can be established between the NO contacts and the safety circuit.
  In this case at least one of the two switches must have positive opening and a normally closed contact NC (11-12, 21-22 or 31-32) must be connected to the safety circuit.
- Actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol ⊖.
- The actuation system must be able to exert a force that is greater than the **positive opening force**, as specified in brackets below each article, next to the minimum force value.
- The device must be affixed in compliance with EN ISO 14119.

Whenever the machine guard is opened and during the whole opening travel, **the switch must be pressed directly** (fig. 1) **or through a rigid connection** (fig. 2)**.**
Only in this way the positive opening of the normally closed NC contacts (11-12, 21-22, 31-32) is guaranteed.

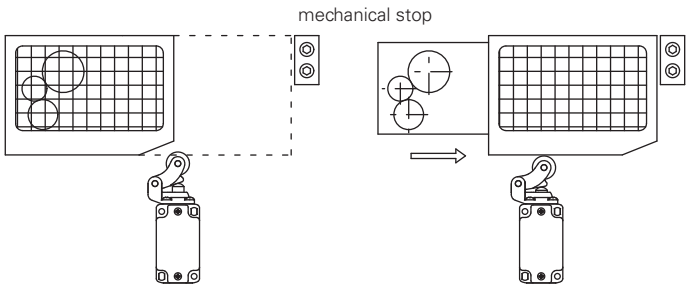


Fig.1

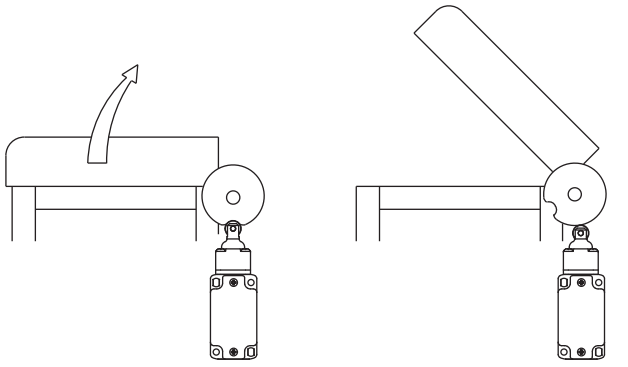


Fig.2

In safety applications with only one switch for each guard, the switches **must never be activated by a release** (fig. 3 and 4) **or through a non rigid connection** (i.e. by a spring).

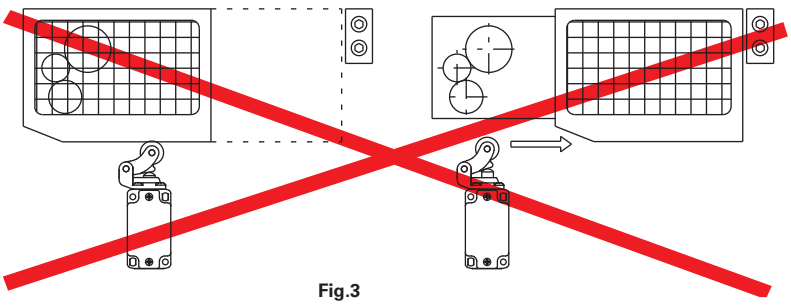


Fig.3

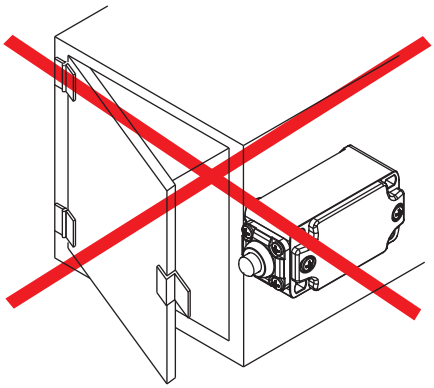
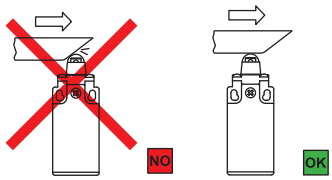


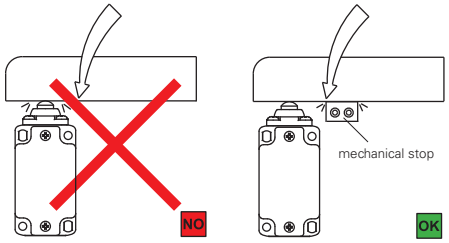
Fig.4

Mechanical stop

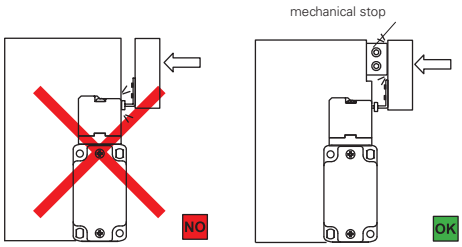
Acc. to EN ISO 14119 paragraph 5.2 letter h) the position sensors must not be used as mechanical stop.



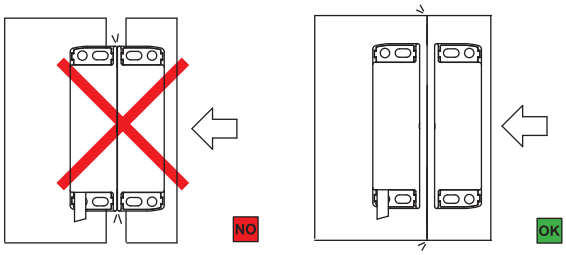
The actuator must not exceed the max. travel as indicated in the travel diagrams.



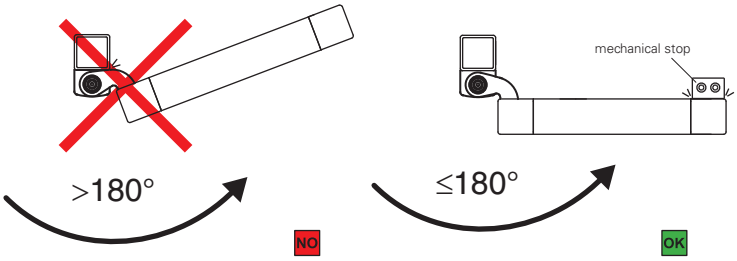
The guard must not use the switch head as a mechanical stop.



The actuator must not strike directly against the switch head.

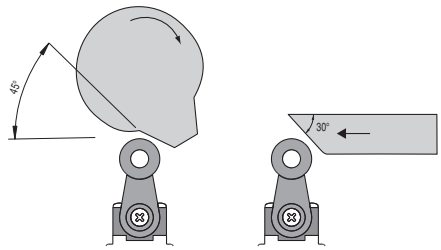
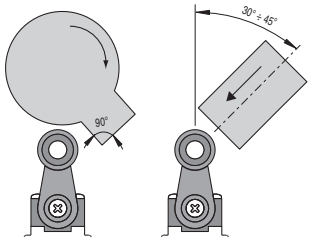
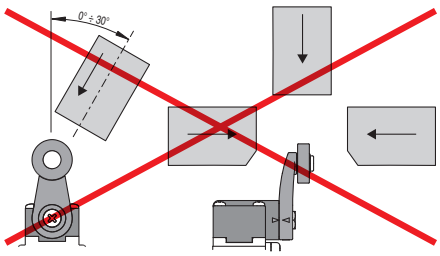
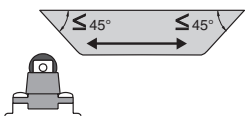
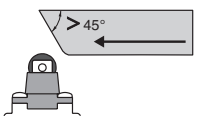
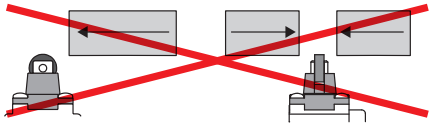
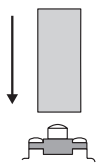
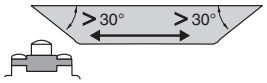
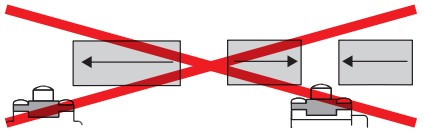


The actuator must not strike directly against the magnetic sensor.



The opening angle of safety hinge switch HP, HC and HX series must not exceed 180°.

Actuation modes

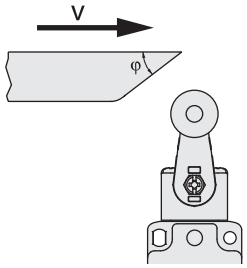
Recommended application	Application to avoid This application is possible, but increased mechanical stress may shorten the operating life of the switch	Forbidden application
		
		
		

Switches for heavy duty applications

Maximum and minimum actuation speed - FD-FL-FP-FC series

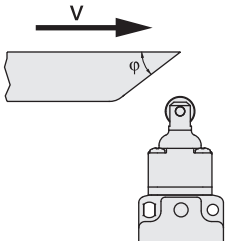
Roller lever - Type 1

φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	2,5	9	0,07
30°	1,5	8	
45°	1	7	
60°	0,75	7	



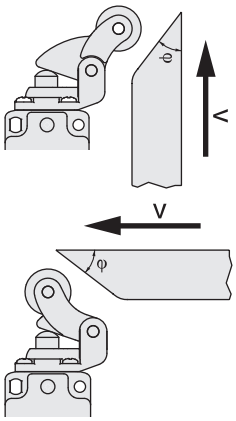
Roller plunger - Type 2

φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	1	4	0,04
30°	0,5	2	0,02
45°	0,3	1	0,01



Roller lever - Type 3

φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	1	5	0,05
30°	0,5	2,5	0,025
45°	0,3	1,5	0,015

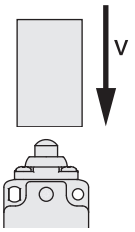


Contact type:

R = snap action
L = slow action

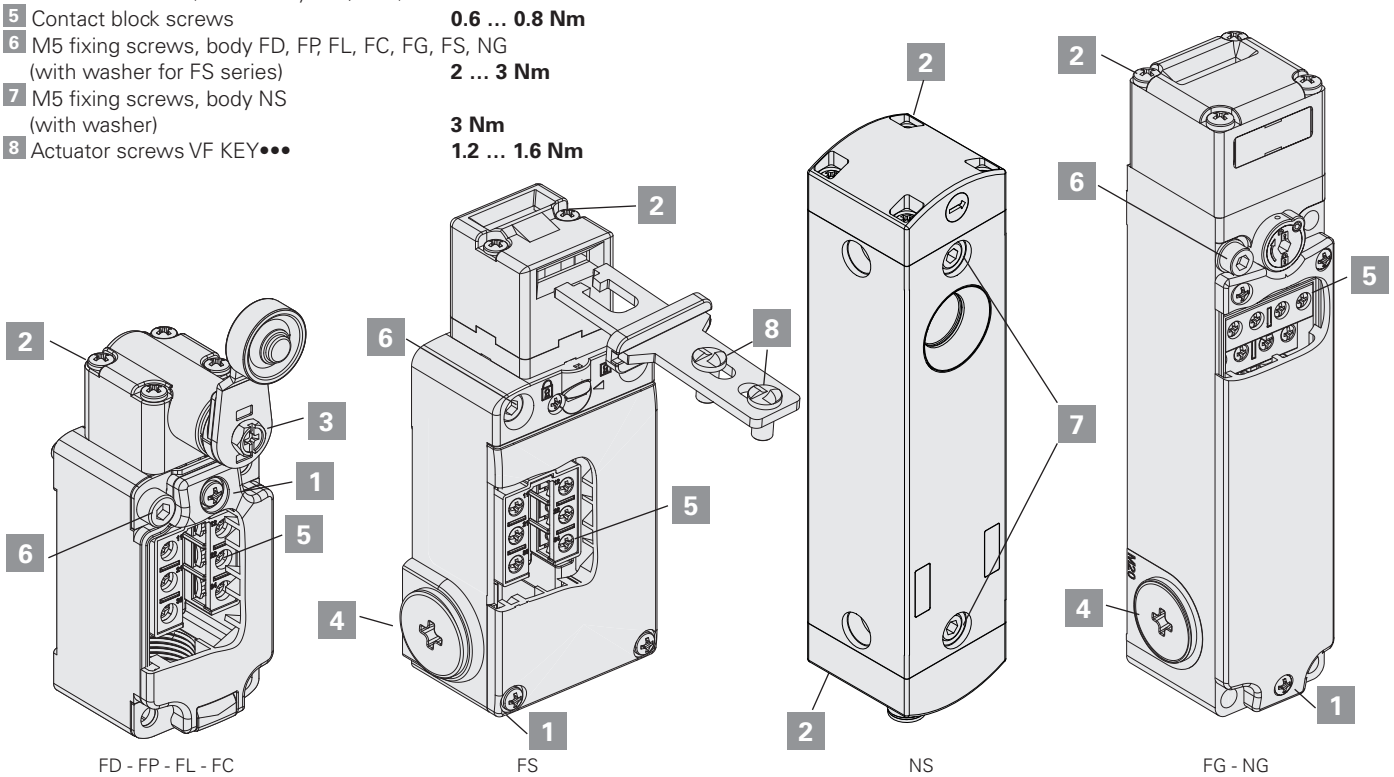
Plunger - Type 4

Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
0,5	1	0,01



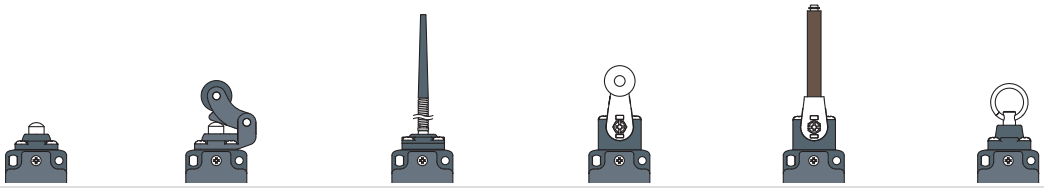
Tightening torques FD-FP-FL-FC-FG-FS-NG-NS series

1	Cover screws	**0.8 ... 1.2 Nm**
2	Head screws	**0.8 ... 1.2 Nm**
3	Lever screw	**0.8 ... 1.2 Nm**
4	Protection caps (conduit entry M20/PG13.5)	**1.2 ... 1.6 Nm**
	(conduit entry M16/PG11)	**1 ... 1.4 Nm**
5	Contact block screws	**0.6 ... 0.8 Nm**
6	M5 fixing screws, body FD, FP, FL, FC, FG, FS, NG (with washer for FS series)	**2 ... 3 Nm**
7	M5 fixing screws, body NS (with washer)	**3 Nm**
8	Actuator screws VF KEY•••	**1.2 ... 1.6 Nm**



FD-FP-FL-FC series switches for heavy duty applications

Travel diagrams



Contact block	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6 inverted contacts
2 2x(1NO-1NC)	13 21 43 31 / 14 22 44 32	0 1.3 6 / 0.7	0 1.6 8 / 0.9	0 8° / 4°	0 20° 75° / 13°	0 20° 75° / 13°	0 3.3 8 / 2.5
3 1NO-1NC	13 21 / 14 22	0 1.3 6 / 0.8	0 1.7 8 / 1.1	0 10° / 5°	0 20° 75° / 13°	0 20° 75° / 13°	0 5.3 8 / 4.5
5 1NO+1NC	13 21 / 14 22	0 2.2 ⊖4 6 / 1.1	0 2.7 ⊖4.9 8 / 1.4	0 15° / 5°	0 30° ⊖60° 75° / 17°	0 22° ⊖52° 75° / 9°	0 2.9 8 / 1.7
6 1NO+1NC	11 23 / 12 24	0 1.5 ⊖3 6 / 3.4	0 1.8 ⊖3.7 8 / 4.2	/	0 22° ⊖42° 75° / 42°	0 14° ⊖34° 75° / 34°	0 2.3 8 / 0.8
7 1NO+1NC	11 23 / 12 24	0 3.1 ⊖4.6 6 / 1.6	0 3.8 ⊖5.7 8 / 2	/	0 40° 60° ⊖75° / 23°	0 32° ⊖52° 75° / 15°	0 1 8 / 2.2
9 2NC	11 21 / 12 22	0 2.9 ⊖4.4 6	0 3.6 ⊖5.4 8	/	0 40° 60° ⊖75°	0 32° ⊖52° 75°	0 1 8
10 2NO	13 23 / 14 24	0 1.4 6	0 1.7 8	0 9°	0 22° 75°	0 14° 75°	0 2.5 8
11 2NC	11 21 / 12 22	0 2 ⊖4 6 / 0.6	0 2.5 ⊖4.9 8 / 0.7	/	0° 27° ⊖57° 75° / 11°	/	0 3.5 8 / 2.1
12 2NO	13 23 / 14 24	0 2.9 6 / 1.5	0 3.6 8 / 1.8	/	0 38° 75° / 22°	0 30° 75° / 14°	0 2.6 8 / 1.1
13 2NC	11 21 / 12 22	0 0.8 ⊖2.3 6 / 3 ⊖4.5	0 1 ⊖2.8 8 / 3.7 ⊖5.5	/	0 14° ⊖34° 75° / 41° ⊖61°	0 6° ⊖26° 75° / 33° ⊖53°	0 1 8 / 3.2
14 2NC	11 21 / 12 22	0 1.4 ⊖2.9 6 / 3 ⊖4.5	0 1.7 ⊖3.6 8 / 3.7 ⊖5.5	/	0 22° ⊖42° 75° / 40° ⊖60°	0 14° ⊖34° 75° / 32° ⊖52°	0 0.9 8 / 2.5
15 2NO	13 23 / 14 24	0 1.4 6 / 3	0 1.7 8 / 3.7	/	0 22° 75° / 40°	0 14° 75° / 32°	0 1 8 / 2.6
16 2NC	11 21 / 12 22	/	/	/	66° 0 26° ⊖30° / ⊖37° 26° 66°	/	/
18 1NO+1NC	11 23 / 12 24	0 1.5 ⊖3 6 / 2	0 1.8 ⊖3.7 8 / 2.5	0 10° / 13°	0 23° ⊖43° 75° / 29°	0 15° ⊖35° 75° / 21°	0 2.4 8 / 1.9
20 1NO+2NC	11 21 33 / 12 22 34	0 1.5 ⊖3 6 / 2	0 1.8 ⊖3.7 8 / 2.5	0 10° / 13°	0 23° ⊖43° 75° / 29°	0 15° ⊖35° 75° / 21°	0 2.4 8 / 1.9
21 3NC	11 21 31 / 12 22 32	0 1.5 ⊖3 6	0 1.8 ⊖3.7 8	0 10°	0 23° ⊖43° 75°	0 15° ⊖35° 75°	0 2.4 8
22 2NO+1NC	11 23 33 / 12 24 34	0 1.5 ⊖3 6 / 2	0 1.8 ⊖3.7 8 / 2.5	0 10° / 13°	0 23° ⊖43° 75° / 29°	0 15° ⊖35° 75° / 21°	0 2.4 8 / 1.9
28 1NO+2NC	11 21 33 / 12 22 34	0 1.5 ⊖3 4.5 6 / 2 ⊖5.5	0 1.8 ⊖3.7 5.6 8 / 2.5 ⊖6.9	/	0 23° ⊖43° 60° 75° / 29° ⊖70°	0 15° ⊖35° 52° 75° / 21° ⊖62°	/
29 3NC	11 21 31 / 12 22 32	0 1.5 ⊖3 6 / 4.5 ⊖5.5	0 1.8 ⊖3.7 8 / 5.6 ⊖6.9	/	0 23° ⊖43° 75° / 60° ⊖70°	0 15° ⊖35° 75° / 52° ⊖62°	/
30 3NC	11 21 31 / 12 22 32	0 1.5 ⊖3 6 / 4.5 ⊖5.5	0 1.8 ⊖3.7 8 / 5.6 ⊖6.9	/	0 23° ⊖43° 75° / 60° ⊖70°	0 15° ⊖35° 75° / 52° ⊖62°	/
33 1NO+1NC	13 21 / 14 22	0 1.5 ⊖3 6 / 2	0 1.8 ⊖3.7 8 / 2.5	0 10° / 12°	0 23° ⊖43° 75° / 27°	0 15° ⊖35° 75° / 19°	0 2.4 8 / 2.1
34 2NC	11 21 / 12 22	0 1.5 ⊖3 6	0 1.8 ⊖3.7 8	0 10°	0 23° ⊖43° 75°	0 15° ⊖35° 75°	0 2.4 8
37 1NO+1NC	11 23 / 12 24	0 3.4 ⊖4.9 6 / 1.5	0 4.3 ⊖6.2 8 / 1.9	/	0 45° 65° ⊖75° / 18°	0 37° ⊖57° 75° / 10°	0 3 8 / 1.1
66 1NC	11 / 12	0 1.4 ⊖2.9 6	0 1.7 ⊖3.6 8	/	0 22° ⊖42° 75°	0 14° ⊖34° 75°	0 0.9 8
67 1NO	13 / 14	0 1.4 6	0 1.7 8	0 9°	0 22° 75°	0 14° 75°	0 2.5 8

Legend

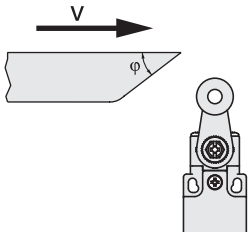
Closed contact | Open contact | ⊖ Positive opening travel acc. to EN 60947-5-1 | ► Switch pressed / ◄ Switch released

Switches for standard applications

Maximum and minimum actuation speed - FR-FM-FX-FZ-FK series

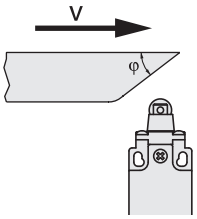
Roller lever - Type 1

φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	2,5	9	0,07
30°	1,5	8	
45°	1	7	
60°	0,75	7	



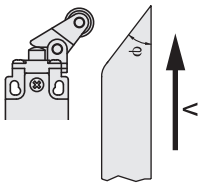
Roller plunger - Type 2

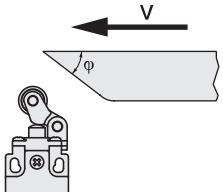
φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	1	4	0,04
30°	0,5	2	0,02
45°	0,3	1	0,01



Roller lever - Type 3

φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	1	5	0,05
30°	0,5	2,5	0,025
45°	0,3	1,5	0,015



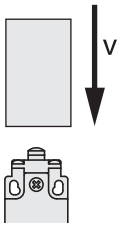


Contact type:

R = snap action
L = slow action

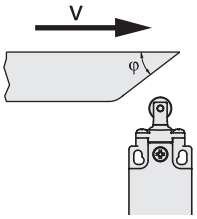
Plunger - Type 4

Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
0,5	1	0,01



Roller plunger - Type 5

φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	0,3	4	0,04
30°	0,2	2	0,02

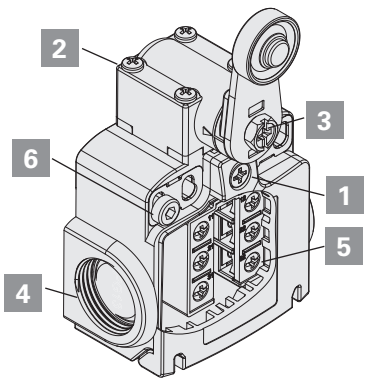


Tightening torques - FR, FX, FK and FW series

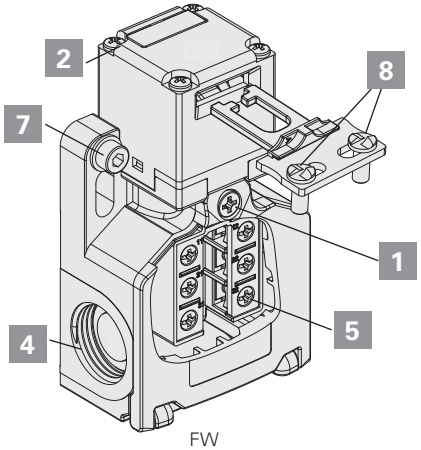
1	Cover screws	**0.7 ... 0.9 Nm**
2	Head screws	**0.5 ... 0.7 Nm**
3	Lever screw	**0.7 ... 0.9 Nm**
4	Protection caps	**1.2 ... 1.6 Nm**
5	Contact block screws	**0.6 ... 0.8 Nm**
6	M4 fixing screws, body (with washer for FR-FK series)	**2 ... 2.5 Nm**
7	M5 fixing screws, body (with washer for FW series)	**2 ... 2.5 Nm**
8	Actuator screws VF KEY•••	**1.2 ... 1.6 Nm**

Tightening torques - FM and FZ series

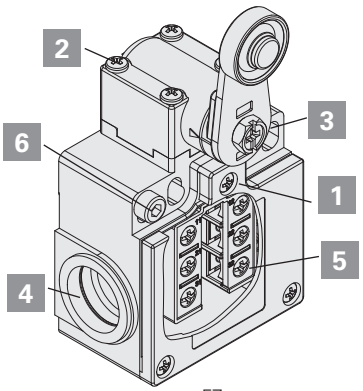
1	Cover screws	**0.5 ... 0.7 Nm**
2	Head screws	**0.5 ... 0.7 Nm**
3	Lever screw	**0.8 ... 1.2 Nm**
4	Protection caps	**1.2 ... 1.6 Nm**
5	Contact block screws	**0.6 ... 0.8 Nm**
6	M4 fixing screws, body	**2 ... 3 Nm**



FR - FX - FK - FM



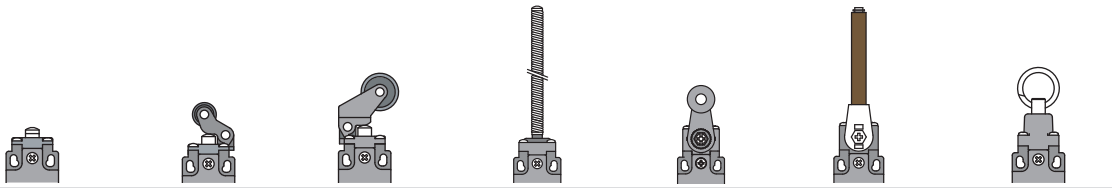
FW



FZ

FR-FM-FX-FZ-FK series switches for standard applications

Travel diagrams



Contact block	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7 inverted contacts
2 2x(1NO-1NC)	0 1.3 6 / 0.7	0 2 8 / 1.1	0 3 13 / 1.6	0 9° / 4°	0 17° 75° / 10°	0 17° 75° / 10°	0 5.4 8 / 4.8
3 1NO-1NC	0 1.3 6 / 0.8	0 2 8 / 1.2	0 3 13 / 1.8	0 9° / 4°	0 17° 75° / 10°	0 17° 75° / 10°	0 3.4 8 / 2.9
5 1NO+1NC	0 2.2 ⊖4 6 / 1.1	0 3.3 ⊖6 8 / 1.7	0 5.1 ⊖9.2 13 / 2.5	0 17° / 6°	0 30° 60°⊖ 75° / 15°	0 25° ⊖55° 75° / 10°	0 5 8 / 3.8
6 1NO+1NC	0 1.5 ⊖3 6 / 3.1	0 2.3 ⊖4.5 8 / 4.7	0 3.5 ⊖6.9 13 / 7.1	/	0 20° ⊖40° 75° / 42°	0 15° ⊖35° 75° / 35°	0 4.6 8 / 3
7 1NO+1NC	0 3.1 ⊖4.6 6 / 1.6	0 4.7 ⊖6.9 / 2.4 8	0 7.1 ⊖10.6 / 3.7 13	/	0 41° 61°⊖ 75° / 22°	0 36° ⊖56° 75° / 17°	0 3 8 / 4.5
9 2NC	0 2.9 ⊖4.4 6	0 4.4 ⊖6.6 / 8	0 6.7 ⊖10.1 / 13	/	0 39° 75° / ⊖59°	0 34° ⊖54° 75°	0 3.1 8
10 2NO	0 1.4 6	0 2.1 8	0 3.2 13	0 10°	0 20° 75°	0 15° 75°	0 4.6 8
11 2NC	0 2 ⊖4 6 / 0.6	0 3 ⊖6 8 / 0.9	0 4.6 ⊖9.2 13 / 1.4	/	0° 26° 56°⊖ 75° / 7°	/	0 5.6 8 / 4
12 2NO	0 2.9 6 / 1.5	0 4.4 8 / 2.3	0 6.7 13 / 3.5	0 21° / 8°	0 37° 75° / 19°	0 32° 75° / 14°	0 4.7 8 / 3.3
13 2NC	0 0.8 ⊖2.3 6 / 3 ⊖4.5	0 1.2 ⊖3.5 8 / 4.5 ⊖6.8	0 1.8 ⊖5.3 13 / 6.9 ⊖10.4	/	0 11° ⊖31° 75° / 40° ⊖60°	6° ⊖26° 75° / 0 35° ⊖55°	0 3.1 8 / 5.3
14 2NC	0 1.4 ⊖2.9 6 / 3 ⊖4.5	0 2.1 ⊖4.4 8 / 4.5 ⊖6.8	0 3.2 ⊖6.7 13 / 6.9 ⊖10.4	/	0 19° ⊖39° 75° / 40° ⊖60°	0 14° ⊖34° 75° / 35° ⊖55°	0 3 8 / 4.7
15 2NO	0 1.4 6 / 3	0 2.1 8 / 4.5	0 3.2 13 / 6.9	/	0 19° 75° / 40°	0 14° 75° / 35°	0 4.7 8 / 3.1
16 2NC	/	/	/	/	75° 0 28° ⊖48° / 48°⊖ 28° 75°	/	/
18 1NO+1NC	0 1.5 ⊖3 6 / 2	0 2.3 ⊖4.5 8 / 3	0 3.5 ⊖6.9 13 / 4.6	0 10° ⊖21°* / 14°	0 20° ⊖40° 75° / 27°	0 15° ⊖35° 75° / 22°	0 4.6 8 / 4.1
20 1NO+2NC	0 1.5 ⊖3 6 / 2	0 2.3 ⊖4.5 8 / 3	0 3.5 ⊖6.9 13 / 4.6	0 10° ⊖21°* / 14°	0 20° ⊖40° 75° / 27°	0 15° ⊖35° 75° / 22°	0 4.6 8 / 4
21 3NC	0 1.5 ⊖3 6	0 2.3 ⊖4.5 8	0 3.5 ⊖6.9 13	0 10° ⊖21°*	0 20° ⊖40° 75°	0 15° ⊖35° 75°	0 4.6 8
22 2NO+1NC	0 1.5 ⊖3 6 / 2	0 2.3 ⊖4.5 8 / 3	0 3.5 ⊖6.9 13 / 4.6	0 10° ⊖21°* / 14°	0 20° ⊖40° 75° / 27°	0 15° ⊖35° 75° / 22°	0 4.6 8 / 4.1
28 1NO+2NC	0 1.5 ⊖3 4.5 6 / 2 ⊖5.5	0 2.3 ⊖4.5 6.5 8 / 3 ⊖7.5	0 3.5 ⊖6.9 13 / 4.6 10.2 ⊖12.5	/	0 20° 40°⊖ 58° 75° / 27° ⊖70°	0 15° ⊖35° 53° 75° / 22° ⊖65°	0 1.8 4.6 8 / 4
29 3NC	0 1.5 ⊖3 6 / 4.5 ⊖5.5	0 2.3 ⊖4.5 8 / 6.5 ⊖7.5	0 3.5 ⊖6.9 13 / 10.2 ⊖12.5	/	0 20° ⊖40° 75° / 58° ⊖70°	0 15° ⊖35° 75° / 53° ⊖65°	0 4.6 8 / 1.8
30 3NC	0 1.5 ⊖3 6 / 4.5 ⊖5.5	0 2.3 ⊖4.5 8 / 6.5 ⊖7.5	0 3.5 ⊖6.9 13 / 10.2 ⊖12.5	/	0 20° ⊖40° 75° / 58° ⊖70°	0 15° ⊖35° 75° / 53° ⊖65°	0 4.6 8 / 1.8
33 1NO+1NC	0 1.5 ⊖3 6 / 2	0 2.3 ⊖4.5 8 / 3	0 3.5 ⊖6.9 13 / 4.6	0 10° ⊖21°* / 14°	0 20° ⊖40° 75° / 25°	0 15° ⊖35° 75° / 20°	0 4.6 8 / 4.3
34 2NC	0 1.5 ⊖3 6	0 2.3 ⊖4.5 8	0 3.5 ⊖6.9 13	0 10° ⊖21°*	0 20° ⊖40° 75°	0 15° ⊖35° 75°	0 4.6 8
37 1NO+1NC	0 3.4 ⊖4.9 / 1.5 6	0 5.2 ⊖7.4 / 2.3 8	0 7.8 13 / 3.4 ⊖11.2	/	0 45° ⊖65° / 18° 75°	0 40° ⊖60° 75° / 13°	0 2.8 8 / 4.9
66 1NC	0 1.4 ⊖2.9 6	0 2.1 ⊖4.4 8	0 3.2 ⊖6.7 13	0 10° ⊖21°*	0 19° ⊖39° 75°	0 14° ⊖34° 75°	0 3 8
67 1NO	0 1.4 6	0 2.1 8	0 3.2 13	0 10°	0 20° 75°	0 15° 75°	0 4.6 8

(*) Positive opening of NC contacts (11-12 / 21-22 / 31-32) with 22 actuator with rigid rod only. Do not operate the 22 actuator with rigid rod at an angle of more than 27°.

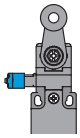
Legend

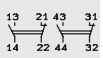
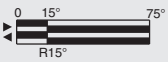
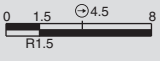
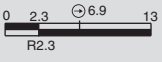
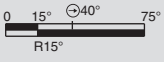
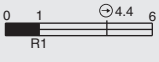
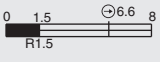
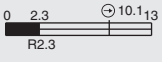
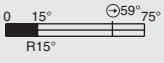
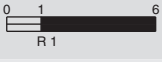
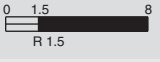
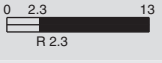
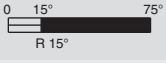
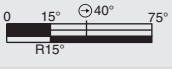
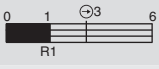
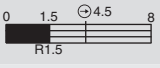
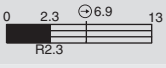
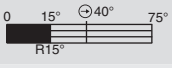
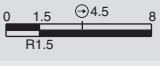
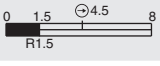
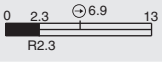
Closed contact | Open contact | ⊖ Positive opening travel acc. to EN 60947-5-1 | ► Switch pressed / ◄ Switch released

FR-FM-FX-FZ-FK series switches with W3 reset for standard applications

Travel diagrams



Contact block	Group 1	Group 2	Group 3	Group 4
2 2x(1NO-1NC)				
6 1NO+1NC					
9 2NC					
10 2NO					
20 1NO+2NC					
21 3NC					
22 2NO+1NC					
33 1NO+1NC					
34 2NC					

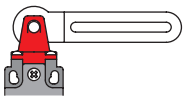
Legend

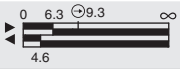
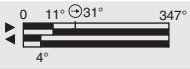
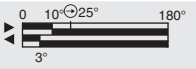
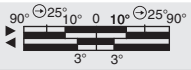
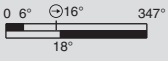
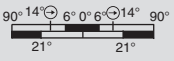
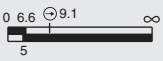
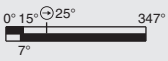
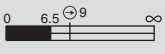
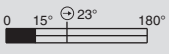
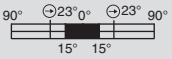
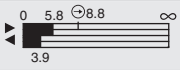
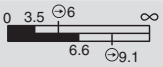
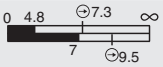
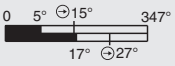
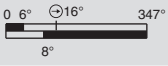
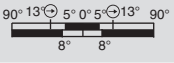
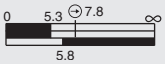
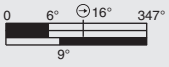
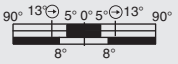
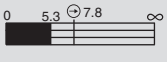
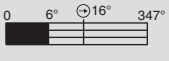
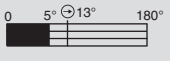
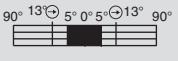
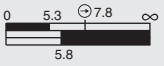
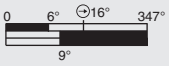
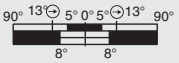
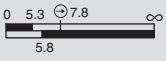
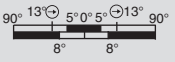
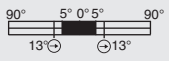
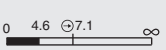
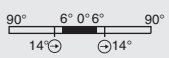
Closed contact | Open contact | ⊖ Positive opening travel acc. to EN 60947-5-1 | ► Switch pressed / ◄ Switch released | R reset engagement travel

FR-FM-FX-FZ-FK-FW series switches for safety applications

Travel diagrams






Contact block	Group 8	Group 9	Group 10	Group 11
5 1NO+1NC				
6 1NO+1NC				
7 1NO+1NC			/	/
9 2NC				
11 2NC		/	/	/
13 2NC		/	/	/
14 2NC			/	/
18 1NO+1NC				
20 1NO+2NC				
21 3NC				
22 2NO+1NC				
33 1NO+1NC				
34 2NC				
37 1NO+1NC		/	/	/
66 1NC				

Legend

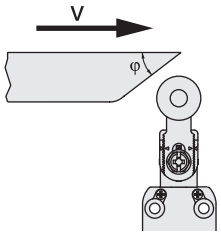
Closed contact | Open contact | ⊖ Positive opening travel acc. to EN 60947-5-1 | ► Switch pressed / ◄ Switch released

FA-NA-NB-NF series modular pre-wired switches

Maximum and minimum actuation speed

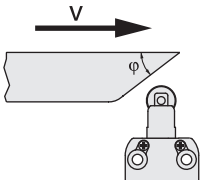
Roller lever - Type 1

φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	2,5	9	0,07
30°	1,5	8	
45°	1	7	
60°	0,75	7	



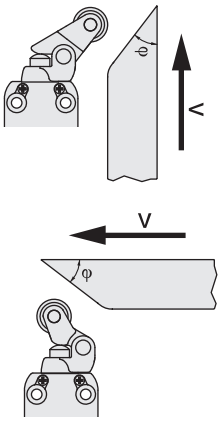
Roller plunger - Type 2

φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	1	4	0,04
30°	0,5	2	0,02
45°	0,3	1	0,01



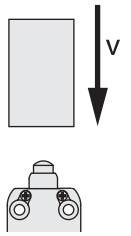
Roller lever - Type 3

φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	1	5	0,05
30°	0,5	2,5	0,025
45°	0,3	1,5	0,015



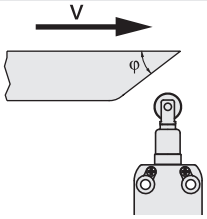
Plunger - Type 4

Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
0,5	1	0,01



Roller plunger - Type 5

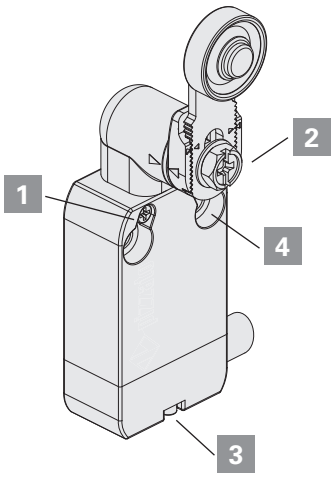
φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	0,3	4	0,04



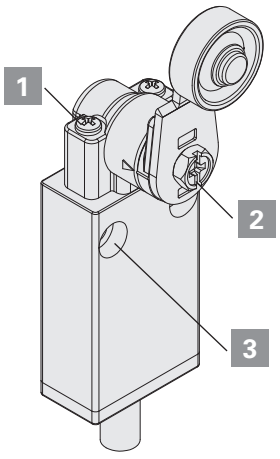
Contact type:

R = snap action
L = slow action

Screw tightening torques



NA - NB - NF



FA

For NA and NB series:

1	Head screws	**0.5 ... 0.7 Nm**
2	Lever screw	**0.8 ... 1.2 Nm**
3	Connector screw	**0.3 ... 0.6 Nm**
4	M4 fixing screws, body	**2 ... 3 Nm**

For NF series:

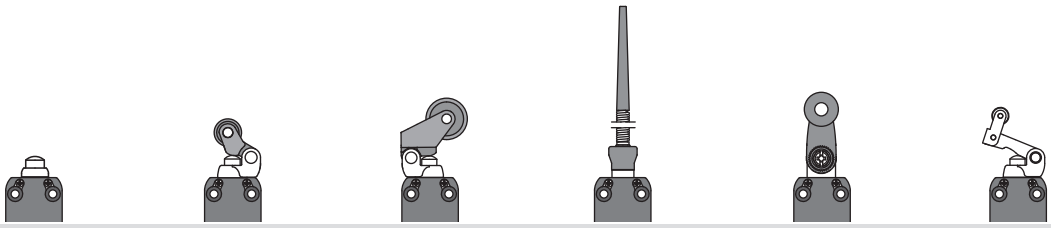
1	Head screws	**0.3 ... 0.4 Nm**
2	Lever screw	**0.8 ... 1.2 Nm**
3	Connector screw	**0.2 ... 0.3 Nm**
4	M4 fixing screws, body	**2 ... 3 Nm**

For FA series:

1	Head screws	**0.5 ... 0.7 Nm**
2	Lever screw	**0.8 ... 1.2 Nm**
3	M4 fixing screws, body	**2 ... 3 Nm**

NA-NB-NF series modular pre-wired switches

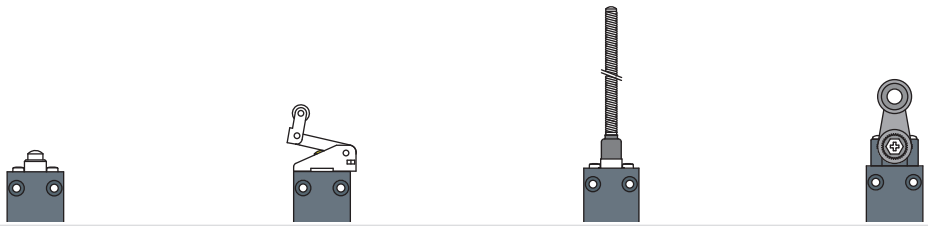
Travel diagrams



Contact block	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
B11 1NO+1NC	0 1.5 4⊖ 5 / 0.9	0 2.1 5.6⊖ 7 / 1.5	0 3.5 9.6⊖ 11 / 2.5	0 13° / 8°	0 20° ⊖50° 75° / 11°	0 4.6 11.2⊖ 14 / 3.1
B02 2NC	0 1.5 ⊖4 5 / 0.9	0 2.1 5.6⊖ 7 / 1.5	0 3.5 9.6⊖ 11 / 2.5	0 13° / 8°	0 20° ⊖50° 75° / 11°	0 4.6 11.2⊖ 14 / 3.1
B12 1NO+2NC	0 1.5 4⊖ 5 / 0.9	0 2.1 5.6⊖ 7 / 1.5	0 3.5 9.6⊖ 11 / 2.5	0 13° / 8°	0 20° ⊖50° 75° / 11°	0 4.6 11.2⊖ 14 / 3.1
B22 2NO+2NC	0 1.5 ⊖4 5 / 0.9	0 2.1 5.6⊖ 7 / 1.5	0 3.5 9.6⊖ 11 / 2.5	0 13° / 8°	0 20° ⊖50° 75° / 11°	0 4.6 11.2⊖ 14 / 3.1
G11 1NO+1NC	0 1.4 ⊖2.9 5 / 3.1	0 2 ⊖4.1 7 / 4.5	0 3.3 ⊖7 11 / 7.3	/	0 18° ⊖38° 75° / 41°	0 4.1 ⊖8.1 14 / 9.5
G02 2NC	0 1.4 ⊖2.9 5	0 2 ⊖4.1 7	0 3.3 ⊖7 11	0 12°	0 18° ⊖38° 75°	0 4.1 ⊖8.1 14
G12 1NO+2NC	0 1.4 ⊖2.9 5 / 3.1	0 2 ⊖4.1 7 / 4.5	0 3.3 ⊖7 11 / 7.3	/	0 18° ⊖38° 75° / 41°	0 4.1 ⊖8.1 14 / 9.5
G22 2NO+2NC	0 1.4 ⊖2.9 5 / 3.1	0 2 ⊖4.1 7 / 4.5	0 3.3 ⊖7 11 / 7.3	/	0 18° ⊖38° 75° / 41°	0 4.1 ⊖8.1 14 / 9.5
H11 1NO+1NC	0 1.4 ⊖2.9 5 / 1	0 2 ⊖4.1 7 / 1.4	0 3.3 ⊖7 11 / 2.3	0 12° / 7°	0 18° ⊖38° 75° / 10°	0 4.4 ⊖8.1 14 / 2.8
H12 1NO+2NC	0 1.4 ⊖2.9 5 / 1	0 2 ⊖4.1 7 / 1.4	0 3.3 ⊖7 11 / 2.3	0 12° / 7°	0 18° ⊖38° 75° / 10°	0 4.4 ⊖8.1 14 / 2.8
H22 2NO+2NC	0 1.4 ⊖2.9 5 / 1	0 2 ⊖4.1 7 / 1.4	0 3.3 ⊖7 11 / 2.3	0 12° / 7°	0 18° ⊖38° 75° / 10°	0 4.4 ⊖8.1 14 / 2.8
L11 1NO+1NC	0 1.4 ⊖2.9 5 / 1.8	0 2 ⊖4.1 7 / 2.6	0 3.3 ⊖7 11 / 4.2	0 12° / 15°	0 18° ⊖38° 75° / 23°	0 3.8 ⊖8.1 14 / 5.2
L12 1NO+2NC	0 1.4 ⊖2.9 5 / 1.8	0 2 ⊖4.1 7 / 2.6	0 3.3 ⊖7 11 / 4.2	0 12° / 15°	0 18° ⊖38° 75° / 23°	0 3.8 ⊖8.1 14 / 5.2
L22 2NO+2NC	0 1.4 ⊖2.9 5 / 1.8	0 2 ⊖4.1 7 / 2.6	0 3.3 ⊖7 11 / 4.2	0 12° / 15°	0 18° ⊖38° 75° / 23°	0 3.8 ⊖8.1 14 / 5.2
BA1 1NO+1NC change-over	0 1.5 4⊖ 5 / 0.9	0 2.1 5.6⊖ 7 / 1.5	0 3.5 9.6⊖ 11 / 2.5	0 13° / 8°	0 20° ⊖50° 75° / 11°	0 4.6 11.2⊖ 14 / 3.1

FA series pre-wired switches

Travel diagrams



Contact block	Group 1	Group 2	Group 3	Group 4
41 1NO+1NC (13 21 / 14 22)	0 1.8 5 / 1.1	0 4.2 9.9 / 2.3	0 12° / 4°	0 22° 70° / 8°
45 1NO+1NC (13 21 / 14 22)	0 1.8 ⊖4 5 / 1	0 4.2 ⊖8 9.9 / 2	0 13° / 3°	0 22° ⊖52° 70° / 7°
46 1NO+1NC (13 21 / 14 22)	0 1.3 ⊖2.8 5 / 3.2	0 2.7 ⊖5.6 9.9 / 6.8		0 13° ⊖33° 70° / 43°
48 1NO+1NC (13 21 / 14 22)	0 1.3 ⊖2.8 5 / 1.8	0 2.7 ⊖5.6 9.9 / 4	0° 7° / 12°	0 14° ⊖34° 70° / 22°

Legend

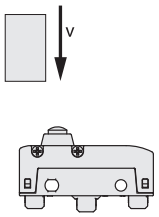
Closed contact | Open contact | ⊖ Positive opening travel acc. to EN 60947-5-1 | ► Switch pressed / ◄ Switch released

MK series microswitches

Maximum and minimum actuation speed

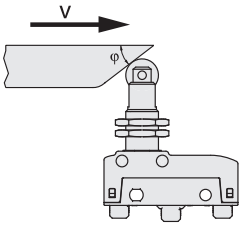
Plunger - Type 1

Vmax (m/s)	Vmin (mm/s)
0,5	0,05



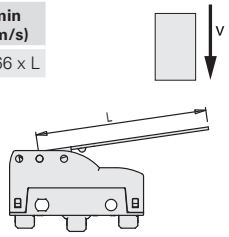
Roller plunger - Type 2

φ	Vmax (m/s)	Vmin (mm/s)
15°	0,6	0,2
30°	0,3	0,1
45°	0,1	0,05



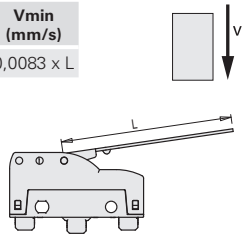
Lever with direct action (D) - Type 3

Vmax (m/s)	Vmin (mm/s)
0,03 x L	0,0166 x L



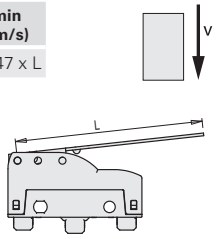
Lever with inverted action (R) - Type 4

Vmax (m/s)	Vmin (mm/s)
0,015 x L	0,0083 x L



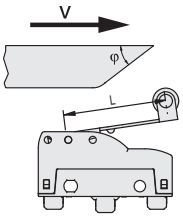
Lever with direct action, rear (F) - Type 5

Vmax (m/s)	Vmin (mm/s)
0,01 x L	0,0047 x L



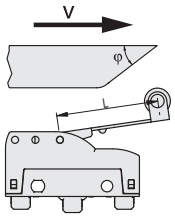
Roller lever with direct action (D) - Type 6

φ	Vmax (m/s)	Vmin (mm/s)
15°	0,1 x L	0,0664 x L
30°	0,05 x L	0,0332 x L
45°	0,03 x L	0,0166 x L



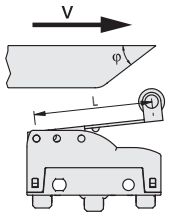
Roller lever with inverted action (R) - Type 7

φ	Vmax (m/s)	Vmin (mm/s)
15°	0,048 x L	0,0332 x L
30°	0,024 x L	0,0166 x L
45°	0,015 x L	0,0083 x L



Roller lever with direct action, rear (F) - Type 8

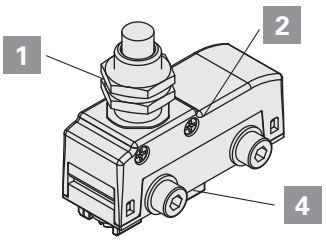
φ	Vmax (m/s)	Vmin (mm/s)
15°	0,032 x L	0,0188 x L
30°	0,016 x L	0,0094 x L
45°	0,01 x L	0,0047 x L

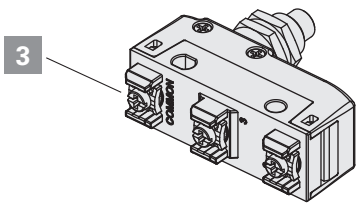


Tightening torques

1	Head nuts	**2 ... 3 Nm**
2	Head screws	**0.3 ... 0.4 Nm**
3	Terminal screws	**0.6 ... 0.8 Nm**
4	M4 fixing screws, body (insert washer)	**0.8 ... 1.2 Nm**

Attention: A tightening torque higher than 1.2 Nm can cause the breaking of the microswitch.



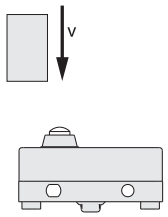


MS-MF series microswitches

Maximum and minimum actuation speed

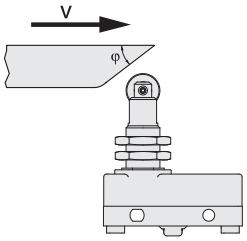
Plunger - Type 1

Vmax (m/s)	Vmin (mm/s)
0,5	0,05



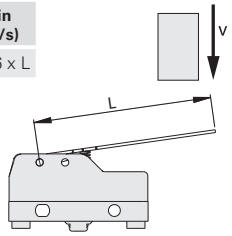
Roller plunger - Type 2

φ	Vmax (m/s)	Vmin (mm/s)
15°	0,6	0,2
30°	0,3	0,1
45°	0,1	0,05



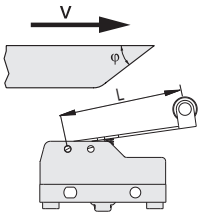
Lever with direct action (D) - Type 3

Vmax (m/s)	Vmin (mm/s)
0,03 x L	0,0166 x L



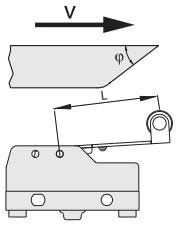
Roller lever with direct action (D) - Type 6

φ	Vmax (m/s)	Vmin (mm/s)
15°	0,1 x L	0,0664 x L
30°	0,05 x L	0,0332 x L
45°	0,03 x L	0,0166 x L



Roller lever with inverted action (R) - Type 7

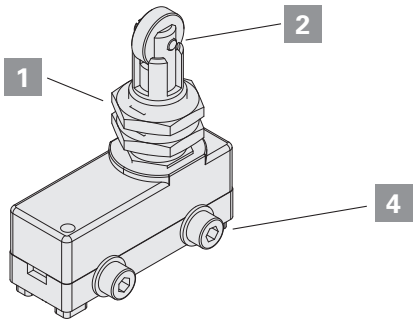
φ	Vmax (m/s)	Vmin (mm/s)
15°	0,048 x L	0,0332 x L
30°	0,024 x L	0,0166 x L
45°	0,015 x L	0,0083 x L

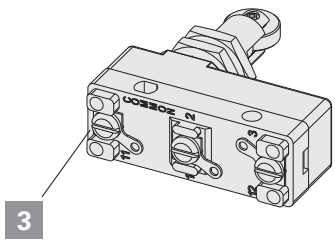


Tightening torques

1	Head nuts	**2 ... 3 Nm**
2	Head screw	**0.3 ... 0.4 Nm**
3	Terminal screws	**0.6 ... 0.8 Nm**
4	M4 fixing screws, body (insert washer)	**0.8 ... 1.2 Nm**

Attention: A tightening torque higher than 1.2 Nm can cause the breaking of the microswitch.





General requirements

The device is designed to be installed on industrial machineries.

The installation must be performed only by qualified staff aware of the regulations in force in the country of installation.

The device must be used exactly as supplied, properly fixed to the machine and wired.

It is not allowed to disassemble the product and use only parts of the same, the device is designed to be used in its assembly as supplied. It is prohibited to modify the device, even slightly e.g.: replace parts of it, drill it, lubricate it, clean it with gasoline or gas oil or any aggressive chemical agents.

The protection degree of the device refers to the electrical contacts only. Carefully evaluate all the polluting agents present in the application before installing the device, since the IP protection degree refers exclusively to agents such as dust and water according to EN 60529. Thus the device may not be suitable for installation in environments with dust in high quantity, condensation, humidity, steam, corrosive and chemical agents, flammable or explosive gas, flammable or explosive dust or other polluting agents.

Some devices are provided with a housing with openings for connecting the electrical cables. To guarantee an adequate protection degree of the device, the opening that the wiring passes through must be protected against the penetration of harmful materials by means of an appropriate seal. Proper wiring therefore requires the use of cable glands, connectors or other devices with IP protection degree that is equal to or greater than that of the device.

Store the products in their original packaging, in a dry place with temperature between -40° C and +70°C

Failure to comply with these requirements or incorrect use during operation can lead to the damage of the device and the loss of the function performed by the device itself. This will result in termination of the warranty on the item and will release the manufacturer from any liability.

Using the devices

- Before use, check if the national rules provide for further requirements in addition to those given here.
- Before installation, make sure the device is not damaged in any part.
- All devices are designed for actuation by moving parts of industrial machines.
- Do not use the device as mechanical stop of the actuator.
- Do not apply excessive force to the device once it has reached the end of its actuation travel.
- Do not exceed the maximum actuation travel.
- Avoid contact of the device with corrosive fluids.
- Do not stress the device with bending and torsion.
- Do not disassemble or try to repair the device, in case of defect or fault replace the entire device.
- In case the device is deformed or damaged it must be entirely replaced. Correct operation cannot be guaranteed when the device is deformed or damaged.
- Always attach the following instructions to the manual of the machine in which the device is installed.
- If specific operating instructions exist for a device (supplied or downloadable from www.pizzato.com), they must always be included with the machine manual and be available for the entire service life of the machine.
- These operating instructions must be kept available for consultation at any time and for the whole period of use of the device.

Wiring and installation

- Installation must be carried out by qualified staff only.
- Use of the device is limited to function as a control switch.
- Observe minimum distances between devices (if provided).
- Comply with the tightening torques indicated in this catalogue.
- Keep the electrical load below the value specified by the respective utilization category.
- Disconnect the power before to work on the contacts, also during the wiring.
- Do not paint or varnish the devices.
- Install the product on flat and clean surfaces only.
- Do not bend or deform the device during installation.
- Never use the device as support for other machine components (cable ducts, tubes, etc.)
- For installation on the machine, use the intended bore holes in the housing. The device must be fixed with screws of adequate length and resistance to the expected stress. At least two screws (fitted to holes most suitable for the intended use) are required to fix the housing to the machine.
- After and during installation, do not pull the electrical cables connected to the device. If excessive tension is applied to the cables (that is not supported by an appropriate cable gland), the contact block of the device may be damaged.
- Provided that the device has an electrical connector, always switch off the circuit voltage before disconnecting the connector from the switch. The connector is not suitable for separation of electrical loads.
- During wiring comply with the following requirements:
  - for terminals (if present), comply with the minimum and maximum cross-sections of the conductors;
  - tighten the electrical terminals (if present) with the torque indicated in this catalogue;
  - do not introduce polluting agents into the device as: talc, lubricants for cable sliding, powder separating agents for multipolar cables, small strands of copper and other pollutants that could affect the proper functioning of the device;
  - before closing the device cover (if present) verify the correct positioning of the gaskets;
  - verify that the electrical cables, wire-end sleeves, cable numbering systems and any other parts do not obstruct the cover from closing correctly or if pressed between them do not damage or compress the internal contact block;
  - for devices with integrated cable, the free end of the cable must be properly connected inside a protected housing. The electrical cable must be properly protected from cuts, impacts, abrasion, etc After installation and before commissioning of the machine, verify:
  - the correct operation of the device and all its parts;
  - the correct wiring and tightening of all screws;
  - the actuating travel of the actuator must be shorter than the maximum travel allowed by the device.
- After installation, periodically check for correct device operation.

Do not use in following environments:

- Environments where dust and dirt can cover the device and by sedimentation stop its correct working.
- Environment where sudden temperature changes cause condensation.
- Environments where coatings of ice may form on the device.
- Environments where the application causes knocks or vibra-

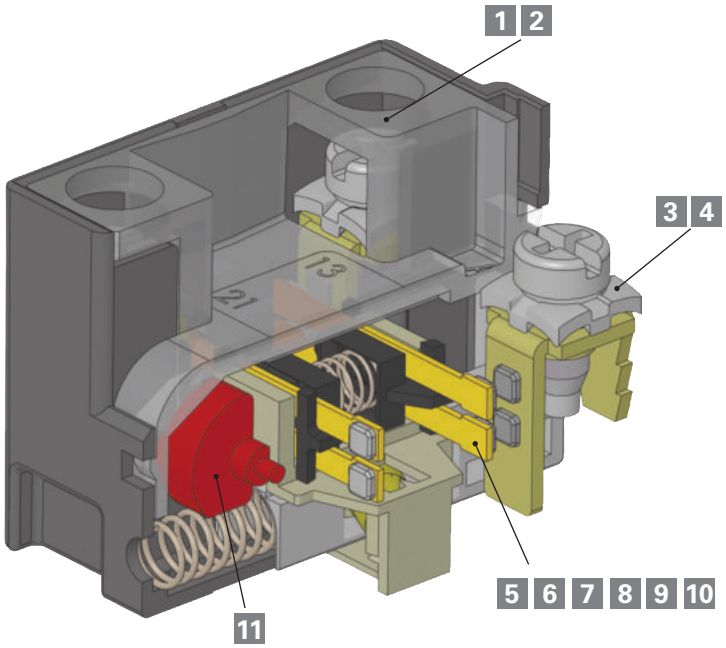
tions that could damage the device.
- Environment with presence of explosive or flammable gas or dust. The current limit does not apply to devices declared compliant with directive ATEX 2014/34/EU.

Limits of use
- Use the devices following the instructions, complying with their operation limits and the standards in force.
- The devices have specific application limits (min. and max. ambient temperature, mechanical endurance, protection degree, utilisation category, etc.) These limits are met by the different devices only if considered individually and not if combined with each other. For further information contact our technical department.
- The utilization implies knowledge of and compliance with following standards: EN 60204-1, EN 60947-5-1, ISO 12100, EN ISO 14119.
- Please contact our technical department for information and assistance (phone +39.0424.470.930 / fax +39.0424.470.955 / e-mail tech@pizzato.com) in the following cases:
- Cases not mentioned in the present utilization requirements.
- In nuclear power stations, trains, airplanes, cars, incinerators, medical devices or any application where the safety of two or more persons depend on the correct operation of the device.

Additional requirements for safety applications
- Provided that all previous requirements for the devices are fulfilled, for installations with operator protection function additional requirements must be observed.
- The utilization implies knowledge of and compliance with following standards: IEC 60204-1, IEC 60947-5-1, ISO 12100, EN ISO 14119, EN 62061, EN ISO 13849-1, EN ISO 13850.
- The protection fuse (or equivalent device) must be always connected in series with the NC contacts of the safety circuit.
- Periodically verify the correct working of the safety devices; the periodicity of this verification is settled by the machine manufacturer based on the machine danger degree and it does not have to be less than one a year.
- After installation and before commissioning of the machine, verify:
  - the correct operation of the device and all its parts;
  - the correct wiring and tightening of all screws;
  - the actuating travel of the actuator must be shorter than the maximum travel allowed by the device;
  - the actuating travel of the actuator must be greater than the positive opening travel;
  - the actuation system must be able to exert a force that is greater than the positive opening force.
- Devices with a safety function have a limited service life. Although still functioning, after 20 years from the date of manufacture the device must be replaced completely.
- The production date can be derived from the production batch on the item. Example: A18 FD7-411. The batch's first letter refers to the month of manufacture (A=January, B=February, etc.) The second and third letters refer to the year of manufacture (18 =2018, 19=2019, etc…)

Features

The contact blocks developed by Pizzato Elettrica are the result of more than 30 years of development experience and millions of sold switches. The range of available contact blocks is one of the most extensive in the world in the sector of position switches.
This chapter introduces to some features of Pizzato Elettrica contact blocks, in order to give the final user a better understanding of the technologies behind that element simply named "contact".
We underline that contact blocks are not available for sale (to the public) separately from switches, both because some of them are mechanically connected to the switch and because some technical features may change in accordance with the switch and its function. The following data is only intended to serve as an aid for the initial selection of the contact block. It is not to be used for determining the characteristics of the switch that uses this contact block. For example, the use of a contact block with positive opening with a switch with flexible actuator results in the combination of the two devices not having positive opening.
In this chapter, the properties of the E1 electronic contact block are explained in detail. It is used with position switches with multiple monitoring tasks that would require extensive effort to realize with electronic sensors. There is no other electronic sensor on the market that can match this contact unit with respect to precision and repeatability, adjustment of the switching point, operating temperature and price.



Description

1 Captive screws

2 Finger protection

3 Clamping screw plates for cables with various diameters

4 Self-lifting clamping screw plates

5 Material of the contacts: Silver alloy or gold-plated silver alloy

6 Contact technology and reliability: Single bridge, double bridge

7 Operating voltages and currents for reliable switching

Description

8 Classification of the contact design acc. to EN 60947-5-1: X, Y, C, Za, Zb

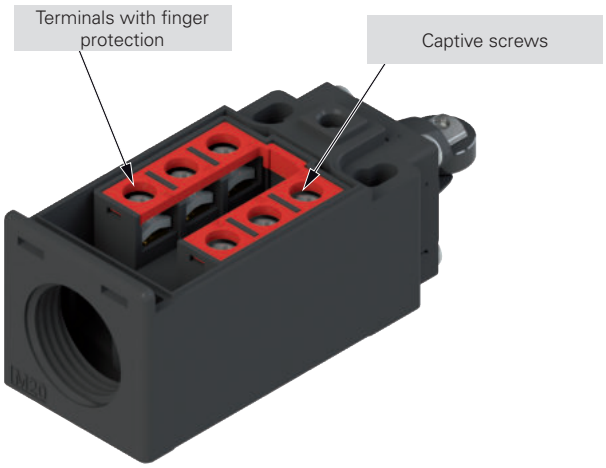
9 Contact type: Slow action / snap action / snap action with constant pressure

10 Force on contacts

11 Positive opening of contacts

1 Captive screws

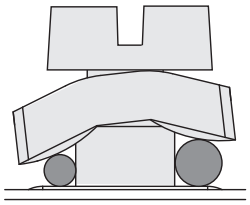
Switches with this characteristic have clamping screws that remain in place even if completely unscrewed. This feature reduces wiring time, since the operator does not have to be careful not to unscrew the screws completely and does not risk to lose them by mistake, which is very useful in case of wirings in uncomfortable position



2 Finger protection

All terminals in the contact blocks have protection degree IP20 in accordance with EN 60529, they are therefore protected against access to dangerous parts with a diameter greater than 12 mm.

3 Clamping screw plates for cables with various diameters



The clamping screw plates are provided with a particular "roofing tile" structure and are loosely coupled to the clamping screw. The design causes connection wires of different diameter to be pulled towards the screw when tightening the screw (see figure), preventing the wires from escaping towards the outside.

4 Self-lifting clamping screw plates

Switches with this feature are equipped with clamping screw plates that move up or down by turning the clamping screw; wiring is easier and faster as a result.

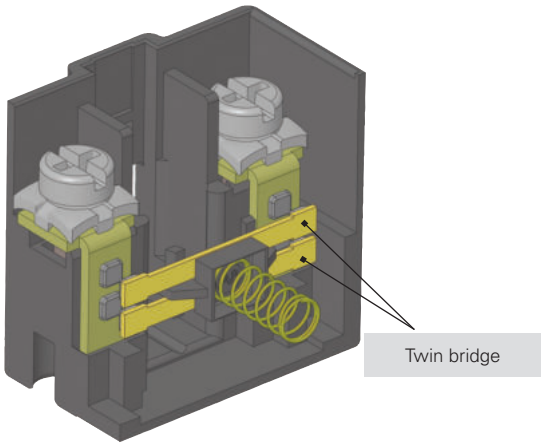
5 Contact material: gold-plated silver alloy

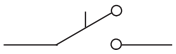
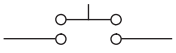
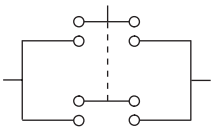
The contact blocks can be supplied with silver electric contacts with a special gold-plated surface, with total gold thickness of one micron. This type of treatment can be useful in environments which are aggressive against silver (very humid or sulphurous atmospheres) and in case of very small electric loads, usually with low voltages and supply currents. This thickness of the gold coating permits several million switching cycles.

6 Contact technology and reliability

Very rarely, an electric contact does not function. A failed switching operation is a typical consequence of an exceptionally high contact resistance caused by dust, a thin layer of oxidation or other impurities that could penetrate the switch during wiring. Thus, the repeated occurrence of faulty switching depends not only on the sensor type, but also on its environmental conditions and the load that the switch drives. These effects are more evident with low electrical loads if the electric voltage cannot penetrate the thin layers of oxide or small grains of dust.
This type of malfunction can normally be tolerated with hand-operated devices, because repeating the operation is enough to restore the function. This is not the case with position switches, as severe machine damage could result if the end position is not ascertained.
In the following table we refer to two typical contact structures (type A and B) normally used in the industry and the ones which have been used by Pizzato Elettrica for several years in most switches: movable contacts with double interruption and twin bridge (type C).
As you can see from the table below, the last structure (type C) has the same contact resistance (**R**) as the simple mobile contact (type A), but with a lower failure probability (**fe**).
With a failure probability of **x** for a single switching operation, the failure probability for type A is **fe=x**, for type B **fe 2·x**, whereas for type C it is **fe 4·x²**
This means that if the probability of a switching failure is x in a given situation, e.g., $1x10^{-4}$, (1 switching failure in 10,000), the result is as follows:

- for type A one failed commutation every 10,000.
- for type B one failed commutation every 5,000.
- for type C one failed commutation every 25,000,000.



Type	Diagram	Description	Contact resistance R	Probability of errors fe
A		simple mobile contact	R=Rc	fe=x
B		mobile contact with double interruption	R=2·Rc	$fe=2x-x^2$
C		mobile contact with double interruption and twin bridge	R= 2·Rc=Rc 2	$fe=4x^2-4x^3+x^4$

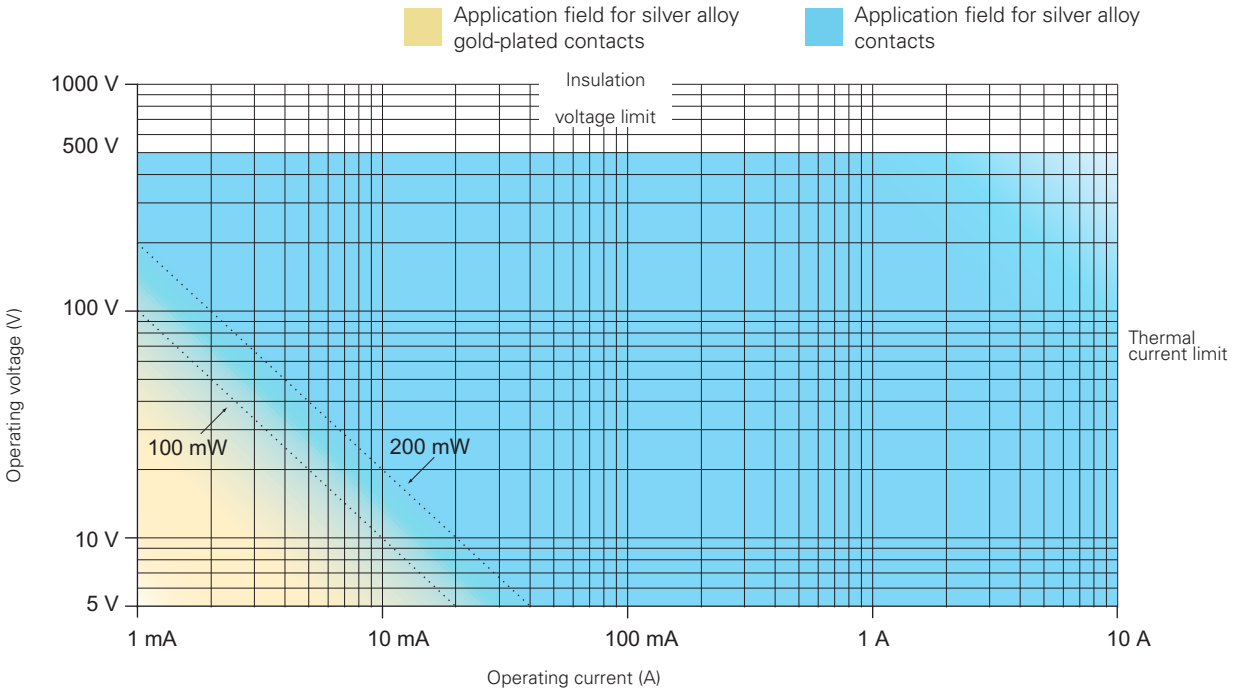
7 Minimum operating voltages and currents for reliable switching

The reliability of an electric contact depends on several factors, whose influence varies depending on the type of load. For high power loads is necessary for the contact to be able to dissipate the heat generated during switching. For low power loads, instead, it is important that it oxides and other impurities do not obstruct the passing of the electric signal. As a result, the material chosen for the electric contacts is a compromise among different and sometimes contrasting needs. In position switches contacts are usually made of a silver that has proved to be suitable for the switching of loads in the range of approximately 1 kW to 0.1 W. However, at lower loads, the effects of the oxide, which silver naturally develops upon contact with air, may occur; additionally to be taken into account are possible contaminations or impurities in the contact switching chamber (for example the talc powder in the cable sheaths that an installer could accidentally insert in the switch may have a similar effect).

It is impossible to define a fix threshold above which the "missing switching phenomenon" does not appear, because there are a lot of mechanical end electric parameters that influence this value. For example, in laboratory environment a good twin bridge electric contact is able to switch loads in the µW range for dozens of millions of handling operations, without losing signals. However, this does not mean that the same contact will have the same performance when the switch operates in environments with sudden changes of temperature (condensation) or where few switching occur (oxidation).

In order to avoid this kind of problem, gold plated contacts are used for very low loads profiting from the non-oxidability of this material. The gold-plating layer should be thick enough to be mechanically resistant to switching as well as electrically resistant to possible sparks that may vaporize it. For this reason Pizzato Elettrica uses micron thickness gold plating suitable for millions of working cycles. Thinner gold plating layers have often a purely aesthetic function and are only suitable to protect the product against oxidation during long time storage.

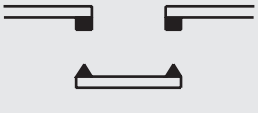
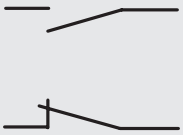
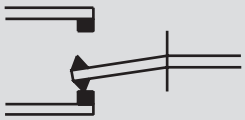
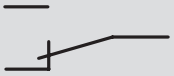
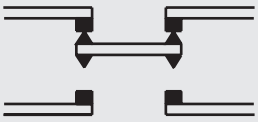
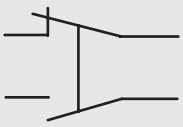
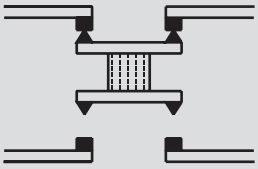
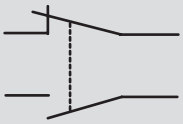
The minimum current and voltage values recommended by Pizzato Elettrica are shown in the diagram below, that is divided into two areas defined by a steady power limit. These values identify voltage and current combinations with high commutation reliability in most industrial fields. The lower voltage and current limits shown in the diagram are typical minimum values for industrial applications. They may also be reduced in non typical conditions. It is recommended, however, to always evaluate that the signal power to be switched is at least one magnitude order higher than the noise produced in the electric circuit, in particular when circuit cables are long and pass through areas with high electromagnetic fields and especially for powers lower than 10 mW.



100 mW Suggested limit for general applications with snap action contact blocks with silver alloy contacts.

200 mW Recommended limit for general applications with slow action contact blocks with silver alloy contacts.

8 Classification of the contact block acc. to the EN 60947-5-1

Design	Figure	Symbol	Description
X Y			Double interruption contact element with two terminals
C			Change-over contact element with single interruption and three terminals
Za			Change-over contact element with double interruption and four terminals. **The contacts have identical polarity**
Zb			Change-over contact element with double interruption and four terminals. **Mobile contacts are electrically separated**

Electrically separated contacts

The "**+**" symbol between two designs (e.g., X+X, Za+Za, X+X+Y, etc.) represents the combination of simple, **electrically separated** contact blocks.

The electrically separated contacts allow different voltages to be applied between the contacts and loads to be connected to different polarities (figure 1).

Requirements and restrictions for Za contacts

Electrical loads must be connected to the same phase or polarity. The contacts **are not** electrically separated. As a result, different voltages may not be applied to the NC and NO contacts (figures 2 and 3).

According to EN 60947-5-1 section K.7.1.4.6.1., the following restrictions apply for positive opening contacts of design Za when used for safety applications.

When the control switch has form C or form Za change-over contact elements, **only one contact element shall be used** (make or break).

In the case of form Zb change-over contact elements, both contacts may be used.

Contact design Zb

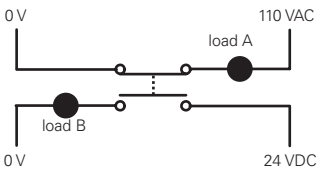


figure 1: **correct**

Contact design Za

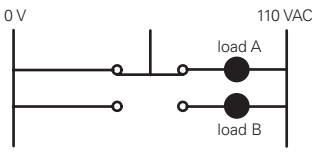


figure 2: **correct**

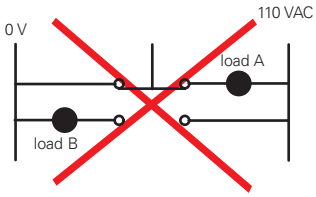
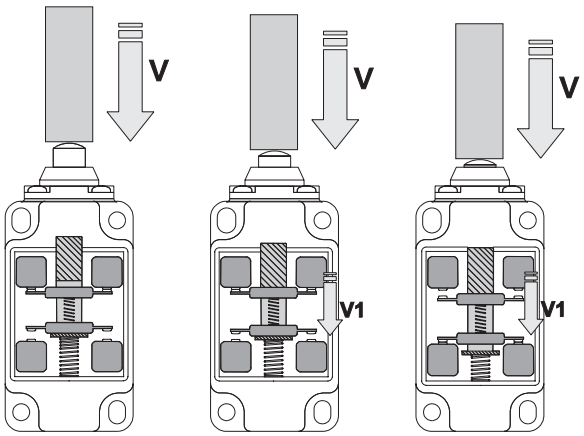


figure 3: **incorrect**

9 Contact blocks with different operating principle: slow action and snap action

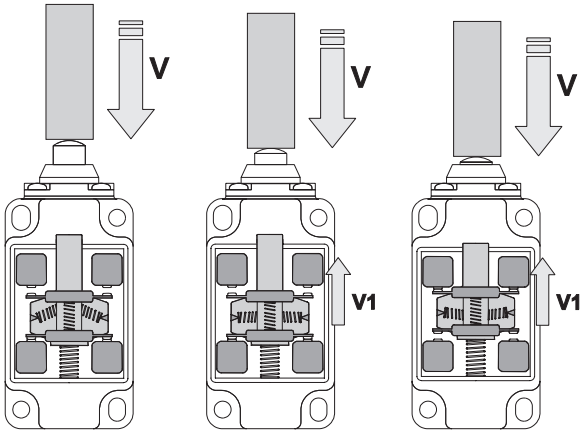
Contact blocks with slow action: component where the speed of the contact movement (**V1**) depends on the speed of the switch actuation (**V**). The contact carrier moves at a rate proportional to the actuation speed.
The slow action contact block is suitable for applications having low to medium currents and quick actuation movements. It has no differential travel.

$$V = V1$$



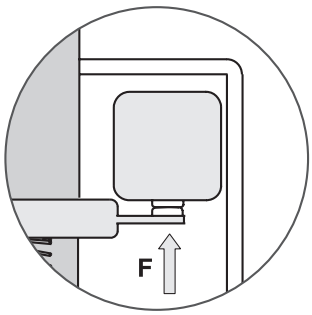
Contact block with snap action: component where the speed of the contact movement (**V1**) doesn't depend on the speed of the switch actuation (**V**). Upon reaching a predetermined point in the actuation travel, the contact carrier triggers and switches the contacts.
The snap action contact block is suitable for applications having high currents and/or slow actuation movements. This kind of contact block has a differential travel.

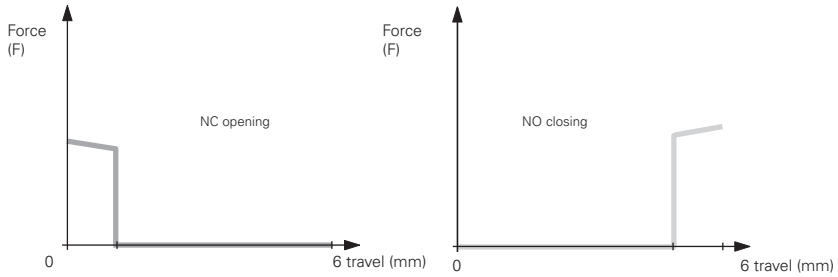
$$V \neq V1$$



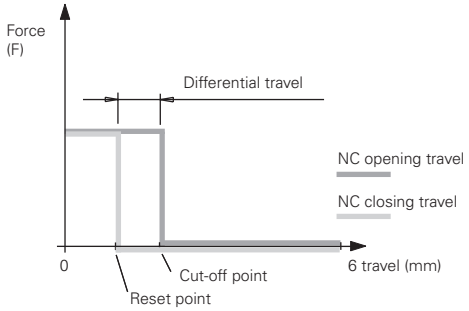
10 Contact blocks: diagrams of the force on the contacts

The following diagrams show the relationship between of the force exerted on the contacts (F) and the actuation travel to the end position.

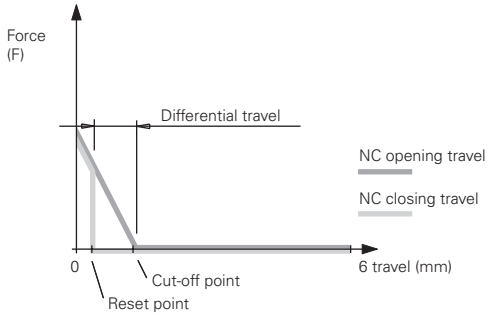




Contact block with slow action



Contact block with snap action and constant pressure: 5, 11, 12.
The pressure on the contacts remains constant as the switching point is approached



Contact block with snap action: 2, 3, 17
The pressure on the contacts decreases as the switching point is approached

Contact blocks of the FD-FP-FL-FC-FR-FM-FX-FZ-FK-FW-FS series

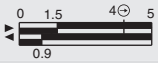
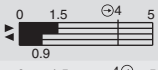
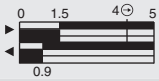
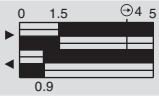
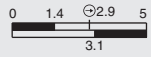
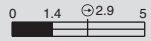
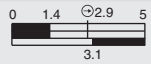
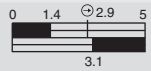
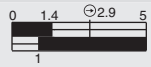
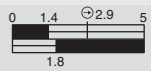
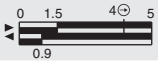
Contact block		Contact diagram	Linear travel diagram	Contact design	Operation type	Positive opening ⊖	Contact type	Wire cross-section min.	Wire cross-section max.	Wire stripping length	Captive screws	Terminals with finger protection	Gold-plated contacts
2	2x (1NO-1NC)	13 21 43 31 / 14 22 44 32	2x 0 1.3 6 / 0.7	Za+Za	snap action	no	Double interruption	1 x 0.5 mm² 1 x AWG 20	2 x 1.5 mm² 2 x AWG 16	6 mm	no	no	G
3	1NO-1NC	13 21 / 14 22	0 1.3 6 / 0.8	Za	snap action	no	Double interruption	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	6 mm	no	no	G
5	1NO+1NC	13 21 / 14 22	0 2.2 ⊖4 6 / 1.1	Zb	snap action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
6	1NO+1NC	11 23 / 12 24	0 1.5 ⊖3 6 / 3.1	Zb	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
7	1NO+1NC	11 23 / 12 24	0 3.1 ⊖4.6 6 / 1.6	Zb	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
8	1NC	11 21 / 12 22	0 1 4 ⊖8 8.5 / S 6.3	Y	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
9	2NC	11 21 / 12 22	0 2.9 ⊖4.4 6	Y+Y	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
10	2NO	13 23 / 14 24	0 1.4 6	X+X	slow action	no	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
11	2NC	11 21 / 12 22	0 2 ⊖4 6 / 0.6	Y+Y	snap action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
12	2NO	13 23 / 14 24	0 2.9 6 / 1.5	X+X	snap action	no	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
13	2NC	11 21 / 12 22	0 0.8 ⊖2.3 6 / 3 ⊖4.5	Y+Y	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
14	2NC	11 21 / 12 22	0 1.4 ⊖2.9 6 / 3 ⊖4.5	Y+Y	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
15	2NO	13 23 / 14 24	0 1.4 6 / 3	X+X	slow action	no	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
16	2NC	11 23 / 12 24	75° 0 28° ⊖48° / 48° ⊖ 28° 75°	Y+Y	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
18	1NO+1NC	11 23 / 12 24	0 1.5 ⊖3 6 / 2	Zb	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
20	1NO+2NC	11 21 33 / 12 22 34	0 1.5 ⊖3 6 / 2	Y+Y+X	slow action	yes	Double interruption, twin bridge	1 x 0.34 mm² 1 x AWG 22	2 x 1.5 mm² 2 x AWG 16	7 mm	yes	yes	G
21	3NC	11 21 31 / 12 22 32	0 1.5 ⊖3 6	Y+Y+Y	slow action	yes	Double interruption, twin bridge	1 x 0.34 mm² 1 x AWG 22	2 x 1.5 mm² 2 x AWG 16	7 mm	yes	yes	G
22	2NO+1NC	11 23 33 / 12 24 34	0 1.5 ⊖3 6 / 2	Y+X+X	slow action	yes	Double interruption, twin bridge	1 x 0.34 mm² 1 x AWG 22	2 x 1.5 mm² 2 x AWG 16	7 mm	yes	yes	G
28	1NO+2NC	11 21 33 / 12 22 34	0 1.5 ⊖3 4.5 6 / 2 ⊖5.5	Y+Y+X	slow action	yes	Double interruption, twin bridge	1 x 0.34 mm² 1 x AWG 22	2 x 1.5 mm² 2 x AWG 16	7 mm	yes	yes	G
29	3NC	11 21 31 / 12 22 32	0 1.5 ⊖3 6 / 4.5 ⊖5.5	Y+Y+Y	slow action	yes	Double interruption, twin bridge	1 x 0.34 mm² 1 x AWG 22	2 x 1.5 mm² 2 x AWG 16	7 mm	yes	yes	G
30	3NC	11 23 33 / 12 24 34	0 1.5 ⊖3 6 / 4.5 ⊖5.5	Y+Y+Y	slow action	yes	Double interruption, twin bridge	1 x 0.34 mm² 1 x AWG 22	2 x 1.5 mm² 2 x AWG 16	7 mm	yes	yes	G
33	1NO+1NC	13 21 / 14 22	0 1.5 ⊖3 6 / 2	Zb	slow action	yes	Double interruption, twin bridge	1 x 0.34 mm² 1 x AWG 22	2 x 1.5 mm² 2 x AWG 16	7 mm	yes	yes	G
34	2NC	11 21 / 12 22	0 1.5 ⊖3 6	Y+Y	slow action	yes	Double interruption, twin bridge	1 x 0.34 mm² 1 x AWG 22	2 x 1.5 mm² 2 x AWG 16	7 mm	yes	yes	G
37	1NO+1NC	11 23 / 12 24	0 3.4 ⊖4.9 / 1.5 6	Zb	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
66	1NC	11 / 12	0 1.4 ⊖2.9 6	Y	slow action	yes	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
67	1NO	13 / 14	0 1.4 6	X	slow action	no	Double interruption, twin bridge	1 x 0.5 mm² 1 x AWG 20	2 x 2.5 mm² 2 x AWG 14	8 mm	yes	yes	G / G1
E1	1NO-1NC		0 x 6	PNP	electronic	no	Electronic	1 x 0.5 mm² 1 x AWG 20	1 x 1.5 mm² 1 x AWG 16	7 mm	no	no	/

Legend: G = gold-plated contacts 1 µm, G1 = gold-plated contacts 2.5 µm

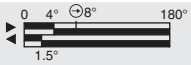
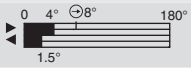
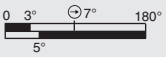
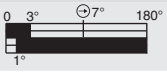
Contact blocks - FG series

Contact block	Contact diagram	Linear travel diagram	Contact design	Operation type	Positive opening ⊖	Contact type	Wire cross-section min.	Wire cross-section max.	Wire stripping length	Captive screws	Terminals with finger protection	Gold-plated contacts
60•	Contact block with 4 poles and multiple contact designs. See page 107, General Catalogue Safety 2019-2020			Slow action	yes	Double interruption, twin bridge and double contact point	1 x 0.34 mm² 1 x AWG 22	2 x 1.5 mm² 2 x AWG 16	7 mm	yes	yes	G

Contact blocks - NA-NB-NF series

Contact block		Contact diagram	Linear travel diagram	Contact design	Operation type	Positive opening ⊖	Contact type	Captive screws	Terminals with finger protection	Gold-plated contacts
B11	1NO+1NC			Zb	snap action	yes	Double interruption	/	/	G
B02	2NC			Y+Y	snap action	yes	Double interruption	/	/	G
B12	1NO+2NC			X+Y+Y	snap action	yes	Double interruption	/	/	G
B22	2NO+2NC			X+X+Y+Y	snap action	yes	Double interruption	/	/	G
G11	1NO+1NC			Zb	slow action	yes	Double interruption	/	/	G
G02	2NC			Y+Y	slow action	yes	Double interruption	/	/	G
G12	1NO+2NC			X+Y+Y	slow action	yes	Double interruption	/	/	G
G22	2NO+2NC			X+X+Y+Y	slow action	yes	Double interruption	/	/	G
H11	1NO+1NC			Zb	slow action	yes	Double interruption	/	/	G
H12	1NO+2NC			X+Y+Y	slow action	yes	Double interruption	/	/	G
H22	2NO+2NC			X+X+Y+Y	slow action	yes	Double interruption	/	/	G
L11	1NO+1NC			Zb	slow action	yes	Double interruption	/	/	G
L12	1NO+2NC			X+Y+Y	slow action	yes	Double interruption	/	/	G
L22	2NO+2NC			X+X+Y+Y	slow action	yes	Double interruption	/	/	G
BA1	1NO+1NC change-over			C	snap action	yes	Double interruption	/	/	G

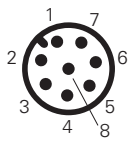
Contact blocks - HP series

Contact block		Contact diagram	Linear travel diagram	Contact design	Operation type	Positive opening ⊖	Contact type	Captive screws	Terminals with finger protection	Gold-plated contacts
50C	1NO+1NC			Zb	snap action	yes	Double interruption	/	/	G
50D	2NC			Y+Y	snap action	yes	Double interruption	/	/	G
50F	1NO+2NC			X+Y+Y	snap action	yes	Double interruption	/	/	G
50M	2NO+2NC			X+X+Y+Y	snap action	yes	Double interruption	/	/	G
52C	1NO+1NC			Zb	slow action	yes	Double interruption	/	/	G
52D	2NC			Y+Y	slow action	yes	Double interruption	/	/	G
52F	1NO+2NC			X+Y+Y	slow action	yes	Double interruption	/	/	G
52M	2NO+2NC			X+X+Y+Y	slow action	yes	Double interruption	/	/	G
53C	1NO+1NC			Zb	slow action	yes	Double interruption	/	/	G
53F	1NO+2NC			X+Y+Y	slow action	yes	Double interruption	/	/	G
53M	2NO+2NC			X+X+Y+Y	slow action	yes	Double interruption	/	/	G

Wiring diagram for assembled connectors

For FD - FL - FM - FZ - FC series with metal housing

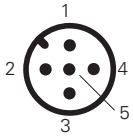
Contact block 2 2x(1NO-1NC)



M12 connector, 8-pole

Contacts	Pin no.
NO	3-4
NC	5-6
NC	7-8
NO	1-2

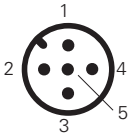
Contact block 5 1NO+1NC



M12 connector, 5-pole

Contacts	Pin no.
NC	1-2
NO	3-4
ground	5

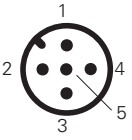
Contact block 6 1NO+1NC



M12 connector, 5-pole

Contacts	Pin no.
NC	1-2
NO	3-4
ground	5

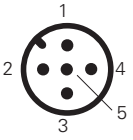
Contact block 7 1NO+1NC



M12 connector, 5-pole

Contacts	Pin no.
NC	1-2
NO	3-4
ground	5

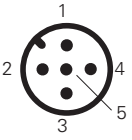
Contact block 9 2NC



M12 connector, 5-pole

Contacts	Pin no.
NC	1-2
NC	3-4
ground	5

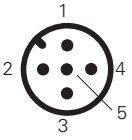
Contact block 10 2NO



M12 connector, 5-pole

Contacts	Pin no.
NO	1-2
NO	3-4
ground	5

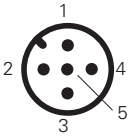
Contact block 11 2NC



M12 connector, 5-pole

Contacts	Pin no.
NC	1-2
NC	3-4
ground	5

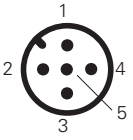
Contact block 12 2NO



M12 connector, 5-pole

Contacts	Pin no.
NO	1-2
NO	3-4
ground	5

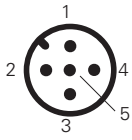
Contact block 13 2NC



M12 connector, 5-pole

Contacts	Pin no.
NC (1°)	1-2
NC (2°)	3-4
ground	5

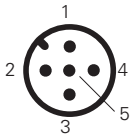
Contact block 14 2NC



M12 connector, 5-pole

Contacts	Pin no.
NC (1°)	1-2
NC (2°)	3-4
ground	5

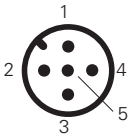
Contact block 15 2NO



M12 connector, 5-pole

Contacts	Pin no.
NO (1°)	1-2
NO (2°)	3-4
ground	5

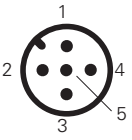
Contact block 16 2NC



M12 connector, 5-pole

Contacts	Pin no.
NC, lever to the right	1-2
NC, lever to the left	3-4
ground	5

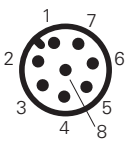
Contact block 18 1NO+1NC



M12 connector, 5-pole

Contacts	Pin no.
NC	1-2
NO	3-4
ground	5

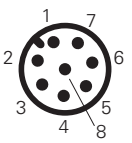
Contact block 20 1NO+2NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NO	7-8
ground	1

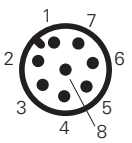
Contact block 21 3NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NC	7-8
ground	1

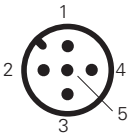
Contact block 22 2NO+1NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NO	5-6
NO	7-8
ground	1

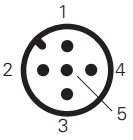
Contact block 33 1NO+1NC



M12 connector, 5-pole

Contacts	Pin no.
NC	1-2
NO	3-4
ground	5

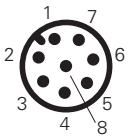
Contact block 34 2NC



M12 connector, 5-pole

Contacts	Pin no.
NC	1-2
NC	3-4
ground	5

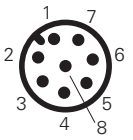
Contact block 28 1NO+2NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NO	7-8
ground	1

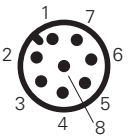
Contact block 29 3NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NC	7-8
ground	1

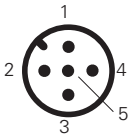
Contact block 30 3NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NC	7-8
ground	1

Contact block E1 PNP

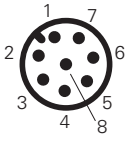


M12 connector, 5-pole

Contacts	Pin no.
+	1
-	3
NC	2
NO	4
ground	5

For FS series with technopolymer housing

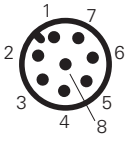
Contact block 18 1NO+1NC



M12 connector, 8-pole

Contacts	Pin no.
A1-A2	1-2
NC	3-4
NO	5-6

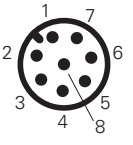
Contact block 20 1NO+2NC



M12 connector, 8-pole

Contacts	Pin no.
A1-A2	1-2
NC	3-4
NC	5-6
NO	7-8

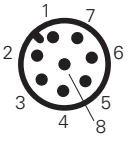
Contact block 21 3NC



M12 connector, 8-pole

Contacts	Pin no.
A1-A2	1-2
NC	3-4
NC	5-6
NC	7-8

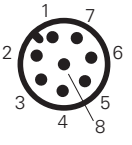
Contact block 28 1NO+2NC



M12 connector, 8-pole

Contacts	Pin no.
A1-A2	1-2
NC	3-4
NC	5-6
NO	7-8

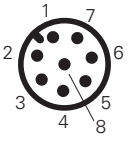
Contact block 29 3NC



M12 connector, 8-pole

Contacts	Pin no.
A1-A2	1-2
NC	3-4
NC	5-6
NC	7-8

Contact block 30 3NC



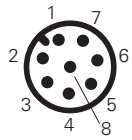
M12 connector, 8-pole

Contacts	Pin no.
A1-A2	1-2
NC	3-4
NC	5-6
NC	7-8

Wiring diagram for assembled connectors

For FP - FR - FX - FW series with technopolymer housing

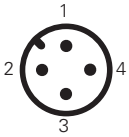
Contact block 2
2x(1NO-1NC)



M12 connector, 8-pole

Contacts	Pin no.
NO	3-4
NC	5-6
NC	7-8
NO	1-2

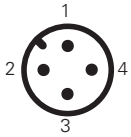
Contact block 5
1NO+1NC



M12 connector, 4-pole

Contacts	Pin no.
NC	1-2
NO	3-4

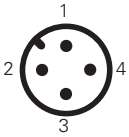
Contact block 6
1NO+1NC



M12 connector, 4-pole

Contacts	Pin no.
NC	1-2
NO	3-4

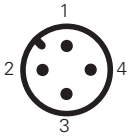
Contact block 7
1NO+1NC



M12 connector, 4-pole

Contacts	Pin no.
NC	1-2
NO	3-4

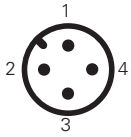
Contact block 9
2NC



M12 connector, 4-pole

Contacts	Pin no.
NC	1-2
NC	3-4

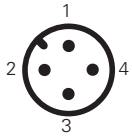
Contact block 10
2NO



M12 connector, 4-pole

Contacts	Pin no.
NO	1-2
NO	3-4

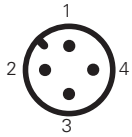
Contact block 11
2NC



M12 connector, 4-pole

Contacts	Pin no.
NC	1-2
NC	3-4

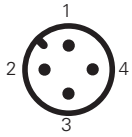
Contact block 12
2NO



M12 connector, 4-pole

Contacts	Pin no.
NO	1-2
NO	3-4

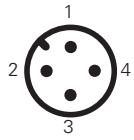
Contact block 13
2NC



M12 connector, 4-pole

Contacts	Pin no.
NC (1°)	1-2
NC (2°)	3-4

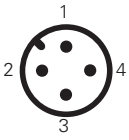
Contact block 14
2NC



M12 connector, 4-pole

Contacts	Pin no.
NC (1°)	1-2
NC (2°)	3-4

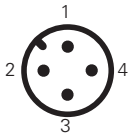
Contact block 15
2NO



M12 connector, 4-pole

Contacts	Pin no.
NO (1°)	1-2
NO (2°)	3-4

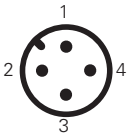
Contact block 16
2NC



M12 connector, 4-pole

Contacts	Pin no.
NC, lever to the right 1-2	
NC, lever to the left 3-4	

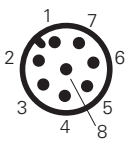
Contact block 18
1NO+1NC



M12 connector, 4-pole

Contacts	Pin no.
NC	1-2
NO	3-4

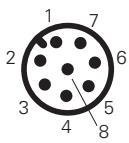
Contact block 20
1NO+2NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NO	7-8

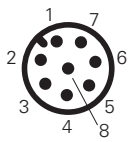
Contact block 21
3NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NC	7-8

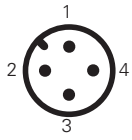
Contact block 22
2NO+1NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NO	5-6
NO	7-8

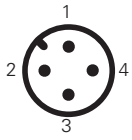
Contact block 33
1NO+1NC



M12 connector, 4-pole

Contacts	Pin no.
NC	1-2
NO	3-4

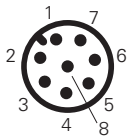
Contact block 34
2NC



M12 connector, 4-pole

Contacts	Pin no.
NC	1-2
NC	3-4

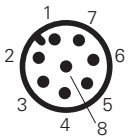
Contact block 28
1NO+2NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NO	7-8

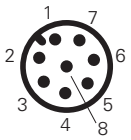
Contact block 29
3NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NC	7-8

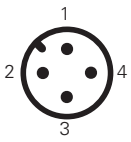
Contact block 30
3NC



M12 connector, 8-pole

Contacts	Pin no.
NC	3-4
NC	5-6
NC	7-8

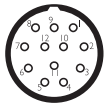
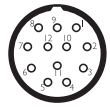
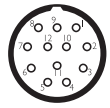
Contact block E1
PNP

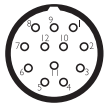
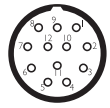
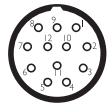


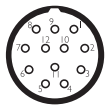
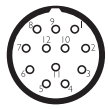
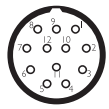
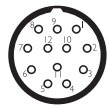
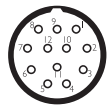
M12 connector, 4-pole

Contacts	Pin no.
+	1
-	3
NC	2
NO	4

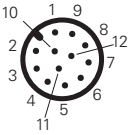
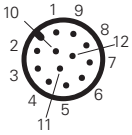
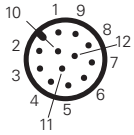
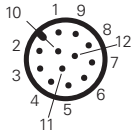
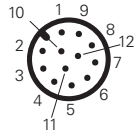
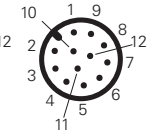
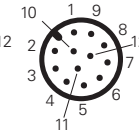
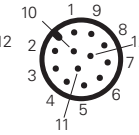
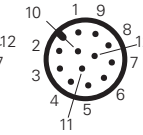
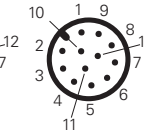
For FG series with metal housing and M23 connector

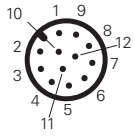
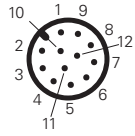
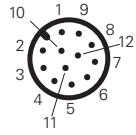
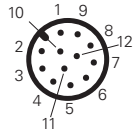
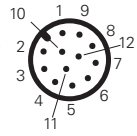
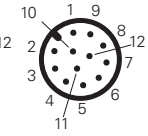
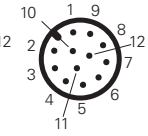
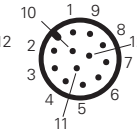
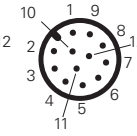
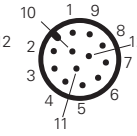
Contact block 60A 2NO+2NC	Contact block 60B 1NO+3NC	Contact block 60C 4NC	Contact block 60D 1NO+3NC	Contact block 60E 1NO+3NC	Contact block 60F 2NO+2NC	Contact block 60G 4NC	Contact block 60H 4NC	Contact block 60I 1NO+3NC	Contact block 60L 2NO+2NC
									
M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole
Contacts **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**
A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2
NC 3-4	NC 3-4	NC 3-4	NO 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4
NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6
NO 7-8	NC 7-8	NC 7-8	NC 7-8	NC 7-8	NO 7-8	NC 7-8	NC 7-8	NC 7-8	NO 7-8
NO 9-10	NO 9-10	NC 9-10	NC 9-10	NO 9-10	NO 9-10	NC 9-10	NC 9-10	NO 9-10	NO 9-10
ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11

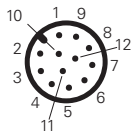
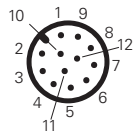
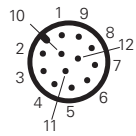
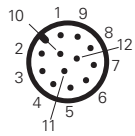
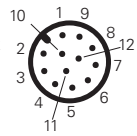
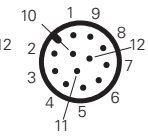
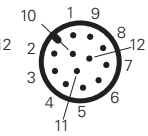
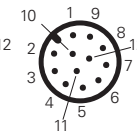
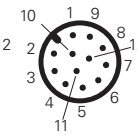
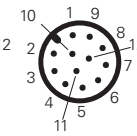
Contact block 60M 3NO+1NC	Contact block 60N 3NO+1NC	Contact block 60P 4NC	Contact block 60R 2NO+2NC	Contact block 60S 2NO+2NC	Contact block 60T 1NO+3NC	Contact block 60U 4NC	Contact block 60V 2NO+2NC	Contact block 60X 1NO+3NC	Contact block 60Y 2NO+2NC
									
M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole
Contacts **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**
A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2
NO 3-4	NO 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NO 3-4	NC 3-4
NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6
NO 7-8	NO 7-8	NC 7-8	NO 7-8	NO 7-8	NC 7-8	NC 7-8	NO 7-8	NC 7-8	NO 7-8
NO 9-10	NO 9-10	NC 9-10	NO 9-10	NO 9-10	NO 9-10	NC 9-10	NO 9-10	NC 9-10	NO 9-10
ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11

Contact block 61A 1NO+3NC	Contact block 61B 2NO+2NC	Contact block 61C 3NO+1NC	Contact block 61D 3NO+1NC	Contact block 61E 3NO+1NC	Contact block 61G 3NO+1NC	Contact block 61H 2NO+2NC	Contact block 61M 3NO+1NC	Contact block 61R 1NO+3NC	Contact block 61S 3NO+1NC
									
M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole	M23 connector, 12-pole
Contacts **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**
A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2
NC 3-4	NC 3-4	NO 3-4	NO 3-4	NO 3-4	NO 3-4	NC 3-4	NO 3-4	NC 3-4	NO 3-4
NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6
NC 7-8	NO 7-8	NO 7-8	NO 7-8	NO 7-8	NO 7-8	NO 7-8	NO 7-8	NC 7-8	NO 7-8
NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10
ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11	ground 11

For FG series with metal housing and M12 connector

Contact block 60A 2NO+2NC	Contact block 60B 1NO+3NC	Contact block 60C 4NC	Contact block 60D 1NO+3NC	Contact block 60E 1NO+3NC	Contact block 60F 2NO+2NC	Contact block 60G 4NC	Contact block 60H 4NC	Contact block 60I 1NO+3NC	Contact block 60L 2NO+2NC
									
M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole
Contacts **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**
A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2
NC 3-4	NC 3-4	NC 3-4	NO 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4
NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6
NO 7-8	NC 7-8	NC 7-8	NC 7-8	NC 7-8	NO 7-8	NC 7-8	NC 7-8	NC 7-8	NO 7-8
NO 9-10	NO 9-10	NC 9-10	NC 9-10	NO 9-10	NO 9-10	NC 9-10	NC 9-10	NO 9-10	NO 9-10

Contact block 60M 3NO+1NC	Contact block 60N 3NO+1NC	Contact block 60P 4NC	Contact block 60R 2NO+2NC	Contact block 60S 2NO+2NC	Contact block 60T 1NO+3NC	Contact block 60U 4NC	Contact block 60V 2NO+2NC	Contact block 60X 1NO+3NC	Contact block 60Y 2NO+2NC
									
M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole
Contacts **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**
A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2
NO 3-4	NO 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NC 3-4	NO 3-4	NC 3-4
NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6
NO 7-8	NO 7-8	NC 7-8	NO 7-8	NO 7-8	NC 7-8	NC 7-8	NO 7-8	NC 7-8	NO 7-8
NO 9-10	NO 9-10	NC 9-10	NC 9-10	NO 9-10	NO 9-10	NC 9-10	NO 9-10	NC 9-10	NO 9-10

Contact block 61A 1NO+3NC	Contact block 61B 2NO+2NC	Contact block 61C 3NO+1NC	Contact block 61D 3NO+1NC	Contact block 61E 3NO+1NC	Contact block 61G 3NO+1NC	Contact block 61H 2NO+2NC	Contact block 61M 3NO+1NC	Contact block 61R 1NO+3NC	Contact block 61S 3NO+1NC
									
M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole	M12 connector, 12-pole
Contacts **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**	**Contacts** **Pin no.**
A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2	A1-A2 1-2
NC 3-4	NC 3-4	NO 3-4	NO 3-4	NO 3-4	NO 3-4	NC 3-4	NO 3-4	NC 3-4	NO 3-4
NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6	NC 5-6
NC 7-8	NO 7-8	NO 7-8	NO 7-8	NO 7-8	NO 7-8	NO 7-8	NO 7-8	NC 7-8	NO 7-8
NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10	NO 9-10

Note: the wires connected to pins 11 and 12 of the M12 connector can be used to activate the LEDs in FG series configurations with freely connectable LEDs.

1- Introduction

The purpose of this section is to provide the machine manufacturer with a quick overview of a number of standards related to machine safety, to clarify some basic terms and to provide some application examples. This brief guide only covers aspects related to the functional safety of the machine, i.e., all measures that must be taken to protect the operating personnel from the hazards arising from the operation of the machine, as well as the project planning and selection of the appropriate interlocking devices for the given guard.
The machine designer himself must identify risks that are posed by other hazards, such as live parts, pressurised containers, explosive atmospheres, etc. These risks are not dealt with in this guideline.
Pizzato Elettrica prepared this document to the best of its knowledge, taking into consideration the standards, interpretations and existing technologies. The examples provided here must always be considered by the end customer with respect to the latest state of technology and standardisation. Pizzato Elettrica accepts no responsibility for the examples provided here and does not exclude the possibility of unintentional errors or inaccuracies.

2 -Design in safety. Structure of the European standards.

To freely market any type of device or machine in the countries of the European Community, they must comply with the provisions of the EU directives. They establish the general principles for ensuring that manufacturers place products on the market that are not hazardous to the operating personnel. The vast range of products pose many different hazards and, over time, has led to the release of various directives. As an example, consider the Low Voltage Directive 2014/35/EU, the Equipment for Explosive Atmospheres (ATEX) Directive 2014/34/EU, the Electromagnetic Compatibility Directive 2014/30/EU, etc. The hazards that arise from the operation of machinery are described in the Machinery Directive 2006/42/EC.
Conformity with the directives is certified by the Declaration of Conformity issued by the manufacturer and by the application of the CE marking on the machine.

For the assessment of risks posed by a machine and for the realisation of the safety systems for protecting the operating personnel from those risks, the European standardisation organisations CEN and CENELEC have issued a series of standards which translate the contents of the directives into technical requirements. The standards published in the Official Journal of the European Union are harmonised. The manufacturer is to verify conformity with the applied and listed standards.

The machine safety standards are divided into three types: A, B and C.
Type A standards: Standards that cover basic concepts and general principles for design in order to achieve safety in the design of machinery.
Type B standards: Standards that deal with one or more safety aspects and are divided into the following standards:
- B1: Standards on particular safety aspects (e.g. safety distances, temperature, noise, etc.)
- B2: Standards on safeguards (e.g. two-hand controls, interlocking devices, guards, etc.)

Type C standards: Standards that deal with detailed safety requirements for a particular group of machines (e.g. hydraulic presses, injection moulding machines, etc.)

The system or machine manufacturer must therefore determine whether the product is covered by a type C standard. If this is the case, this standard specifies the safety requirements; otherwise, the type B standards shall apply for any specific aspect or device of the product. In the absence of specifications, the manufacturer shall follow the general guidelines stated in the type A standards.

TYPE A STANDARDS
For example:

EN ISO 12100. Safety of machinery - General principles for design - Risk assessment and risk reduction.

TYPE B1 STANDARDS
For example:

EN 62061. Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
EN ISO 13849-1 e -2. Safety-related parts of control systems

TYPE B2 STANDARDS
For example:

EN 574. Two-hand control devices
EN ISO 13850. Emergency stop
EN ISO 14119. Interlocking devices associated with guards
EN 60204-1. Electrical equipment of machines
EN 60947-5-1. Electromechanical control circuit devices

TYPE C STANDARDS
For example:

EN 201. Plastics and rubber machines - Injection moulding machines
EN 415-1. Safety of packaging machines
EN 692. Mechanical presses
EN 693. Hydraulic presses
EN 848-1. Safety of wood-working machines – One side moulding machines with rotating tool – Part 1: Single spindle vertical moulding machines

3 - Designing safe machines. Risk analysis.

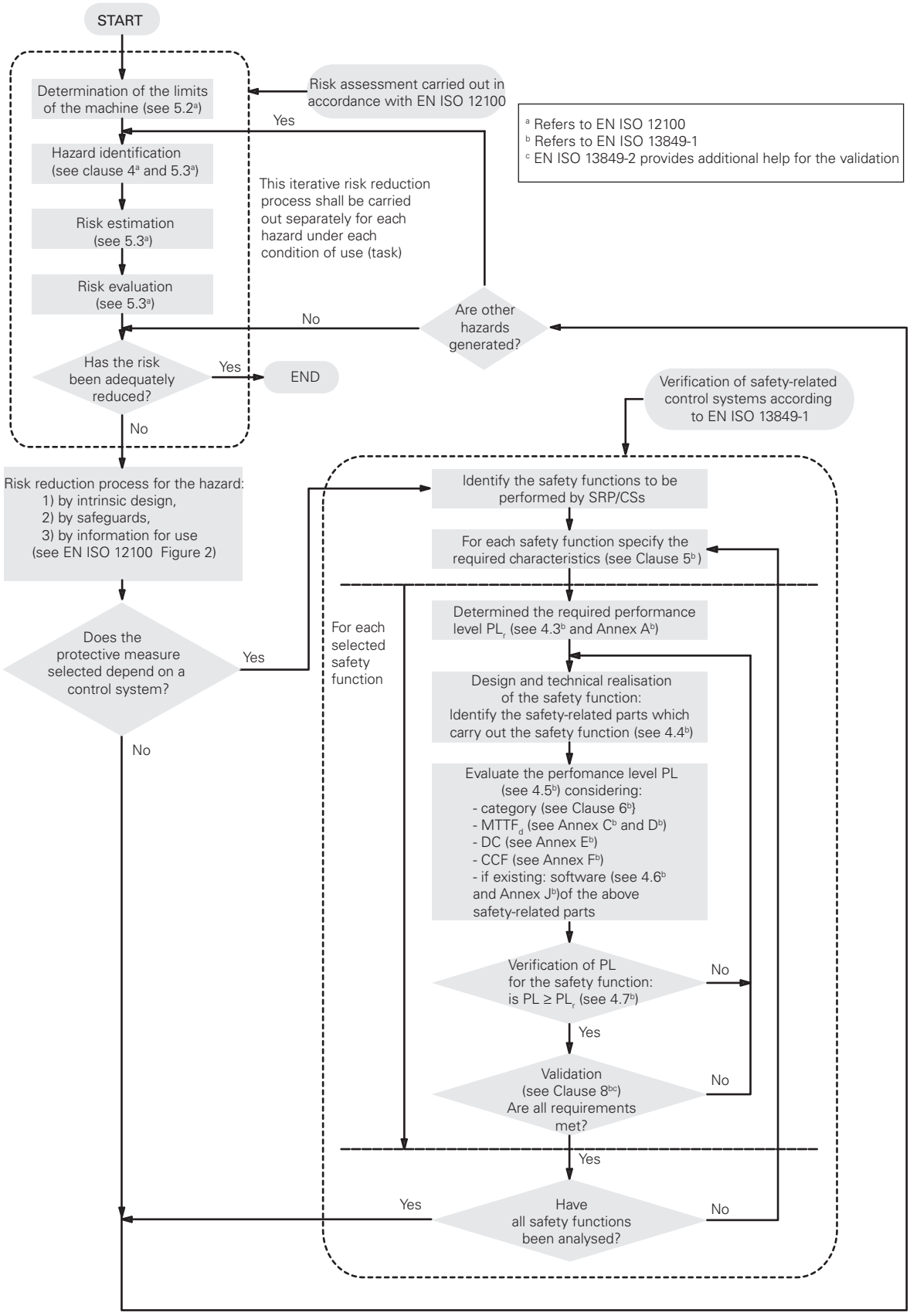
The first step in producing a safe machine is to identify the possible hazards to which the operators of a machine are exposed. The identification and classification of the hazards allows the risk for the operator or the combination of the probability of a hazard and the possible injury to be determined.

The methodology for risk analysis and evaluation and the procedure for the elimination/reduction of risks is defined by standard EN ISO 12100. This standard introduces a cyclic analysis model: starting with the initial objectives, the risk analysis and the various possibilities for reducing these risks are repeatedly evaluated until the initial objective is met.

The model introduced in this standard specifies that one proceed as follows after performing a risk analysis to reduce or eliminate risks:
1) Elimination of risks at their source through the use of intrinsically safe design principles and the structural set-up of the systems;
2) Risk reduction through safeguarding and monitoring systems;
3) Identification of residual risks though signalling and by informing the operating personnel.

Since every machine has hazards and because it is not possible to eliminate all possible risks, the objective is to reduce the residual risks to an acceptable level.

If a risk is reduced by means of a monitoring system, standard EN ISO 13849-1, which provides an evaluation model for the quality of this system, comes into play. If a given level is specified for a risk, it is possible to use a safety function of equal or higher level.

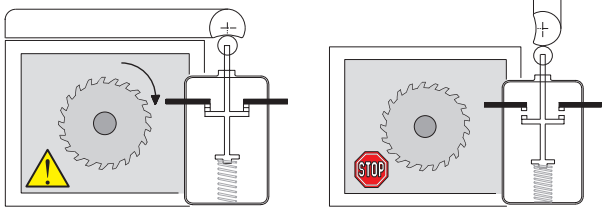


Note: This diagram was created by combining figures 1 and 3 of standard EN 13849-1. The texts in the diagram are not identical to those in the standard.

4 - Positive opening, redundancy, diversification and self-monitoring

Positive mode and negative mode.
According to the standard EN ISO 12100, if a moving mechanical component inevitably moves another component along with it, either by direct contact or via rigid elements, these components are said to be connected in the **positive** mode. Instead, if the movement of a mechanical component simply allows another element to move freely, without using direct force (for example by gravity force, spring effect, etc.), that connection is said to be connected in the **negative** mode.

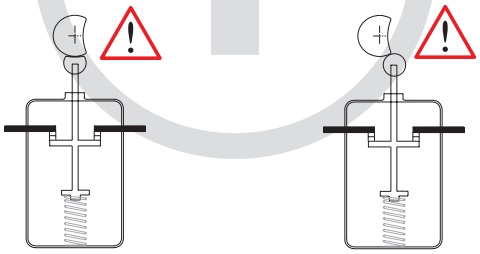
Positive mode



Machine in operation
Gate closed

Machine standstill
Gate open

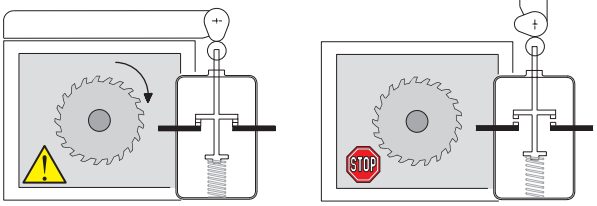
Dangerous failures: The machine continues operation.



Worn-out roller

Misaligned roller

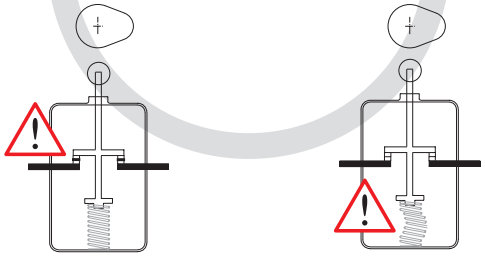
Negative mode



Machine in operation
Gate closed

Machine standstill
Gate open

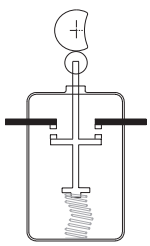
Dangerous failures: The machine continues operation.



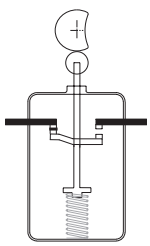
Welded contacts

Damaged spring

With positive mode, preventive maintenance can be performed, thereby avoiding the dangerous failures described above. With negative mode, on the other hand, failures can occur within the switch and are therefore difficult to detect.
In the event of an internal failure (welded contacts or a damaged spring), the contacts will still open in positive mode in spite of the damage and the machine will be stopped.

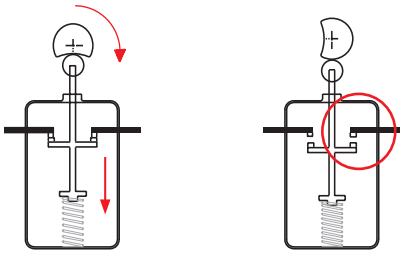


Damaged spring → Machine standstill



Welded contacts → Machine standstill

Use of switches in safety applications
If only one switch is used in a safety application, the switch must be actuated in positive mode. In order to be used for safety applications, the opening contact (normally closed) must be with "**positive opening**". All switches with the symbol ⊖ are provided with NC contacts with positive opening.



No flexible connection between the moving contacts and the actuator on which the actuating force is exerted.

In case of two or more switches, they should operate in opposite modes, for example:
- The first with an NC contact (normally closed contact), actuated by the guard in positive mode.
- The other with an NO contact (normally open contact), actuated by the guard in negative mode.
This is a common practice, though it does not exclude the possible use of two switches that are actuated in positive mode (see diversification).

Diversification
In redundant systems, safety is increased through **diversification**. This can be obtained by using two switches with different design and/or technology; failures with the same cause can thereby be prevented. Examples for diversification include: the use of one switch with positive actuation and one switch without positive actuation, the use of one switch with mechanical actuation and one switch without mechanical actuation (e.g., electronic sensor) or the use of two switches with mechanical, positive actuation but with different types of actuation (e.g., an FR 693-M2 key switch and a switch with FR 1896-M2 hinge pin).

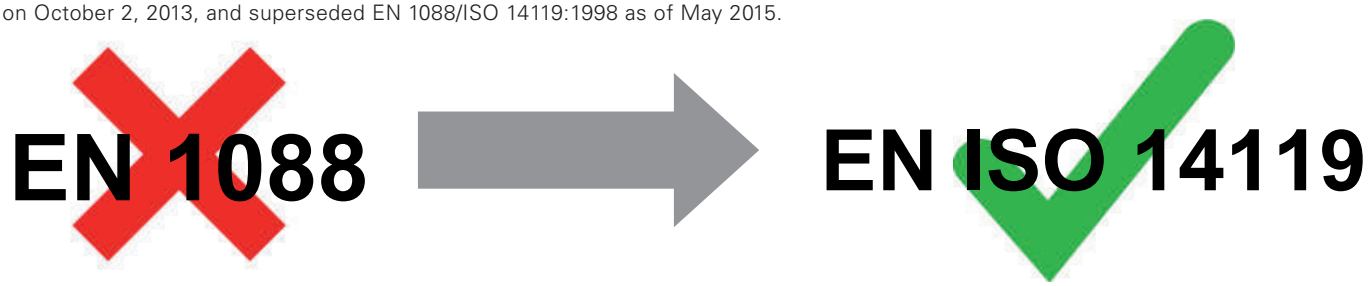
Redundancy
Redundancy implies the use of more than one device or system to make sure that, in case of a failure in one device, there is another one available to perform the required safety functions. If the first failure is not detected, an additional failure may lead to the loss of the safety function.

Self-monitoring
Self-monitoring consists in an automatic control performed to check the functioning of all devices involved in the machine working-cycle. This way the next working cycle can be either accepted or rejected.

Redundancy and self-monitoring
Combining **redundancy** and **self-monitoring** in the same system makes sure that a first failure in the safety circuit does not lead to the loss of safety functions. This first failure will be detected at the next re-start or, in any case, before a second failure which may lead to the loss of the safety function.

5 - Design and selection of interlocking devices associated with guards (standard EN ISO 14119)

The European standard EN ISO 14119 "Interlocking devices associated with guards – Principles for design and selection" came into force on October 2, 2013, and superseded EN 1088/ISO 14119:1998 as of May 2015.



The standard is intended for manufacturers of interlocking devices as well as machine manufacturers (and integrators) and describes the requirements on the devices and their correct installation.
The new standard provides clarification to a number of questions that are not always clear cut and considers the latest technologies used in the design of interlocking devices, defines a number of parameters (actuator type and level of coding) and describes the procedure for correct installation with the goal of minimizing the defeat possibilities of the interlocking devices.
The standard also considers other aspects related to interlocking devices (e.g. guard locking principles, electromagnetic guard locking, auxiliary release, escape and emergency release, etc.) which are not described here.

Coding level of the actuators

An important new addition to the standard is the definition of a coded actuator and the classification of the coding levels:
- **coded actuator** – actuator which was specially designed for use with a specific interlocking device;
- **low level coded actuator** – coded actuator for which 1 to 9 variations in code are available (e.g. the SR magnetic switch series or the safety switches with separate actuator and mechanical detection FS, FG, FR, FD…);
- **medium level coded actuator** – coded actuator for which 10 to 1000 variations in code are available;
- **high level coded actuator** – coded actuator for which more than 1000 variations are available. (e.g. the ST series sensors with RFID technology or the interlocking devices of the NG and NS series with RFID technology and guard locking).

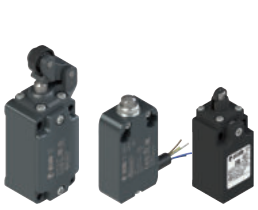
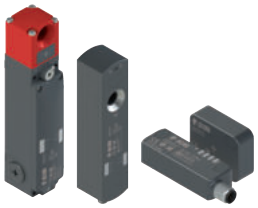
Types of interlocking devices

Standard EN ISO 14119 defines different types of interlocking devices:
- **Type 1 interlocking device** – interlocking device that is mechanically actuated by an uncoded actuator (e.g. HP series hinged interlocking devices)
- **Type 2 interlocking device** – interlocking device that is mechanically actuated by a coded actuator (e.g. safety switches with separate actuator of the FR, FS, FG, … series)
- **Type 3 interlocking device** – interlocking device that is contactlessly actuated by an uncoded actuator
- **Type 4 interlocking device** – interlocking device that is contactlessly actuated by a coded actuator (e.g. ST series safety sensors with RFID technology and NG and NS series safety switches with RFID technology)

Examples of actuation principles		Actuator examples		Type
Mechanical	Direct contact/force	Uncoded	Rotary cam	Type 1
			Linear cam	
			Hinge	
		Coded	Key-actuated	Type 2
			Trapped key	
Non-contact	Inductive	Uncoded	Ferromagnetic material	Type 3
	Magnetic		Magnet, solenoid	
	Capacitive		Any suitable object	
	Ultrasonic		Any suitable object	
	Optic		Any suitable object	
	Magnetic	Coded	Coded magnet	Type 4
	RFID		Coded RFID tag	
	Optic		Optically coded tag	

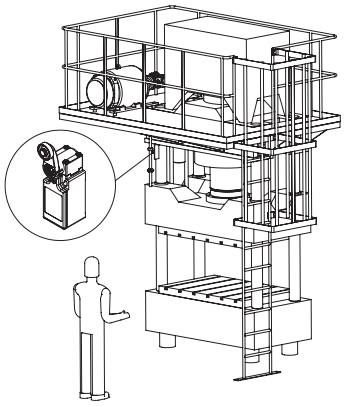
Excerpt from EN ISO 14119 - Table 1

Requirements for the design and the installation of interlocking devices according to EN ISO 14119 to reduce defeating of guards.

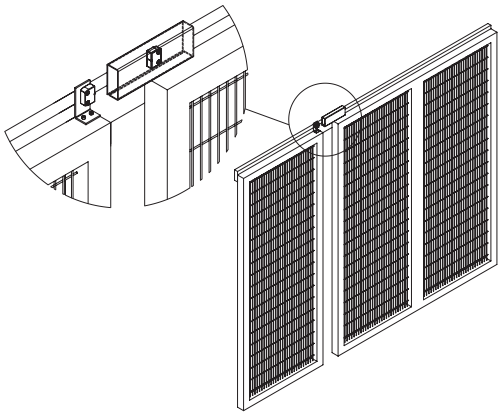
Principles and measures against defeating	Type 1 devices		Type 2 and type 4 devices	Type 2 and type 4 devices
	Cam safety switches rotary or linear cam	Safety hinge switches	Low and medium level coded actuators	High level coded actuators
				
Installation out of reach (1)	X		X	
Barriers or shielding (2)				
Installation in hidden position (3)				
Testing by means of control circuit (4)				
Non-detachable fixing of position switch and cam				
Non-detachable fixing of position switch		M		
Non-detachable fixing of the actuation element or cam		M	M	M
Additional position sensing and plausibility check	R		R	

Excerpt from EN ISO 14119 - Table 3

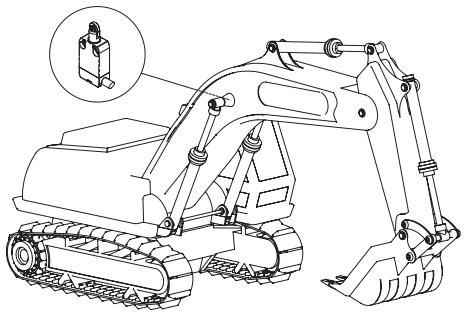
X: mandatory to apply at least one of the measures listed in the "Principles and measures" column
M: mandatory measure
R: recommended measure
It is clear that the use of devices with RFID technology, high coding level and hinged switches is the easiest way to meet the requirements of EN ISO 14119, as it is only necessary to fulfil a few requirements in order to prevent defeating of guards.
Devices with low or medium coding level require additional measures to ensure a tamperproof application.



(1) - Installation out of reach



(2) - Barriers or shielding



(3) - Installation in hidden position

(4) - Status monitoring or periodic testing can, for example, be performed on a machine with a simple operating cycle so as to verify that the guards are actually open at the end of or during specific operating phases (e.g. to remove the processed material or to perform quality controls). If status monitoring does not detect opening of the guard, an alarm is generated and the machine is stopped.

Guard locking devices and holding force

The manufacturer of the interlocking device with guard locking must ensure that the device can withstand at least the measured holding force F_{Zh} while the interlock is engaged. This holding force must not exceed the maximum holding force divided by a safety coefficient equal to 1.3.
Example: A device with maximum holding force of F_{Zh} =2000 N must pass a test with a maximum holding force equal to F_{1max} =2600 N.
An interlocking device with guard locking can both monitor the position of the guard (open/closed) as well as lock the guard (locked/unlocked). Each of the two functions may require a different PL safety level (acc. to EN ISO 13849-1). The guard locking function generally requires a lower PL than the position monitoring function. (See paragraph 8.4, note 2 of EN ISO 14119).
To identify whether an interlocking device also performs status monitoring, the standard specifies that the product label includes the symbol shown to the side here.

$$F_{Zh} = \frac{F_{1max}}{1{,}3}$$

6 - Current status of the standards. Reason for changes, new standards and some overlapping

The "traditional" standards for functional safety, such as EN 954-1, played a large part in formalising some of the basic principles for the analysis of safety circuits on the basis of deterministic principles. On the other hand, they make no mention of the topic of programmable electronic control systems and are not generally in line with the current state of technology. To take programmable electronic control systems into account in the analysis of safety circuits, the approach taken by current standards is fundamentally probabilistic and introduces new statistical variables.

This approach is based on IEC 61508, which deals with the safety of complex programmable electronic systems and is very extensive (divided into 8 sections with nearly 500 pages). It is also used in a diverse range of application fields (chemical industry, machine construction, nuclear plants). This standard introduces the SIL concept (Safety Integrity Level), a probabilistic indication of a system's residual risk.

From IEC 61508 comes EN 62061, which covers the functional safety of the complex electronic or programmable control systems in industrial applications. The concepts introduced here permit general use for any safety-related electrical, electronic and programmable electronic control systems (systems with non-electrical technologies are not covered).

EN ISO 13849-1, developed by CEN under the aegis of ISO, is also based on this probabilistic approach. This standard, however, attempts to structure the transition to the concepts in a less problematic way for the manufacturer, who is accustomed to the concepts of EN 954-1. The standard covers electromechanical, hydraulic, "non-complex" electronic systems and some programmable electronic systems with predefined structures. EN ISO 13849-1 is a type B1 standard and introduces the PL concept (Performance Level); as with SIL, the concept provides a probabilistic indication of a machine's residual risk. This standard points out a correlation between SIL and PL; concepts borrowed by EN 61508 – such as DC and CCF – are used and a connection to the safety categories of EN 954-1 is established.

Important note
EN 13849-1 is a type B1 standard; if a type C standard is already applied for a machine, the type C standard is to be used. Some type C standards not yet updated are based on the concepts of EN 954-1. For manufacturers of machines that are covered by a type C standard, the introduction time of the new standards depends on how quickly the various technical committees update the C standards.

In the area of functional safety for the safety of control circuits, there are thus two standards presently in force:
EN ISO 13849-1. Standard type B1, which uses the PL concept.
EN 62061. Standard type B1, which uses the SIL concept.

There is clear overlapping of the two standards EN 62061 and EN ISO 13849-1 concerning their application field and many aspects are similar; there is also a link between the two symbol names (SIL and PL), which indicate the result of the analyses according to the two standards.

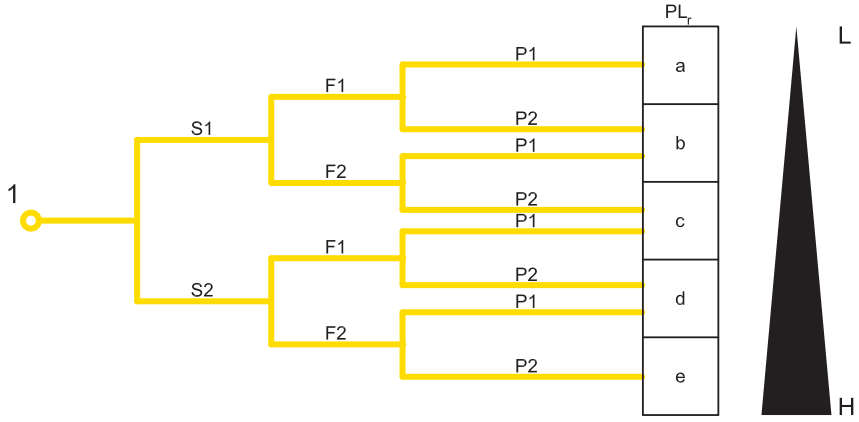
PL EN ISO 13849-1	**a**	**b**	**c**	**d**	**e**
SIL EN 62061 - IEC 61508	**-**	**1**	**1**	**2**	**3**
PFH_D	from 10^{-4} to 10^{-5}	from 10^{-5} to $3x10^{-6}$	from $3x10^{-6}$ to 10^{-6}	from 10^{-6} to 10^{-7}	from 10^{-7} to 10^{-8}
A hazardous failure every n years	from ~1 to ~10	from ~10 to ~40	from ~40 to ~100	from ~100 to ~1000	from ~1000 to ~10000

The choice of the standard to be applied is left to the manufacturer according to the technology that is used. We believe that standard EN ISO 13849-1 is easier to use thanks to its mediatory approach and the re-utilisation of the concepts already introduced on the market.

7 - Standard EN ISO 13849-1 and the new parameters: PL, $MTTF_D$, DC, CCF

Standard EN ISO 13849-1 offers the manufacturer an iterative method for assessing whether the hazards posed by a machine can be reduced to an acceptable residual level through the use of appropriate safety functions. The applied method specifies a hypothesis-analysis-validation cycle for each risk. Once completed, it must be possible to demonstrate that every selected safety function is appropriate for the respective risk.
The first step involves the determination of the required performance level, which is required of each safety function. Like EN 954-1, EN ISO 13849-1 also uses a risk graph for the risk analysis of a machine function (figure A.1). Instead of a safety category, however, this graph is used to determine – as a function of the risk – a Required Performance Level or PL_r for the safety function which protects the respective part of the machine.
Starting with point 1 of the graph, the machine manufacturer answers questions S, F and P and can then determine the PL_r for the safety function being examined. He must then develop a system with a performance level PL that is equal to or greater than that which is required to protect the operating personnel.

Risk graph for determining the required PL_r for the safety function (excerpt from EN ISO 13849-1, figure A.1)



Key

1 Starting point for the evaluation of the safety function's contribution to risk reduction
L Low contribution to risk reduction
H High contribution to risk reduction
PL_r Required performance level

* F1 should be selected if the total duration of the exposure to the hazard does not exceed 1/20 of the total work time and the frequency of exposure to the hazard does not exceed once every 15 minutes
****** If there are no other reasons, F2 should be selected if the frequency of exposure to the hazard is greater than once every 15 minutes.

Risk parameters

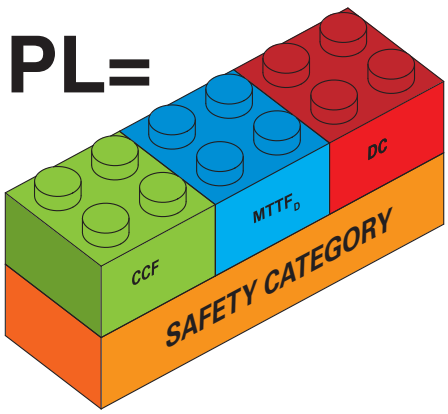
S Severity of injury
S1 Slight (normally reversible injury)
S2 Serious (normally irreversible injury or death)
F Frequency and/or exposure to hazard
***F1** Seldom-to-less-often and/or exposure time is short
****F2** Frequent-to-continuous and/or exposure time is long
P Possibility of avoiding hazard or limiting harm
P1 Possible under certain conditions
P2 Scarcely possible

Note: For a machine manufacturer, it may be of interest forego repeating the risk analysis of the machine and to instead to try and reuse the data already derived from the EN 954-1 risk analysis.
This is not generally possible, since the risk graph changed with the new standard (see previous figure) and, as a result, the required performance level of the safety function may have changed with identical risks. The German Institute for Occupational Safety and Health (BGIA), in its report 2008/2 on EN ISO 13849-1, recommends the following: assuming the "worst case", implementation can occur according to the table to the right. For further information, refer to the mentioned report.

Category required by EN 954-1		Required performance level (PLr) and category acc. to EN ISO 13849-1
B	→	b
1	→	c
2	→	d, Category 2
3	→	d, Category 3
4	→	e, Category 4

There are five performance levels, from PL a to PL e, with increasing risk; each represents a numerical range for the average probability of a dangerous failure per hour. For example, PL d specifies that the average probability of dangerous failures per hour is between $1x10^{-6}$ and $1x10^{-7}$, i.e., about 1 dangerous failure every 100-1000 years.

PL	Average probability of dangerous failures per hour PFHd (1/h)		
a	$\geq 10^{-5}$	e	$< 10^{-4}$
b	$\geq 3 \times 10^{-6}$	e	$<10^{-5}$
c	$\geq 10^{-6}$	e	$< 3 \times 10^{-6}$
d	$\geq 10^{-7}$	e	$< 10^{-6}$
e	$\geq 10^{-8}$	e	$<10^{-7}$

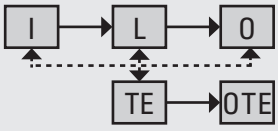
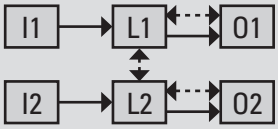
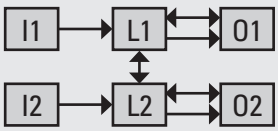


Several parameters are needed to determine the PL of a control system:
1. The safety category of the system, which is dependent on the architecture (structure) of the control system and its behaviour in the event of damage
2. $MTTF_D$ of the components
3. DC or Diagnostic Coverage of the system.
4. CCF or Common Cause Failures.

Safety category.
Most control circuits normally used can be represented with the following logic components:
- Input or signal input
- Logic or signal processing logic
- Output or output of the monitoring signal

These are connected to one another differently depending on the structure of the control circuit.

EN ISO 13849-1 allows for five different basic circuit structures, referred to as the designated architectures of the system. As shown in the following table, the architectures – combined with the requirements on the system behaviour in the event of failure and the minimum values of $MTTF_D$, DC and CCF – give the safety category of the system control. Thus, the safety categories of EN ISO 13849-1 are not the equivalent, but rather extend the concept of the safety category introduced by the previous standard EN 954-1.

Category	Summary of the requirements	System behaviour	Safety principles	$MTTF_D$ of each channel	DC_{avg}	CCF
B	Safety-related parts of monitoring systems and/or their protective equipment, as well as their accessories, must be designed, constructed, selected, assembled and combined in accordance with the relevant standards so that they can withstand the expected influences. Fundamental safety principles must be used. Architecture: 	The occurrence of a fault can lead to the loss of the safety function.	Mainly determined by the selection of components	Low to medium	None	Not relevant
1	In addition to the requirements of Category B, proven components and safety principles must be used. Architecture: 	The occurrence of a fault can lead to the loss of the safety function; the probability of fault occurrence is, however, lower than for Category B.	Mainly determined by the selection of components	High	None	Not relevant
2	Requirements of Category B and proven safety principles must be used. The safety function must be checked at appropriate intervals by the control system. Architecture: 	The occurrence of a fault between two checks can lead to the loss of the safety function. The loss of the safety function is detected through the check.	Determined mainly by the structure	Low to high	Low to medium	See Annex F
3	Requirements of Category B and proven safety principles must be used. Important safety-related parts must be designed so that: - A single fault in any of these parts does not lead to the loss of the safety function. - Where reasonably practicable, the single fault is detected. Architecture: 	If a single fault occurs, the safety function is always performed. Some, but not all faults are detected. Accumulation of undetected faults can lead to the loss of the safety function.	Determined mainly by the structure	Low to high	Low to medium	See Annex F
4	Requirements of Category B and proven safety principles must be used. Important safety-related parts must be designed, so that: - a single fault in any of these parts does not lead to the loss of the safety function, and - a single fault during or before the next request for the safety function is detected. If this is not possible, the accumulation of undetected faults must not lead to the loss of the safety function. Architecture: 	If a single fault occurs, the safety function is always performed. The detection of accumulated faults reduces the probability of the loss of the safety function (high DC). The faults are detected in time to prevent the loss of the safety function.	Determined mainly by the structure	High	High (including accumulation of faults)	See Annex F

$MTTF_D$ ("Mean Time To Dangerous Failure").
This parameter is used to determine the functional system quality over the mean lifetime in years before a dangerous failure occurs (other failures are not considered). The calculation of the $MTTF_D$ is based on numerical values supplied by the manufacturers of the individual components of the system. In the absence of this data, the values can be taken from the tables with guide values included in the standard (EN ISO 13849-1 Annex C). The evaluation results in a numerical value, divided into three categories: High, Medium or Low.

Classification	Values
Not acceptable	$MTTF_D$ < 3 years
Low	3 years ≤ $MTTF_D$< 10 years
Medium	10 years ≤ $MTTF_D$< 30 years
High	(30 years ≤ $MTTF_D$ ≤ 100 years

For components that are susceptible to high wear (typical for mechanical and hydraulic devices), the manufacturer supplies the value B_{10D} for the component, i.e., the number of component operations within which 10% of the samples failed dangerously, instead of the $MTTF_D$ of the component.
The B_{10D} value of the component must be converted to $MTTF_D$ by the machine manufacturer using the following formula:

$$MTTF_D = \frac{B_{10_D}}{0{,}1 \cdot n_{op}}$$

Where n_{op}= means number of annual operations for the component.
By assuming the daily operating frequency and the daily operating hours for the machine, n_{op} can be calculated as follows:

$$n_{op} = \frac{d_{op} \cdot h_{op} \cdot 3600s/h}{t_{ciclo}}$$

where
d_{op}= work days per year
h_{op}= operating hours per day
t_{cycle}= cycle time (s)

For components that are susceptible to wear, note that parameter $MTTF_D$ is dependent not only on the component itself but also on the application. An electromechanical device with low frequency of use, e.g. a remote switch that is only used for emergency stops, has a high $MTTF_D$; if the same device is used for normal processes in the operating cycle, the $MTTF_D$ of the same remote switch could drop dramatically.

All elements of the circuit contribute to the calculation of the $MTTF_D$ depending on their structure. In control systems with single-channel architecture (as is the case in categories B, 1 and 2), the contribution of each components is linear and the $MTTF_D$ of the channel is calculated as follows:

$$\frac{1}{MTTF_D} = \sum_{i=1}^{N} \frac{1}{MTTF_{D\,i}}$$

To avoid overly optimistic designs, the maximum value of the $MTTF_D$ of each channel is limited to 100 years (for categories B, 1, 2 and 3) or 2500 years (category 4). Channels with an $MTTF_D$ of less than 3 years are not allowed.

For two-channel systems (categories 3 and 4), the $MTTF_D$ of the circuit is calculated by averaging the $MTTF_D$ of the two channels using the following formula:

$$MTTF_D = \frac{2}{3}\left[MTTF_{DC1} + MTTF_{DC2} - \frac{1}{\frac{1}{MTTF_{DC1}} + \frac{1}{MTTF_{DC2}}}\right]$$

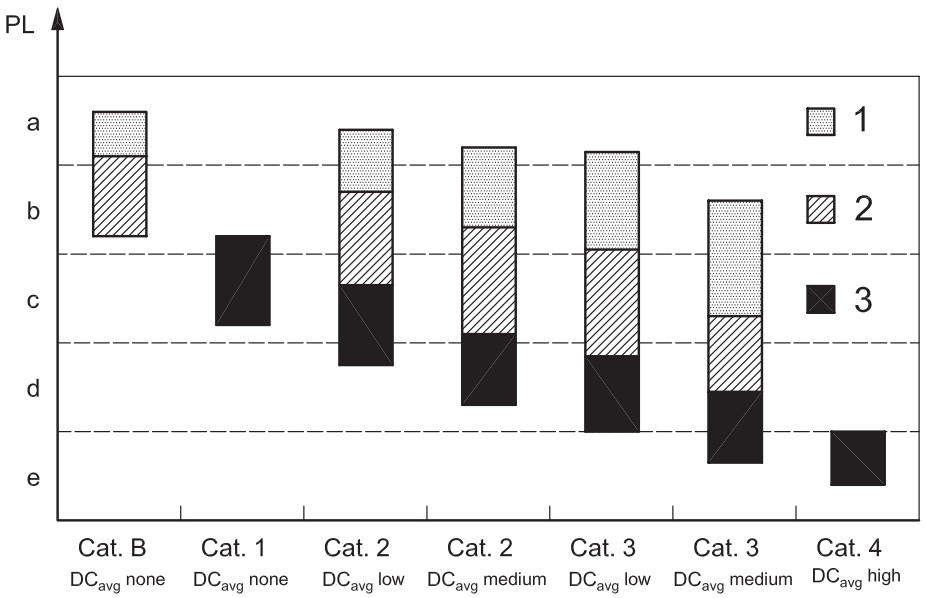
DC ("Diagnostic Coverage").

This parameter provides information on the effectiveness of a system's ability to self-detect any possible failures within the system. Using the percentage of the detectable dangerous failures, one obtains a diagnostic coverage of better or worse quality. The numerical DC parameter is a percentage value which is calculated using values taken from a table (EN ISO 13849-1 Annex E). Depending on the measures for failure detection taken by the manufacturer, example values are provided there. Because multiple measures are normally taken to rectify different anomalies in the same circuit, an average value or a DC_{avg} is calculated and can be assigned four levels:
High $DC_{avg} \geq 99\%$
Medium $90\% \leq DC_{avg} < 99\%$
Low $60\% \leq DC_{avg} < 90\%$
None $DC_{avg} < 60\%$
A diagnostic coverage of none is only permissible for systems of category B or 1.

CCF ("Common Cause Failures")
For the calculation of the PL for systems of category 2, 3 or 4, it is also necessary to evaluate possible common cause failures or CCF, which may compromise the redundancy of the system. The evaluation is performed using a checklist (Annex F of EN ISO 13849-1); on the basis of the measures taken against common cause failures, points from 0 to 100 are assigned. The minimum permissible value for categories 2, 3 and 4 is 65 points.

PL ("Performance Level")
After determining this data, EN ISO 13849-1 gives the PL of the system using an assignment table (EN ISO 13849-1) or, alternatively, using a simplified graphic (EN ISO 13849-1, paragraph 4.5) as shown in the following.

Relationships between the categories, DC_{avg}, $MTTF_D$ of each channel and PL (acc. to EN ISO 13849-1, figure 5)



1 = $MTTFD_{\text{of each channel = Low}}$ (3 years ≤ $MTTF_D$ < 10 years)

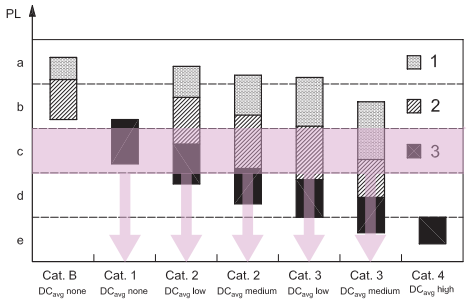
2 = $MTTF_D$ of each channel = Medium (10 years ≤ $MTTF_D$ < 30 years)

3 = $MTTF_D$ of each channel = High (30 years ≤ $MTTF_D$ ≤ 100 years)

This figure is very useful, as it can be read from multiple points of view. For a given PL_r, it shows all possible solutions with which this PL can be achieved, i.e., the possible circuit structures that provide the same PL.

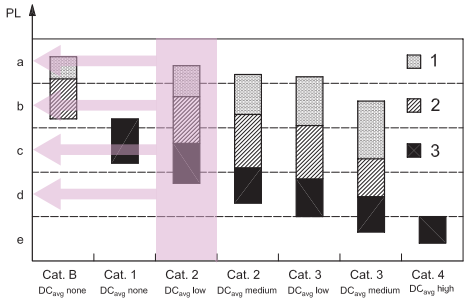
Considering the figure more closely, it is seen that the following possibilities exist for a system with PL equal to "c":

1. Category 3 system with less reliable components ($MTTF_D$=low) and medium DC.
2. Category 3 system with reliable components ($MTTF_D$=medium) and low DC.
3. Category 2 system with reliable components ($MTTF_D$=medium) and medium DC.
4. Category 2 system with reliable components ($MTTF_D$=medium) and low DC.
5. Category 1 system with very reliable components ($MTTF_D$=high).



Considering a given circuit structure, in this figure one can also identify the maximum PL that can be reached depending on the average diagnostic coverage and the $MTTF_D$ of the components.
Thus, the manufacturer can exclude a number of circuit structures in advance, as they do not meet the required PL_r.

However, the figure is not usually used to determine the PL of the system since the graphic areas overlap the boundaries of the different PL levels in many cases. Instead, the table in Annex K of standard EN ISO 13849-1 is used to precisely determine the PL of the circuit.



Notes

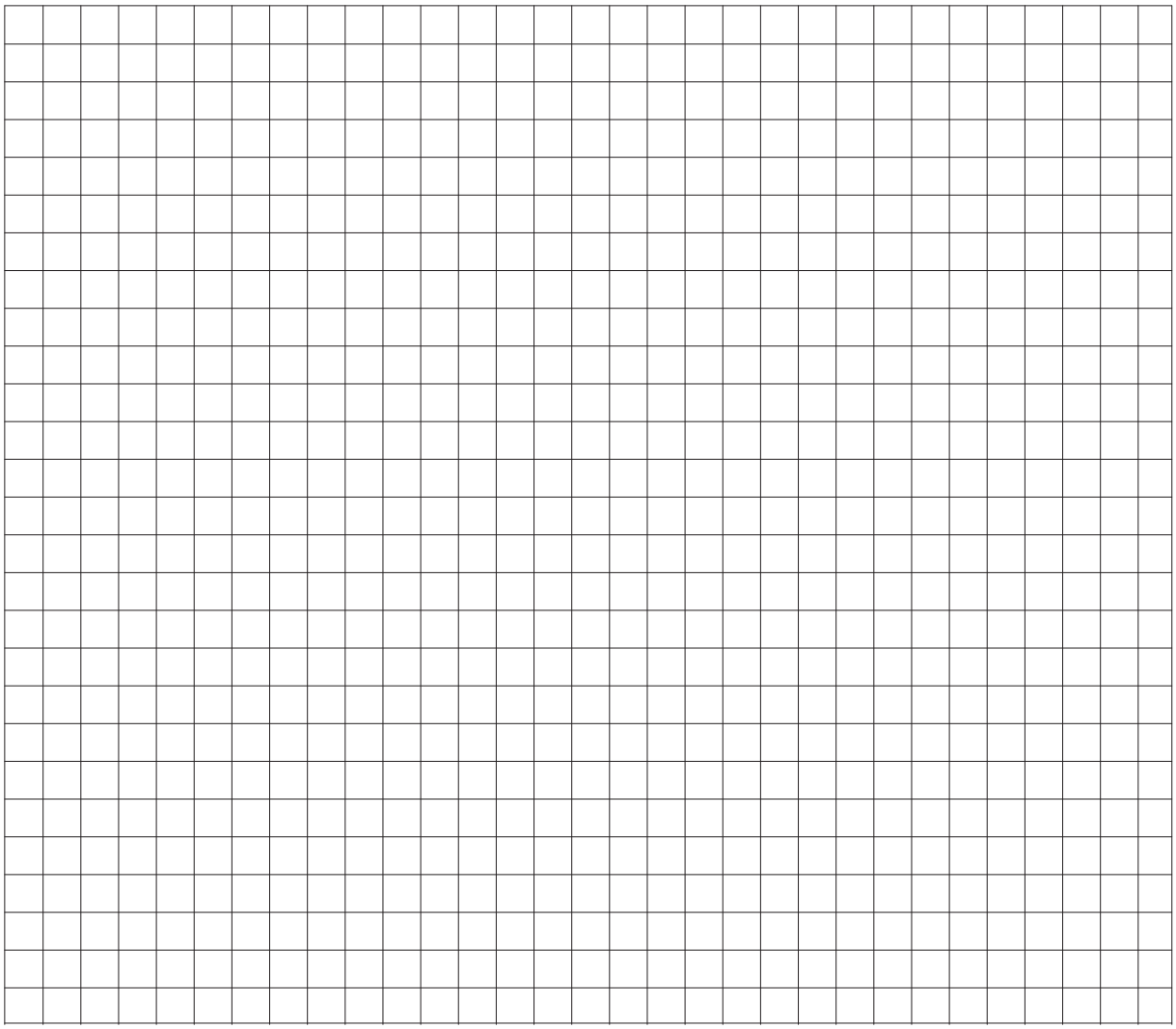


Table of safety parameters

The B_{10D} data in the table refers to the mechanical life of the device contacts under normal ambient conditions.
The value of B_{10D} for NC and NO contacts refers to a maximum electrical load of 10% of the current value specified in the utilisation category. Mission time (for all articles listed below): 20 years.

Electromechanical control devices

Series	Article description	B_{10D} (NO)	B_{10D} (NC)	B_{10}/B_{10D}
F• ••••	Position switches	1,000,000	40,000,000	50%
F• ••93 F• ••92	Safety switches with separate actuator	1,000,000	2,000,000	50%
F• ••99 F• ••R2	Safety switches with separate actuator with lock	1,000,000	1,000,000	50%
FG	Safety switches with separate actuator with lock	1,000,000	5,000,000	20%
FS	Safety switches with separate actuator with lock	1,000,000	4,000,000	20%
F• ••96 F• ••95	Safety switches with hinge pin	1,000,000	5,000,000	20%
F• ••C•	Switches with slotted hole lever for hinged guards	1,000,000	2,000,000	50%
F• ••••	Rope switches for emergency stop	1,000,000	2,000,000	50%
HP - HX B•22-•••	Safety hinges	1,000,000	5,000,000	20%
SR	Magnetic safety sensors (with compatible Pizzato Elettrica safety modules)	20,000,000	20,000,000	50%
SR	Magnetic safety sensors (used at max. load: DC12 24 V 250 mA)	400,000	400,000	100%
PX, PA	Foot switches	1,000,000	20,000,000	50%
MK	Micro position switches	1,000,000	20,000,000	50%
NA, NB, NF	Modular pre-wired position switches	1,000,000	40,000,000	50%
E2 C•••••••	Contact blocks	1,000,000	40,000,000	50%

Series	Article description	B_{10D}	B_{10}/B_{10D}
E2 •PU1••••••, E2 •PL1••••••	Single buttons, maintained	2,000,000	50%
E2 •PU2••••••, E2 •PL2••••••	Single buttons, spring-return	30,000,000	50%
E2 •PD••••••, E2 •PT••••••	Double and triple buttons	2,000,000	50%
E2 •PQ••••••	Quadruple buttons	2,000,000	50%
E2 •PE••••••	Emergency stop buttons	600,000	50%
VN NG-AC2605•	Integrated emergency stop buttons on NG series safety switches	100.000	50%
E2 •SE••••••, E2 •SL••••••	Selector switches with and without illumination	2,000,000	50%
E2 •SC••••••	Key selector switches	600,000	50%
E2 •MA••••••	Joysticks	2,000,000	50%

ATEX series	Article description	B_{10D} (NO)	B_{10D} (NC)	B_{10}/B_{10D}
F• ••••-EX•	Position switches	500,000	20,000,000	50%
F• ••93-EX• F• ••92-EX•	Safety switches with separate actuator	500,000	1,000,000	50%
F• ••99-EX• F• ••R2-EX•	Safety switches with separate actuator with lock	500,000	500,000	50%
F• ••96-EX• F• ••95-EX•	Safety switches with hinge pin	500,000	2,500,000	20%
F• ••C•-EX•	Switches with slotted hole lever for hinged guards	500,000	1,000,000	50%
F• ••••-EX•	Rope switches for emergency stop	500,000	1,000,000	50%

Electronic devices

Code/series	Article description	$MTTF_D$	DC	PFH_D	SIL CL	PL	Cat
HX BEE1-•••	Safety hinges with electronic unit	2413	High	1.24E-09	3	e	4
ST	Safety sensors with RFID technology	4077	High	1.20E-11	3	e	4
NG	RFID safety switches with lock						
	Monitoring function: actuator locked - Mode 1	2968	High	1,15E-09	3	e	4
	Monitoring function: actuator present - Mode 2	3946	High	1,15E-09	3	e	4
	Monitoring function: actuator locked - Mode 3	2957	High	1,48E-09	2	d	2
	Monitoring function: actuator present - Mode 3	3927	High	1,48E-09	2	d	2
	Dual-channel control for locking function of the actuator	4011	High	1,51E-10	3	e	4
	Single-channel control for locking function of the actuator	4011	High	1,51E-10	2	d	2
NS	RFID safety switches with lock						
	Monitoring function: actuator locked - Mode 1	2657	High	1.23E-09	3	e	4
	Monitoring function: actuator present - Mode 2	1840	High	1.22E-09	3	e	4
	Monitoring function: actuator locked - Mode 3	2627	High	1.50E-09	2	d	2
	Monitoring function: actuator present - Mode 3	3987	High	1.49E-09	2	d	2
	Dual-channel control for locking function of the actuator	2254	High	2.04E-10	3	e	4
	Single-channel control for locking function of the actuator	2254	High	2.04E-10	2	d	2

B_{10D}: Number of operations after which 10% of the components have failed dangerously
B_{10}: Number of operations after which 10% of the components have failed
B_{10}/B_{10D}: ratio of total failures to dangerous failures.
$MTTF_D$: Mean Time To Dangerous Failure

DC: Diagnostic Coverage
PFH_D: Probability of Dangerous Failure per hour
SIL CL: Safety Integrity Level Claim Limit. Maximum achievable SIL according to EN 62061
PL: Performance Level. PL acc. to EN ISO 13849-1

Electronic devices

Code/series	Article description	$MTTF_D$	DC	PFH_D	SIL CL	PL	Cat
CS AM-01	Safety module for standstill monitoring	218	Medium	8.70E-09	2	d	3
CS AR-01, CS AR-02	Safety modules for monitoring guards and emergency stops	227	High	1.18E-10	3	e	4
CS AR-04	Safety module for monitoring guards and emergency stops	152	High	1.84E-10	3	e	4
CS AR-05, CS AR-06	Safety modules for monitoring guards, emergency stops and light barriers	152	High	1.84E-10	3	e	4
CS AR-07	Safety module for monitoring guards and emergency stops	111	High	7.56E-10	3	e	4
CS AR-08	Safety module for monitoring guards, emergency stops and light barriers	1547	High	9.73E-11	3	e	4
CS AR-20, CS AR-21	Safety modules for monitoring guards and emergency stops	225	High	4.18E-10	3	e	3
CS AR-22, CS AR-23	Safety modules for monitoring guards and emergency stops	151	High	5.28E-10	3	e	3
CS AR-24, CS AR-25	Safety modules for monitoring guards and emergency stops	113	High	6.62E-10	3	e	3
CS AR-40, CS AR-41	Safety modules for monitoring guards and emergency stops	225	High	4.18E-10	2	d	2
CS AR-46	Safety module for monitoring guards and emergency stops	435	-	3.32E-08	1	c	1
CS AR-51	Safety module for monitoring safety mats and safety bumpers	212	High	3.65E-09	3	e	4
CS AR-90	Safety module for monitoring floor leveling in lifts	382	High	5.03E-10	3	e	4
CS AR-91	Safety module for monitoring floor leveling in lifts	227	High	1.18E-10	3	e	4
CS AR-93	Safety module for monitoring floor leveling in lifts	227	High	1.34E-10	3	e	4
CS AR-94	Safety module for monitoring floor leveling in lifts	227	High	1.13E-10	3	e	4
CS AR-94•U12	Safety module for monitoring floor leveling in lifts	227	High	1.13E-10	3	e	4
CS AR-95	Safety module for monitoring floor leveling in lifts	213	High	5.42E-09	3	e	4
CS AT-0•, CS AT-1•	Safety modules with timer for monitoring guards and emergency stops	88	High	1.23E-08	3	e	4
CS AT-3•	Safety module with timer for monitoring guards and emergency stops	135	High	1.95E-09	3	e	4
CS DM-01	Safety module for monitoring two-hand controls	142	High	2.99E-08	3	e	4
CS DM-02	Safety module for monitoring two-hand controls	206	High	2.98E-08	3	e	4
CS DM-20	Safety module for monitoring two-hand controls	42	-	1.32E-06	1	c	1
CS FS-1•	Safety timer module	404	High	5.06E-10	3	e	4
CS FS-2•, CS FS-3•	Safety timer modules	205	High	1.10E-08	2	d	3
CS FS-5•	Safety timer module	379	Medium	1.31E-09	2	d	3
CS ME-01	Contact expansion module	91	High	5.26E-10	①	①	①
CS ME-02	Contact expansion module	114	High	4.17E-10	①	①	①
CS ME-03	Contact expansion module	152	High	3.09E-10	①	①	①
CS ME-20	Contact expansion module	114	High	6.14E-10	①	①	①
CS ME-3•	Contact expansion module	110	High	4.07E-09	①	①	①
CS M•201	Multifunction safety modules	135	High	1.44E-09	3	e	4
CS M•202	Multifunction safety modules	614	High	1.32E-09	3	e	4
CS M•203	Multifunction safety modules	103	High	1.61E-09	3	e	4
CS M•204	Multifunction safety modules	134	High	1.52E-09	3	e	4
CS M•205	Multifunction safety modules	373	High	2.19E-09	3	e	4
CS M•206	Multifunction safety modules	3314	High	1.09E-09	3	e	4
CS M•207	Multifunction safety modules	431	High	7.08E-09	3	e	4
CS M•208	Multifunction safety modules	633	High	7.02E-09	3	e	4
CS M•301	Multifunction safety modules	128	High	1.88E-09	3	e	4
CS M•302	Multifunction safety modules	535	High	1.57E-09	3	e	4
CS M•303	Multifunction safety modules	485	High	1.76E-09	3	e	4
CS M•304	Multifunction safety modules	98	High	2.05E-09	3	e	4
CS M•305	Multifunction safety modules	535	High	1.57E-09	3	e	4
CS M•306	Multifunction safety modules	100	High	1.86E-09	3	e	4
CS M•307	Multifunction safety modules	289	High	8.38E-09	3	e	4
CS M•308	Multifunction safety modules	548	High	7.27E-09	3	e	4
CS M•309	Multifunction safety modules	496	High	7.46E-09	3	e	4
CS M•401	Multifunction safety modules	434	High	1.73E-09	3	e	4
CS M•402	Multifunction safety modules	478	High	7.24E-09	3	e	4
CS M•403	Multifunction safety modules	438	High	7.42E-09	3	e	4

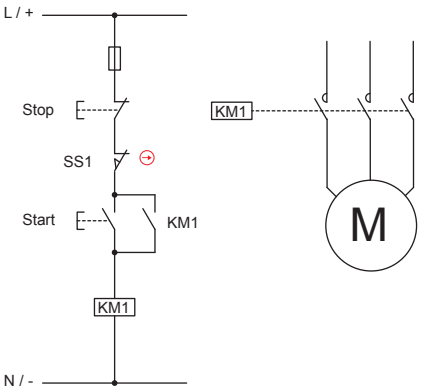
B_{10D}: Number of operations after which 10% of the components have failed dangerously
B_{10}: Number of operations after which 10% of the components have failed
B_{10}/B_{10D}: ratio of total failures to dangerous failures.
$MTTF_D$: Mean Time To Dangerous Failure

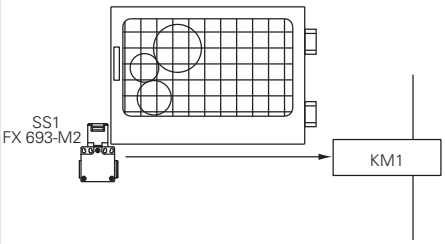
DC: Diagnostic Coverage
PFH_D: Probability of Dangerous Failure per hour
SIL CL: Safety Integrity Level Claim Limit. Maximum achievable SIL according to EN 62061
PL: Performance Level. PL acc. to EN ISO 13849-1

① = Depending on the base module

EXAMPLE 1
Application: Guard monitoring

Reference standard EN ISO 13849-1	
Safety category	**1**
Performance Level	**PL c**





Description of the safety function
The control circuit illustrated above has a guard monitoring function. If the guard is open the engine must not be able to start. The hazard analysis showed that the system has no inertia or rather that the engine, once the power has been switched off, stops at a much faster rate than the opening of the guard. The risk analysis has shown that the required PL_r target is PL c. This is necessary to verify if the intended control circuit with single channel structure is provided with a PL higher or equal to PL_r.
The guard position is detected by the switch with separate actuator SS1, which operates directly on the contactor KM1. The contactor KM1 monitoring the moving parts is usually activated by the Start and Stop buttons. Though, the analysis of the working cycle has shown that the guard is opening at every switching operation too. Therefore, the number of switch operations by the contactor and by the safety switch can be considered equal.
A circuit structure is defined as single-channel without supervision (category B or 1) if there are only an Input component (switch) and an Output (contactor) component.
In case a failure on one of the two devices the safety function is not guaranteed anymore.
No measures for fault detection have been applied.

Device data:
- SS1 (FX 693-M2) is a switch with positive opening (in accordance with EN 60947-5-1, Annex K). The switch is a well-tried component according to EN ISO 13849-2 table D.4. The B_{10D} value of the device supplied by the manufacturer is equal to 2,000,000 switching operations.
- KM1 is a contactor operated at nominal load and is a well-tried component in compliance with EN ISO 13849-2, table D.4. The B_{10D} value of this component is equal to 1,300,000 switching operations. This value results from the tables of the applicable standard (see EN ISO 13849-1, table C.1).

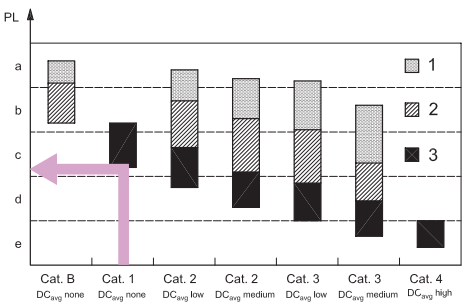
Assumption of the frequency of use
- It is assumed that the equipment is used for a maximum of 365 days per year, for three shifts of 8 hours and 600 s cycle time. For the switch, the number of switching operations per year is equal to maximum N_{op}=(365x24x3,600)/600=52,560.
- It is assumed that the start button is operated every 300 seconds. Therefore, the maximum number of switching operations per year is equal to n_{op}/year=105,120
- The contactor KM1 is actuated both for the normal start-stop of the machine as well as for the restart after a guard opening. n_{op}/year=52,560+105,120 = 157,680

$MTTF_D$ calculation
The $MTTF_D$ of the SS1 switch is equal to: $MTTF_d = B_{10D}/(0,1 \times n_{op})$ = 2,000,000/(0,1 x 52560) = 381 years
The$MTTF_D$ of the KM1 contactor is equal to: $MTTF_D = B_{10D}/(0.1 \times n_{op})$ = 1,300,000/(0.1 x 157680) = 82 years
Therefore, the $MTTF_D$ of the single-channel circuit is equal to: 1/(1/381+1/82) = 67 years

Diagnostic Coverage DCavg
No measures for fault detection have been applied and there is therefore no diagnostic coverage, a permissible condition for the circuit in question that is in category 1.

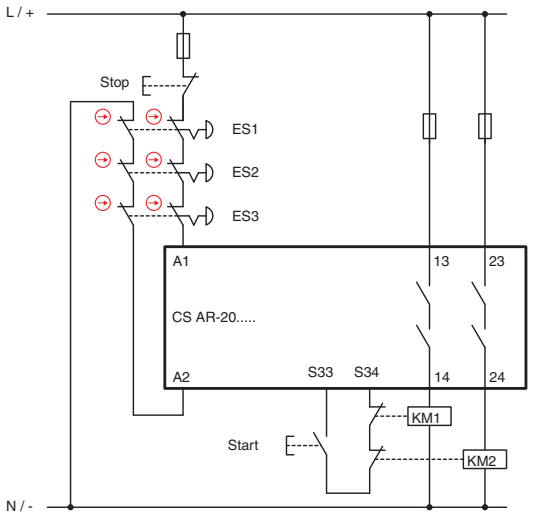
CCF Common Cause Failures
The CCF calculation is not required for category 1 circuits.

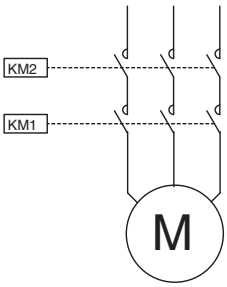
PL determination
Using the graph or the figure no. 5 of the standard, it can be verified that for a Category 1 circuit with $MTTF_D$ = 95 years the resulting PL of the control circuit is PL c. The PL_r target is therefore achieved.

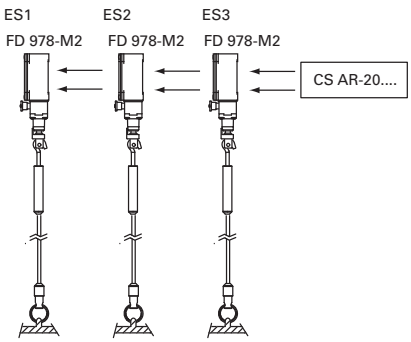


EXAMPLE 2
Application: Emergency stop control

Reference standard EN ISO 13849-1	
Safety category	3
Performance Level	PL e







Description of the safety function
The operation of one of the emergency devices causes the intervention of the safety module and the two contactors KM1 and KM2. The signal of the devices ES1, ES2, ES3 is redundantly read by the CS safety module. The contactors KM1 and KM2 (with forcibly guided contacts) are monitored by the CS via the feedback circuit too.

Device data:
- The devices ES1, ES2, ES3 (FD 978-M2) are rope switches for emergency stop with positive opening. The B10D value is 2,000,000
- KM1 and KM2 are contactors operated at nominal load. The B10D value is 1,300,000 (see EN ISO 13849-1 - Table C.1)
- CS is a safety module (CS AR-20) with $MTTF_D$ = 225 years and DC = High
- The circuit structure is two-channel in category 3

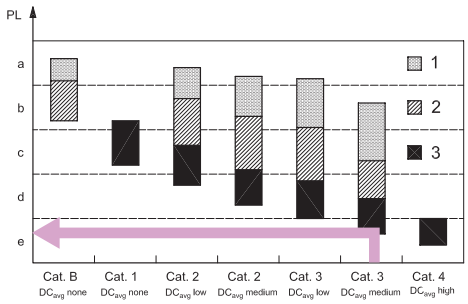
Assumption of the frequency of use
- Twice a month, nop/year = 24
- Start button actuation: 4 times a day
- Assuming 365 working days, the contactors will take action 4 x 365 + 24 = 1484 times / year
- The switches will be operated with the same frequency.
- It is not expected that multiple buttons will be pressed simultaneously.

$MTTF_D$ calculation
- $MTTF_{D\ ES1,ES2,ES3}$ = 833,333 years
- $MTTF_{D\ KM1,KM2}$ = 8760 years
- $MTTF_{D\ CS}$ = 225 years
- $MTTF_{D\ ch1}$ = 219 years. The value must be limited to 100 years. The channels are symmetric, therefore $MTTF_D$ = 100 years (High)
-

Diagnostic Coverage DC_{avg}
- The contacts of KM1 and KM2 are monitored by the CS module via the feedback circuit. DC=99% (High)
- The safety module CS AR-20 is provided with a "High" diagnostic coverage.
- Not all failures in the series of emergency devices can be detected. The diagnostic coverage is 90% (Medium)

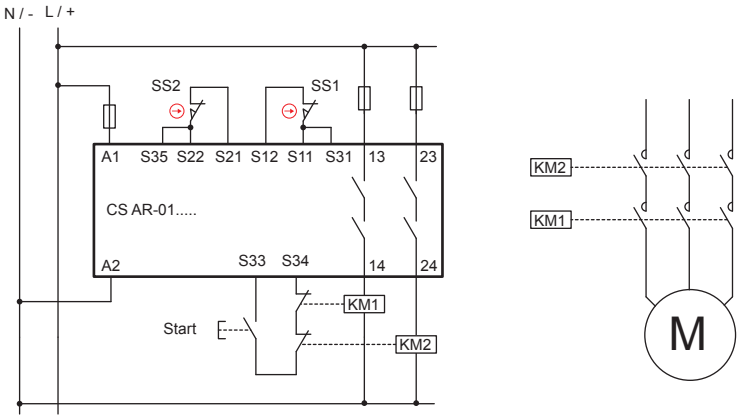
CCF Common Cause Failures
We assume a score > 65 (acc. to EN ISO 13849-1 - Annex F).

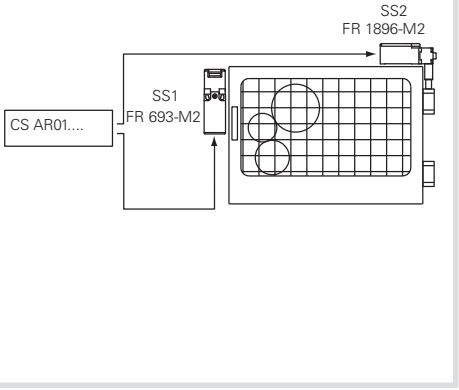
PL determination
A circuit in category 3 with $MTTF_D$=High and DC_{avg}= High can reach a PL e.



EXAMPLE 3
Application: Guard monitoring

Reference standard EN ISO 13849-1	
Safety category	**4**
Performance Level	**PL e**





Description of the safety function
The guard opening causes the intervention of the switches SS1 and SS2 and, by consequence, of the safety module and the KM1 and KM2 contactors too
The signal of the devices SS1 and SS2 is redundantly monitored by the CS safety module.
The switches have different operating principles.
The contactors KM1 and KM2 (with forcibly guided contacts) are monitored by the CS via the feedback circuit too.

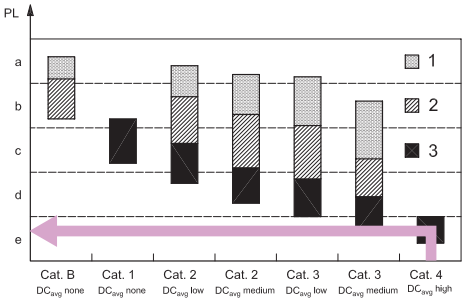
Device data:
- The switch SS1 (FR 693-M2) is a switch with positive opening. The B_{10D} value is 2,000,000
- The switch SS2 (FR 1896-M2) is a hinge switch with positive opening. B_{10D}= 5,000,000
- KM1 and KM2 are contactors operated at nominal load. B_{10D} = 1,300,000 (see EN ISO 13849-1 - Table C.1)
- The CS modules are safety modules (CS AR-01) with $MTTF_D$ = 227 years and DC = High

Assumption of the frequency of use
365 days/year, 16 h/day, 1 action every 4 minutes (240 s). n_{op}/year = 87,600.

$MTTF_D$ calculation
- $MTTF_{D\ SS1}$ = 228 years
- $MTTF_{D\ SS2}$ = 571 years
- $MTTF_{D\ KM1,KM2}$ = 148 years
- $MTTF_{D\ CS}$ = 227 years
- $MTTF_{D\ CH1}$ = 64 years (SS1,CS,KM1)
- $MTTF_{D\ CH2}$ = 77 years (SS2,CS,KM2)
- $MTTF_D$: by calculating the average of the two channels $MTTF_D$ = 70.7 years (High) is achieved
-

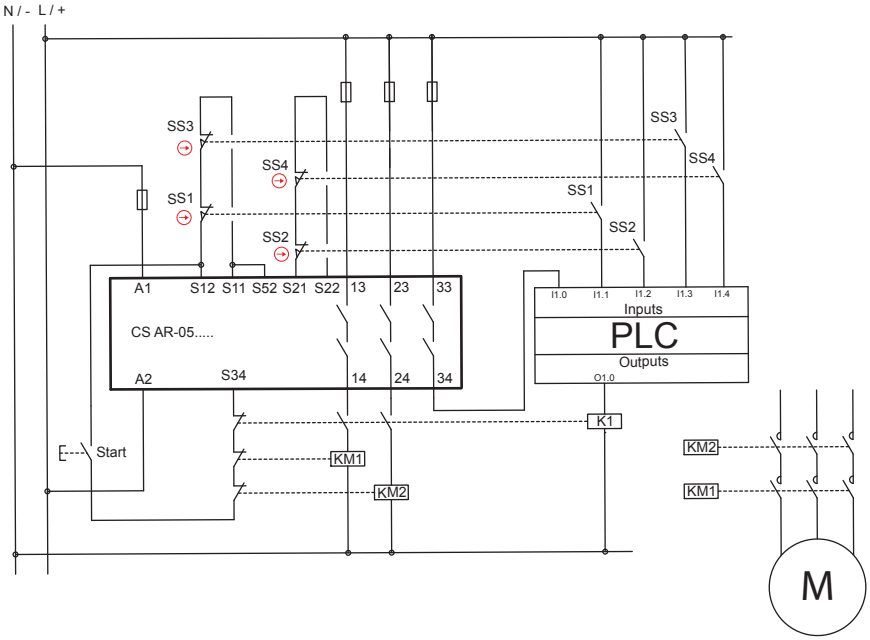
Diagnostic Coverage DC_{avg}
- SS1 and SS2 have DC = 99% since the SS1 and SS2 contacts are monitored by CS and have different operation principles.
- The contacts of KM1 and KM2 are monitored by the CS module via the feedback circuit. DC=99% (High)
- CS AR-01 is provided with an internal redundant and self-monitoring circuit. DC = High
- DC_{avg}= High

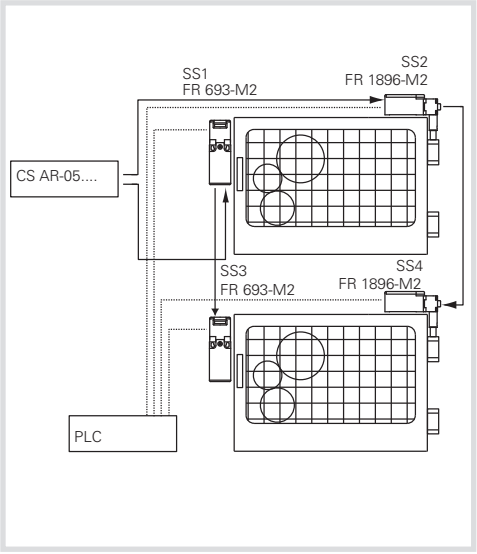
PL determination
A circuit in category 4 with $MTTF_D$ = 72.1 years and DC_{avg} = High corresponds to PL e.



EXAMPLE 4
Application: Guard monitoring

Reference standard EN ISO 13849-1	
Safety category	**4**
Performance Level	**PL e**





Description of the safety function
The opening of a guard triggers switches SS1 and SS2 on the first guard and triggers SS3, SS4 on the second; the switches trigger the safety module and both contactors KM1 and KM2.
The signal of the devices SS1, SS2 and SS3, SS4 is redundantly monitored by the CS safety module. Furthermore, an auxiliary contact of the switch is monitored by the PLC.
The switches have different operating principles.
The contactors KM1 and KM2 (with forcibly guided contacts) are monitored by the CS via the feedback circuit too.

Device data:
- The switches SS1, SS3 (FR 693-M2) are switches with positive opening. The B_{10D} value is 2,000,000
- The switches SS2, SS4 (FR 1896-M2) are hinge switches with positive opening. B_{10D}= 5,000,000
- KM1 and KM2 are contactors operated at nominal load. The B_{10D} value is 1,300,000 (see EN ISO 13849-1 - Table C.1)
- CS is a safety module (CS AR-05) with $MTTF_D$ = 152 years and DC = High

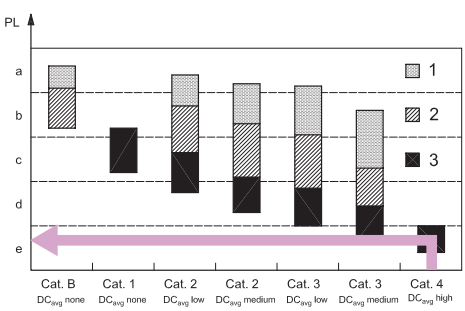
Assumption of the frequency of use
- 4 times per hour for 24 h/day for 365 days/year equal to n_{op}/year = 35,040
- The contactors will operate for twice the number of operations = 70,080

$MTTF_{d\ calculation}$
- $MTTF_{D\ SS1,SS3}$ = 571 years; $MTTF_{D\ SS2,SS4}$ = 1,427 years
- $MTTF_{D\ KM1,KM2}$ = 185 years
- $MTTF_{D\ CS}$ = 152 years
- $MTTF_{D\ Ch1}$ = 73 years (SS1, CS, KM1) / (SS3, CS, KM1)
- $MTTF_{D\ Ch2}$ = 79 years (SS2, CS, KM2) / (SS4, CS, KM2)
- $MTTF_D$: by calculating the average of the two channels $MTTF_D$ = 76 years (High) is achieved

Diagnostic Coverage DC_{avg}
- The contacts of KM1, KM2 are monitored by the CS module via the feedback circuit. DC=99%
- All auxiliary contacts of the switches are monitored by the PLC. DC=99%
- The CS AR-05 module has a DC= High
- The diagnostic coverage for both channels is 99% (High)

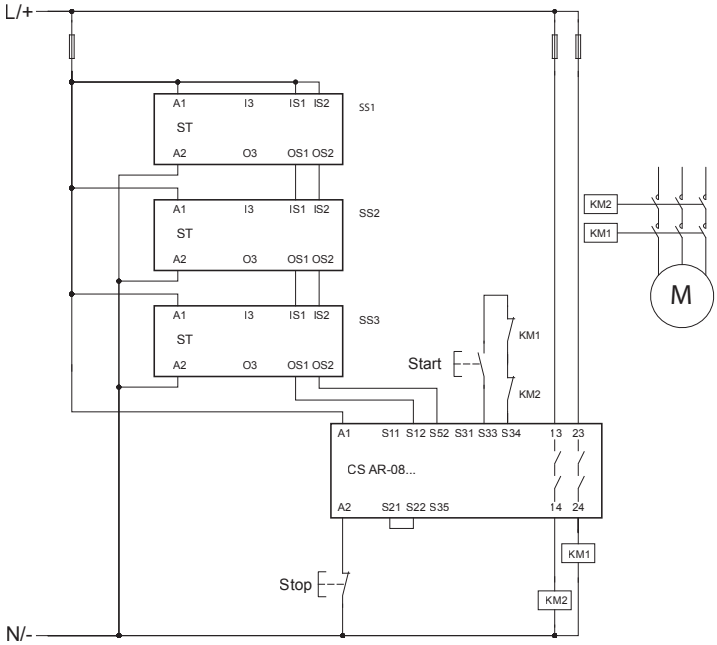
CCF Common Cause Failures
- We assume a score > 65 (acc. to EN ISO 13849-1 - Annex F).

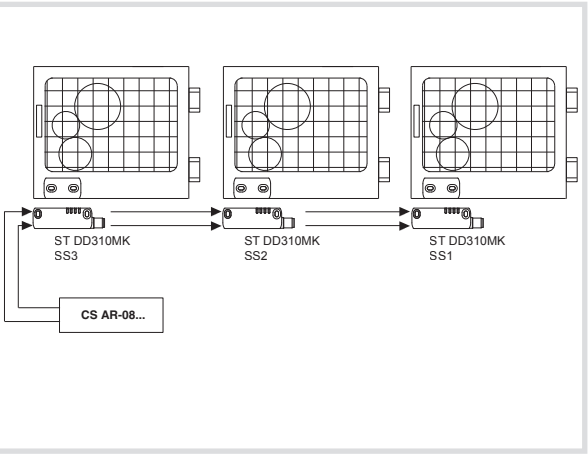
PL determination
- A circuit in category 4 with $MTTF_D$ = 88.6 years (High) and DC_{avg} = High corresponds to PL e.



EXAMPLE 5
Application: Guard monitoring

Reference standard EN ISO 13849-1	
Safety category	**4**
Performance Level	**PL e**

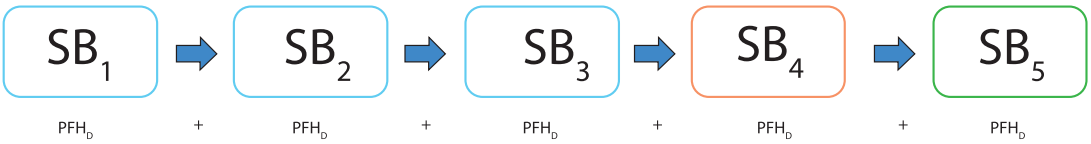




Description of the safety function
The opening of guards triggers the sensors SS1 on the first guard, SS2 on the second and SS3 on the third. The sensors trigger the safety module CS AR-08 and the contactors KM1 and KM2 too. The contactors KM1 and KM2 (with forcibly guided contacts) are monitored by the CS AR-08 via the feedback circuit.

Device data
SS1, SS2, SS3 are ST series coded sensors with RFID technology. PFH_D = 1.20E-11, PL ="e"
CS AR-08 is a safety module. PFH_D = 9.73E-11, PL = "e"
KM1 and KM2 are contactors operated at nominal load. B_{10D} = 1,300,000 (see EN ISO 13849-1 - Table C.1)

Assumption of the frequency of use
Each door is opened every 2 minutes, 16 hours a day, for 365 days a year, equal to nop = 175,200
Definition of the SRP/CS and subsystems
The SRP/CS consists of 5 subsystems (SB):
SB1,2,3 represent the three ST series RFID sensors
SB4 represents the safety module CS AR-08
SB5 represents the two contactors KM1 and KM2 in redundant architecture (cat. 4)



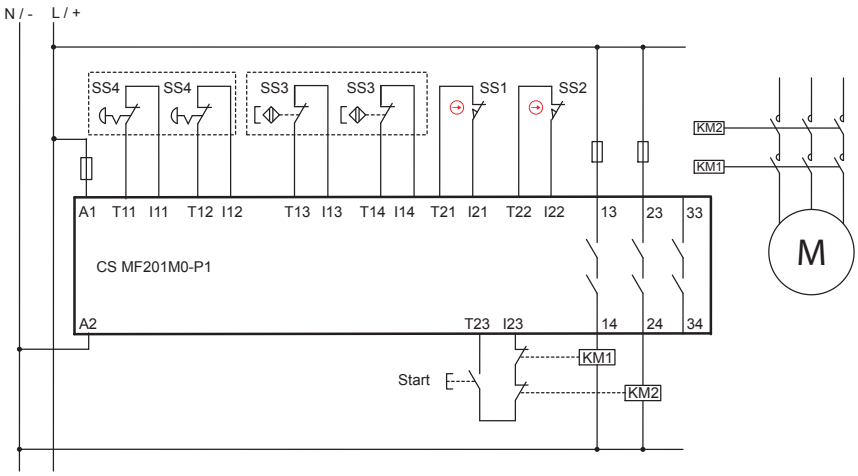
PFH_D calculation for SB5
$MTTF_D$ KM1,KM2 = 74.2 years.
DC = 99%, the contacts of KM1 and KM2 are monitored by the CS safety module via the feedback circuit.
For the CCF parameter we assume a score higher than 65 (acc. to EN ISO 13849-1 - Annex F).
A category 4 circuit with $MTTF_D$ = 74.2 years (high) and high diagnostic coverage (DC = 99%) corresponds to a failure probability of PFH_D = 3.4E-08 and a PL "e".

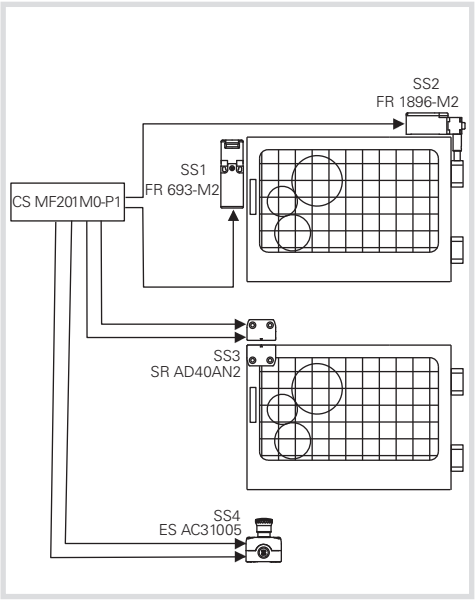
Calculation of the total PFH_D of the SRP/CS
$PFH_{DTOT} = PFH_{DSB1} + PFH_{DSB2} + PFH_{DSB3} + PFH_{DSB4} + PFH_{DSB5}$ = 3.5E-08
It corresponds to PL "e".

Calculation example performed with SISTEMA software, downloadable free of charge at www.pizzato.com

EXAMPLE 6
Application: Guard monitoring

Reference standard EN ISO 13849-1	
Safety category	4
Performance Level	PL e





Description of the safety function
The opening of a guard triggers switches SS1 and SS2 on the first guard and triggers sensor SS3 on the second; the switches trigger the safety module and both contactors KM1 and KM2.
The signals from the SS1, SS2 and SS3 devices are redundantly monitored by the CS MF safety module.
There is also an emergency stop button which has a two-channel connection with the safety module too.
The contactors KM1 and KM2 (with forcibly guided contacts) are monitored by the CS MF via the feedback circuit too.

Device data:
- The switch SS1 (FR 693-M2) is a switch with positive opening. B_{10D} = 2,000,000
- The switch SS3 (FR 1896-M2) is a hinge switch with positive opening. B_{10D}= 5,000,000
- SS3 (SR AD40AN2) is a magnetic safety sensor. B_{10D} = 20,000,000
- SS4 (ES AC31005) is a housing with emergency stop button (E2 1PERZ4531) provided with 2 NC contacts. B_{10D}= 600,000
- KM1 and KM2 are contactors operated at nominal load. B_{10D} = 1,300,000 (see EN ISO 13849-1 - Table C.1)
- CS MF201M0-P1 is a safety module with $MTTF_D$ = 842 years and DC = 99%

Assumption of the frequency of use
- Each door is opened 2 times per hour for 16 h/day for 365 days/year equal to n_{op}/year = 11,680
- It is assumed that the emergency button is actuated at a maximum of once a day, n_{op}/year = 365
- The contactors will operate for twice the number of operations = 23,725

$MTTF_D$ calculation

Guard SS1/SS2
- $MTTF_{D\ SS1,SS3}$ = 1,712 years
- $MTTF_{D\ SS2,SS4}$ = 4,281 years
- $MTTF_{D\ KM1,KM2}$ = 548 years
- $MTTF_{D\ CS}$ = 842 years
- $MTTF_{D\ CH1}$ = 278 years (SS1, CS, KM1)
- $MTTF_{D\ CH2}$ = 308 years (SS2, CS, KM2)
- $MTTF_D$ = by calculating the average of the two channels $MTTF_D$ = 293 years is achieved

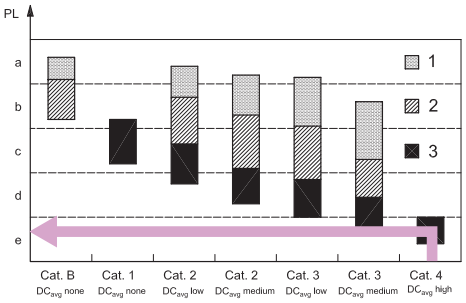
Guard SS3
- $MTTF_{D\ SS3}$ = 17,123 years
- $MTTF_{D\ KM1,KM2}$ = 548 years
- $MTTF_{D\ CS}$ = 842 years
- $MTTF_D$ = 325 years

Emergency stop button SS4
- $MTTF_{D\ SS4}$ = 16,438 years
- $MTTF_{D\ KM1,KM2}$ = 548 years
- $MTTF_{D\ CS}$ = 842 years
- $MTTF_D$ = 325 years

Diagnostic Coverage DC_{avg}
- The contacts of KM1, KM2 are monitored by the CS MF module via the feedback circuit. DC=99%
- For the devices SS1, SS2 and SS3 it is possible to detect all faults. DC=99%
- The CS MF201M0-P1 module has a DC=99%
- We assume a diagnostic coverage of 99% (High)

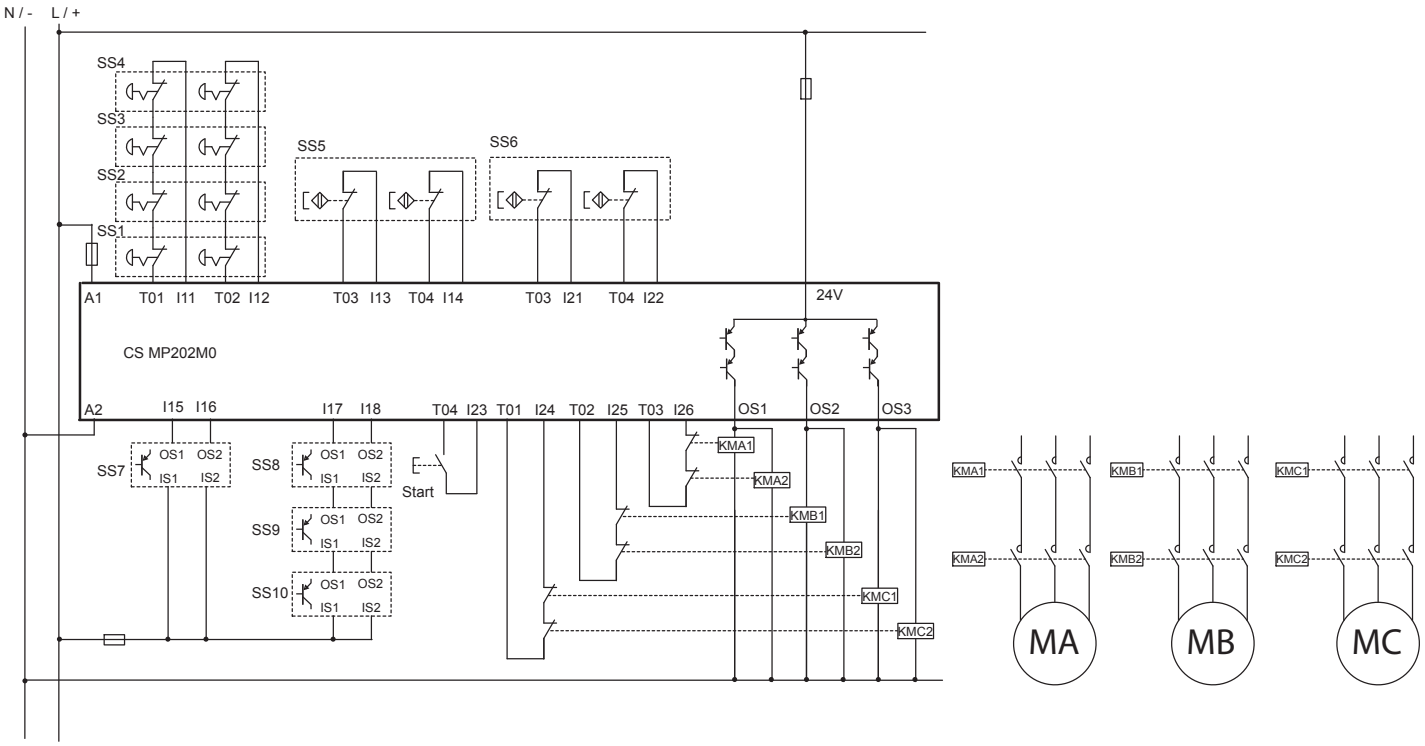
CCF Common Cause Failures
- We assume a score > 65 (acc. to EN ISO 13849-1 - Annex F).

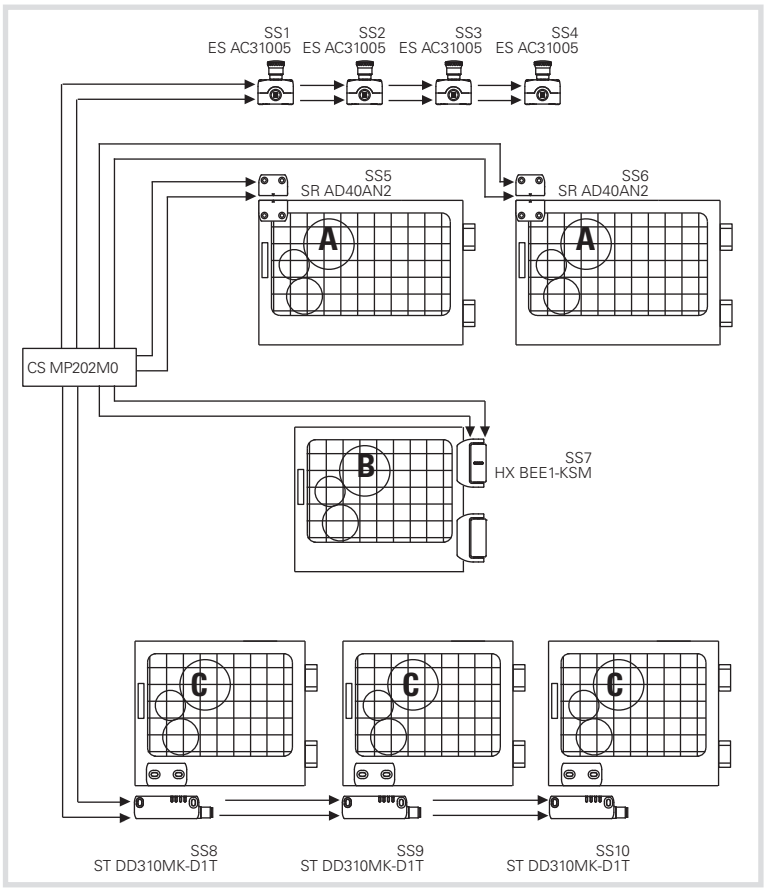
PL determination
- A circuit in category 4 with $MTTF_D \geq 30$ years (High) and DC_{avg} = High corresponds to PL e.
- The safety functions associated to the guards SS1/SS2, SS3 and the emergency stop button present the level PL e.

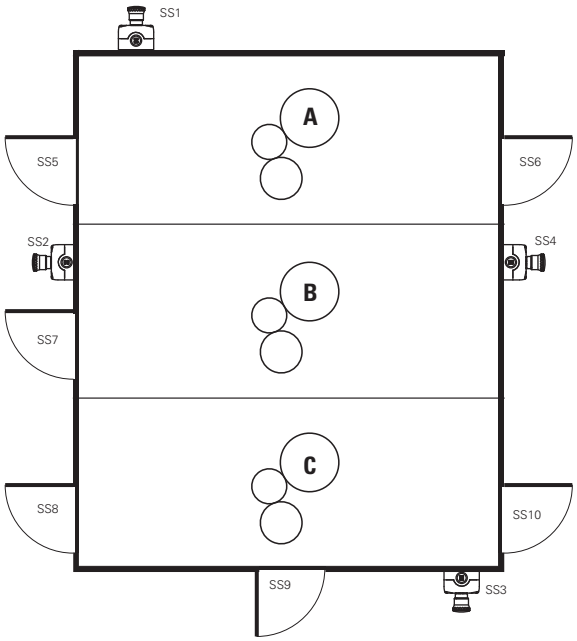


EXAMPLE 7
Application: Guard monitoring

Reference standard EN ISO 13849-1	
Safety category	**4**
Performance Level	**PL e**







Description of the safety function

Every machine is divided into 3 different zones. The access to each zone is monitored by the guards and 4 emergency stop buttons are present too.
The operation of an emergency stop button will trigger the CS MP safety module as well as the forcibly guided contactors KMA1/2, KMB1/2 and KMC1/2, and will therefore stop all motors.
The opening of a guard in zone A triggers the devices SS5 or SS6 and, as a consequence, the CS MP safety module as well as the contactors KMA1 and KMA2, and therefore also the stop of the MA motor. The devices SS5 and SS6 are connected to the CS MP safety module separately, with a two-channel connection.
The opening of the guard in zone B triggers the device SS7 and, as a consequence, the CS MP safety module as well as the contactors KMB1 and KMB2, and therefore also the stop of the MB motor. The SS7 hinge is provided with two OSSD outputs and is redundantly controlled by the CS MP safety module.
The opening of a guard in zone C triggers the devices SS8, SS9 or SS10 and, as a consequence, the safety module as well as the contactors KMC1 and KMC2, and therefore also the stop of the MC motor. The sensors SS8, SS9 and SS10 are interconnected via the OSSD outputs and are redundantly monitored by the CS MP safety module.

Device data

- SS1, SS2, SS3 and SS4 (ES AC31005) are emergency stop buttons (E2 1PERZ4531) provided with 2 NC contacts. B_{10D} = 600,000
- SS5 and SS6 (SR AD40AN2) are magnetic safety sensors. B_{10D} = 20,000,000
- SS7 (HX BEE1-KSM) is a safety hinge with OSSD outputs. $MTTF_D$ = 4,077 years / DC = 99%
- SS8, SS9 and SS10 (ST DD310MK-D1T) are safety sensors with RFID technology and OSSD outputs. $MTTF_D$ = 4,077 years / DC = 99%
- KMA, KMB and KMC are contactors operated at nominal load. B_{10D} = 1,300,000 (see EN ISO 13849-1 - Table C.1)
- CS MP202M0 is a safety module with $MTTF_D$ = 2035 years / DC = 99%

Assumption of the frequency of use

- Each door of zone A is opened 2 times per hour for 16 h/day for 365 days/year equal to n_{op}/year = 11,680. The contactors will operate for twice the number of operations = 23,360
- The door of zone B is opened 4 times per hour for 16 h/day for 365 days/year equal to n_{op}/year = 23,360. The contactors will operate for a given number of operations = 23,360
- Each door of zone C is opened 1 times per hour for 16 h/day for 365 days/year equal to n_{op}/year = 5,840. The contactors will operate for a given number of operations = 17,520
- It is assumed that the emergency button is actuated at a maximum of once a week, n_{op}/year = 52
- Fault Exclusion: since it is assumed that the pairs of contactors, connected in parallel to the respective safety outputs, are wired permanently within the switching cabinet, the possibility of short-circuit between +24V and the contactors is excluded (see Table D.4, item D.5.2 of EN ISO 13849-2).

$MTTF_D$ calculation

Emergency stop buttons
- $MTTF_D$ SS1/SS2/SS3/SS4 = 115,384 years
- $MTTF_D$ CS = 2035 years
- $MTTF_D$ KMC1,KMC2 = 742 years
- $MTTF_D$ e-stop = 541 years

Guards, zone A
- $MTTF_D$ SS5/SS6 = 17,123 years
- $MTTF_D$ CS = 2035 years
- $MTTF_D$ KMA1,KMA2 = 556 years
- $MTTF_D$ A = 425 years (SS5/SS6,CS,KMA)

Guards, zone B
- $MTTF_D$ SS7 = 4,077 years
- $MTTF_D$ CS = 2035 years
- $MTTF_D$ KMB1,KMB2 = 556 years
- $MTTF_D$ B = 394 years (SS7,CS,KMB)

Guards, zone C
- $MTTF_D$ SS8/SS9/SS10 = 4,077 years
- $MTTF_D$ CS = 2035 years
- $MTTF_D$ KMC1,KMC2 = 742 years
- $MTTF_D$ C = 479 years (SS8/SS9/SS10,CS,KMC)

Diagnostic Coverage DC_{avg}

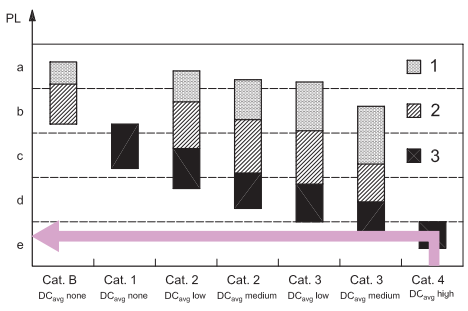
- The contacts of KMA, KMB and KMC are monitored by the CS MP module via the feedback circuit. DC=99%
- All faults in the various devices can be detected. DC=99%
- The CS MP202M0 module has a DC=99%
- The result is a diagnostic coverage of 99% for each function

CCF Common Cause Failures

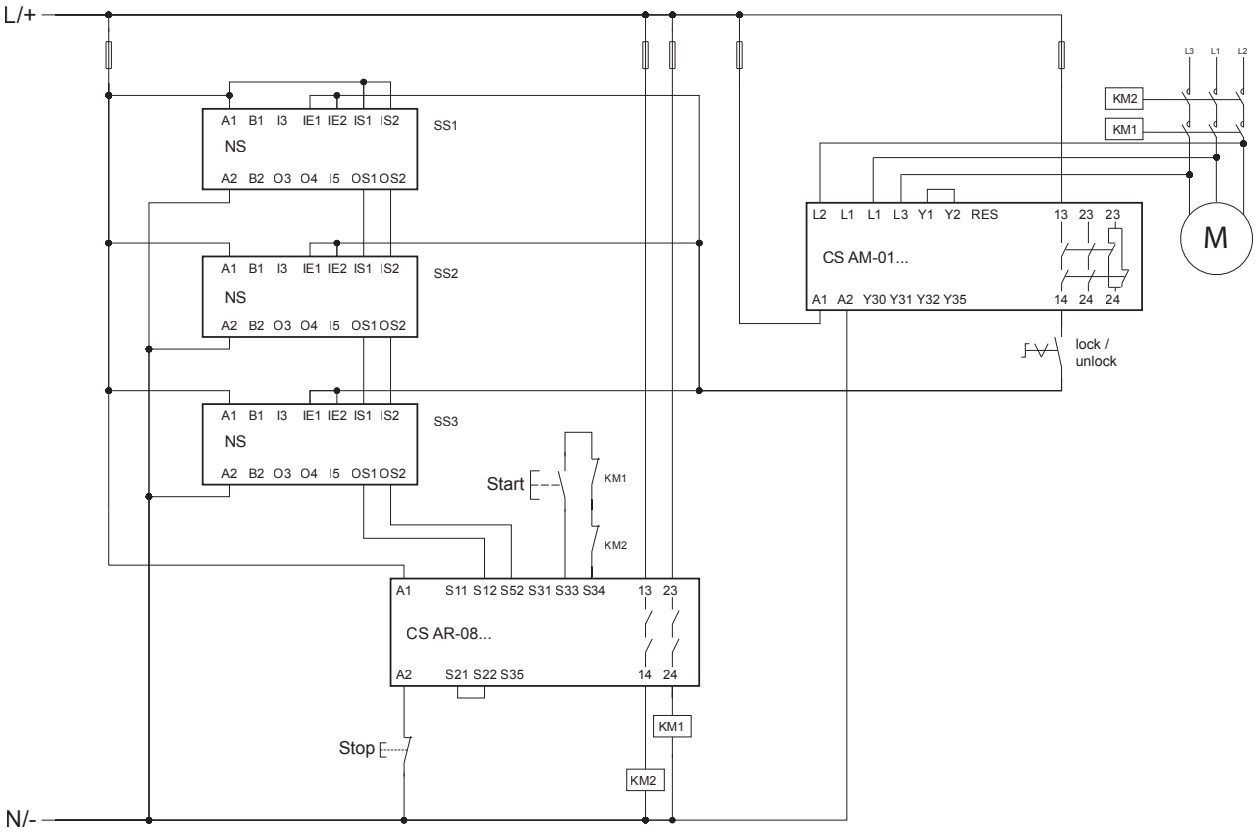
- We assume a score > 65 for all safety functions (acc. to EN ISO 13849-1 - Annex F).

PL determination

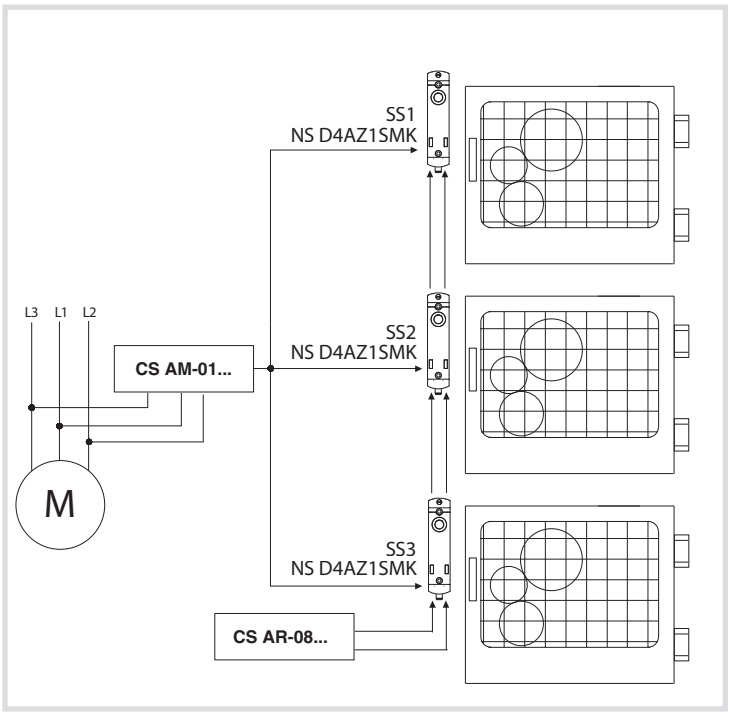
- A circuit in category 4 with $MTTF_D \geq 30$ years (High) and DC_{avg} = High corresponds to PL e.
- All safety functions associated to the guards and the emergency stop buttons have PL e.



EXAMPLE 8
Application: Guard monitoring



Reference standard EN ISO 13849-1	
Performance Level - Safety function 1	**PL e**
Performance Level - Safety function 2	**PL d**

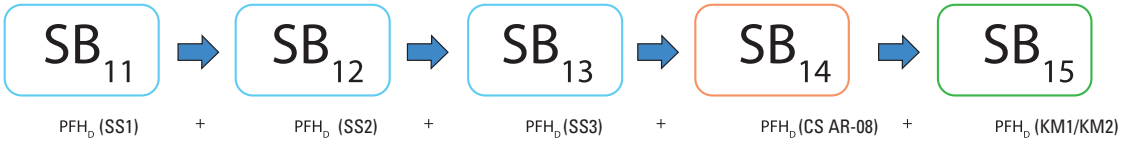


Description of the safety function
Interlocking devices SS1, SS2 and SS3 perform two safety functions: monitoring the locked state and locking the guard.
Once the guards have been released, the three sensors trigger the safety module and the contactors KM1 and KM2 too. The contactors KM1 and KM2 (with forcibly guided contacts) are monitored by the CS AR-08 via the feedback circuit.
The interlock command on the three devices SS1, SS2 and SS3 is maintained until the motor standstill monitoring module CS AM-01 detects the actual stopping of movement.

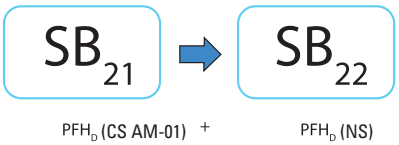
Device data
SS1, SS2, SS3 are NS series coded interlock devices with RFID technology, with guard locking device. Locked protection detection function PFH_D = 1.22E-09 PL = "e", operating of locking control PFH_D = 2.29E-10 PL = "e".
CS AR-08 is a safety module, PFH_D = 9.73 E-11, PL = "e".
CS AM-01 is a safety module for motor standstill monitoring, PFH_D = 8,70E-09, PL "d".
KM1 and KM2 are contactors operated at nominal load. $B10_D$ = 1,300,000 (see EN ISO 13849-1 - Table C.1)

Assumption of the frequency of use
Each door is opened every 10 minutes, 16 hours a day, for 365 days a year, equal to n_{op}/year = 35,040

Definition of the SRP/CS and subsystems
This application example presents two safety functions:
1. Safety-related stop function initiated by a protective measure
2. Maintain interlock of the guard with motor M in motion
The safety function 1 is performed by an SRP/CS consisting of 5 subsystems (SB):
- SB11,12,13 represent the three RFID interlock devices of the NS series: SS1, SS2 and SS3
- SB14 represents the safety module CS AR-08
- SB15 represents the two contactors KM1 and KM2 in redundant architecture (cat. 4)



The safety function 2 is performed by 2 subsystems (SB):
- SB21 represents the CS AM-01 safety module for motor standstill monitoring
- SB22 represents the three NS series RFID interlock devices



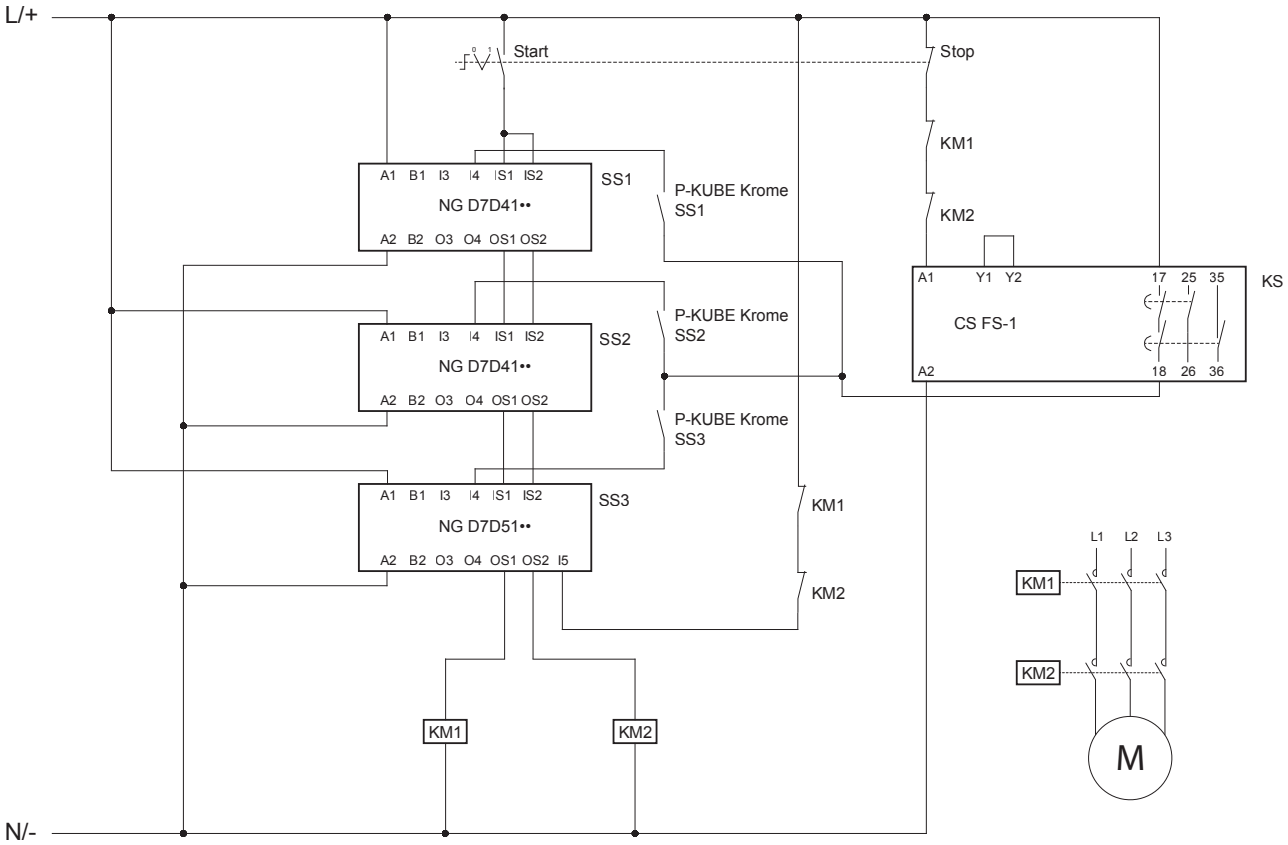
PFH_D calculation for SB15
$MTTF_D$ KM1,KM2 = 371 years.
DC = 99%, the contacts of KM1 and KM2 are monitored by the CS safety module via the feedback circuit.
For the CCF parameter we assume a score higher than 65 (acc. to EN ISO 13849-1 - Annex F).
A category 4 circuit with $MTTF_D$ = 371 and high diagnostic coverage (DC = 99%) corresponds to a failure probability of PFH_D = 6.3E-09 and a PL "e".

Calculation of the total PFH_D of the SRP/CS safety function 1
$PFH_{DTOT} = PFH_{DSB11} + PFH_{DSB12} + PFH_{DSB13} + PFH_{DSB14} + PFH_{DSB15}$ = 1E-08
It corresponds to PL "e".

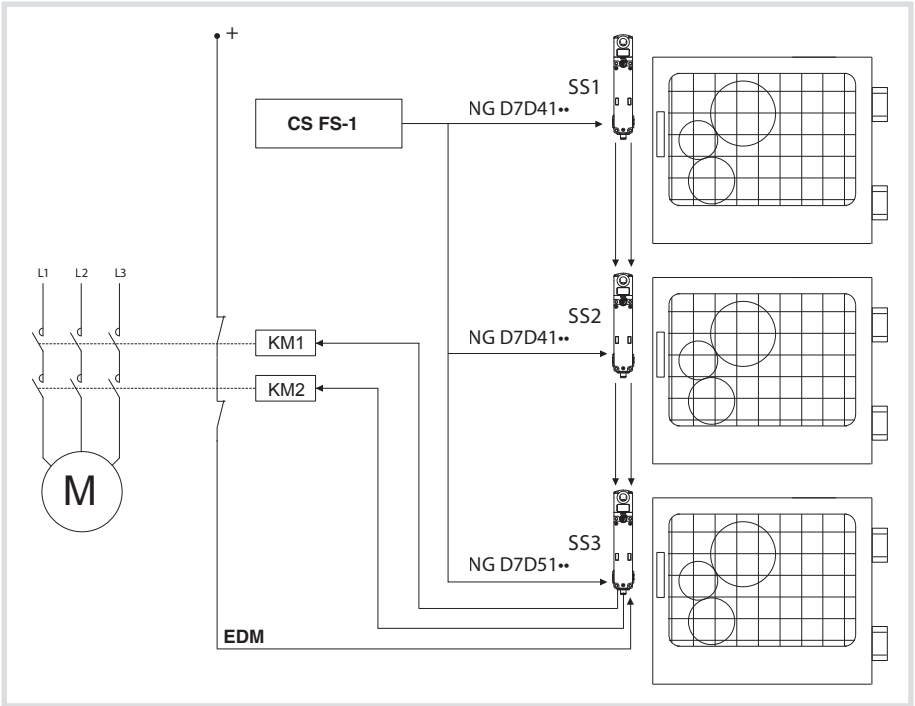
Calculation of the total PFH_D of the SRP/CS safety function 2
$PFH_{DTOT} = PFH_{DSB21} + PFH_{DSB22}$ = 8.9E-09
That would correspond to PL "e". However, considering that the motor standstill monitoring module is characterised by a PL "d", and that the unlock command takes place via a single-channel architecture, the entire SRP/CS is downgraded to this value, therefore PL "d".

Calculation example performed with SISTEMA software, downloadable free of charge at www.pizzato.com

EXAMPLE 9
Application: Guard monitoring



Reference standard EN ISO 13849-1	
Performance Level - Safety function 1	**PL e**
Performance Level - Safety function 2	**PL d**

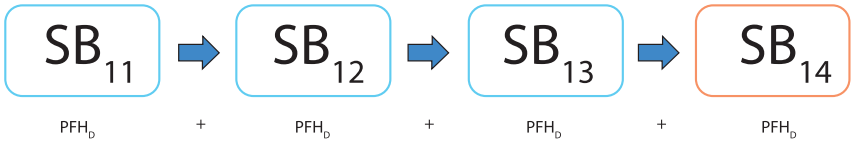


Description of the safety function
Interlocking devices SS1, SS2 and SS3 perform two safety functions: monitoring the locked state and locking the guard.
Once the guards have been released, the three sensors act directly on contactors KM1 and KM2. Contactors KM1 and KM2 (with forcibly guided contacts) are controlled by the SS3 sensor, via EDM (External Device Monitoring) input I5.
The interlock command on the three devices SS1, SS2 and SS3 depends on the closure of the safe contact of a CS FS-1 safety timer module. Each device will receive the unlock command, when the button mounted on the P-KUBE Krome handle is pressed.

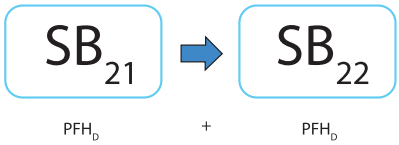
Device data
SS1, SS2, SS3 are coded interlock devices with RFID technology, with guard locking device. Locked protection detection function PFH_D = 1,17E-09 PL ="e", single channel locking control function PFH_D = 1,51E-10 PL ="d".
CS FS-1 is a safety timer module, PFH_D = 5.06E-10, PL "e".
KM1 and KM2 are contactors operated at nominal load. B10d = 1.300.000 (see EN ISO 13849-1 - Table C.1)

Assumption of the frequency of use
Each door is opened every 10 minutes, 16 hours a day, for 365 days a year, equal to nop = 35,040

Definition of the SRP/CS and subsystems
This application example presents two safety functions:
1. Safety-related stop function initiated by a protective measure
2. Maintain interlock of the guard with motor M1 in motion
The safety function 1 is performed by an SRP/CS consisting of 4 subsystems (SB):
- SB11,12,13 represent the three RFID interlock devices of the NG series: SS1, SS2 and SS3
- SB14 represents the two contactors KM1 and KM2 in redundant architecture (cat. 4)



The safety function 2 is performed by 2 subsystems (SB):



- SB21 represents the safety timer module CS FS-1
- SB22 represents the NG series RFID interlocking device

PFH_D calculation for SB14
$MTTF_D$ KM1,KM2 = 371 years.
DC = 99%, the KM1 and KM2 contacts are monitored by the last NG device in the series, via the EDM input.
For the CCF parameter we assume a score higher than 65 (acc. to EN ISO 13849-1 - Annex F).
A category 4 circuit with $MTTF_D$ = 371 and high diagnostic coverage (DC = 99%) corresponds to a failure probability of PFH_D = 6.3E-09 and a PL "e".

Calculation of the total PFH_D of the SRP/CS safety function 1
$PFH_{DTOT} = PFH_{DSB11} + PFH_{DSB12} + PFH_{DSB13} + PFH_{DSB14}$ = 9.8E-09
It corresponds to PL "e".

Calculation of the total PFH_D of the SRP/CS safety function 2
$PFH_{DTOT} = PFH_{DSB21} + PFH_{DSB22}$ = 6.6E-10
That would correspond to PL "e". Considering however, that the NG device with single channel interlock command is characterized by a PL "d", the entire SRP/CS is downgraded to this value; therefore PL "d".

Definitions according to the EN 60947-1 and EN 60947-5-1 standards

Control switches
Devices or operating mechanisms for controlling the operation of equipment, including signalling, interlocking, etc.

Utilization category
Combination of specified requirements related to the conditions in which the switching device fulfils its purpose.

Operating cycle
Sequence of two operations, one for opening and one for closing.

Rated current Ie
This current depends on the rated operating voltage, the rated frequency, the utilization category and the type of protective enclosure, if present.

Thermal current Ith
Maximum current for heating tests on equipment without enclosure, in free air. Its value shall be least to equal to the maximum value of the rated operational current Ie of the equipment without enclosure, in eight-hour duty.

Electrical endurance
Number of on-load operating cycles, under the conditions defined by the corresponding product standard, which can be carried out without repair or replacement.

Mechanical endurance
Number of no-load operating cycles (i.e. without current on the main contacts), under the conditions defined by the corresponding product standard, which can be carried out without repair or replacement of mechanical parts.

Contact elements
The parts, fixed or movable, conducting or insulating, of a control switch necessary to close and open one single conducting path of a circuit.

Single interruption contact elements
Contact element opening or closing the circuit's conducting path at one point only.

Double interruption contact elements
Contact element opening or closing the circuit's conducting path at two points in series.

Make-contact elements (normally open)
Contact element closing a circuit's conducting path when the control switch is actuated.

Break-contact elements (normally closed)
Contact element opening a circuit's conducting path when the control switch is actuated.

Change-over contact elements
Contact element combination including one make-contact element and one break-contact element.

Electrically separated contact elements
Contact elements of the same control switch which are well isolated from each other and therefore can be connected to electric circuits with different voltages.

Contact elements with independent action (snap action)
Contact element of a manual or automatic device for control circuits where the motion speed of the contact is substantially independent from the motion speed of the actuator.

Contact elements with dependent action (slow action)
Contact element of a manual or automatic device for control circuits where the motion speed of the contact depends on the motion speed of the actuator.

Minimum actuating force
Minimum force to be applied to the actuator that will cause all contacts to reach their switched position.

Position switch
Control switch whose controller is actuated by a moving part of the machine, when this part arrives to a set position.

Foot switch
Control switch whose actuator is actuated by exerting force with a foot on the pedal.

Pre-travel of the actuator
The maximum travel of the actuator which does not cause any travel of the contact elements.

Ambient temperature
The air temperature surrounding the complete switching device, under prescribed conditions.

Rated operating voltage Ue
Voltage which, combined with the rated operational current Ie, determinates the application of the equipment and the referred utilization categories.

Rated insulation voltage Ui
Reference voltage for the dielectric test voltage and the creepage distances along surfaces.

Rated impulse withstand voltage Uimp
The highest peak value of an impulse voltage, of a prescribed shape and polarity, which does not cause destructive discharge under the specified test conditions.

Contact block
Contact element or contact elements combination which can be combined with similar units, operated by a common actuating system

Markings and quality marks

CE marking

The CE marking is a mandatory declaration made by the manufacturer of a product in order to indicate that the product satisfies all requirements foreseen by the directives (regulated by the European Community) in terms of safety and quality. Therefore, it ensures National bodies of the EU countries about the fulfilment of obligations laid down in the agreements.

IMQ mark

The IMQ (Italian Institute of the Quality Mark) is an association in Italy (independent third body) whose task is to check and certify the compliance of materials and equipment with safety standards (CEI standards in the electric and electronic sector). This voluntary conformity certification is a guarantee of quality, safety and technical value.

UL mark

UL (Underwriters Laboratories Inc.) is an independent non-profit body that tests materials, devices, products, equipment, constructions, methods and systems with regard to their risk for human life and goods according to the standard in force in the United States and Canada. Decisions made by UL are often recognized by many governing authorities concerning the compliance with local safety regulations.

CCC mark

The CQC is the organization in the Chinese Popular Republic whose task is to check and certify the low voltage electrical material. This organization issues the product mark CCC which certifies the passing of electrical/mechanical conformity tests by products and the compliance of the company quality system with required standards. To obtain the mark, the Chinese body makes preliminary company visits as well as periodical check inspections. Position switches cannot be sold in the Chinese territory without this mark.

TÜV SÜD mark

TÜV SÜD is an international authority claiming long-standing experience in the certification of operating safety for electrical, electromechanical and electronic products. In the course of type approval, TÜV SÜD closely inspects the quality throughout all the stages concerning product development, from software design and completion, to production and to the tests conducted according to ISO/IEC standards. The operating safety certification is obtained voluntarily and has a high technical value, since it not only certifies the electrical safety of the product, but also its specific operating suitability for use in safety applications according to the IEC 61508 standard.

EAC mark

The EAC certificate of conformity is a certificate issued by a Customs Union certification body formed by Russia, Belarus and Kazakhstan, with which the conformity of a product is certified with the essential safety requirements laid down by one or more Technical Regulations (Directives) of the Customs Union.

ECOLAB mark

ECOLAB is one of the world's leading providers of technologies and services for hygiene in food processing. ECOLAB certifies the compatibility of tested electrical devices in its own laboratories, using disinfectants and cleaning agents used in the area of food processing worldwide.

International and European Standards

EN 50041: Low voltage switchgear and controlgear for industrial use. Control switches. Position switches 42.5x80 mm. Dimensions and features
EN 50047: Low voltage switchgear and controlgear for industrial use. Control switches. Position switches 30x55 mm. Dimensions and features
EN ISO 14119: Safety of machinery. Interlocking devices associated with guards. Design and selection principles.
EN ISO 12100: Safety of machinery. General design principles. Risk assessment and risk reduction.
EN ISO 13849-1: Safety of machinery. Safety-related parts of control systems. Part 1: General principles for design.
EN ISO 13850: Safety of machinery. Emergency stop devices, functional aspects. Design principles.
EN 61000-6-3 (equivalent to IEC 61000-6-3): Electromagnetic compatibility. Generic emission standard. Part 1: residential, commercial and light-industrial environments.
EN 61000-6-2 (equivalent to IEC 61000-6-2): Electromagnetic compatibility. Generic immunity standard. Part 2: Industrial environments.
EN ISO 13855: Safety of machinery. Positioning of safeguards with respect to the approach speeds of parts of the human body.
EN 1037: Safety of machinery. Prevention of unexpected start-up.
EN 574: Safety of machinery. Two-hand control devices. Functional aspects. Principles for design.
EN 60947-1 (equivalent to IEC 60947-1): Low-voltage switchgear and controlgear. Part 1: General rules.
EN 60947-5-1 (equivalent to IEC 60947-5-1): Low-voltage switchgear and controlgear. Part 5: Devices for control and operation circuits. Section 1: Electromechanical control circuit devices.
EN 60947-5-2: Low-voltage switchgear and controlgear. Part 5-2: Control circuit devices and switching elements - Proximity switches
EN 60947-5-3: Low-voltage switchgear and controlgear. Part 5-3: Control circuit devices and switching elements - Requirements for proximity devices with defined behaviour under fault conditions (PDF)
EN 60204-1 (equivalent to IEC 60204-1): Safety of machinery. Electrical equipment of machines. Part 1: General rules.
EN 60529 (equivalent to IEC 60529): Protection degree of the housings (IP codes).
ISO 20653: Road vehicles-degrees of protection (IP CODE)
EN 62326-1 (equivalent to IEC 62326-1): Printed boards. Part 1: Generic specification
EN 60664-1 (equivalent to IEC 60664-1): Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests.
EN 61508 (equivalent to IEC 61508): Functional safety of electrical, electronic and programmable electronic systems for safety applications.
EN 62061 (equivalent to IEC 62061): Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems.
EN 60079-0 (equivalent to IEC 60079-0): Electrical devices for potentially explosive atmospheres. General rules
EN 60079-11 (equivalent to IEC 60079-11): Electrical apparatus for potentially explosive atmospheres. Intrinsic safety "i"
EN 60079-31 (equivalent to IEC 60079-31): Electrical apparatus for potentially explosive atmospheres. Type of protection: "n".
EN 60079-28 (equivalent to IEC 60079-28): Electrical apparatus for use in the presence of combustible dust. Part 1-1: Construction and testing
EN 50581: Technical documentation for the evaluation of electrical and electronic products in relation to the restriction of hazardous substances
BG-GS-ET-15: Prescriptions about how to test switches with forced contact opening to be used in safety applications (German standard).
UL 508: Standards for industrial control equipment. (American standard).
CSA 22-2 No.14: Standards for industrial control equipment. (Canadian standard).

European directives

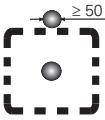
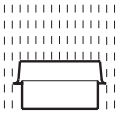
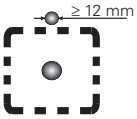
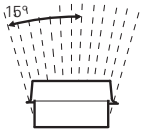
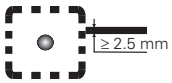
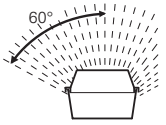
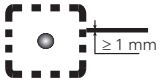
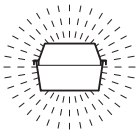
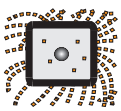
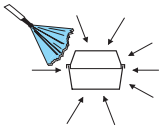
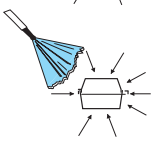
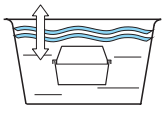
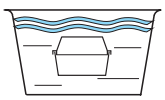
2014/35/EU	Directive on low-voltage switchgear and controlgear
2006/42/EC	Machinery Directive
2014/30/EU	Directive on electromagnetic compatibility
2014/34/EU	ATEX Directive
2011/65/UE	RoHS Directive

Regulatory Organisations

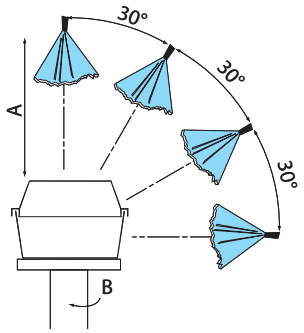
CEI	Comitato Elettrotecnico Italiano (IT)	**NF**	Normes Françaises (FR)
CSA	Canadian Standard Association (CAN)	**VDE**	Verband Deutscher Elektrotechniker (DE)
CENELEC	European Committee for Electrotechnical Standardisation	**UNI**	Ente Nazionale Italiano di Unificazione (IT)
CEN	European Committee for Standardisation	**UL**	Underwriter's Laboratories (USA)
IEC	International Electrotechnical Commission	**TÜV**	Technischer Überwachungs-Verein (DE)

Protection degree of housings for electrical material according to EN 60529

The following table reports the required protection degrees according to the IEC 60529, EN 60529, CEI 70-1 standards.
The protection degrees are indicated by the abbreviation IP and 2 following digits. 2 additional letters can be reported indicating protection of persons or other features. The first digit shows the degree of protection against penetration of external solid materials. The second digit identifies instead the protection degree against liquid penetration.

1st digit	Description	Protection for the machine	Protection for persons	2nd digit	Description	Protection for the machine
0		Not protected	Not protected	**0**		Not protected
1		Protected against solid objects greater than 50 mm	Against access to hazardous parts with the back of a hand (Ø 50 mm)	**1**		Protected against vertically falling water drops
2		Protected against solid objects greater than 12 mm	Against access to hazardous parts with a finger (Ø 12 mm)	**2**		Protected against water drops falling at max. 15° angle
3		Protected against solid objects greater than 2.5 mm	Against access to hazardous parts with a tool (Ø 2.5 mm)	**3**		Protected against rain drops falling at max. 60° angle
4		Protected against solid objects greater than 1 mm	Against access to hazardous parts with a wire (Ø 1 mm)	**4**		Protected against splash water from any direction
5		Protected against dust	Against access to hazardous parts with a wire (Ø 1 mm)	**5**		Protected against water jets from any direction
6		Totally protected against dust	Against access to hazardous parts with a wire (Ø 1 mm)	**6**		Protected against powerful water jets from any direction (e.g. waves)
				7		Protected against temporary water immersion (30 minutes at one-meter depth)
				8		Protected against continuous immersion in water

Protection degree IP69K according to ISO 20653



ISO 20653 envisages a particularly strenuous test. This test simulates the conditions of pressure washing in industrial environments with water jets having pressure between 80 and 100 bar, flow rate between 14 and 16 l/min. and a temperature of 80°C.

Test specifications:

Rotation speed (B):	5 ± 1 rpm
Distance from water jet (A):	100 +50/-0 mm
Water flow rate:	15 ± 1 l/min
Water pressure:	9000 ± 1000 kPa
Water temperature:	80 ± 5 °C
Test duration:	30 s per position

Housing data in accordance with UL (UL 508) and CSA (C22-2 no.14) approvals

The features required for a housing are determined by a specific environmental designation and other features such as the kind of gasket or the use of solvent materials.

Type	Intended use and description
1	Mainly for indoor utilization, supplied with protection against contact with the internal mechanism and against a limited quantity of falling dirt.
4X	Suitable for both indoor and outdoor use, provided with protection degree against falling rain, water splashes and direct coming water from a pipe. No damage caused by ice formation on the hosing. Corrosion-resistant.
12	Indoor utilization, provided with a protection degree against dust, dirt, flying fibres, dripping water and outside condensation of non-corrosive fluids.
13	Indoor utilization, supplied with a protection degree against gauze, dust penetration, outside condensation and sprinkling of water, oil and non-corrosive fluids.

Pollution degree (of environmental conditions) according to EN 60947-1

According to the EN 60947-1 standard, the pollution degree is a conventional number based on the quantity of conducting hygroscopic dust, ionized gas or salt, and on the relative humidity and its frequency of occurrence resulting in hygroscopic absorption or condensation of moisture leading to reduction in dielectric strength and/or surface resistivity. In equipment to be used inside a housing or having an integral enclosure as part of the device, the pollution degree applies to the inner part of housing. With the purpose of evaluating the air and surface insulation distances, the following four pollution degrees are defined:

Degree	Description
1	No pollution or only dry and non-conductive pollution occurs.
2	Normally, only non-conductive pollution is present. Occasionally some temporary conductivity caused by condensation may occur.
3	Some conductive pollution is present, or some dry non-conductive pollution that becomes conductive because of condensation.
4	Pollution causes persistent conductivity, for instance due to conductive dust or rain or snow.

Where not otherwise specified by the applicable standards for the product, equipment for industrial applications are generally intended for their use in environment with pollution degree 3. Nevertheless, other degrees can be considered, depending on the micro-environment or on particular applications.

Use in alternating and direct current of auxiliary devices acc. to EN 60947-5-1

Alternating current use

Utilization category	Intended use
AC12	Control of resistive loads and solid state loads with insulation by optocouplers.
AC13	Control of solid state loads with transformer isolation
AC14	Control of electromagnetic loads, power ≤ 72 VA
AC15	Control of electromagnetic loads, power ≥ 72 VA

Direct current use

Utilization category	Intended use
DC12	Control of resistive loads and solid state loads with insulation by optocouplers.
DC13	Control of electromagnetic loads without economy resistors in circuit
DC14	Control of electromagnetic loads with economy resistors in circuit

Changed article codes

Legend:

CS AR-03•••• → CS AR-08•••• The codes in grey have been replaced by the code after the arrow

Old Article	New Article
CS AR-03•••• →	CS AR-08••••
CS AT-0A•••• →	CS AT-00••••-TF0.5
CS AT-0B•••• →	CS AT-00••••-TF1
CS AT-0C•••• →	CS AT-00••••-TF3
CS AT-0D•••• →	CS AT-00••••-TF10
CS AT-1A•••• →	CS AT-10••••-TF0.5
CS AT-1B•••• →	CS AT-10••••-TF1
CS AT-1C•••• →	CS AT-10••••-TF3
CS AT-1D•••• →	CS AT-10••••-TF10
CS AT-2••••• →	CS AT-3•••••
CS FS-0••••• →	CS FS-1•••••
CS FS-0A•••• →	CS FS-00••••-TF0.5
CS FS-0B•••• →	CS FS-00••••-TF1
CS FS-0C•••• →	CS FS-00••••-TF3
CS FS-0D•••• →	CS FS-00••••-TF10
CS ME-2AVU24 →	CS ME-20VU24-TF0.5
CS ME-2BVU24 →	CS ME-20VU24-TF1
CS ME-2EVU24 →	CS ME-20VU24-TF2
CS ME-2CVU24 →	CS ME-20VU24-TF3
VF IL•••••• →	VF SL••••••

Order sending procedure:
Purchase orders must always be sent in writing (e-mail). We reserve the right to not accept e-mail orders in case of missing information necessary to correctly identify the sender or to reject them in case of virus infected attachments or attachments of dubious origin.

Minimum invoicing amount:
Unless specifically agreed, the minimum invoicing amount is EUR 200 net (VAT excluded). For invoices of less than EUR 200, a EUR 30 fee will be applied.
Invoices are issued weekly.

Prices:
The prices quoted in the price list do not include VAT, custom duties or any other charges. Unless otherwise agreed, the prices quoted in the price list are not binding and may undergo changes.

Order quantities:
Some products are shipped in packs. The ordered quantities of these items must be multiples of the quantities contained in the packages.

Changes and cancellation of orders:
Changes and cancellation of orders might be accepted depending on the progress of the order. Changes or cancellation of orders for special items will not be accepted.

Supply:
The supply includes only what is expressly stated in the order confirmation. In compliance with article 1461 of the Italian Civil Code, we reserve the right to suspend the supply in case of changes in the customer's financial standing.

Delivery:
The delivery is indicated in the order confirmation and shows the period in which the goods can be available at the factories of Pizzato Elettrica and not the date of arrival at the customer's premises. This period is an approximate value and cannot be opposed as proof of non-compliance with the order.
Stock items are indicated on the website www.pizzato.com

Packaging:
Packaging is free. For more than six boxes pallets can be necessary for the transport.

Shipment:
Unless expressly agreed between the parties, Pizzato Elettrica ships goods Ex Works, in accordance with Incoterms 2010 (published by the ICC). If the customer, for his convenience, requests a transport to be charged on the invoice, it is understood between the parties that the goods always travel at the risk and peril of the customer. The customer must check that the forwarder delivers the number of boxes indicated in the delivery note, that the boxes are intact and that the weight corresponds to what is stated in the documents. In case of any inconsistencies, please always accept the goods indicating on the document SUBJECT TO VERIFICATION, clearly specifying the type of damage. Any discrepancy or mistake must be reported in writing within 8 days from the date of receipt of the goods at info@pizzato.com.

Warranty:
The warranty has a validity of 12 months starting from the shipping date of the material. The warranty does not cover products damaged due to improper use, negligence or installation. The warranty does not cover parts subjected to wear, products used out of the technological limits described in the catalogue, or items that have not received an adequate maintenance. Pizzato Elettrica undertakes to repair or replace all or part of products that present evident and proved manufacturing defects, provided that they are still covered by warranty.
Pizzato Elettrica is only responsible for the value of the product and requests for compensation due to machine downtime, repairs or costs for direct or indirect damages resulting from product malfunctions will not be accepted, even if these occur during the warranty period. It is the responsibility of the manufacturer to evaluate the importance of the products used and the possible damage caused by their malfunction and consequently adopt the necessary technical measures in order to minimise consequences, also for personal safety purposes (redundant systems, self controlled systems, etc). The warranty will be subject to the customer's compliance with the payment terms.
Any samples provided free of charge or bearing the phrase "SAMPLE" must be considered as purely demonstrative and are not covered by warranty.

Products:
Products can be subjected to technical improvements in any moment without prior notice.

Payment terms:
Payments must be settled within the terms established in the order confirmation. The payment method is always at the risk of the customer, whatever the method is. In case of delayed payment, Pizzato Elettrica reserves the right to stop deliveries of orders and charge interest as prescribed by European Directive 2011/7/EU. Any technical or commercial complaints do not entitle the claimant to suspend the due payments.

Returns:
Any return for any reason will not be accepted unless previously APPROVED and AUTHORISED in writing.
Otherwise, Pizzato Elettrica reserves the right to reject the goods and send them back at the expense of the customer. Returns have to be received no later than 3 months from the date of authorisation. After this period, returns will not be accepted. Returns involve a devaluation with respect to their sales price and will be accepted for standard items shipped no more than 12 months earlier. The returned goods and their packaging must be intact and undamaged.

Ownership:
The delivered products remain the property of Pizzato Elettrica until the balance of the payments due.

Disputes:
For any dispute, the Court of Vicenza will have sole jurisdiction.

For the updated conditions of sale, please consult the website www.pizzato.com

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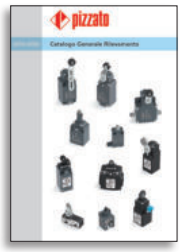
Any information or application example, connection diagrams included, described in this document are to be intended as purely descriptive.
The choice and application of the products in conformity with the standards, in order to avoid damage to persons or goods, is the user's responsibility.
The drawings and data contained in this catalogue are not binding and we reserve the right, in order to improve the quality of our products, to modify them at any time without prior notice.
They are also property of Pizzato Elettrica and can be reproduced only with our written permission.



General Catalogue
Detection

General Catalogue
HMI

General Catalogue
Safety

General Catalogue
LIFT

Website
www.pizzato.com

PASSION FOR QUALITY

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