

1 Company Profile



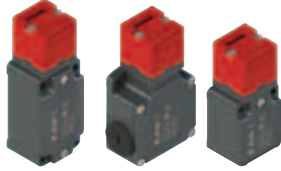
▶ 3

1 New products 2015-2016



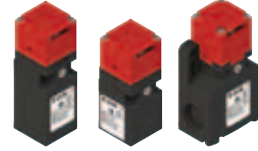
▶ 15

2 Safety switches with separate actuator



For heavy duty applications

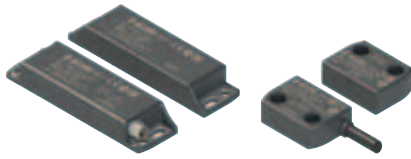
▶ 17



For normal duty applications

▶ 23

3 Magnetic safety sensors

Coded magnetic sensors
SR series

▶ 29

4 Safety sensors with RFID technology

Coded sensors with RFID technology
ST series

▶ 41

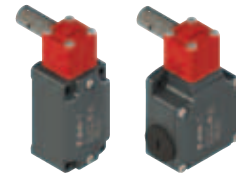
5 Safety switches for hinged doors

Hinge switches
HP-HC series

▶ 51

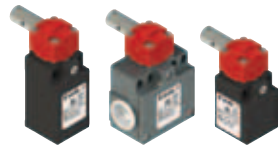
Stainless steel hinge switches
HX series

▶ 61



For hinges in heavy duty applications

▶ 71



For hinges in normal duty applications

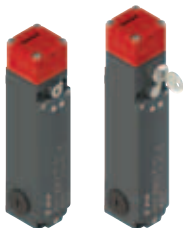
▶ 77



With slotted hole lever in normal duty applications

▶ 83

6 Safety switches with separate actuator with lock

With solenoid
FG series

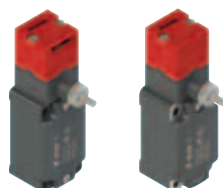
▶ 93

With solenoid
FS series

▶ 107

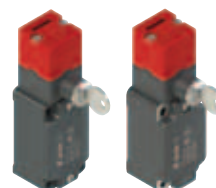
With solenoid and RFID technology
NG series

▶ 117



With manual mechanical delay

▶ 127



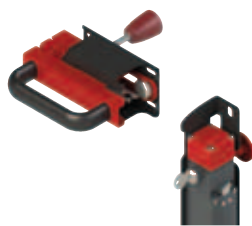
With key release

▶ 135

7 Safety handles



Series VF AP-P for FG-FD series
▶ 143

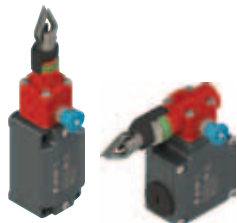


Series VF AP-S for FG-FD series
▶ 149



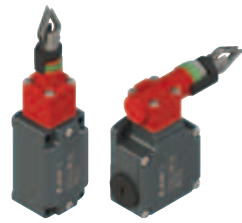
Series AP for NG series
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8 Rope safety switches



With reset for emergency stops

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Without reset for simple stops

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Accessories for rope switches

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Housings complete with emergency buttons ES series

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9 Housings complete with emergency buttons

10 Single-function safety modules



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10A



For emergency stops and movable guard monitoring CS AR series

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For monitoring of emergency stops, movable guards, safety mats and safety bumpers with 4-wire technology CS AR series

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200 PASSIONATE PROFESSIONALS

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 collaborators. 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 since the year 2000 and has achieved a considerable increase in business 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

An entrepreneurial company such as Pizzato Elettrica, which has grown day after day thanks to the “culture of doing” of a family that benefited from approaching its work with tenacity, intelligence and far-sightedness, has its foundations in a system of solid and deeply-shared values. The pillars that form the basis of the company’s work have remained constant and constitute Pizzato Elettrica’s fundamental guiding principles.

- **TERRITORIAL ROOTS.** Pizzato Elettrica is a successful example of the ripe entrepreneurship that characterises the North-East of Italy and Veneto in particular, an area that is tellingly referred to as “Italy’s locomotive”. The territory is highly productive in every sector, from agriculture to high technology, and makes a fundamental contribution to the generation of Italian wealth; where 100 is the average per capita value added produced at the national level, the figure here has consistently been between 110 and 135. The productivity rate is among the highest in Europe and originates from a tradition of diffuse and markedly export-oriented entrepreneurship.

- **ORIENTATION TO EXCELLENCE.** Innovation and development: this company philosophy is at the heart of the operations and product quality assessments that Pizzato Elettrica performs in a 360 degree manner, and is also manifest in the heightened propensity for research and innovation that characterises its design work. Every product development in Pizzato Elettrica is born with the aim of bringing a secure, reliable and innovative choice to the market: those using Pizzato Elettrica products do so in the certainty that they are of certified quality as fruits of a process that is scrupulously controlled at every stage.

- **ATTENTION TO THE CLIENT.** In order to be successful, a product must respond to the specific needs of those who will use it: quality alone is not enough. Market developments must be carefully monitored so that one can understand, in advance, which new applications will prove truly useful. This is why Pizzato Elettrica has always cultivated close synergies with the companies that choose it as a supplier, using this continuous dialogue to identify the potential developments of its product range so as to render it highly flexible, complete and able to offer optimal solutions to diverse needs.





1984: AN ENTREPRENEURIAL STORY BEGINS

16 NOVEMBER 1984. This is the date that marks the beginning of a long entrepreneurial story: the story of a family that was able to build a company and allow it to grow consistently, one step at a time, to reach important results, guided by a profound work ethic and a marked spirit of initiative.

- 80s. The company was initially called Pizzato, owned by the Pizzato B. & C. general partnership with headquarters in Marostica. It was immediately able to assert itself on the market thanks to the quality of its products. In the short space of four years, the firm had already developed to the point of making a fundamental upgrade: on 18 April 1988, it became Ltd. company and was re-named Pizzato Elettrica, a brand shortly destined to become renowned and appreciated nationwide. During the year 1988, its 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 turned to the international market: in 1989, the commercialisation of products was extended to the USA.

- 90s. The range of products continued to be upgraded and specialised with the introduction of new machinery and the growing input of technology. In 1994, Pizzato Elettrica introduced its first line of prewired switches with immediate success. 1996 and 1997 were important years in the development of safety devices, a sector that became strategic when new European directives on working environments were introduced. Pizzato Elettrica immediately became an Italian leader in this regard, thanks to its evolved safety switches and switches with solenoid. Meanwhile (1995), its second plant, geared towards the moulding of plastic materials, was also born. The brand was now ready to approach the new frontiers of the international market: South Africa in 1995 and Australia in 1997. As a confirmation of its innovative spirit, Pizzato Elettrica was among the first companies to believe in the strong potential of the Web, presenting itself online with a well-constructed and multi-functional site as early as 1996. This exciting, constant growth culminated in 1998 with the construction of the third plant, dedicated to the assembly department.

- 00s. The new millennium heralded the search for quality certifications: the ISO 9002 was achieved in April 2000, followed by the ISO 9001 achieved in November 2002. In the meanwhile, technological evolution continued: in 2000, the design studio began using 3D CAD systems. This allowed new avant garde product models to be developed, such as safety modules (2002) and switches conforming to the European ATEX directives (2005), laid out for equipment operating in potentially explosive environments.

In 2006, the HP switch, the result of an innovative engineering design project combining safety and style in a single product, was introduced to the market.

In 2007, the company extended its range of products for machine safety, introducing two new series of magnetic safety sensors, suitable for the monitoring of protections and repairs.

The initial months of 2009 have witnessed the introduction of the new prewired modular switches NA-NB-NF series.

In 2010 Pizzato Elettrica introduced the new EROUND line control and signalling devices, therefore remarkably widening its offer within the man-machine interface sector.

In 2011, the first pre-programmed safety modules of the GEMNIS CS MF series are introduced.

In 2012, the company integrates its offering in the machine safety field, thanks to the ST series sensors with RFID technology and to the programmable safety modules of the GEMNIS CS MP series.

In 2013, the range of hinge safety switches was expanded with the AISI 316L stainless steel HX switches.

2014 saw the launch on the market of the RFID safety switches with NG series block and of the safety handle of the P-KUBE 2 line for NG series switches.

Thanks to the robust interlocking system, the NG series switches ensure a maximum locking force of the Fzh actuator that is equivalent to 7500 N.

The new safety handle P-KUBE 2, which is installed in combination with the RFID safety switch with NG series block, provides an integrated locking system of the protections with related access control to dangerous areas.



59,000,000 PARTS SOLD WORLDWIDE

Pizzato Elettrica's product catalogue contains about 7,000 items, with more than 1,300 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.** They are installed on a daily basis on any type of industrial machinery, for applications in the wood, metal, plastic, elevators, automotive, naval sectors, 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.

The product range that Pizzato Elettrica can offer in the field of position switches is one of the widest in the world. Moreover, the use of high quality materials, high reliability technologies as twin bridge contact blocks and the protection degree IP67, make this range of position switches one of the most technologically evolved.

Furthermore since 2005 Pizzato Elettrica has also started to produce versions of its switches with specific features for some sectors as follows: switches with ATEX homologations and switches for high temperature.

- **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, so becoming one of the main European manufacturers of safety devices. The wide range of specific products for machine safety completely designed and assembled in our company premises in Marostica (VI), has been widened by the introduction of coded magnetic sensors, switches with solenoid provided with anti-panic release device, hinged safety switches and new safety handles. Recent products include the RFID safety sensors of the ST series, the stainless steel hinge safety switches of the HX series, the RFID switches with block of the NG series, and the safety handle of the P-KUBE 2 line.

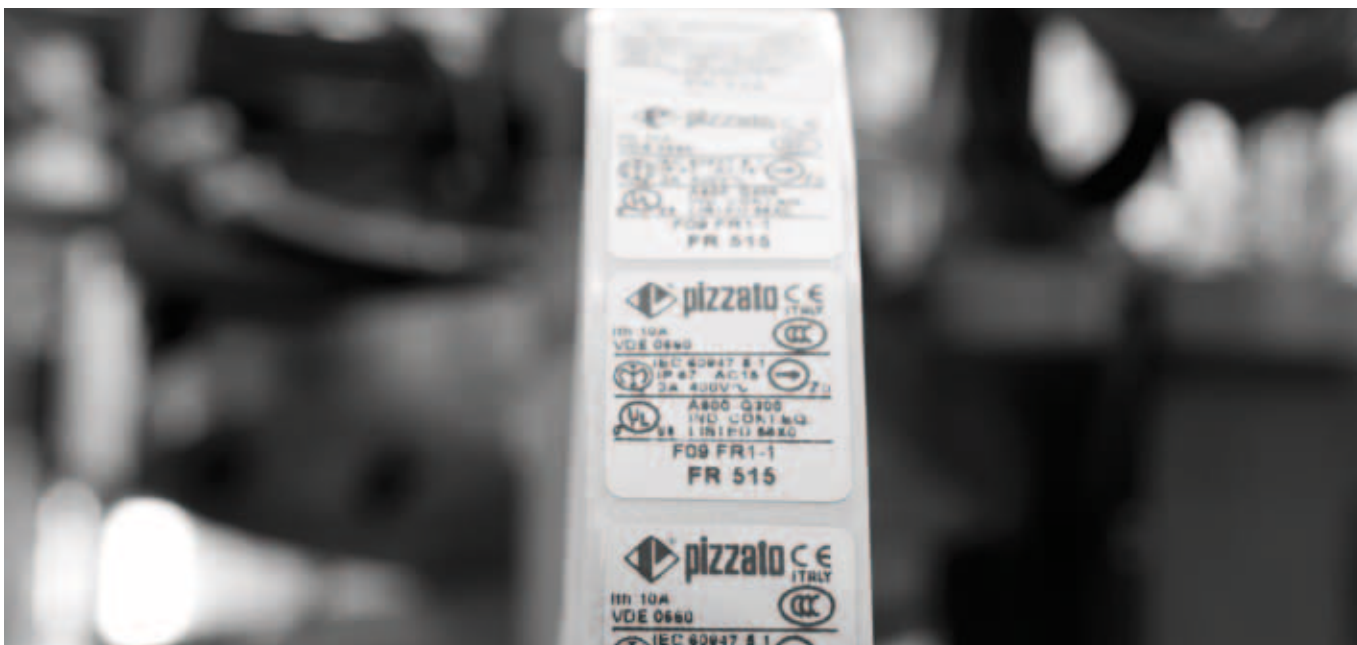
- **MAN-MACHINE INTERFACE.** Thanks to the recent introduction of the EROUND control and signalling devices, Pizzato Elettrica considerably widens its offer in the man-machine interface sector.

The new design, the attention to details and the elegance of the product combined with its maximum safety and reliability, take the series to the forefront of the market.

The wide range that our Company offers in the man-machine interface sector includes single and modular foot switches with many patented joint kits.

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 their installations on machineries.





10 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 organs. 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 seven different 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 mark, in concordance with the European Directives.
- **ISO 9001 CERTIFICATION.** The company's production system conforms with national UNI EN ISO 9001 and international ISO 9001 standards. 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.
- **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 and its various product sectors. CISQ is the Italian representative within IQNet, the biggest international Quality Systems and Company Management certification network, which is adhered to by 25 certification organs in as many countries.



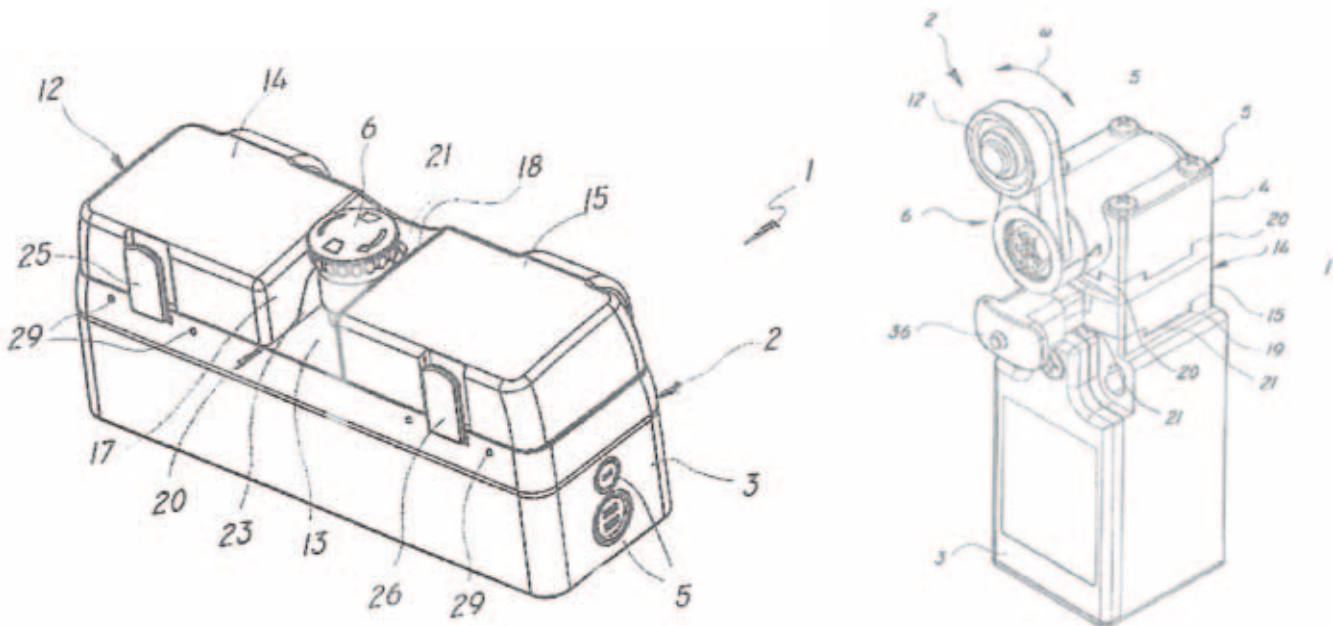


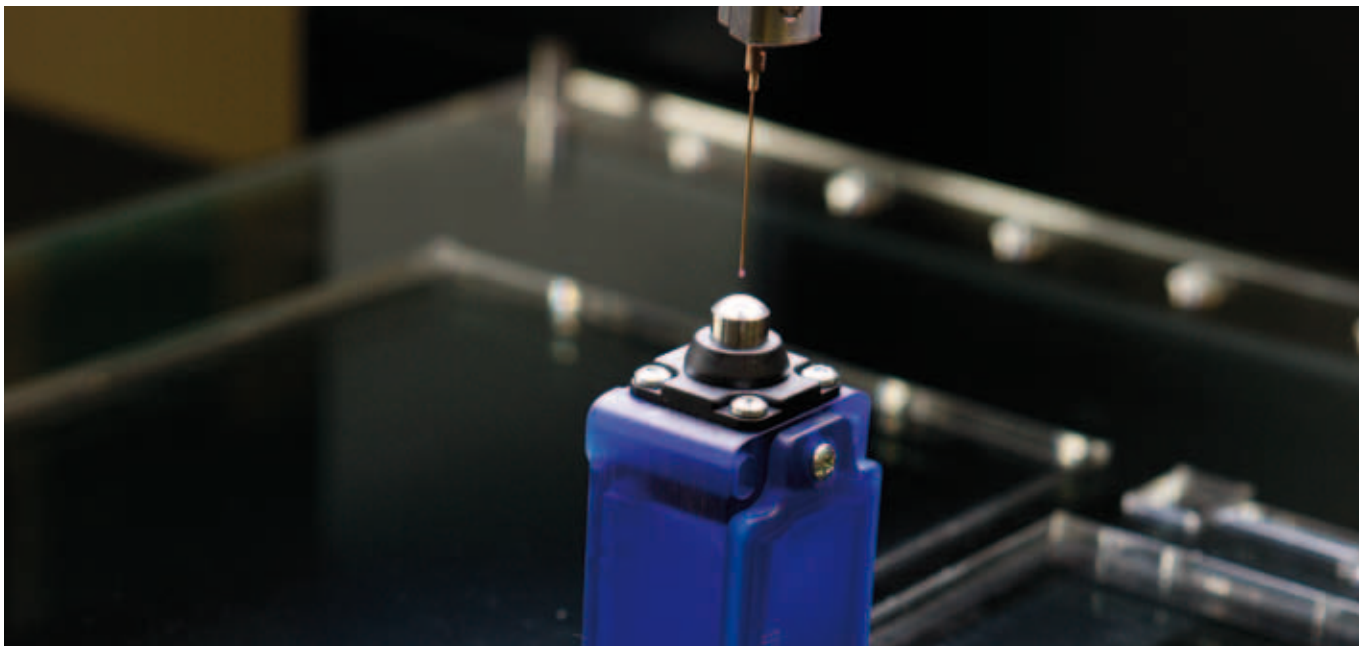
140 REGISTERED PATENTS

The fact that Pizzato Elettrica has, over 30 years, been able to take on a leadership role at the European level is also a result of continuous research and innovation, which its labs and internal design studios undertake on a daily basis.

This is a strategic sector that is exploited to the maximum thanks to a constant process of innovation: indeed, this undoubtedly represents the most important value added. This is why, on average, Pizzato Elettrica develops innovative projects to be covered by international patents each year: a route that the company has been following since its birth, immediately understanding the importance of registering and protecting ideas in order to approach the market with the added strength of being truly 'different' from its competitors.

The company's ideas are what have distinguished it and allowed it to come to occupy a highly important market position, through the tens of patents that have been developed and registered. An ever evolving know-how that is renewed daily, as demonstrated, for example, by the more recent innovations introduced in the safety device sector. This field is due to change significantly in the coming years through profound technological developments: a path that Pizzato Elettrica once again intends to take before time, outlining new principles destined to respond to the international market trends of the future.





20,800 HOURS DEDICATED TO RESEARCH PER YEAR

Behind every new product lies a careful research and design process that aims to find technologically advanced solutions that can improve the device.

This evolution would not have been possible if Pizzato Elettrica hadn't acquired increasingly well-adapted instruments over time, thus keeping pace with the latest technological frontiers. In this sense, the number of computers used daily within the company is particularly significant: an average of almost one computer per employee (workers included!) represents an exhaustive index of a highly computerised company.

The design effort utilises the most evolved 3D CAD software; the efficiency of the Electrical and Mechanical labs, which operate in strict synergy, allows for immediate assessments to be undertaken for the development and perfection of every functional aspect of the prototypes.

The switches undergo the most thorough of checks, which evaluate their efficiency in extreme conditions too: this ensures that Pizzato Elettrica's clients will have access to a genuinely safe, reliable product.

Measurements are taken using over 200 precision tools, which allow for every single component and every characteristic of the finished products to be evaluated: from measures of humidity and temperature to weight and force, to electrical levels, flammability, mechanical duration, magnetic characteristics, microscopic surveys, the level of IP protection and EMC electromagnetic compatibility.





1,000 TECHNICAL SUPPORT ANSWERS PER MONTH

Pizzato Elettrica sees itself as a company that is as attentive to customers needs as it is to the development of its products.

This is why significant resources have always been dedicated to the development of the technical assistance service, giving the company the role of a highly qualified technological partner that is able to fully support technicians and designers.

Pizzato Elettrica offices can be contacted by telephone from Monday to Friday and offer both information and advice relating to the choice of products, the technical characteristics and the correct installation, ensuring to the customers a direct technical assistance service.

WWW.PIZZATO.COM

Pizzato Elettrica was one of the first Italian firms of its sector to believe in Internet, developing a web site since 1996.

Pizzato Elettrica website is now available in four languages (Italian, English, French, and German) and it includes plenty of technical data, technical information and news about products and services provided by the company.

- General Catalogue
- Certificates, brochures and leaflets of new products
- Search engine for codes
- List of new products
- Form to require technical and commercial information
- Article cross reference
- Frequently asked questions (FAQ)
- Company profile
- List of trade fairs
- Download 2D CAD drawings in DXF format
- Download 3D CAD drawings in STEP format
- Download Pizzato Elettrica libraries for the SISTEMA software
- Video section with installation examples
- Section dedicated to Machine Safety, explanations of standards and prescriptions for product operation
- Quick News section, with all the latest news on products and services by Pizzato Elettrica
- Newsletter



MORE THAN 40 MEETINGS ORGANISED EACH YEAR

EXHIBITIONS

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

MEETINGS

Pizzato Elettrica, in addition to offering a qualified technical assistance, sees itself as dynamic company attentive to customers needs organising several meetings and training courses, with a particular focus on machinery safety standards.

MULTILINGUAL DOCUMENTATION

Pizzato Elettrica provides to its customers a wide range of technical documentation available in several languages: Italian, English, German, French, Turkish, etc.

From the general catalogue to the detailed brochures, from leaflets of new products to price lists and CD-ROM, Pizzato Elettrica customers can find in a quick and exact way all the information concerning products, the technical characteristics and functionality, the proper installation, application examples, etc.





77,000 PACKAGES SHIPPED PER YEAR

In order to be able to bring its products to distributors and clients operating all over the world, Pizzato Elettrica's guiding principles are speed and efficiency.

These objectives informed the company's creation of a computerised merchandise transfer system, which is managed automatically by an appositely developed company software that is geared towards specific operational needs.

Over 77,000 parcels are sorted by the logistic center each year: a significant volume of merchandise reflecting the needs of an evermore rapid and competitive market.

All shipments and transfers are traced via a barcode system that can immediately identify the contents of any parcel. A pre-arranged system that is easily modulated: this flexibility has also proved key in providing a quick response to particularly urgent shipment requests.

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





TECHNICAL AND COMMERCIAL SERVICE



TECHNICAL OFFICES

Pizzato Elettrica technical offices provide a 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: from Monday to Friday
08.00-12.00 / 14.00-18.00 CET
phone: +39.0424.470.930
fax: +39.0424.470.955
e-mail: tech@pizzato.com

Spoken languages:  | 



SALES OFFICES

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

Office hours: from Monday to Friday
08.00-12.00 / 14.00-18.00 CET
phone: +39.0424.470.930
fax: +39.0424.470.955
e-mail: info@pizzato.com

Spoken languages:  |  |  |  |  | 



RFID safety switches with lock NG series

- Actuator holding force 7500 N
- SIL 3/PL e/category 4 with a single device
- Can be connected in series of up to 32 devices, whilst maintaining the maximum PL e safety level
- Protection degrees IP67 and IP69K
- 6 LEDs for immediate diagnosis
- TÜV SÜD approval

► 117

RFID safety switches with lock NG series

CLOSED
OR
CLOSED & LOCK

- Two different safety output actuation modes
- Mode 1: OS safety outputs active with closed and locked protection for machines with inertia
- Mode 2: OS safety outputs active with closed protection for machines without inertia

► 117

RFID safety switches with lock NG series

EDM

- Available with EDM (External Device Monitoring) function
- The switch checks the integrity of the devices connected to the safety outputs.
- No need to install a safety module downstream of the device. Ability to directly drive relays or safety contactors.

► 117



Safety handle P-KUBE 2

- Compatible with NG series RFID safety switches with lock
- Easy to install and simple to operate
- System designed for use with for hinged and sliding doors, on both left and right
- Solid construction
- Intuitive LOCK OUT device
- LOCK-OUT with dual screening: RFID and actuator entry

► 151

Safety sensors with RFID technology ST series



- SIL 3/PL e/category 4 with a single device
- Can be connected in series of up to 32 devices, whilst maintaining the maximum PL e safety level
- Protection degrees IP67 and IP69K
- Version with EDM (External Device Monitoring)
- Version with extended 12 ... 24 Vdc power supply range for the automotive sector
- TÜV SÜD approval

► 41

Programmable multifunctional safety modules CS MP series



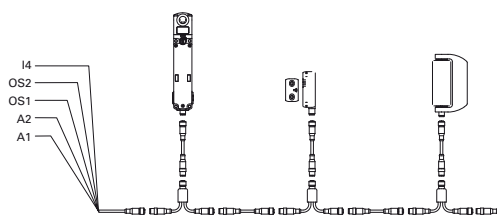
- New module configurations available
- New models with 8 safe outputs
- Gemnis Studio software updates
- Ability to manage projects of up to 4x4 sheets
- Text search on desktop objects

► 243

Accessories Y-shaped connectors for series connection



- Error-proof simplified wiring
- Reduced installation times
- PL e/SIL 3/Category 4/ up to 32 devices in series
- Protection degree IP67
- Applies to ST, NG and HX series



► 290

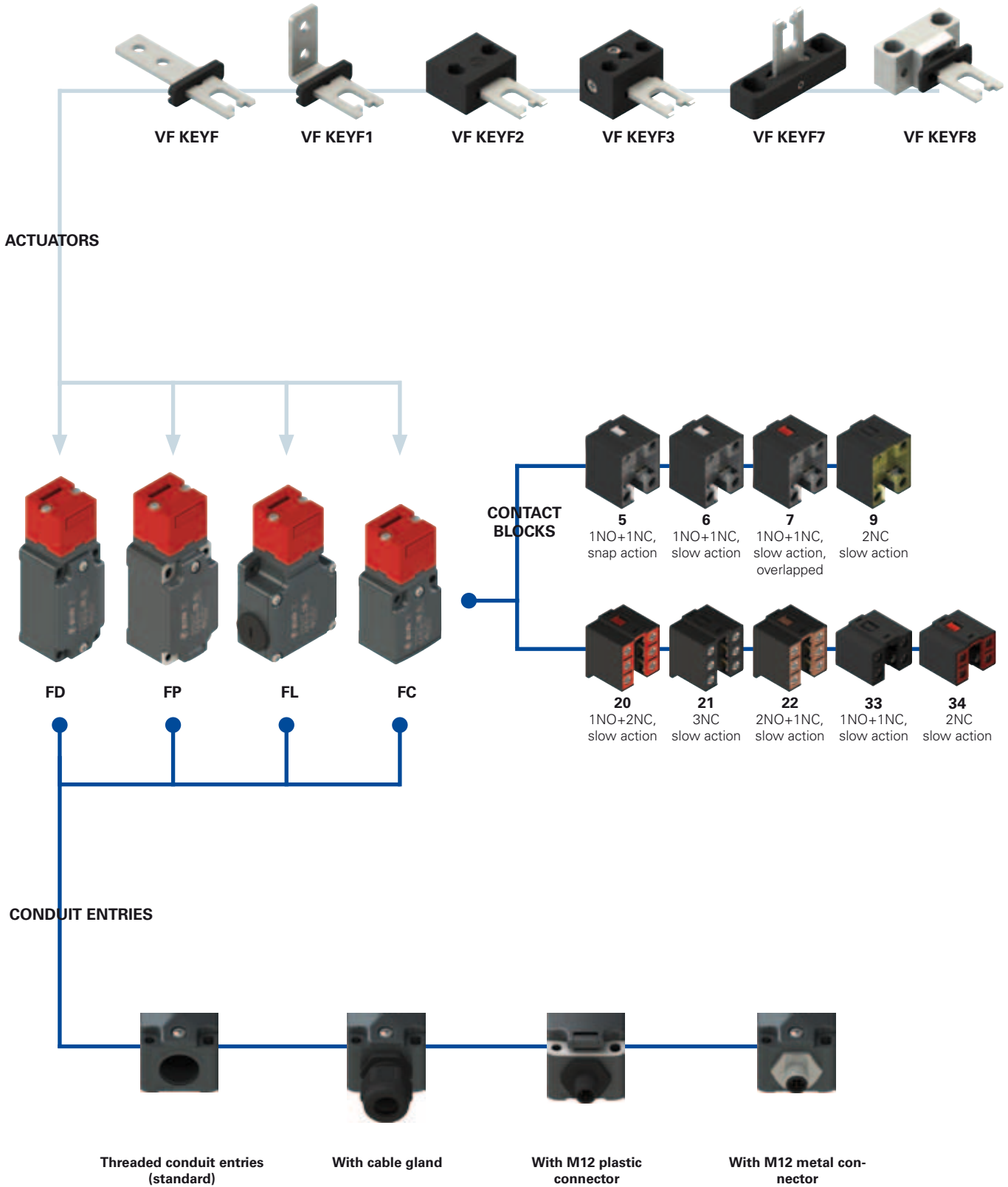
Accessories Safety screws One-Way



- Available with M4, M5 thread in various lengths
- Material AISI304
- Ideal for actuator fixing in accordance with EN ISO 14119

► 287

Selection diagram



—●— product option
 —▶— accessory sold separately



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, overlapped
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

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

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K50	M12 metal connector, 5 poles
...

Please contact our technical service for the complete list of possible combinations.

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

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

article options options
FC 3393-F1GM2K50T6

Housing	
FC	metal, one conduit entry

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

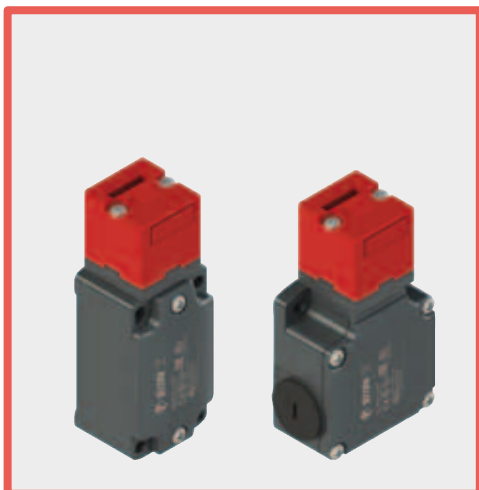
Actuators	
	without actuator (standard)
F	straight actuator VF KEYF
F1	angled actuator VF KEYF1
F2	jointed actuator VF KEYF2
F3	jointed actuator adjustable in two directions VF KEYF3
F7	jointed actuator adjustable in one direction VF KEYF7
F8	universal actuator VF KEYF8

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

Pre-installed cable glands or connectors	
	without cable gland (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
K50	M12 metal connector, 5 poles

Threaded conduit entry	
M2	M20x1.5 (standard)
	PG11

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



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

Markings and quality marks:



IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000 (FD-FL-FC series) 2007010305230014 (FP series)
EAC approval:	RU C-IT ДМ94.В.01024

Technical data

Housing

FP series housing made of glass fiber 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

For safety applications up to: SIL 3 acc. to EN 62061
PL e acc. to EN ISO 13849-1
type 2 acc. to EN ISO 14119
Low acc. to EN ISO 14119

Mechanical interlock, coded:

Coding level:

Safety parameters:

B_{10d} : 2,000,000 for NC contacts

Service life: 20 years

Ambient temperature: -25°C ... +80°C

Max. actuation frequency: 3600 operating cycles¹/hour

Mechanical endurance: 1 million operating cycles¹

Max. actuation speed: 0.5 m/s

Min. actuation speed: 1 mm/s

Tightening torques for installation: see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 33, 34:	min.	1 x 0.34 mm ²	(1 x AWG 22)
	max.	2 x 1.5 mm ²	(2 x AWG 16)
Contact blocks 5, 6, 7, 9:	min.	1 x 0.5 mm ²	(1 x AWG 20)
	max.	2 x 2.5 mm ²	(2 x AWG 14)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, BG-GS-ET-15, UL 508, CSA 22.2 No.14.

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 No.14, GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

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 chapter utilization requirements from page 297 to page 308.

	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) 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	Alternating current: AC15 (50÷60 Hz) U _e (V) 250 400 500 I _e (A) 6 4 1 Direct current: DC13 U _e (V) 24 125 250 I _e (A) 6 1.1 0.4
with M12 connector 4 or 5 poles	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	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) 4 1.1 0.4
with M12 connector 8 poles	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	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



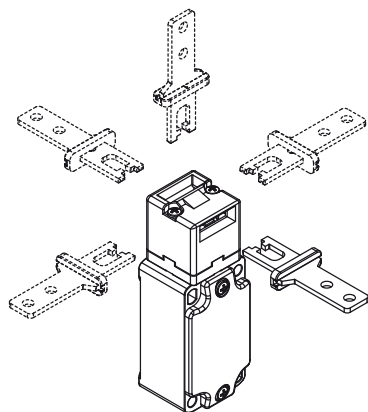
Description



These safety switches are ideal for controlling gates, sliding doors and other guards which protect dangerous parts of machines without inertia.

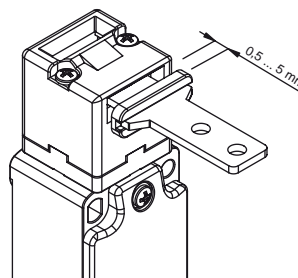
The stainless steel actuator is fastened to the moving part of the guard, so it is removed from the switch on every opening of the guard. The switch mechanism guarantees that removing the actuator forces the positive opening of the electrical contacts. Easy to install, these switches can be applied to any kind of protection (with hinge, sliding and removable ones). Besides, the possibility to actuate the switch only with its actuator guarantees that the machine can be restarted only when the guard has been closed. Made of rugged materials and with oversized thickness, these switches are designed for the use on heavy guards.

Orientable heads



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

Wide-ranging actuator travel



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

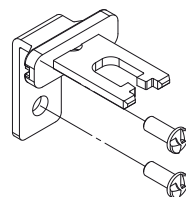
Protection degree IP67

IP67

These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529.

They can therefore be used in all environments where the maximum protection of the housing is required.

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 with using common tools. See accessories on page 295.

Extended temperature range

-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.

They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Laser engraving



All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Characteristics 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 (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 (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 of contacts on contact blocks 5, 6, 7, 9, 20, 21, 22, 33, 34

In conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

Characteristics approved by UL

Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).

In conformity with standard: UL 508, CSA 22.2 No.14.

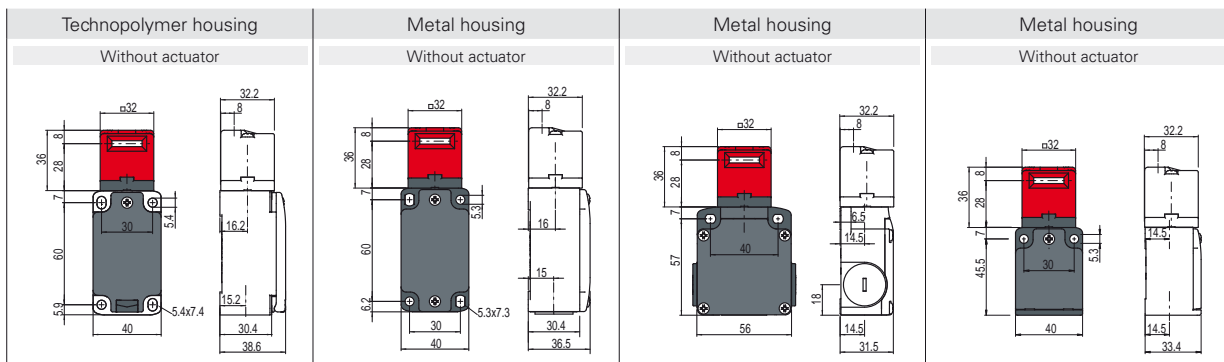
Please contact our technical service for the list of approved products.

Dimensional drawings

All measures in the drawings are in mm

Contact type:
R = snap action
L = slow action
LO = slow action overlapped

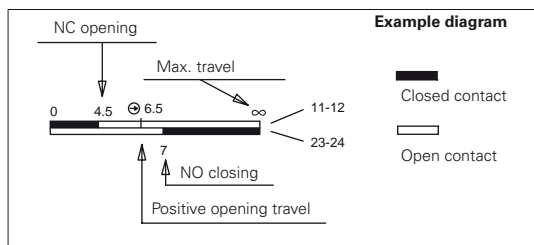
Contact blocks



	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
Min. force	10 N (18 N ⊕)	10 N (18 N ⊕)	10 N (18 N ⊕)	10 N (18 N ⊕)

How to read travel diagrams

All measures in the diagrams are in mm



IMPORTANT:
NC contact has to be considered with inserted actuator. In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol ⊕. Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.

Utilization limits

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 the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific Pizzato catalogue).



Stainless steel actuators

All measures in the drawings are in mm

IMPORTANT: These actuators can be used with items of the FD, FP, FL, FC and FS series only (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 door alignment is not precise.

Article	Description
VF KEYF3	Actuator adjustable in two directions

Actuator adjustable in two directions for doors with reduced dimensions.

Article	Description
VF KEYF7	Actuator adjustable in one direction

Actuator adjustable in one direction for doors with reduced dimensions.

Article	Description
VF KEYF8	Universal actuator

Joined and two directions adjustable actuator for doors with reduced dimensions.

The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.
Body material: zinc alloy

Accessories

Article	Description
VF KB1	Actuator entry locking device

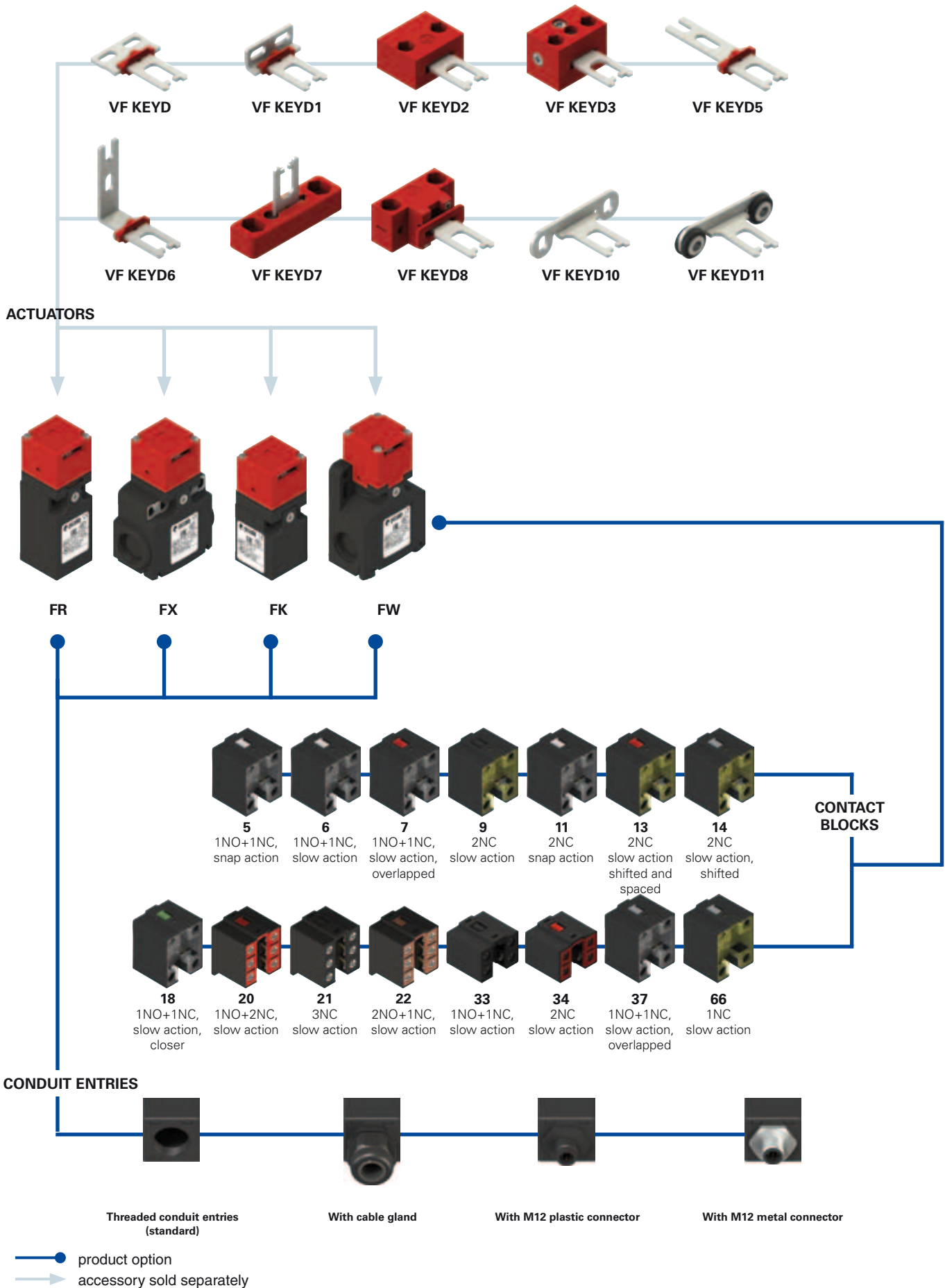
Padlockable device to lock the actuator entry in order to prevent from the accidental closing of the door behind operators while they are inside the machine.

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

Accessories See page 287

→ 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

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

Contact blocks	
5	1NO+1NC, snap action
6	1NO+1NC, slow action
7	1NO+1NC, slow action, overlapped
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, closer
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, overlapped
66	1NC, slow action

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K70	M12 plastic connector, 4 poles
...

Please contact our technical service for the complete list of possible combinations.

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

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

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

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
...

article options options
FK 3393-E3D1XGM1K24T6

Housing	
FK	technopolymer, 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	
	without cable gland (standard)
K24	cable gland for cables Ø 5 ... Ø 10 mm
K28	cable gland for cables Ø 3...Ø 7 mm

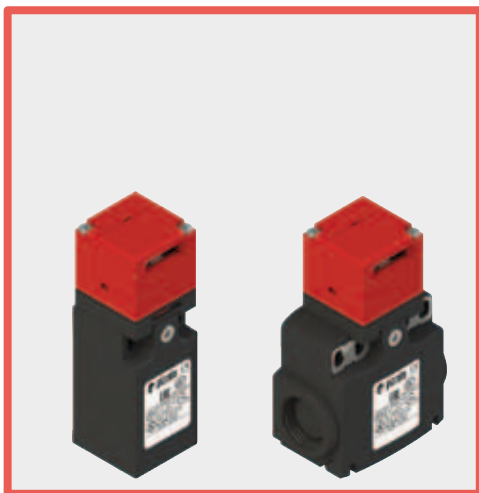
Actuator extraction force	
	10 N (standard)
E3	30 N

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

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

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

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



Main features

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


Markings and quality marks:



IMQ approval:	EG610
UL approval:	E131787
CCC approval:	2007010305230013 (FR-FX-FK-FW series)
EAC approval:	RU C-IT ДМ94.В.01024

Technical data

Housing

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

FR 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)
 Three FW series knock-out threaded conduit entries: M20x1.5 (standard)
 Protection degree: IP67 acc. to EN 60529 with cable gland having equal or higher protection degree

General data

For safety applications up to: SIL 3 acc. to EN 62061
 PL e acc. to EN ISO 13849-1
 type 2 acc. to EN ISO 14119
 Low acc. to EN ISO 14119

Mechanical interlock, coded:
 Coding level:
 Safety parameters:
 B_{10d} : 2,000,000 for NC contacts
 Service life: 20 years
 Ambient temperature: -25°C ... +80°C
 Max. actuation frequency: 3600 operating cycles¹/hour
 Mechanical endurance: 1 million operating cycles¹
 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 pages 7/1-7/12
 (1) One operation cycle means two movements, one to close and one to open contacts, as defined in EN 60947-5-1.

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 33, 34:	min.	1 x 0.34 mm ²	(1 x AWG 22)
	max.	2 x 1.5 mm ²	(2 x AWG 16)
Contact blocks 5, 6, 7, 9, 11, 13, 14, 18, 37, 66:	min.	1 x 0.5 mm ²	(1 x AWG 20)
	max.	2 x 2.5 mm ²	(2 x AWG 14)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, BG-GS-ET-15, UL 508, CSA 22.2 No.14

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 No.14 GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive (2006/42/EC and EMC Directive 2004/108/EC.

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 chapter utilization requirements from page 297 to page 308.

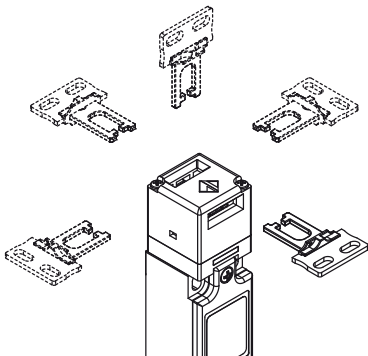
	Electrical data	Utilization category
without connector	Thermal current (I _{th}):	10 A
	Rated insulation voltage (U _i):	500 Vac 600 Vdc 400 Vac 500 Vdc (contact blocks 20, 21, 22, 33, 34)
	Rated impulse withstand voltage (U _{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)
	Conditional short circuit current: Protection against short circuits: Pollution degree:	1000 A acc. to EN 60947-5-1 type aM fuse 10 A 500 V 3
with M12 connector 4 poles	Thermal current (I _{th}):	4 A
	Rated insulation voltage (U _i):	250 Vac 300 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 4 A 500 V 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) 6 1.1 0.4
with M12 connector 8 poles	Thermal current (I _{th}):	2 A
	Rated insulation voltage (U _i):	30 Vac 36 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 2 A 500 V 3
	Utilization category:	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



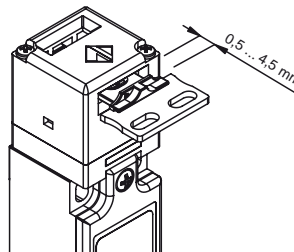
These safety switches are ideal for controlling gates, sliding doors and other guards which protect dangerous parts of machines without inertia. The stainless steel actuator is fastened to the moving part of the guard, so it is removed from the switch on every opening of the guard. The switch mechanism guarantees that removing the actuator forces the positive opening of the electrical contacts. Easy to install, these switches can be applied to any kind of protection (with hinge, sliding and removable ones). Besides, the possibility to actuate the switch only with its actuator guarantees that the machine can be restarted only when the guard has been closed.

Orientable heads



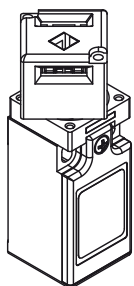
Removing the two fastening screws, in all switches, the head can be rotated in 90° steps. In this way it is possible to actuate the switch from 5 different directions.

Wide-ranging actuator travel



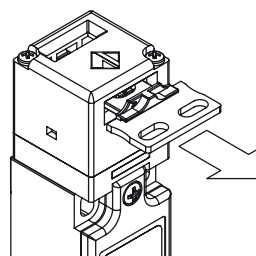
The head of this switch is equipped with an actuator with a wide range of travel. In this way the guard can oscillate along the direction of insertion (4mm) without causing unwanted machine shutdowns. This extensive travel is available in all actuators, in order to ensure maximum device reliability.

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.

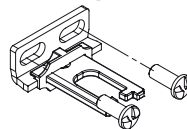
Protection degree IP67

IP67

These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529.

They can therefore be used in all environments where the maximum protection of the housing is required.

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 with using common tools. See accessories on page 295.

Extended temperature range

-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.

They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Characteristics 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 (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 (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 of contacts on contact blocks 5, 6, 7, 9, 11, 13, 14, 18, 20, 21, 22, 33, 34, 66
In conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

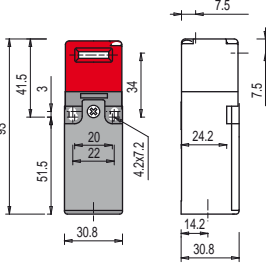
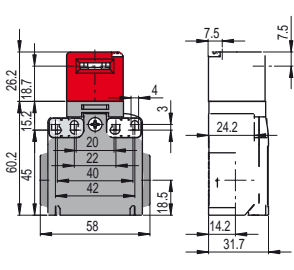
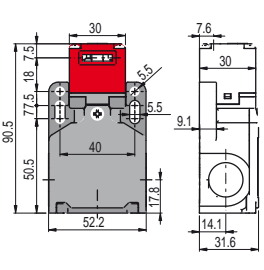
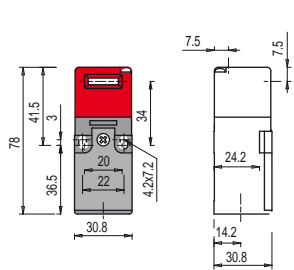
Characteristics approved by UL

Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).
In conformity with standard: UL 508, CSA 22.2 No.14

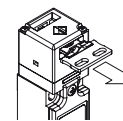
Please contact our technical service for the list of approved products.

Dimensional drawings

All measures in the drawings are in mm

Contact type:	Technopolymer housing		Technopolymer housing		Technopolymer housing		Technopolymer housing	
	Without actuator		Without actuator		Without actuator		Without actuator	
R = snap action L = slow action LO = slow action overlapped LS = slow action shifted LV = slow action shifted and spaced LA = slow action closer								
Contact blocks 5 R FR 593-M2 \rightarrow 1NO+1NC 6 L FR 693-M2 \rightarrow 1NO+1NC 7 LO FR 793-M2 \rightarrow 1NO+1NC 9 L FR 993-M2 \rightarrow 2NC 11 R FR 1193-M2 \rightarrow 2NC 13 LV FR 1393-M2 \rightarrow 2NC 14 LS FR 1493-M2 \rightarrow 2NC 18 LA FR 1893-M2 \rightarrow 1NO+1NC 20 L FR 2093-M2 \rightarrow 1NO+2NC 21 L FR 2193-M2 \rightarrow 3NC 22 L FR 2293-M2 \rightarrow 2NO+1NC 33 L FR 3393-M2 \rightarrow 1NO+1NC 34 L FR 3493-M2 \rightarrow 2NC 37 LO FR 3793-M2 \rightarrow 1NO+1NC 66 L FR 6693-M2 \rightarrow 1NC								
Min. force	10 N (18 N \rightarrow)	10 N (18 N \rightarrow)	10 N (18 N \rightarrow)	10 N (18 N \rightarrow)	10 N (18 N \rightarrow)	10 N (18 N \rightarrow)	10 N (18 N \rightarrow)	10 N (18 N \rightarrow)
Travel diagrams	page 304 - group 8	page 304 - group 8	page 304 - group 8	page 304 - group 8	page 304 - group 8	page 304 - group 8	page 304 - group 8	page 304 - group 8

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



Min. force 30 N version	30 N (38 N \rightarrow)	30 N (38 N \rightarrow)	30 N (38 N \rightarrow)	30 N (38 N \rightarrow)
-------------------------	----------------------------	----------------------------	----------------------------	----------------------------

Utilization limits

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 the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific Pizzato catalogue).



Stainless steel actuators

All measures in the drawings are in mm

IMPORTANT: These actuators can 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

Article	Description
VF KEYD3	Actuator adjustable in two directions

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

Actuator adjustable in two directions for doors with reduced dimensions.

Article	Description
VF KEYD5	Extended actuator

Article	Description
VF KEYD6	Extended angled actuator

Article	Description
VF KEYD7	Actuator adjustable in one direction

Article	Description
VF KEYD8	Universal actuator

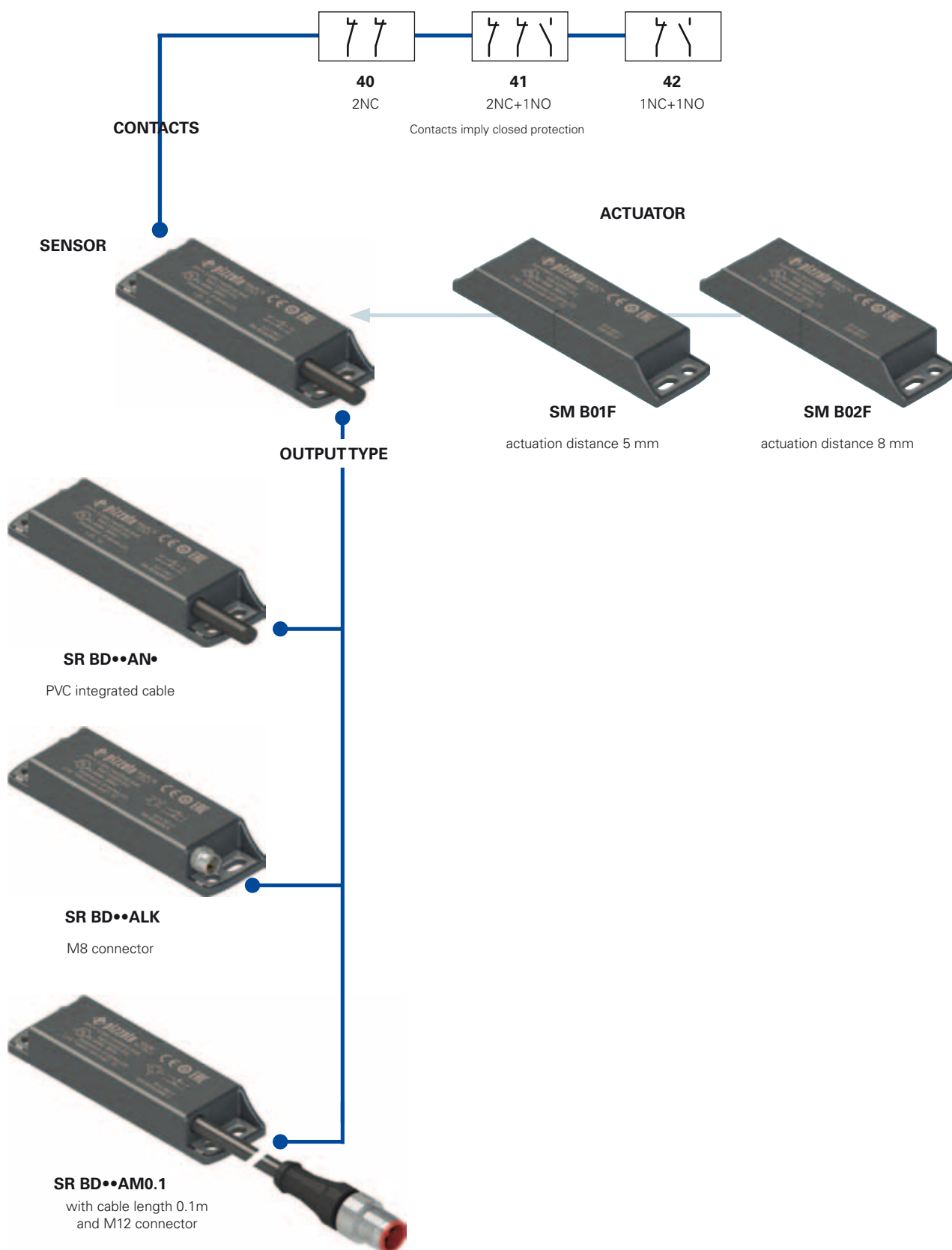
Actuator adjustable in one direction for doors with reduced dimensions.

Joined and two directions adjustable actuator for doors with reduced dimensions.
The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.

Article	Description
VF KEYD10	Shaped actuator

Article	Description
VF KEYD11	Shaped actuator

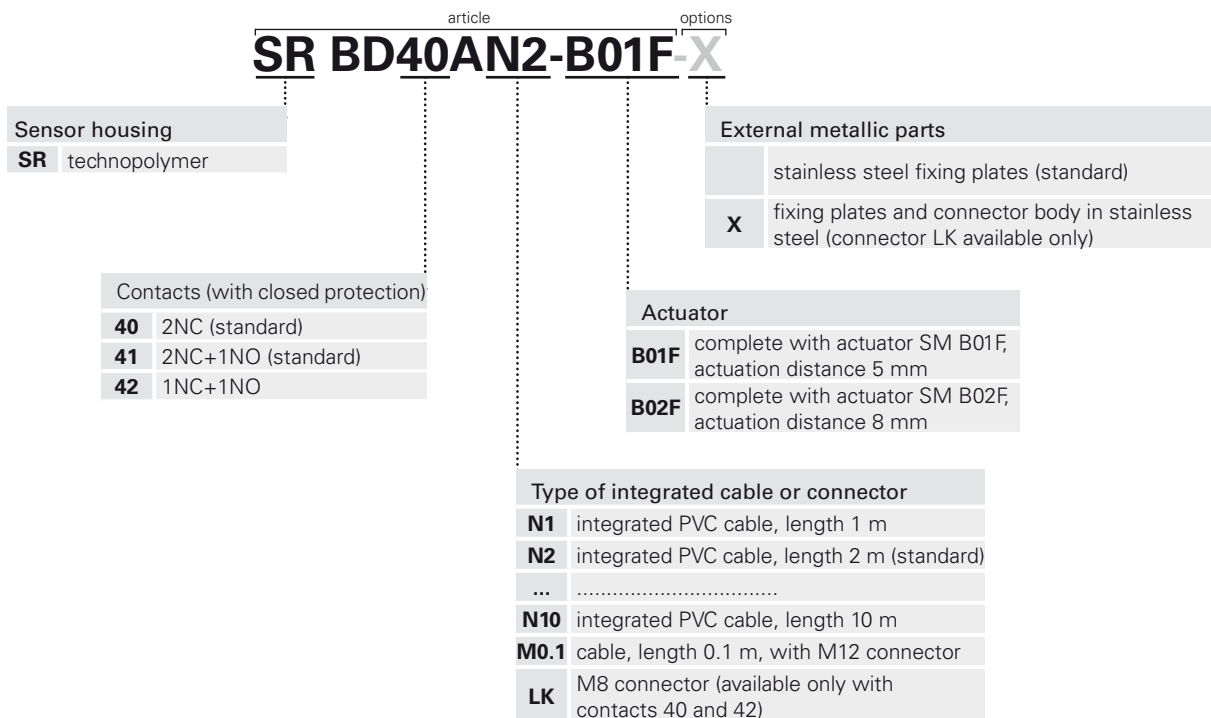
Selection diagram



● product option
→ accessory sold separately

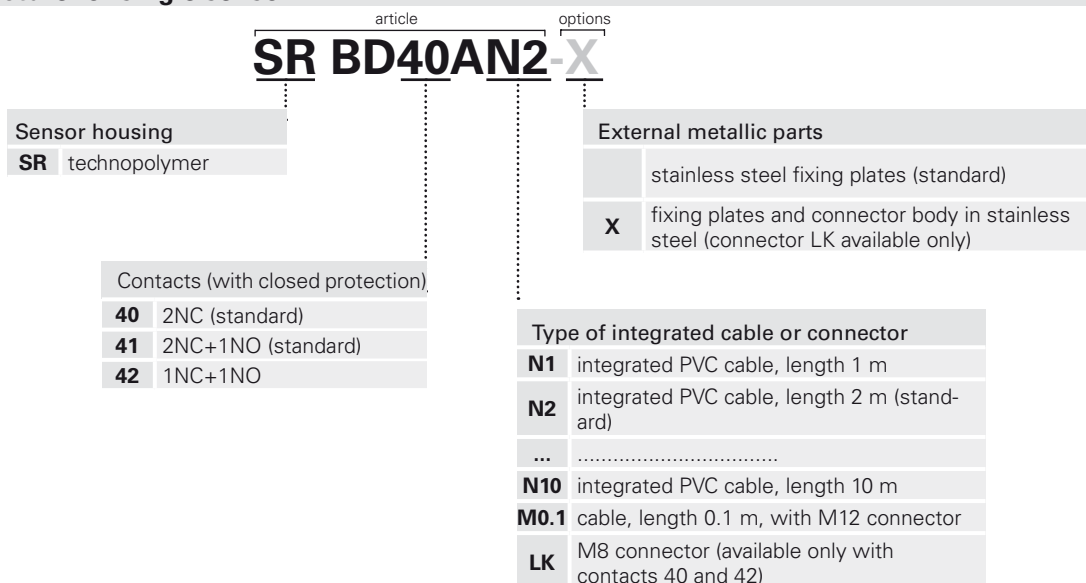


Code structure for sensor with actuator



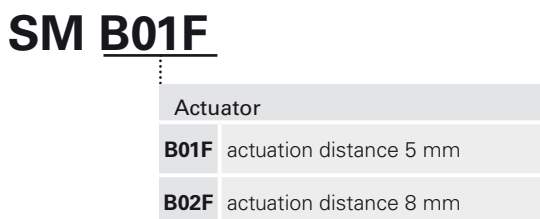
Attention! The feasibility of a code number does not mean the effective availability of a product. Please contact our sales office.

Code structure for single sensor



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

Single actuator code structure





Main features

- Actuation without contact, mechanical
- 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

Markings and quality marks:



UL approval: E131787
 TÜV SÜD approval: Z10 15 08 75157 008
 EAC approval: RU C-IT ДМ94.В.01024

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC
 Machinery Directive 2006/42/EC
 EMC Directive 2004/108/EC.

Technical data

Housing

Housing made of glass fiber reinforced technopolymer, self-extinguishing.
 Versions with integrated cable 4 x 0.25 mm² or 6 x 0.25 mm², length 2 m, other lengths on request.
 Versions with M8 connector
 Versions with cable, length 0.1 m, M12 connector
 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

For safety applications up to: SIL 3 acc. to EN 62061
 PL e acc. to EN ISO 13849-1
 type 4 acc. to EN ISO 14119
 Low acc. to EN ISO 14119

Interlock without contact, coded:
 Coding level:
 Safety parameters:
 B_{10d}: 20,000,000 (with compatible Pizzato Elettrica safety modules)
 400,000 (at max. load: DC12 24 V 250 mA)

Service life: 20 years
 Ambient temperature: -25°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 conformity with standards:

IEC 60947-1, EN 60947-1, IEC 60947-5-1, EN 60947-5-1, EN 60947-5-2, EN 60947-5-3 (in connection with safety module), EN ISO 14119, EN ISO 12100, EN ISO 13849-1, EN ISO 13849-2, IEC 60204-1, EN 60204-1, IEC 60529, EN 60529, 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, IEC 62061, EN 60947-1.

Actuation data

Assured operating distance Sao: 5 mm with actuator SM B01F
 Assured release distance Sar: 15 mm with actuator SM B01F
 Assured operating distance Sao: 8 mm with actuator SM B02F
 Assured release distance Sar: 20 mm with actuator SM B02F
 Repeat accuracy: ≤ 10%
 Switching frequency: up to 150 Hz
 Distance between two sensors: Min. 50 mm

Electrical data

Rated insulation voltage Ui: 120 Vac (with cable)
 60 Vac / 75 Vdc (with M8 connector)
 120 Vac (with 4-pin M12 connector)
 30 Vac / 36 Vdc (with 8-pin M12 connector)

Rated impulse withstand voltage (U_{imp}): 6 kV
 1.5 kV (with connector)

Thermal current I_{th}: 0.25 A
 Max. switching load: 6 W (resistive load)
 Rated operating voltage U_e: 24 Vac/dc
 Rated operating current I_e: 0.25 A (resistive load)
 Protection fuse: 0.25 A type F
 Electrical endurance: 1 million operating cycles

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 to PDF-M (EN 60947-5-3).
 The system can be used in safety circuits to PL e/SIL 3/category 4 in accordance with EN ISO 13849-1.

Characteristics approved by UL

Utilization categories: 24 Vdc, 0.25 A (resistive load).

Data of housing type 1, 4X "indoor use only"; 12.

Accessory for CS series.

In conformity with standard: UL 508, CSA 22.2 No.14

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

Characteristics 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, category 4 with CS AR-08

In conformity with standards: 2006/42/EEC Machine Directive, EN ISO 13849-1:2008, EN 60947-5-3/A1:2005, EN 50178:1997, EN 61508-1:1998 (SIL 1-3), EN 61508-2:2000 (SIL 1-3), EN 61508-4:1998 (SIL 1-3), IEC 62061:2005 (SIL CL 3), EN 60947-1

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

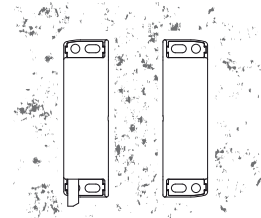


Description



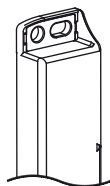
Coded magnetic sensors are devices suitable for monitoring protections and guards of machines without inertia which, when linked to a safety module, can create a system with safety category up to SIL 3 according to EN 62061, up to PL e according to EN ISO 13849-1 and up to category 4 according to EN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

Insensitivity to dirt



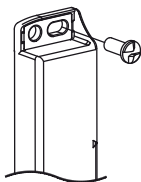
Magnetic sensors are totally sealed and retain their safety characteristics also where dirt and dust are present (not ferromagnetic material). This characteristic, joined with the shape without recesses, make them especially proper to the use in the agro-industrial sector.

Stainless steel fixing plates



In order to avoid that the fixing on non-perfectly plane surfaces could damage the fixing slots, magnetic sensors are provided with stainless steel fixing plates. Also in presence of right fixing surfaces, this solution makes the sensor stronger to mechanical stresses.

Safety screws for actuators



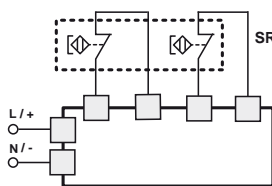
As required by EN ISO 14119, the actuator must be fixed immovably to the door frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered with using common tools. See accessories on page 295.

Laser engraving



All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Compatible safety modules

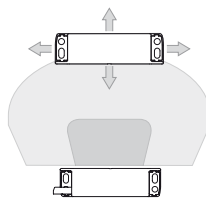


These magnetic sensors have been checked and tested for operation with suitable safety modules (see list). Using completed and tested solutions, the customer has the certainty to have no electric incompatibility between sensor and safety module, and has a higher reliability guarantee.

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 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 243	see page 243
CS MF●●●●●●	see page 271	see page 271	

^a Compatible with CS MF202●●-P4 (page 276) and CS MP●●●●●● only.
^b Compatible with modules with production batch later than 04/2014 only.
For features of the safety modules see page 181.

Wide actuation zone

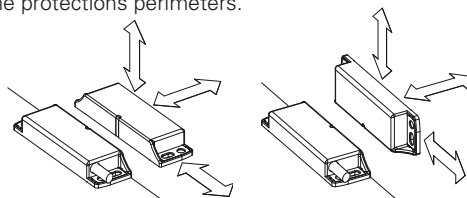


Because of their intrinsic characteristics, magnetic sensors have a wide actuation zone, which make them appreciated in the use of inaccurate protections or for protection that can change their mechanic characteristics through the time.

In this type of sensors actuation distances may change according to the actuator displacement direction from the sensor.

Actuation from many directions

The magnetic sensors have been designed in order to be activated by the related actuator from many directions. In this way, the customer has the max. flexibility about the placing of the devices along the protections perimeters.



Protection degrees IP67 and IP69K

IP69K IP67

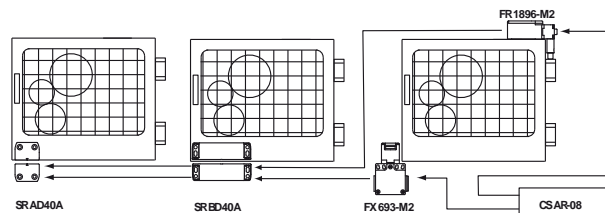
These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529. They can therefore be used in all environments where the maximum protection of the housing is required. Special measures also allow devices to be used even in machines which are subjected to washing with high pressure warm water jets. In fact these devices pass the IP69K test according to ISO 20653, using jets of water to 100 atmospheres at a temperature of 80°C.

Connection of sensors and switches in series

The 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). It is a very high value that, with normal wiring, allows the use of dozens of sensors without problems. It is also possible to realize mixed circuit solutions connecting in series magnetic sensor to safety switches, with the only limitation of the above mentioned max. electric resistance.

We remind you that connection in series of two or more coded sensors reduce the system self-monitoring capacity which passes to category 3 in conformity with EN ISO 13849-1.

It is advisable to use safety modules by Pizzato Elettrica.

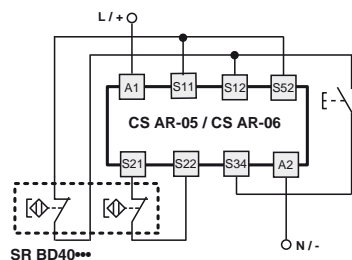


Connection with safety modules

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)

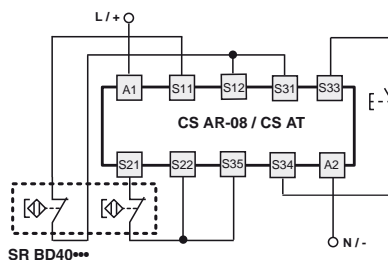
2 channels



Connection with safety module CS AR-08 or CS AT

Input configuration with manual start

2 channels

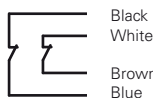


For features of the safety modules see page 181.

Internal connections with cable

Contacts imply closed protection

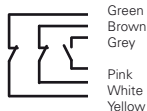
With cable (2NC)



With cable (1NC+1NO)



With cable (2NC+1NO)



Internal connections with connector

Contacts imply closed protection

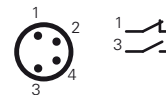
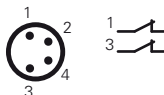
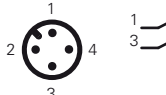
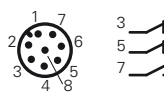
With M12 connector (2NC+1NO)

With M12 connector (2NC)

With M12 connector (1NC+1NO)

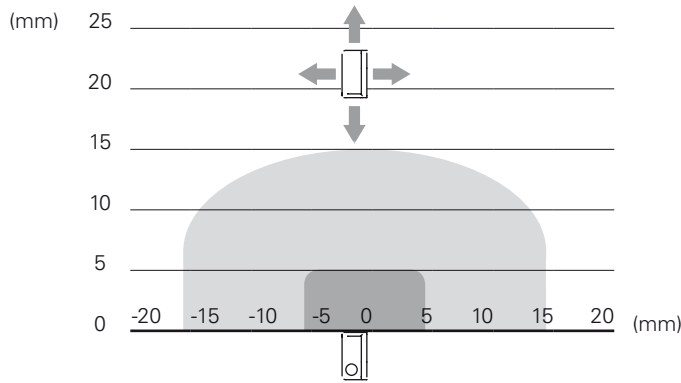
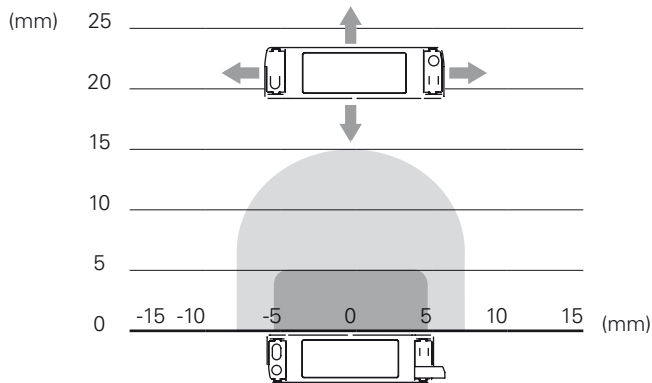
With M8 connector (2NC)

With M8 connector (1NC+1NO)

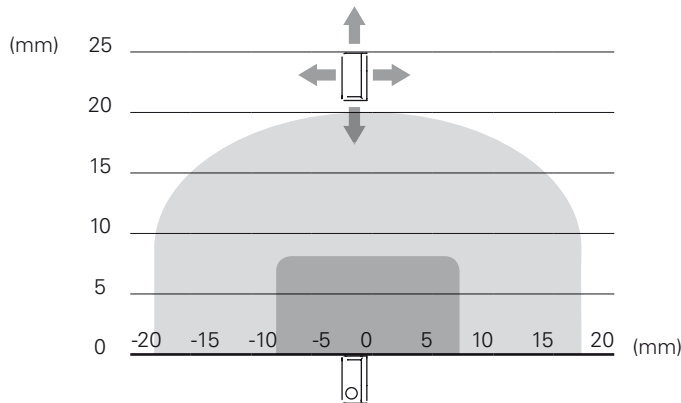
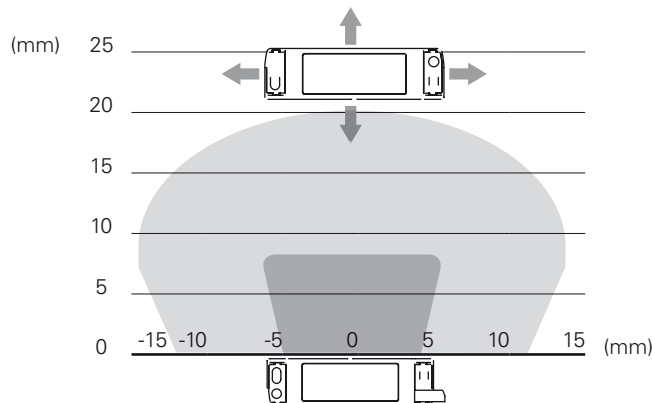


Sockets See page 287

Operating distance SR BD-----B01F



Operating distance SR BD-----B02F



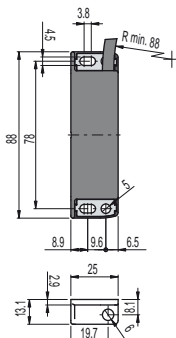
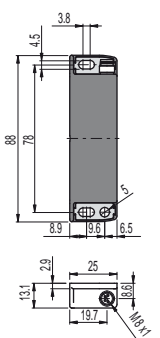
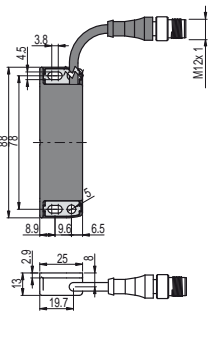
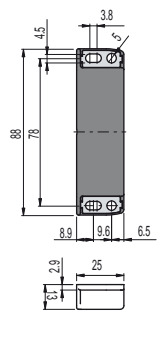
Legend:
 ■ Assured operating distance Sao
 ■ Assured release distance Sar

Note: The drawing of the activation areas is indicative.



Dimensional drawings

All measures in the drawings are in mm

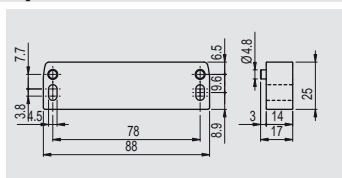
<p>integrated cable, length 2 m</p> 	<p>M8 connector</p> 	<p>cable length 0.1 m and M12 connector</p> 	<p>coded actuator Low level of coding acc. to EN ISO 14119</p> 
<p>SR BD40AN2 2NC</p> <p>SR BD41AN2 1NO+2NC</p> <p>SR BD42AN2 1NO+1NC</p>	<p>SR BD40ALK 2NC</p> <p>SR BD42ALK 1NO+1NC</p>	<p>SR BD40AM0.1 2NC</p> <p>SR BD41AM0.1 1NO+2NC</p> <p>SR BD42AM0.1 1NO+1NC</p>	<p>SM B01F Actuation distance 5 mm</p> <p>SM B02F Actuation distance 8 mm</p>

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

Accessories See page 287

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

Spacer



This spacer is placed between the magnetic safety sensors and metal surfaces that can deviate the magnetic field created by the sensor: with this specific spacer between them the sensor activation and deactivation distances remain the same.

and deactivation distances remain the same.

Article	Description
VS SP1BA1	Spacers for SR B series sensors

Coded magnetic sensors used for safety applications

A coded magnetic sensor alone can not be used for safety functions because its working principles are not considered safe by the standards (as are, for example, the positive opening on mechanical switches). For this reason a coded magnetic sensor, in order to be used in safety applications, has to be compulsory connected to a proper safety module which controls correct operation, through a circuit with at least two channels.

Utilization limits

- The installation must be performed by qualified staff only.
- Before installation and at regular interval, check the right contacts switching and the system operation of the sensor and the associated safety module.
- Do not use a hammer for adjustment.
- Do not use the sensor as a mechanical stop.
- Observe the assured operating and release distances.
- Adhere to the EN ISO 14119 requirements regarding low level of coding for interlocks.
- Do not install the sensor and the actuator on strong magnetic field.
- Keep away from iron filing.

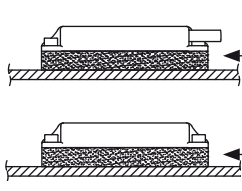
Shock, vibrations and wear:

- Do avoid impact with the sensor. Excessive shock and vibrations may affect correct operation of the sensor.
- The actuator must not strike sensor.
- In case of damages or wear is necessary to change the whole device, included the actuator.

Attention during wiring:

- Keep load under the value indicated in the electrical data.
- When the sensor contacts are used without the respective safety module, connect in series to each contact the protection fuse indicated in the electrical data.
- Turn off the power supply before access to the switch connection contacts, also during the wiring.

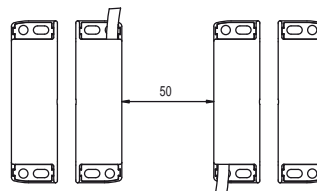
Installation on ferromagnetic material



- If possible do not mount the sensor and the actuator on ferromagnetic materials.
- In order to avoid switching distances reductions, use VS SP1AA1 spacers.

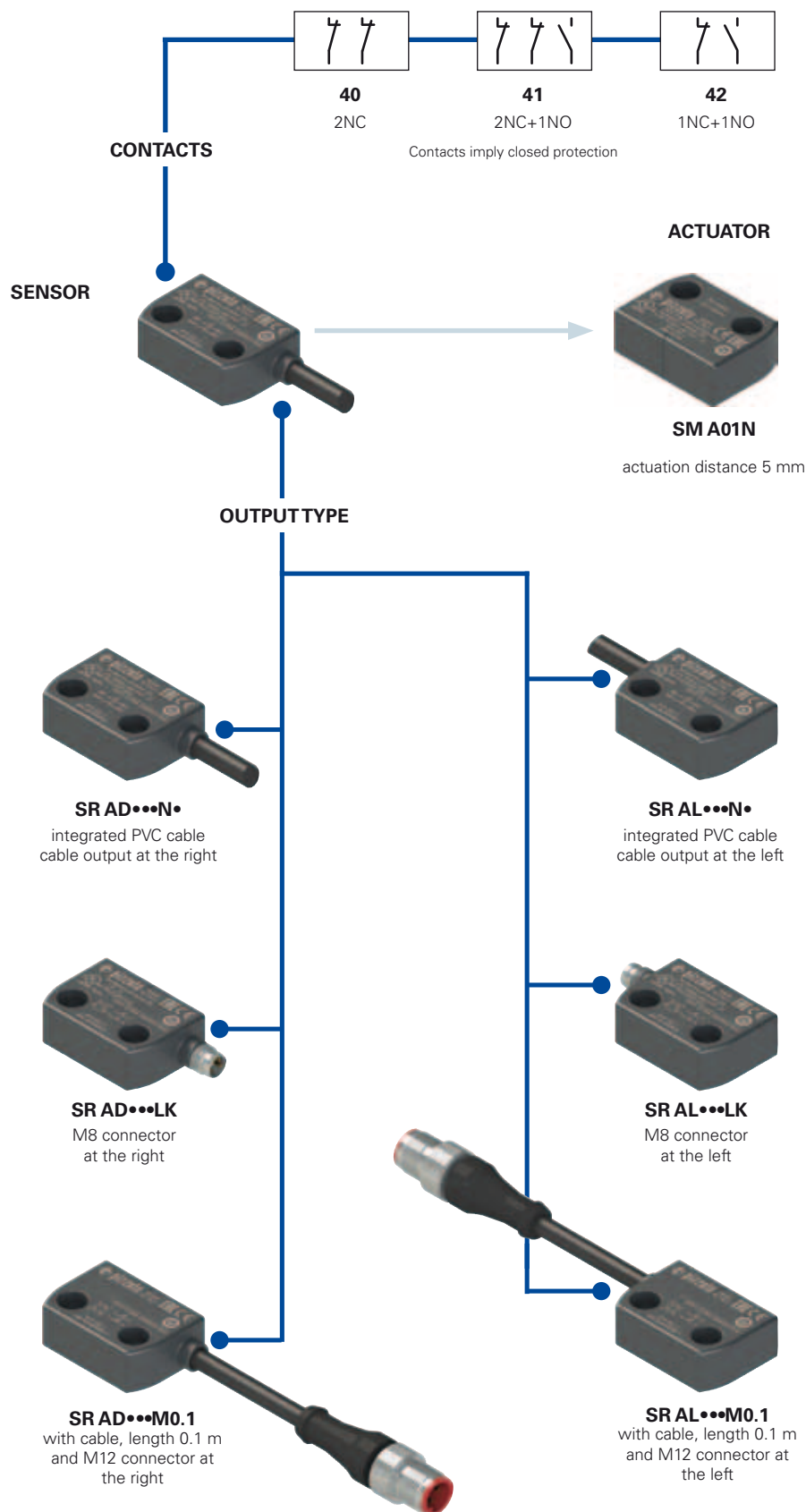
Spacer

Multiple systems sensor-actuator assembly



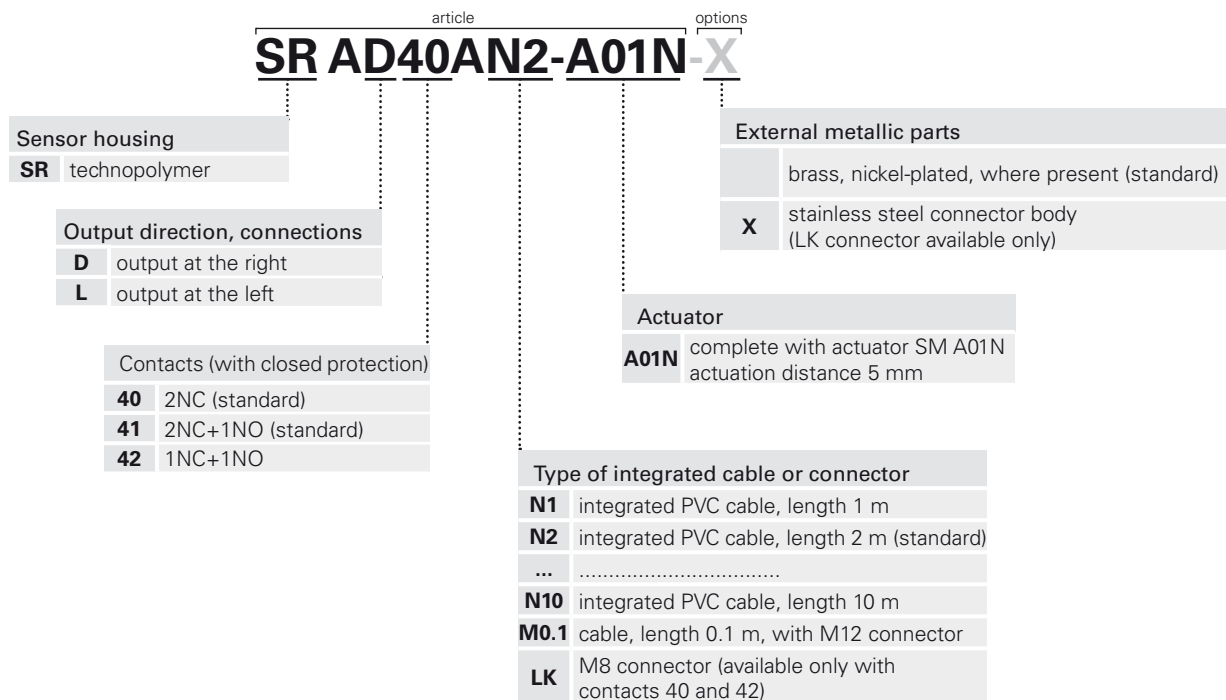
The minimum mounting gap between sensor-actuator systems must be at least 50 mm.

Selection diagram



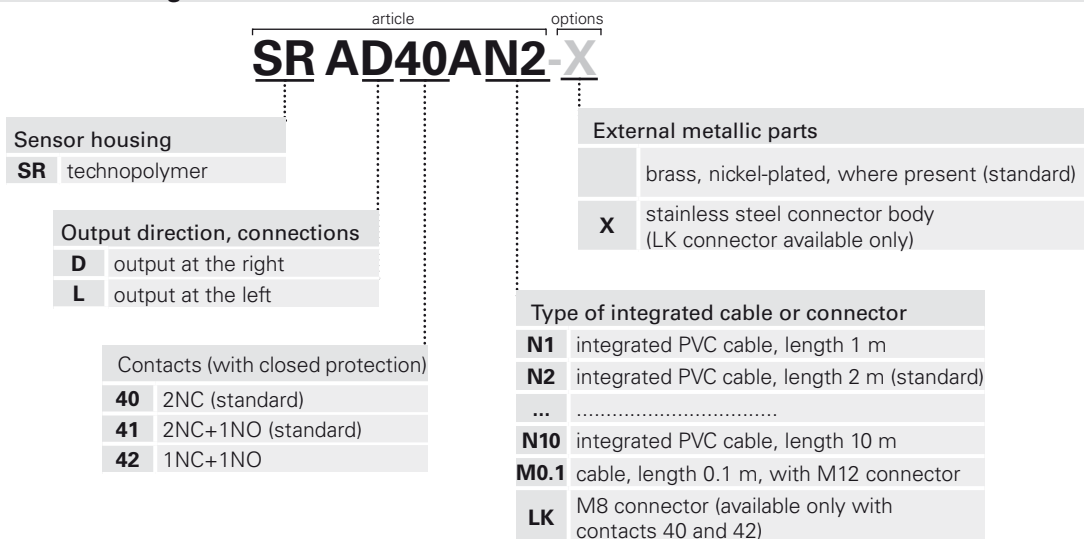


Code structure for sensor with actuator



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



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

Single actuator code structure

SM A01N

Actuator	
A01N	actuation distance 5 mm



Main features

- Actuation without contact, mechanical
- 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

Markings and quality marks:



UL approval: E131787
 TÜV SÜD approval: Z10 15 08 75157 008
 EAC approval: RU C-IT ДМ94.В.01024

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC
 Machinery Directive 2006/42/EC
 EMC Directive 2004/108/EC.

Technical data

Housing

Housing made of glass fiber reinforced technopolymer, self-extinguishing.
 Versions with integrated cable 4 x 0.25 mm² or 6 x 0.25 mm², length 2 m, other lengths on request.

Versions with M8 connector

Versions with cable, length 0.1 m, M12 connector

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

For safety applications up to:

SIL 3 acc. to EN 62061
 PL e acc. to EN ISO 13849-1
 type 4 acc. to EN ISO 14119
 Low acc. to EN ISO 14119

Interlock without contact, coded:

Coding level:

Safety parameters:

B_{10d}:

20,000,000 (with compatible Pizzato Elettrica safety modules)
 400,000 (at max. load: DC12 24 V 250 mA)
 20 years

Service life:

Ambient temperature:

Vibration resistance:

Shock resistance:

Pollution degree

Screw tightening torque:

-25°C ... +80°C
 10 gn (10...150 Hz) acc. to IEC 60068-2-6
 30 gn; 11 ms acc. to EN 60068 2 27
 3
 0.8 ... 2 Nm

In conformity with standards:

IEC 60947-1, EN 60947-1, IEC 60947-5-1, EN 60947-5-1, EN 60947-5-2, EN 60947-5-3 (in connection with safety module), EN ISO 14119, EN ISO 12100, EN ISO 13849-1, EN ISO 13849-2, IEC 60204-1, EN 60204-1, IEC 60529, EN 60529, 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, IEC 62061, EN 60947-1.

Actuation data

Assured operating distance S_{ao}

Assured release distance S_{ar}

Repeat accuracy

Switching frequency

Distance between two sensors

5 mm with actuator SM A01N

15 mm with actuator SM A01N

≤ 10%

up to 150 Hz

Min. 50 mm

Electrical data

Rated insulation voltage U_i:

120 Vac (with cable)
 60 Vac / 75 Vdc (with M8 connector)
 120 Vac (with 4-pin M12 connector)
 30 Vac / 36 Vdc (with 8-pin M12 connector)

Rated impulse withstand voltage (U_{imp}):

6 kV
 1.5 kV (with connector)

Thermal current I_{th}:

Max. switching load:

Rated operating voltage U_e:

Rated operating current I_e:

Protection fuse:

Electrical endurance:

0.25 A
 6 W (resistive load)
 24 Vac/dc
 0.25 A (resistive load)
 0.25 A type F
 1 million operating cycles

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 to PDF-M (EN 60947-5-3).

The system can be used in safety circuits to PL e/SIL 3/category 4 in accordance with EN ISO 13849-1.

Characteristics approved by UL

Utilization categories: 24 Vdc, 0.25 A (resistive load).

Data of housing type 1, 4X "indoor use only", 12.

Accessory for CS series.

In conformity with standard: UL 508, CSA 22.2 No.14

Characteristics 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, category 4 with CS AR-08

In conformity with standards: 2006/42/EEC Machine Directive, EN ISO 13849-1:2008, EN 60947-5-3/A1:2005, EN 50178:1997, EN 61508-1:1998 (SIL 1-3), EN 61508-2:2000 (SIL 1-3), EN 61508-4:1998 (SIL 1-3), IEC 62061:2005 (SIL CL 3), EN 60947-1

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

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

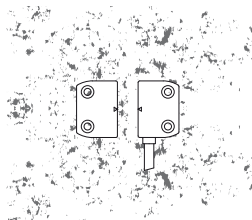


Description



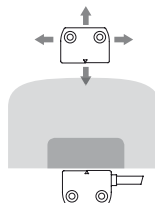
Coded magnetic sensors are devices suitable for monitoring protections and guards of machines without inertia which, when linked to a safety module, can create a system with safety category up to SIL 3 according to EN 62061, up to PL e according to EN ISO 13849-1 and up to category 4 according to EN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

Insensitivity to dirt



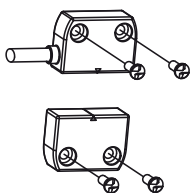
Magnetic sensors are totally sealed and retain their safety characteristics also where dirt and dust are present (not ferromagnetic material). This characteristic, joined with the shape without recesses, make them especially proper to the use in the agro-industrial sector.

Wide actuation zone



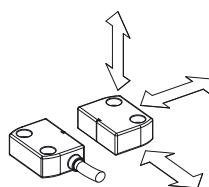
Because of their intrinsic characteristics, magnetic sensors have a wide actuation zone, which make them appreciated in the use of inaccurate protections or for protection that can change their mechanic characteristics through the time. In this type of sensors actuation distances may change according to the actuator displacement direction from the sensor.

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 with using common tools. See accessories on page 295.

Actuation from many directions



The magnetic sensors have been designed in order to be activated by the related actuator from many directions. In this way, the customer has the max. flexibility about the placing of the devices along the protections perimeters.

Laser engraving



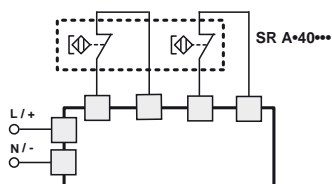
All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

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 IEC 60529. They can therefore be used in all environments where the maximum protection of the housing is required. Special measures also allow devices to be used even in machines which are subjected to washing with high pressure warm water jets. In fact these devices pass the IP69K test according to ISO 20653, using jets of water to 100 atmospheres at a temperature of 80°C.

Compatible safety modules



These magnetic sensors have been checked and tested for operation with suitable safety modules (see list). Using completed and tested solutions, the customer has the certainty to have no electric incompatibility between sensor and safety module, and has a higher reliability guarantee.

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 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 243	see page 243
	CS MF●●●●●●	see page 271	see page 271

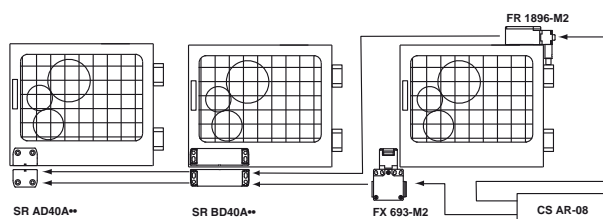
^a Compatible with CS MF202●●-P4 (page 276) and CS MP●●●●●● only.

^b Compatible with modules with production batch later than 04/2014 only. For features of the safety modules see page 181.

Connection of sensors and switches in series

The 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). It is a very high value that, with normal wiring, allows the use of dozens of sensors without problems. It is also possible to realize mixed circuit solutions connecting in series magnetic sensor to safety switches, with the only limitation of the above mentioned max. electric resistance.

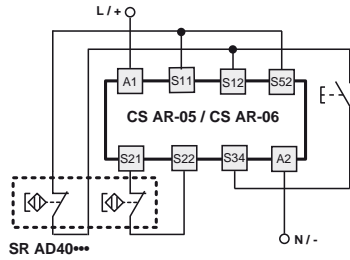
We remind you that connection in series of two or more coded sensors reduce the system self-monitoring capacity which passes to category 3 in conformity with EN ISO 13849-1. It is advisable to use safety modules by Pizzato Elettrica.



Connection with safety modules

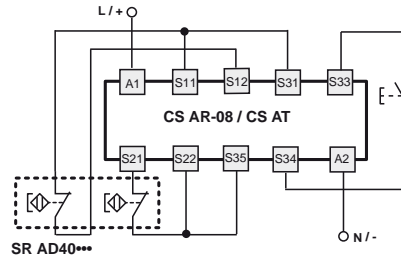
Connection with safety modules CS AR-05 or CS AR-06

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



Connection with safety module CS AR-08 or CS AT

Input configuration with manual start
2 channels

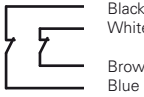


For features of the safety modules see page 181.

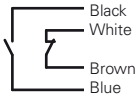
Internal connections with cable

Contacts imply closed protection

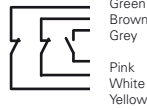
With cable (2NC)



With cable (1NC+1NO)



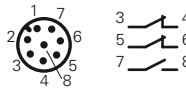
With cable (2NC+1NO)



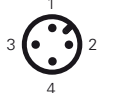
Internal connections with connector

Contacts imply closed protection

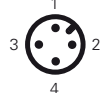
With M12 connector (2NC+1NO)



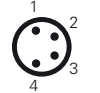
With M12 connector (2NC)



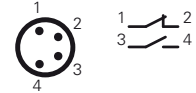
With M12 connector (1NC+1NO)



With M8 connector (2NC)

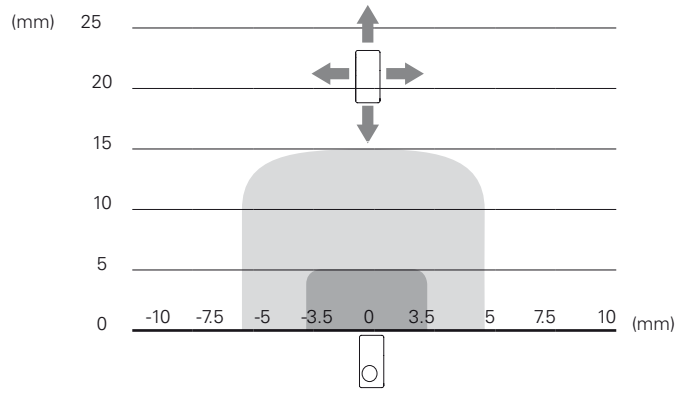
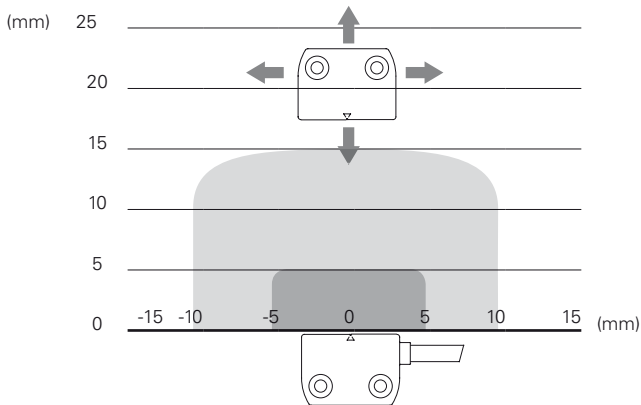


With M8 connector (1NC+1NO)



Sockets See page 287

Operating distance SR AD.....A01N



Legend:
 ■ Assured operating distance Sao
 ■ Assured release distance Sar

Note: The drawing of the activation areas is indicative.

Dimensional drawings

All measures in the drawings are in mm

cable, length 2 m, at the left 		integrated cable, 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

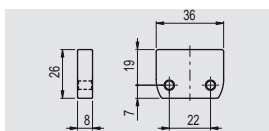
M8 connector, at the right 	M8 connector, at the left 	cable length 0.1 m and M12 connector, at the right 	cable length 0.1 m and M12 connector, at the left
SR AD40ALK	2NC	SR AL40ALK	2NC
SR AD41ALK	1NO+2NC	SR AL41ALK	1NO+2NC
SR AD42ALK	1NO+1NC	SR AL42ALK	1NO+1NC

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

Accessories See page 287

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

Spacer



This spacer is placed between the magnetic safety sensors and metal surfaces that can deviate the magnetic field created by the sensor: with this specific spacer between them the sensor activation and deactivation distances remain the same. Made of a single block material it suits any application where high cleanness is required since it prevents any material in the installation area from getting and settling inside the drain.

Article	Description
VS SP1AA1	Spacers for SR A series sensors

Coded magnetic sensors used for safety applications

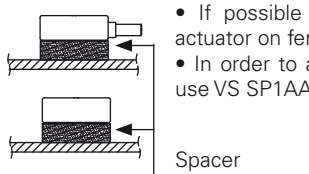
A coded magnetic sensor alone can not be used for safety functions because its working principles are not considered safe by the standards (as are, for example, the positive opening on mechanical switches).

For this reason a coded magnetic sensor, in order to be used in safety applications, has to be compulsory connected to a proper safety module which controls correct operation, through a circuit with at least two channels.

Utilization limits

- The installation must be performed by qualified staff only.
- Before installation and at regular interval, check the right contacts switching and the system operation of the sensor and the associated safety module.
- Do not use a hammer for adjustment.
- Do not use the sensor as a mechanical stop.
- Observe the assured operating and release distances.
- Adhere to the EN ISO 14119 requirements regarding low level of coding for interlocks.
- Do not install the sensor and the actuator on strong magnetic field.
- Keep away from iron filing.
- Shock, vibrations and wear:
 - Do avoid impact with the sensor. Excessive shock and vibrations may affect correct operation of the sensor.
 - The actuator must not strike sensor.
 - In case of damages or wear is necessary to change the whole device, included the actuator.
- Attention during wiring:
 - Keep load under the value indicated in the electrical data.
 - When the sensor contacts are used without the respective safety module, connect in series to each contact the protection fuse indicated in the electrical data.
 - Turn off the power supply before access to the switch connection contacts, also during the wiring.

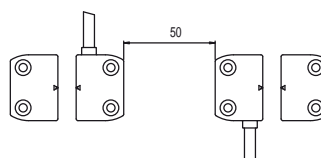
Installation on ferromagnetic material



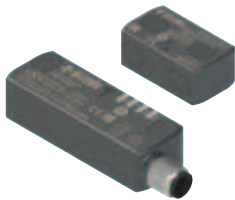
- If possible do not mount the sensor and the actuator on ferromagnetic materials.
- In order to avoid switching distances reductions, use VS SP1AA1 spacers.

Multiple systems sensor-actuator assembly

The minimum mounting gap between sensor-actuator systems must be at least 50 mm.



Introduction



The ST series sensors, combined with appropriate safety modules, are suitable for controlling protections and guards on machines without inertia, allowing the system within which they are integrated to attain a safety category up to SIL 3 acc. to EN 62061, and 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 mishandling thanks to the uniqueness of the code transmitted by the actuator. Having no mechanical contacts, they guarantee long working life even in systems subject to frequent opening/closing and operating in hostile environmental conditions.

Maximum safety with a single device

PL e + SIL 3

Constructed with redundant electronic technology, the ST series sensors make it possible to create circuits having maximum PL e and SIL 3 safety levels by installing just one device on the protection. This avoids expensive wiring on the field and allows quicker installation. Inside the panel, the two electronic safety outputs must be connected to a safety module with OSSD inputs or to a safety PLC.

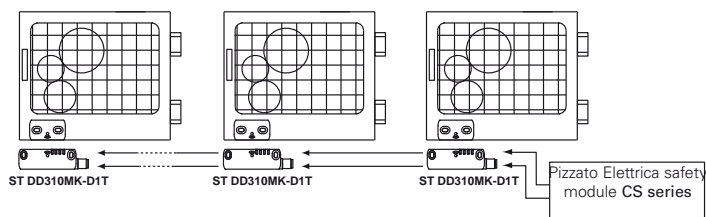
Connection of several sensors in series

PL e + SIL 3

One of the major characteristics of Pizzato Elettrica ST products is that several sensors can be connected in series, up to a maximum number of 32 devices, while maintaining the maximum safety level (PLe) prescribed by the EN 13849-1 standard.

This connection method is permitted in safety systems which, at the end of the chain, feature a safety module evaluating the outputs of last ST sensor.

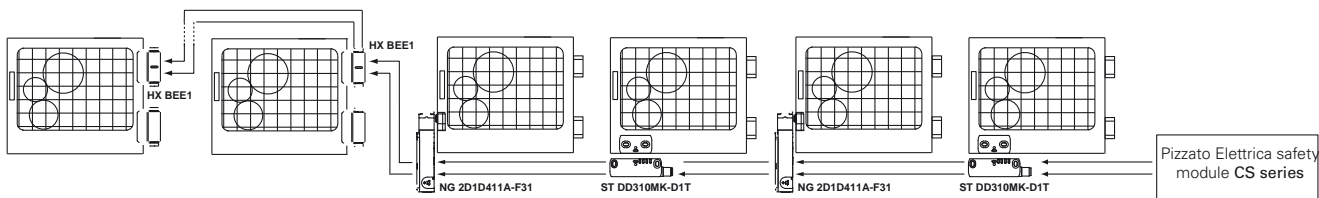
The fact that the PLe safety level can be maintained even with 32 sensors connected in series indicates the presence of an extremely safe structure inside each individual ST sensor.



Series connection with other devices

PL e + SIL 3

The ST series features two safe inputs and two safe 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 the creation of circuits with connections in series, including stainless steel safety hinges (HX BEE1 series), transponder sensors (ST series) and door lock sensors (NG series), while maintaining maximum PL e and SIL 3 safety levels.



High level coded actuators



The ST series features an electronic system based on RFID technology to detect the actuator. This system gives a different coding to each actuator and makes it impossible to tamper with a device by using another actuator belonging to the same series. The actuators may have millions of different coding combinations, and are therefore classified as actuators with a high coding level, according to ISO 14119.

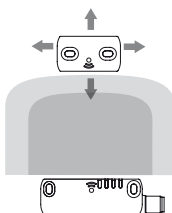
Protection degrees IP67 and IP69K

IP69K
IP67

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

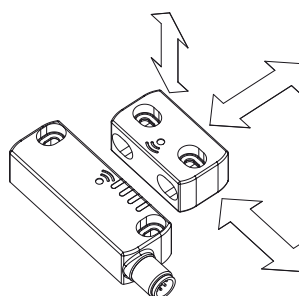
also allow devices to be used even in machines which are subjected to washing with high pressure warm water jets. In fact these devices pass the IP69K test according to ISO 20653, using jets of water to 100 atmospheres at a temperature of 80°C.

Wide actuation zone



Since they exploit the intrinsic characteristics of RFID technology, the ST series sensors cover a wide activation zone, which makes them particularly suitable in conditions of poorly defined protections or with mechanical characteristics changing over time.

Actuation from many directions



Pizzato Elettrica ST series sensors have been designed to be activated from various directions, thus providing the customer with the greatest versatility in positioning the devices along the protection perimeters. Moreover, the actuator can be fixed on 2 perpendicular planes.

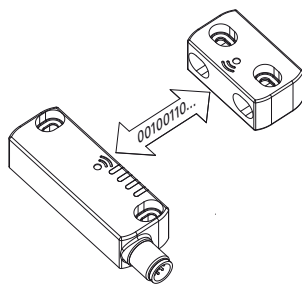


Programmability

Pizzato Elettrica supplies a programmable version of the ST series sensors. A simple brief operation makes it possible to program the sensor in order for it to recognise the code of a new actuator. The procedure involves the activation of a dedicated input which brings the sensor to a safe state, while waiting for a new code to be memorised. When the actuator is brought closer, the ST sensor carries out a number of checks on the code being received, which must respect certain parameters peculiar to RFID technology.

On completion of these checks, the sensor will indicate, by means of LED signals, that the procedure has been successful.

After programming has been completed, the sensor will only recognise the actuator code corresponding to the last programming operation, thereby preserving the level of safety and reliability in the system where it is installed.

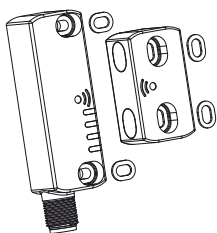


Laser engraving

All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.



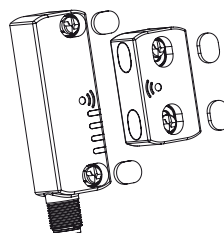
Stainless steel fixing plates



The presence of stainless-steel fixing plates in ST sensors, besides ensuring that fitting on surfaces not perfectly level does not damage the slots, makes the sensor sturdier against mechanical stress. The system therefore becomes safer and more reliable.

It is advisable to block the sensor and the actuator with safety screws in stainless steel.

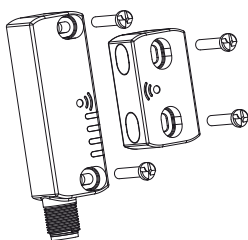
Double anti-tampering safety



The ST series sensors and respective actuators are supplied with appropriate caps for covering the slots housing the fixing screws. These caps prevent dirt from accumulating, therefore making it easier to clean the system where the sensor is installed and keeping its operational capacity unaltered.

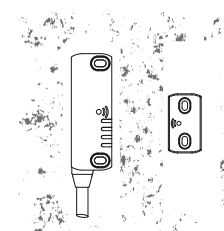
A further mechanical tampering protection is provided by means of fixing screw covers.

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 with using common tools. See accessories on page 295.

Insensitivity to dirt



The sensors are totally sealed and retain their safety characteristics also where dirt and dust are present (not ferromagnetic material). This characteristic, joined with the shape without recesses, make them especially proper to the use in the agro-industrial sector.

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. This makes it possible to quickly identify the interruption points in the safe chain, which device is active, which door is opened and any errors inside the device. All that in a straightforward way without needing to decode complex blinking sequences.



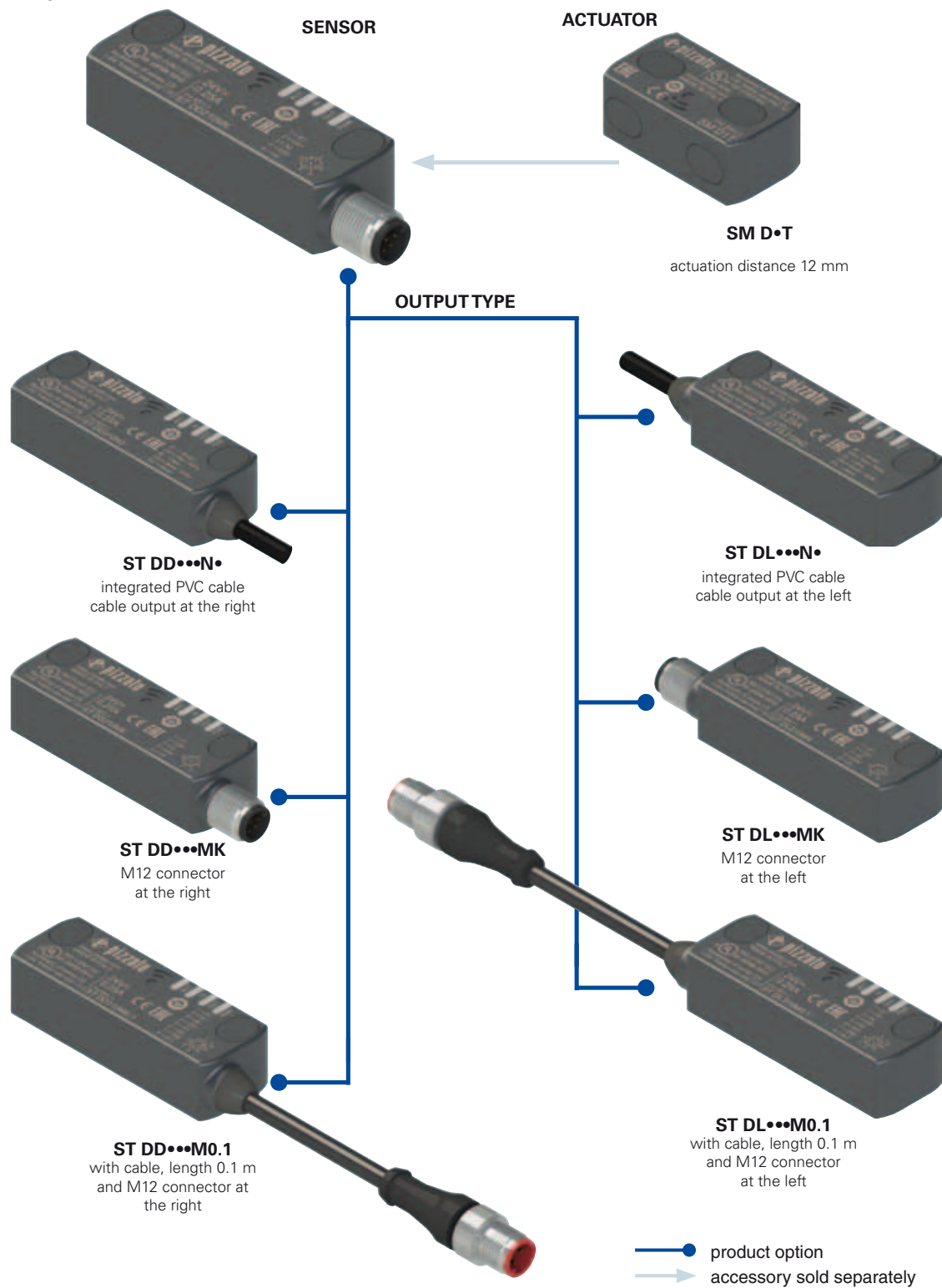
Inverted signalling output

To adapt to specific customer needs, in addition to the standard versions, you can request monitoring output O3 with inverted operation.

External device monitoring

EDM On request we can supply the device with EDM (External Device Monitoring) function, so that the device itself can check the integrity of the relays connected to the safety outputs. These safety relays or safety contactors send a feedback signal to the EDM input, which verifies the consistency of the received signal with the safety outputs state.

Selection diagram





Code structure for sensor with actuator

ST DD420N2-D1T

Output direction, connections

D	output at the right
L	output at the left

Actuator

D0T	complete with coded actuator SM D0T
D1T	complete with uniquely coded actuator SM D1T

Inputs, outputs and programming

	OS safety outputs	NC signalling outputs	IS safety inputs	programming inputs I	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	-

Type of integrated cable or connector

N2	integrated PVC cable, length 2 m (standard)
...
N10	integrated PVC cable, length 10 m
MK	with 5 or 8 pole stainless steel M12 connector
M0.1	cable, length 0.1 m, with M12 connector not available for ST D•2•••• versions

Supply voltage

0	24 Vdc (-15% ... +10%)
1	12 ... 24 Vdc (-30% ... +25%)

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, outputs and programming

	OS safety outputs	NC signalling outputs	IS safety inputs	programming inputs I
42	2	1	2	1
82	2	1 (inverted)	2	1

Type of integrated cable or connector

N2	integrated PVC cable, length 2 m (standard)
...
N10	integrated PVC cable, length 10 m
MK	with 5 or 8 pole stainless steel M12 connector
M0.1	cable, length 0.1 m, with M12 connector

Supply voltage

0	24 Vdc (-15% ... +10%)
1	12 ... 24 Vdc (-30% ... +25%)

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

Actuator code structure

SM D1T

Actuator

D0T	low level coded actuator the switch recognises any type D0T actuator
D1T	high level coded actuator the switch recognises one single 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
- Versions with M12 connector

Markings and quality marks:



UL approval: E131787
 TÜV SÜD approval: Z10 12 11 75157 004
 EAC approval: RU C-IT ДМ94.В.01024

In conformity with the requirements of:

Machinery Directive 2006/42/EC
 EMC Directive 2004/108/EC
 R&TTE Directive 1999/05/EC
 FCC Part 15

In conformity with standards:

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 60947-5-3 /
 A1, EN 60947-5-2, EN 60947-1, EN 61326-1,
 EN 61326-3-1, EN 61326-3-2, ETSI 301 489-1,
 ETSI 301 489-3, ETSI 300 330-2, UL 508,
 CSA 22.2 No.14

Approvals:

UL 508, CSA 22.2 No. 14, see features approved
 by TÜV SÜD.

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 to PDF-M (EN 60947-5-3).

The system can be used in safety circuits
 to PL e/SIL 3/category 4 in accordance with
 EN ISO 13849-1.

Characteristics approved by UL

Utilization categories: 24 Vdc, 0.25 A (resistive load).

Inputs supplied by remote class 2 source or limited voltage and
 limited energy.

Data of housing type 1, 4X "indoor use only", 12.

Accessory for CS series.

In conformity with standard: UL 508, CSA 22.2 No.14

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

Technical data

Housing

Housing made of glass fiber reinforced technopolymer, self-extinguishing.
 Versions with integrated cable 6 x 0.5 mm² or 8 x 0.34 mm², length 2 m, other lengths
 on request.

Versions with M12 connector

Versions with cable, length 0.1 m, M12 connector

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

For safety applications up to: SIL 3 acc. to EN 62061
 PL e acc. to EN ISO 13849-1
 Interlock without contact, coded: type 4 acc. to EN ISO 14119
 Level of coding acc. to EN ISO 14119 High with D1T actuator
 Low with DOT actuator

Safety parameters:

MTTF_d: 4077 years
 PFH_d: 1.46E-09
 DC: High
 Service life: 20 years
 Operating temperature: -25 ... +70°C
 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 inputs IS1/IS2/I3/EDM

Rated operating voltage U_{e1}: 24 Vdc
 Rated current consumption: 5 mA

Electrical data of safety outputs OS1/OS2

Rated operating voltage U_{e1}: 24 Vdc
 Output type: OSSD, PNP
 Maximum current per output I_{e1}: 0.25 A
 Minimum current per output I_{e1}: 0.5 mA
 Utilization category: DC13; U_e=24 Vdc, I_e=0,25 A
 Short circuit detection: Yes
 Protection against overcurrent: Yes
 Auto-resettable internal protection fuse: 0.75 A
 Duration of the deactivation impulses at the safety outputs: < 300 us
 Permissible capacitance between outputs: < 200 nF
 Permissible cap. between output and ground: < 200 nF

Electrical data of signalling output O3

Rated operating voltage U_{e1}: 24 Vdc
 Output type: PNP
 Maximum current per output I_{e1}: 0.1 A
 Utilization category: Dc12; U_e=24 Vdc; I_e=0,1A
 Short circuit detection: No
 Protection against overcurrent: Yes
 Auto-resettable internal protection fuse: 0.75 A

Actuation data

Assured operating distance S_{ao}: 10 mm
 Assured release distance S_{ar}: 16 mm
 Rated operating distance S_r: 12 mm
 Rated release distance S_{nr}: 14 mm
 Repeat accuracy: ≤ 10 % S_n
 Differential travel: ≤ 20 % S_n
 Max. switching frequency: 1 Hz
 Distance between two sensors: min. 50 mm

Electrical data

Rated operating voltage U_e: 24 Vdc -15% ... +10% SELV
 Rated operating current I_e: 0.25 A
 Thermal current I_{th}: 0.25 A
 Consumption at voltage U_e: < 1W
 Rated insulation voltage U_i: 32 Vdc
 Rated impulse withstand voltage U_{imp}: 1.5 kV
 External protection fuse: 1 A type F
 Overvoltage category: III

Characteristics approved by TÜV SÜD

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

In conformity with standards: 2006/42/EEC Machinery Directive,
 EN ISO 13849-1:2008, EN 60947-5-3/A1:2005, 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 (SIL CL 3)

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



Selection table for sensors with actuators

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

Sensor selection table

OS safety outputs	NC signalling outputs	IS safety inputs	programming inputs I	EDM inputs	Programmable	with cable, length 0.1 m, M12 connector at the right	with cable, length 0.1 m, 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

Accessories See page 287

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

Actuator selection table



Type of coding	Level of coding acc. to ISO 14119	actuation distance 12 mm
encoded	low	D0T
unequivocally encoded	high	D1T

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.

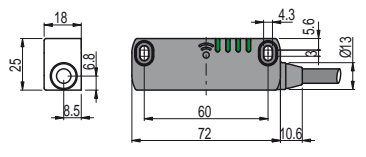
Type D0T actuators are all encoded with the same code. This implies that a sensor associated with an actuator type D0T can be activated by other actuators type D0T.

Type D1T actuators are always encoded with different codes. This implies that a sensor associated with an actuator type D1T can be activated only by a specific actuator. Another D1T type actuator will not be recognised by the sensor until a new association procedure is carried out (reprogramming). After reprogramming, the old actuator D1T will no longer be recognized.

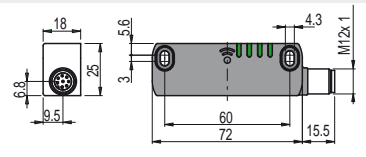
Dimensional drawings

All measures in the drawings are in mm

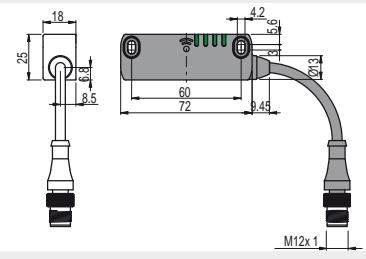
Sensor ST DD•••N• with cable at the right



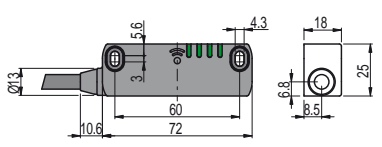
Sensor ST DD•••MK with M12 connector at the right



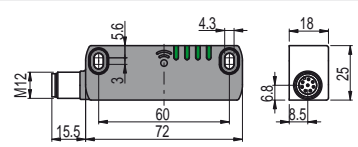
Sensor ST DD•••M0.1 with cable and M12 connector at the right



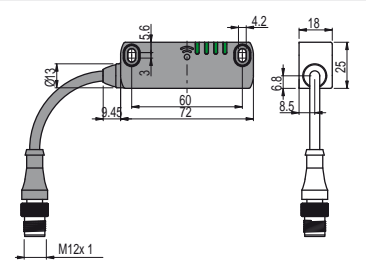
Sensor ST DL•••N• with cable at the left



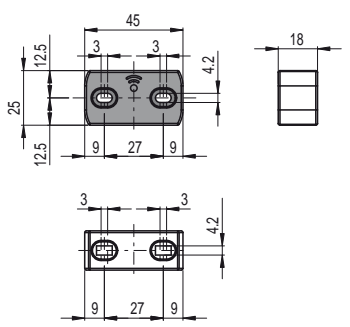
Sensor ST DL•••MK with M12 connector at the left



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



Actuator SM D•T

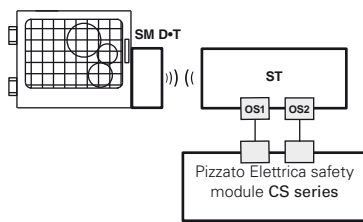


Accessories See page 287

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

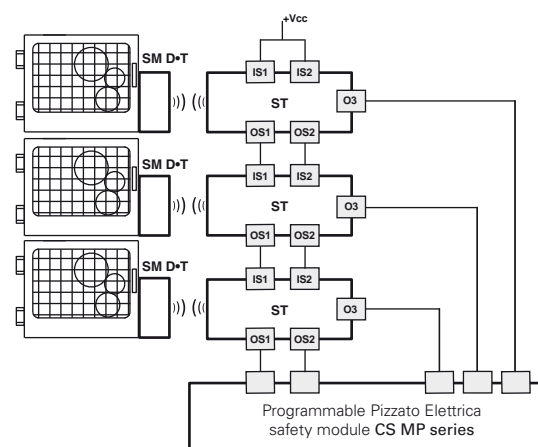
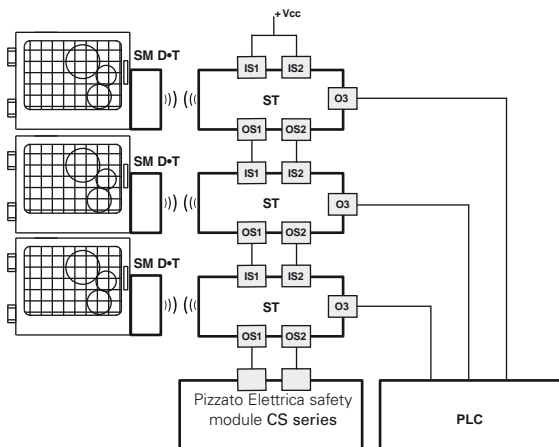
Complete safety system

The use of complete tested solutions means that the customer can be certain of the electrical compatibility between the ST series sensor and Pizzato Elettrica safety modules, thus ensuring greater reliability. In fact, these sensors have been tested for operation with the modules specified in the table shown on the side.



Sensors	Compatible 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 page 243		

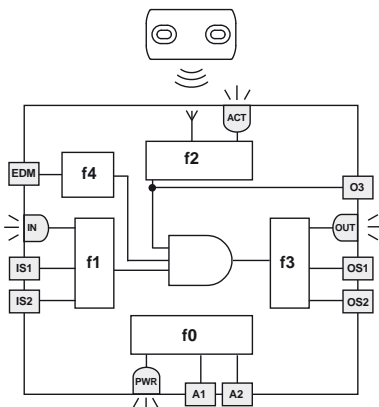
The ST sensor can be used individually after evaluating the outputs by means of a Pizzato Elettrica safety module (table for safety modules to be combined).



Possible connection in series of several sensors in order to simplify the safety system wiring, after evaluating the outputs from the last sensor in the chain by means of a Pizzato Elettrica safety module (table for safety modules to be combined). Each ST sensor is equipped with a signalling output, which is activated or deactivated depending on the version selected, when the respective guard is closed. This piece of information can be managed by a PLC, depending on the specific requirements of the system installed.

Possible connection in series of several sensors in order to simplify the safety system wiring, after evaluating the outputs from the last sensor in the chain by means of a safety module from Pizzato Elettrica CS MP series, which allows management of both safety and signalling functions.

Internal wiring diagram (ST D•42•••)



The diagram on the side represents the 5 logic functions which interact inside the sensor.

Function f0 is a global function which deals with the sensor power supply and the internal tests which it cyclically undergoes.

The task of function f1 is to evaluate the status of the sensor inputs, whereas function f2 checks the presence of the actuator inside the sensor operating areas.

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 f4 function verifies the consistency of the EDM signal during safety output state changes.

The macro-function, which controls the above mentioned functions, enables the safety outputs only in presence of active inputs with actuator within the safe zone limits.

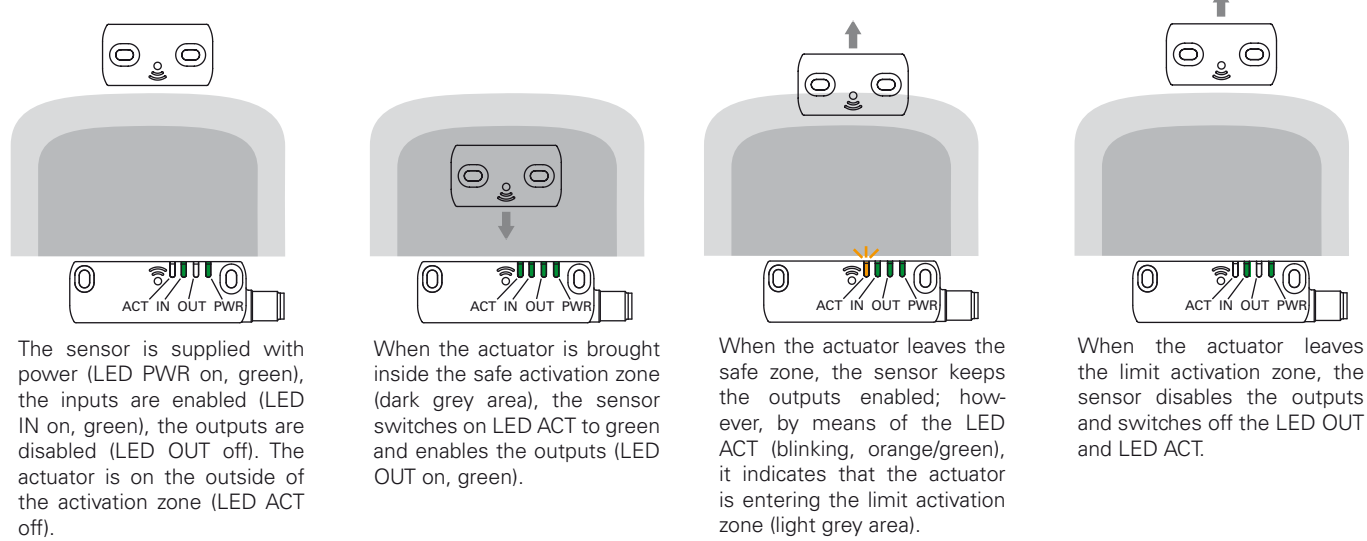
The status of each function is displayed by the corresponding LED (PWR, IN, ACT, OUT), in such a way that the general sensor status becomes immediately obvious to the operator.

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



Limited and safe activation zones (ST D•42•••)

During alignment of the sensor with the actuator, the status LEDs indicate, by means of different colours, the presence of the actuator within the limit activation zone or the safe activation zone. In the figure below an example with sensor ST DD420MK-D1T.

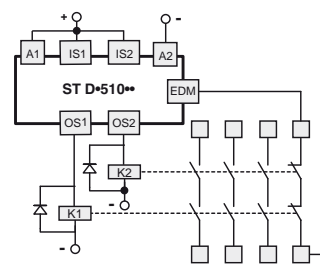


Operating states (ST D•42•••)

PWR LED	OUT LED	IN LED	ACT LED	Status. sensor	Description
○	○	○	○	OFF	Sensor off.
●	○	○	○	POWER ON	Internal tests upon activation.
●	*	○	*	RUN	Sensor with inactive inputs.
●	*	●	*	RUN	Activation of inputs.
●	*	◌	*	RUN	Inputs not coherent. Recommended action: check for presence and/or wiring of inputs.
●	*	*	●	RUN	Actuator in safe area. O3 signalling output active.
●	*	*	◌	RUN	Actuator in limit zone, O3 active. Recommended action: bring the sensor within the safe activation zone.
●	●	●	●	RUN	Activation of 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, and restart the sensor.
●	*	*	*	ERROR	Internal error. Recommended action: restart the sensor. If the fault persists, replace the sensor.

Legend: ○ = off ● = on ◌ = blinking ◐ = alternating colours * = indifferent

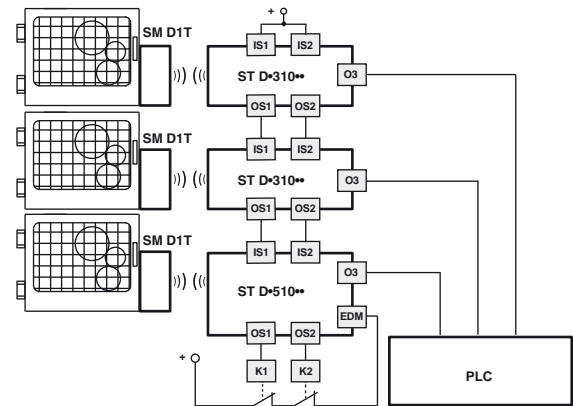
External device monitoring (EDM)



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

235.

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

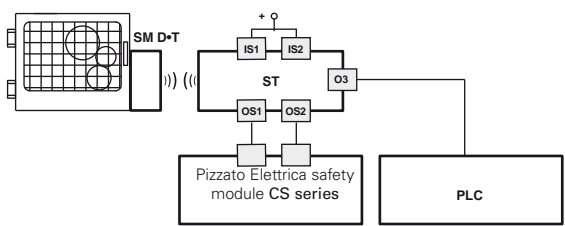


This version, with the IS safety inputs, **can be used at the end of a series of ST sensors, up to a maximum number of 32 devices**, while maintaining the maximum PL e safety level according to EN ISO 13849-1.

This solution allows you to dispense with the safety module connected to the last device in the chain.

Output O3 inverted (ST D•61•••, ST D•71•••, ST D•82•••)

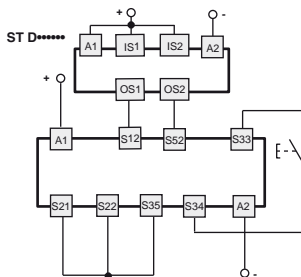
The version with signalling output O3 inverted allows checking of the actual electrical connection of the sensor by an external PLC. In the event of removal of the actuator and switching off of the OS safe outputs, output O3 will become active.



Connection with safety modules

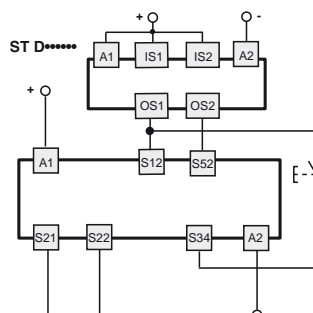
Connection with safety modules CS AR-08•••••

Input configuration with monitored start
2 channels / Category 4 / up to SIL 3 / PL e



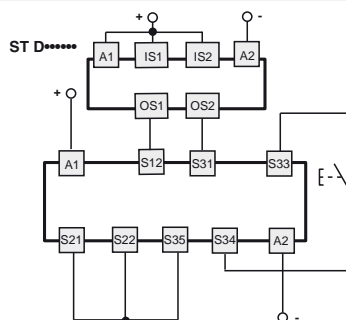
Connection with safety modules CS AR-05••••• / CS AR-06•••••

Input configuration with manual start (CS AR-05•••••)
or monitored start (CS AR-06•••••)
2 channels / Category 4 / up to SIL 3 / PL e



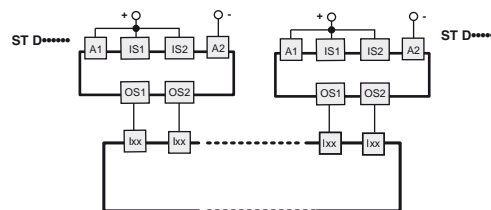
Connection with safety modules CS AT-0••••••• / CS AT-1•••••••

Input configuration with monitored start
2 channels / Category 4 / up to SIL 3 / PL e



Connection with safety modules CS MP•••••0

The connections vary according to the program of the module
Category 4 / up to SIL 3 / PL e



For features of the safety modules see page 181.

Internal connections with cable

cable colour	connection
brown	A1
red/white	OS1
blue	A2
black/white	OS2
black	O3

cable colour	connection
brown	A1
red	IS1
blue	A2
red/white	OS1
black	O3
purple	IS2
black/white	OS2
purple/white	not connected

cable colour	connection
brown	A1
red	IS1
blue	A2
red/white	OS1
black	O3
purple	IS2
black/white	OS2
purple/white	I3

cable colour	connection
brown	A1
red	IS1
blue	A2
red/white	OS1
black	O3
purple	IS2
black/white	OS2
purple/white	EDM

Internal connections with connector

pin	connection
1	A1
2	OS1
3	A2
4	OS2
5	O3

pin	connection
1	A1
2	IS1
3	A2
4	OS1
5	O3
6	IS2
7	OS2
8	not connected

pin	connection
1	A1
2	IS1
3	A2
4	OS1
5	O3
6	IS2
7	OS2
8	I3

pin	connection
1	A1
2	IS1
3	A2
4	OS1
5	O3
6	IS2
7	OS2
8	EDM

Legend

A1-A2 supply
IS1-IS2 safety inputs

OS1-OS2 safety outputs
O3 signalling output

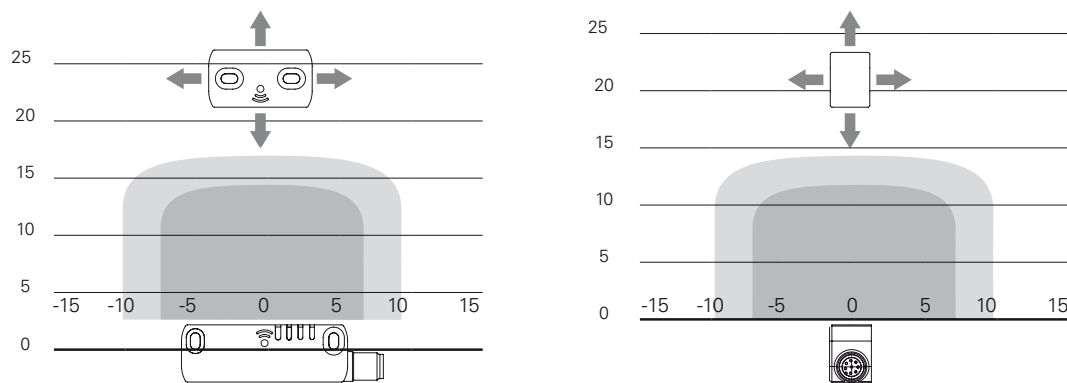
I3 EDM

programming input
input for monitoring of NC contacts of the contactors

Sockets See page 287

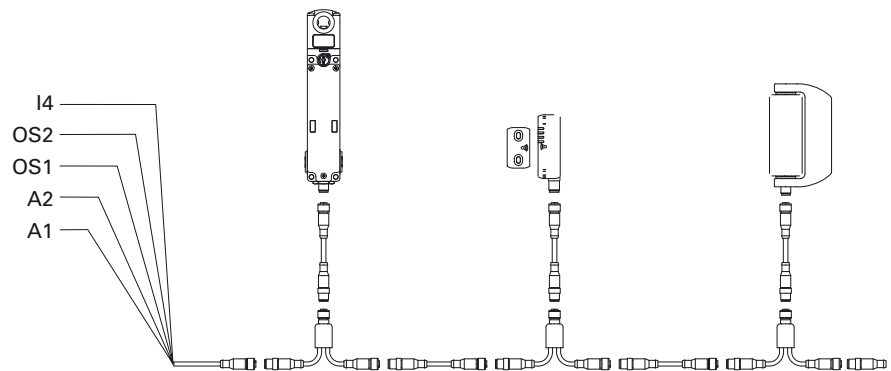


Operating distances



Series connection

To simplify serial connections, a series of M12 connectors are available that allow complete wiring. This solution significantly reduces installation times, whilst maintaining the maximum PL e and SIL 3 safety levels. For further information see page 290.



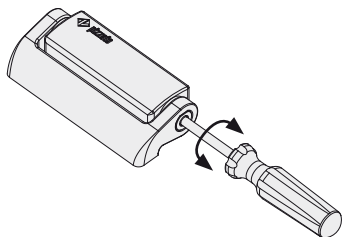
Description



Pizzato Elettrica widens its own range of products with the new HP-HC series of safety hinge switches, where safety and style are melted in one single product.

The electrical switch is completely integrated in the mechanical hinge, to result practically invisible to an inexperienced eye. This guarantees a higher safety because a switch hard to identify is consequently also more difficult to defeat. The assembly without visible screws and the pleasant line, make the switch perfectly integrated also with guards of modern design machinery. In order to complete the offer complementary hinges with purely mechanical functions are available.

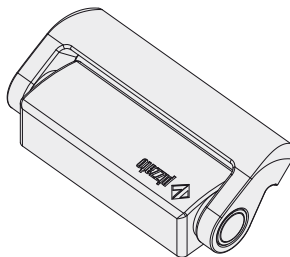
Adjustment of the operating point



The operating point of the switches can be set with a flat-blade screwdriver.

The operating point regulation allows the setting possibility for large guards. After the setting, it's always necessary to seal the hole with the supplied safety seal plug.

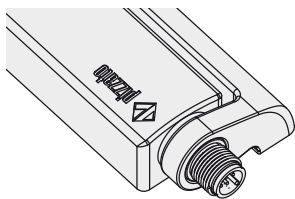
Variations of the activation base angle



New versions with the switch activation angle equal to a multiple of 15° (e.g. 45° or 90°) are available on request.

The different activation angle does not invalidate the possibility to adjust the operating point through the switch adjusting screws. The variation of the operating angle does not alter the switch maximum mechanical travel.

Integrated M12 connector

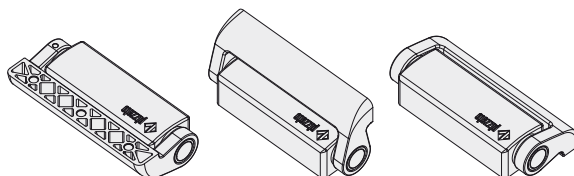


Versions with connection from the top or the bottom are available with integrated M12 connector.

The application of versions with connector allows a faster wiring when it's necessary to move guards from test line to final user.

Opening angle up to 180°

The mechanical design of the switch allows the application also on protections up to 180° opening angle.



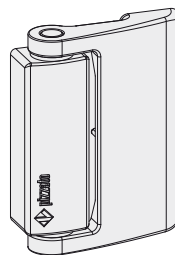
Protection degrees IP67 and IP69K

IP69K
IP67

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

measures also allow devices to be used even in machines which are subjected to washing with high pressure warm water jets. In fact these devices pass the IP69K test according to ISO 20653, using jets of water to 100 atmospheres at a temperature of 80°C.

Versions for glass or polycarbonate doors

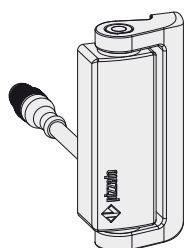


It's available a variation of the switch shape specifically designed for glass and polycarbonate doors without frame.

The wider supporting arm and the spaced fixing points facilitate the installation and prevent the cracking caused by holes too near the guard edge.

However, it is necessary to verify that the door mechanical stop is not performed by the switch.

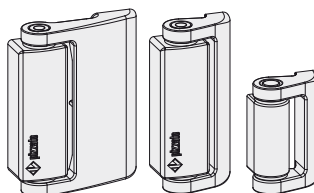
Cable with connector at the back



The version with a rear cable and M12 connector is the best combination between aesthetics and connection ease.

When machineries have to be assembled by the final customer, this solution allows to hide the wiring and at the same time to easily connect or disconnect it from inside the machinery.

Additional hinges



To complete installation, various types of additional hinges are available, varying in numbers depending on the protection guard weight.

These hinges keep the same aesthetics and without the electrical part their price is lower.

Application examples



- Switch without supports
- Rear fixing
- Cable output, rear



- Switch with angular supports for profiles with slots
- Fixing with internal screws
- Connector output, bottom

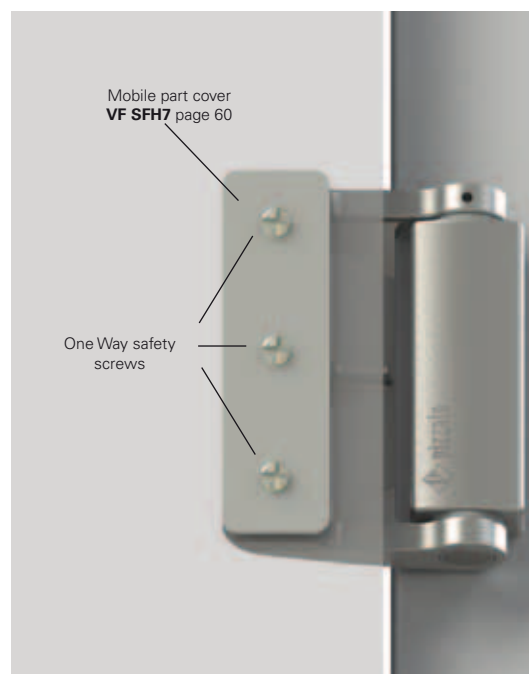


- Switch with plane supports for profiles with slots
 - Fixing with front screws.
 - Cable output, bottom
- One Way safety screws page 295
- One Way safety screws page 295

Closed door



Open door

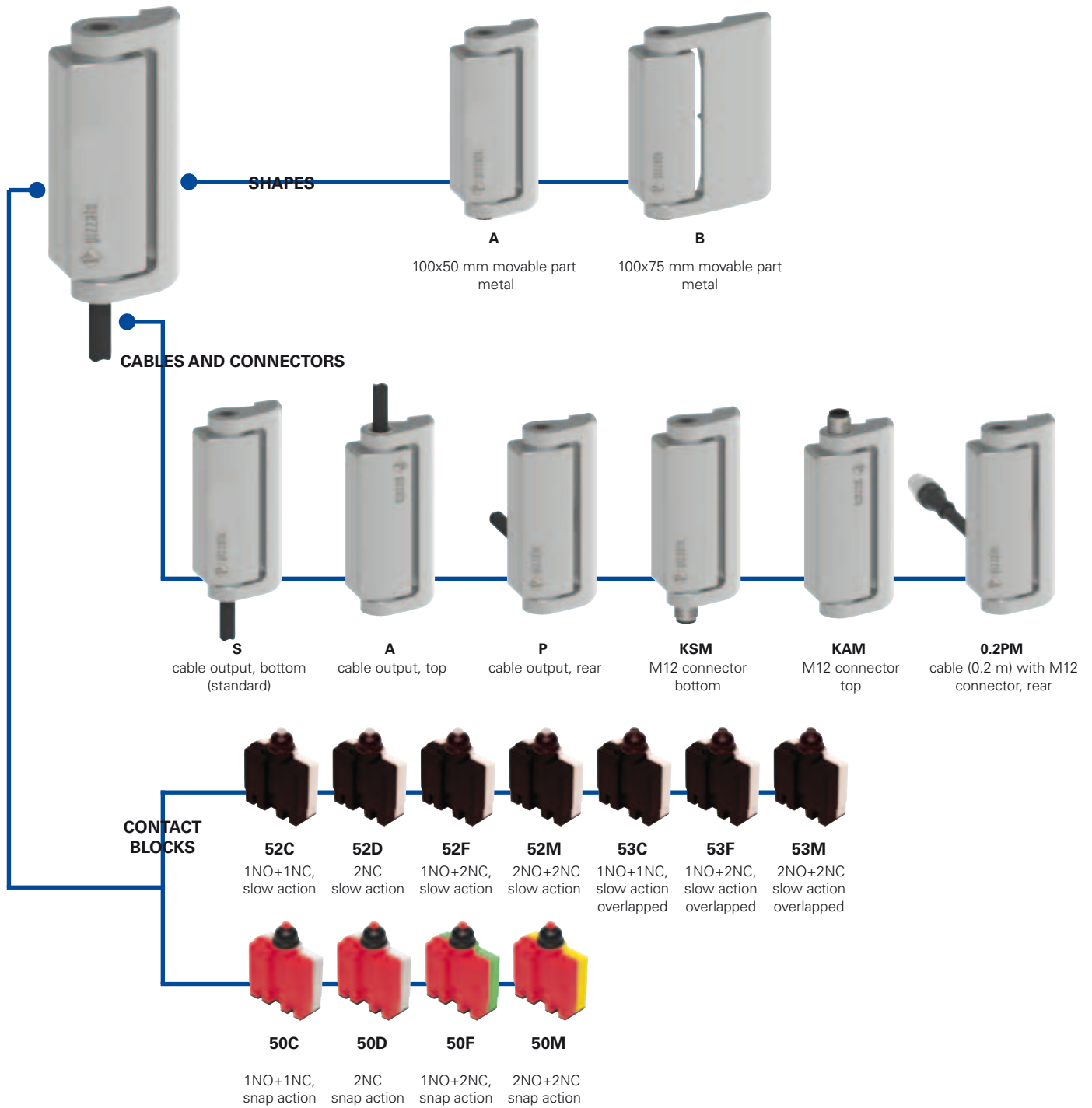


- Direct fixing to the polycarbonate plate
- Switch without supports
- Fixing with internal screws
- Connector output, rear.

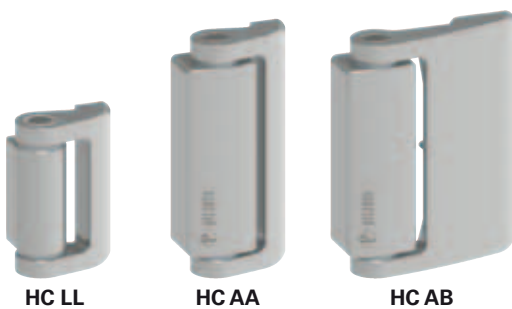
Mobile part cover
VF SFH7 page 60

One Way safety screws

Selection diagram



ADDITIONAL HINGES



—●— product option



Main features

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

Markings and quality marks:



IMQ approval:	CA02.03746
UL approval:	E131787
CCC approval:	2013010305647255
EAC approval:	RU C-IT ДМ94.В.01024

Technical data

Housing

Metal housing, baked powder coating
Version with integrated cable, length 2 m, other lengths on request.
Versions with integrated M12 connector, 5 or 8 poles
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

For safety applications up to: SIL 3 acc. to EN 62061
PL e acc. to EN ISO 13849-1
type 1 acc. to EN ISO 14119

Mechanical interlock, not coded:
Safety parameters:
B_{10d}: 5,000,000 for NC contacts
Service life: 20 years
Ambient temperature: See table on page 56
Max. actuation frequency: 1200 operating cycles/hour
Mechanical endurance: 1 million operating cycles¹
Max. actuation speed: 90°/s
Min. actuation speed: 2°/s
Mounting position: any
Max. axial load: 1500 N (HP AA) / 750 N (HP AB)
Max. radial load: 1000 N (HP AA) / 500 N (HP AB)
Tightening torque, M5 screws: 3 ... 5 Nm

(1) One operation cycle means two movements, one to close and one to open contacts, as defined in EN 60947-5-1. After 1 million operating cycles the operating point increases by 1.8°.

Electrical data

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

In conformity 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, UL 508, CSA 22.2 No.14.

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 No.14.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

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 chapter utilization requirements on page 297.

⚠ 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-pin 2NO+2NC M12 connector can be used only in PELV circuits.

Characteristics approved by IMQ

Rated insulation voltage (U_i): 250 Vac
Conventional free air thermal current (I_{th}): 10 A (1-2 contacts) / 6 A (2-3 contacts) / 4 A (4 contacts or 5-pin M12 connector)
Protection against short circuits (fuse): 10 A (1-2 contacts) / 6 A (2-3 contacts) / 4 A (4 contacts or 5-pin M12 connector), gG type

Rated impulse withstand voltage (U_{imp}): 4 kV
Protection degree of the housing: IP67
MA terminals (saddle clamps)
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 of 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 conformity with standards: EN 60947-1, EN 60947-5-1 + A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

Characteristics approved by UL

Utilization categories 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.)

Data of housing type 1, 4X "indoor use only", 12.
Housing data for versions with 1-2 contacts and type N cable type 1, 4X "indoor use only"

In conformity with standard: UL 508, CSA 22.2 No.14

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

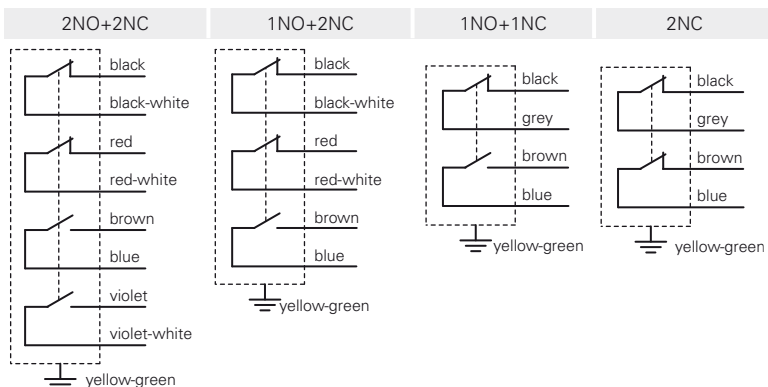


Utilization temperatures and electrical data

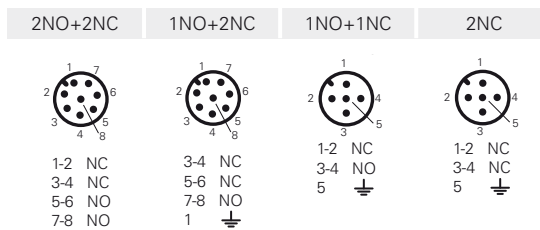
	Output with cable								Output with M12 connector	
	Versions with 2 contacts				Versions with 3 contacts		Versions with 4 contacts		Versions with 2 contacts	Versions with 3/4 contacts
	Cable type N 5x0.75 mm ² ,	Cable type G 5x0.75 mm ² ,	Cable type H 5x0.75 mm ² ,	Cable type R 5x0.5 mm ²	Cable type N 7x0.5 mm ²	Cable type H 7x0.5 mm ² ,	Cable type N 9x0.34 mm ²	Cable type R 9x0.5 mm ²	M12 connector 5 poles	M12 connector 8 poles
			Max. speed 100 m/min Max. acceleration 2 m/s ²	Cable for railway applications EN50306-4 1E-300V-5x0.5 mm ² MM-90		Max. speed 300 m/min Max. acceleration 25 m/s ²		Cable for railway applications EN50306-4 1P300V-9x0.5 mm ² MM-90		
Sheath PVC H05VV-F, Self-extinguishing IEC 60332-1-2 IEC 60332-1-3	Sheath PVC 05VV-F, Self-extinguishing IEC 60332-1-2 IEC 60332-1-3 IEC 60332-3 CEI 20-22 II	Sheath PUR HALO- GEN FREE Self-extinguishing IEC 60332-1-2 IEC 60332-1-3	Cable in conformity with standards: EN 50306-4 EN 45555 Self-extinguishing: IEC 60332-1 EN 50305 EN 50306-1	Sheath PVC 03VV-F, Self-extinguishing IEC 60332-1-2 IEC 60332-1-3	Sheath PUR HALO- GEN FREE Self-extinguishing IEC 60332-1-2 IEC 60332-1-3	Sheath PVC 03VV-F, Self-extinguishing IEC 60332-1-2 IEC 60332-1-3	Cable in conformity with standards: EN 50306-4 EN 45555 Self-extinguishing: IEC 60332-1 EN 50305 EN 50306-1			
Minimum bending radius: 72 mm	Minimum bending radius: 72 mm	Minimum bending radius: 70 mm Without halogen Oil resistant IEC 60811-2-1	Minimum bending radius: 60 mm	Minimum bending radius: 108 mm	Minimum bending radius: 108 mm Halogen free Oil resistant IEC 60811-2-1	Minimum bending radius: 94 mm	Minimum bending radius: 60 mm			
External diameter: 8 mm	External diameter: 8 mm	External diameter: 8 mm	External diameter: 6 mm	External diameter: 7 mm	External diameter: 7 mm	External diameter: 7 mm	External diameter: 6,5 mm			
Stripped end: 80 mm	Stripped end: 80 mm	Stripped end: 80 mm	Stripped end: 80 mm	Stripped end: 80 mm	Stripped end: 80 mm	Stripped end: 80 mm	Stripped end: 80 mm			
Class 5 copper IEC 60228	Class 5 copper IEC 60228	IEC 60228 class 6 copper	Class 5 copper IEC 60228	Class 5 copper IEC 60228	Class 6 copper IEC 60228	Class 5 copper IEC 60228	Class 5 copper IEC 60228			

Ambient temperature standard extended (-T ₀)	Cable fixed installation	-25°C ... +70°C	-25°C ... +70°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 ... +70°C	+5°C ... +70°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		-25°C ... +80°C	
	Cable mobile installation	/	/	-25°C ... +80°C	/	/	-25°C ... +80°C	/	/			
	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	/	-30 °C ... +80 °C	/	-40 °C +80 °C		-40°C ... +80°C	
	Cable mobile installation	/	/	-40°C ... +80°C	/	/	-30 °C ... +80 °C	/	/			
Electrical data	Thermal current I _{th}	10 A	10 A	10 A	6 A	6 A	6 A	3 A	4 A	4 A	2 A	
	Rated insulation voltage U _i	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 500 V 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
		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	/
		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	
	120 V	4 A	4 A	4 A	4 A	4 A	4 A	3 A	4 A	4 A	/	
	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 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 cULus IMQ EAC CCC	CE IMQ EAC CCC	CE cULus IMQ EAC CCC	CE cULus EAC CCC	

Internal connections of the cable



Internal connections of the connector



Sockets See page 287

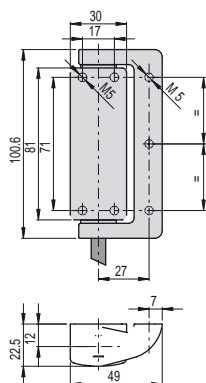
Dimensional drawings

All measures in the drawings are in mm

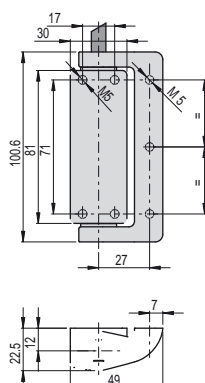
Contact type:

L = slow action
LO = slow action overlapped

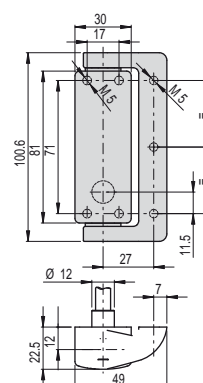
2 m cable, bottom



2 m cable, top



2 m cable, rear



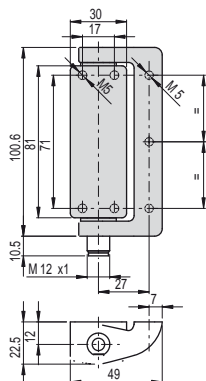
Contact blocks

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
Min. force		0.3 Nm (0.65 Nm ⊕)			0.3 Nm (0.65 Nm ⊕)			0.3 Nm (0.65 Nm ⊕)		
Travel diagrams		page 59 - group 1			page 59 - group 1			page 59 - group 1		

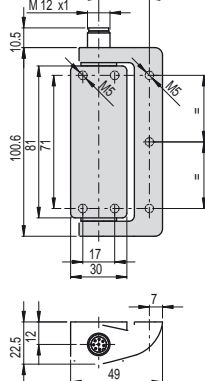
Contact type:

L = slow action
LO = slow action overlapped

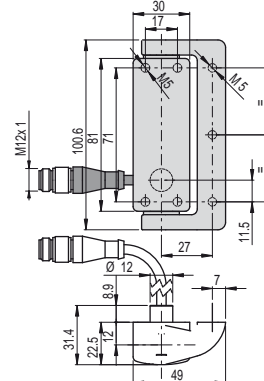
M12 connector, bottom



M12 connector, top



cable (0.2 m) and M12 connector, rear



Contact blocks

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
Min. force		0.3 Nm (0.65 Nm ⊕)			0.3 Nm (0.65 Nm ⊕)			0.3 Nm (0.65 Nm ⊕)		
Travel diagrams		page 59 - group 1			page 59 - group 1			page 59 - group 1		

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

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

Accessories See page 287

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



Versions for glass or polycarbonate doors - Dimensional drawings

All measures in the drawings are in mm

Contact type:

L = slow action
LO = slow action overlapped

	2 m cable, bottom	2 m cable, top	2 m cable, rear
Contact blocks			
52C	L HP AB052C-2SN	L HP AB052C-2AN	L HP AB052C-2PN
52D	L HP AB052D-2SN	L HP AB052D-2AN	L HP AB052D-2PN
52F	L HP AB052F-2SN	L HP AB052F-2AN	L HP AB052F-2PN
52M	L HP AB052M-2SN	L HP AB052M-2AN	L HP AB052M-2PN
53C	LO HP AB053C-2SN	LO HP AB053C-2AN	LO HP AB053C-2PN
53F	LO HP AB053F-2SN	LO HP AB053F-2AN	LO HP AB053F-2PN
53M	LO HP AB053M-2SN	LO HP AB053M-2AN	LO HP AB053M-2PN
Min. force	0.3 Nm (0.65 Nm	0.3 Nm (0.65 Nm	0.3 Nm (0.65 Nm
Travel diagrams	page 59 - group 1	page 59 - group 1	page 59 - group 1

Contact type:

L = slow action
LO = slow action overlapped

	M12 connector, bottom	M12 connector, top	cable (0.2 m) and M12 connector, rear
Contact blocks			
52C	L HP AB052C-KSM	L HP AB052C-KAM	L HP AB052C-0.2PM
52D	L HP AB052D-KSM	L HP AB052D-KAM	L HP AB052D-0.2PM
52F	L HP AB052F-KSM	L HP AB052F-KAM	L HP AB052F-0.2PM
52M	L HP AB052M-KSM	L HP AB052M-KAM	L HP AB052M-0.2PM
53C	LO HP AB053C-KSM	LO HP AB053C-KAM	LO HP AB053C-0.2PM
53F	LO HP AB053F-KSM	LO HP AB053F-KAM	LO HP AB053F-0.2PM
53M	LO HP AB053M-KSM	LO HP AB053M-KAM	LO HP AB053M-0.2PM
Min. force	0.3 Nm (0.65 Nm	0.3 Nm (0.65 Nm	0.3 Nm (0.65 Nm
Travel diagrams	page 59 - group 1	page 59 - group 1	page 59 - group 1

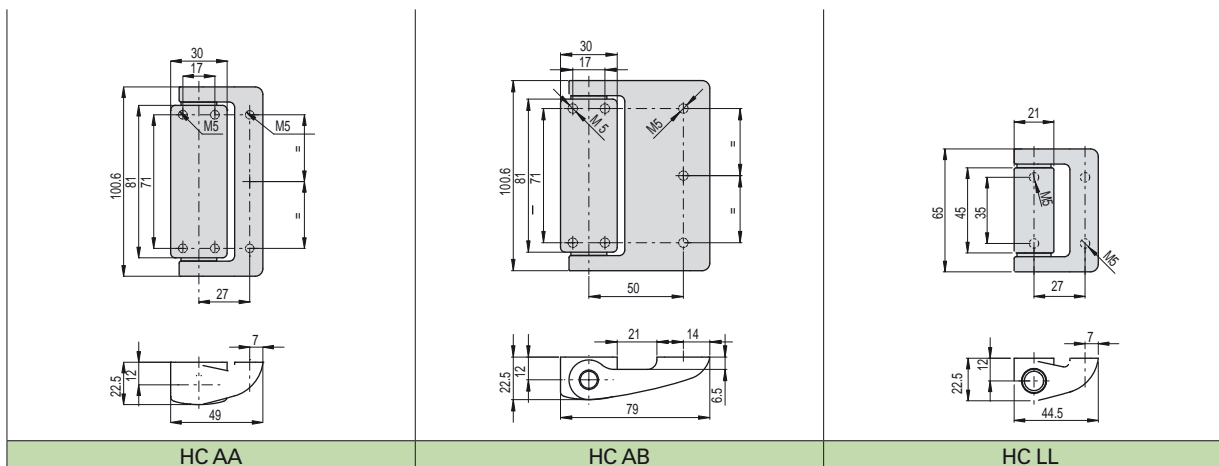
Attention! The safety hinge switch can be combined together exclusively with one or more Pizzato Elettrica hinges (series HP or HC). The use of whichever other hinge does not guarantee the correct operation of the safety device.

Accessories See page 287

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

Additional hinges

All measures in the drawings are in mm



Travel diagrams

All measures in the diagrams are in degrees

Contact blocks	Group 1	Contact blocks	Group 1	Contact blocks	Group 1
52C 1NO+1NC		53C 1NO+1NC		50C 1NO+1NC	
52D 2NC		53F 1NO+2NC		50D 2NC	
52F 1NO+2NC		53M 2NO+2NC		50F 1NO+2NC	
52M 2NO+2NC				50M 2NO+2NC	

The contact operating point indicated in the travel diagrams can be adjusted from 0° to +4°.

Accessories

Article	Description
VF AC7032	Protection cap of regulation screw

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

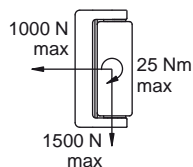
Legend

- Closed contact
- Open contact
- Positive opening travel
- Pushing the switch / Releasing the switch

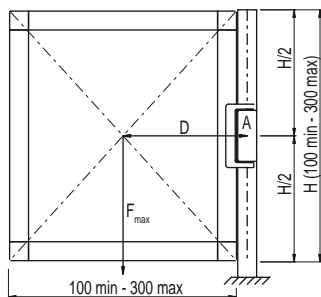
Max. forces and loads HP AA

All measures in the drawings are in mm

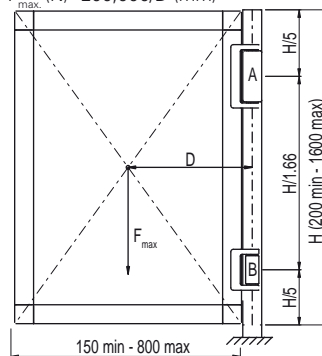
Admitted max. loads, independent of utilization conditions.



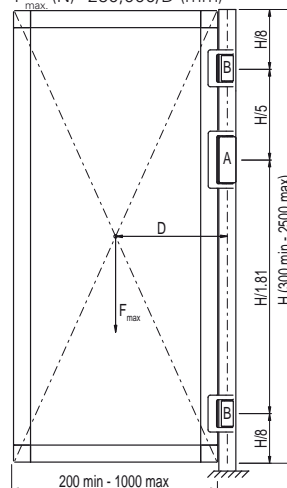
Doors with one safety hinge
 $F_{max} (N) = 25,000/D (mm)$



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 exercised by the door weight (N)
- D Distance from the door barycentre to the hinge axis (mm)
- A Safety hinge
- B Additional hinge

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

Accessories See page 287

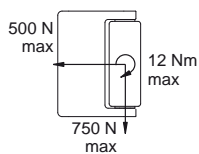
→ The 2D and 3D files are available at www.pizzato.com



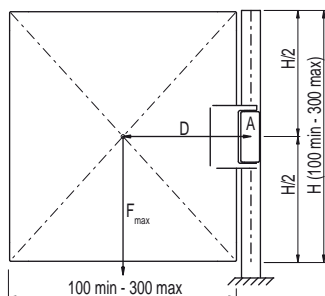
Max. forces and loads HP AB

All measures in the drawings are in mm

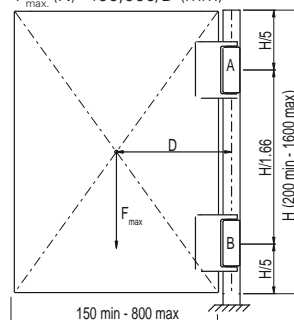
Admitted max. loads, independent of utilization conditions.



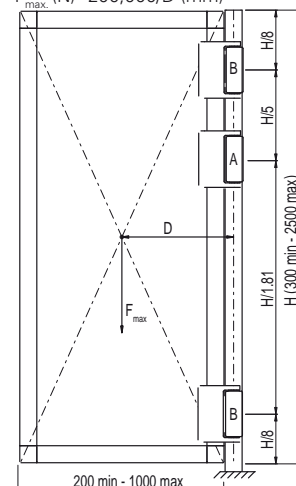
Doors with one safety hinge
 $F_{max} (N) = 12,500/D$ (mm)



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

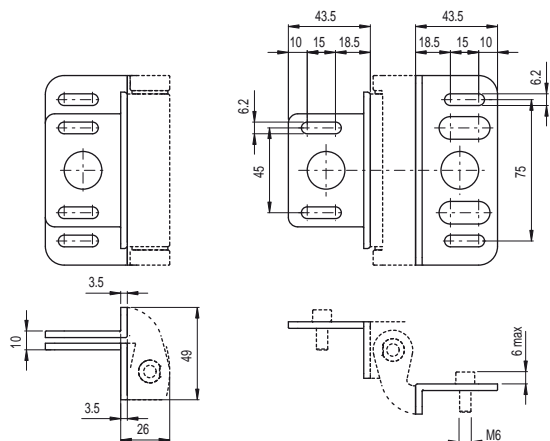
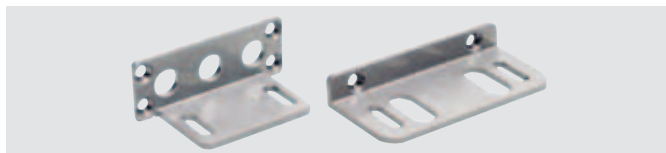
- F_{max} Force exercised by the door weight (N)
- D Distance from the door barycentre to the hinge axis (mm)
- A Safety hinge
- B Additional hinge

Fixing plates

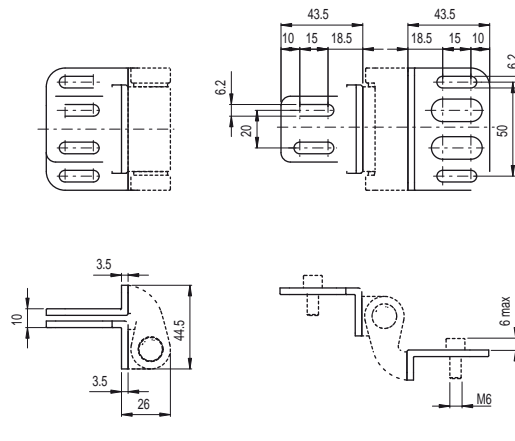
All measures in the drawings are in mm

Fixing screws for profile not supplied.

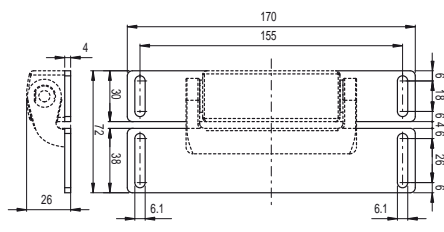
Article	Description
VF SFH1-C	Couple of angular supports for HP AA and HC AA supplied with fixing screws for switch



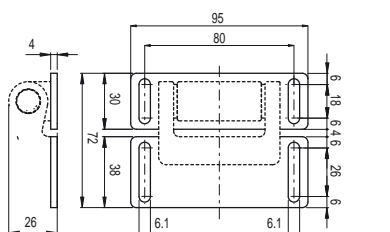
Article	Description
VF SFH2-C	Couple of angular supports for HC LL supplied with fixing screws for switch



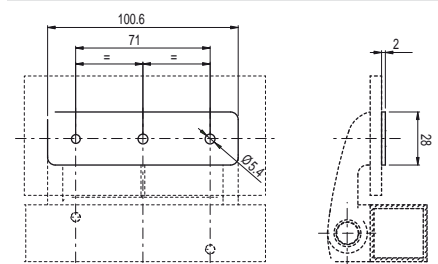
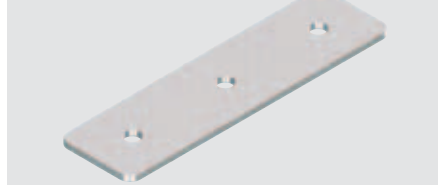
Article	Description
VF SFH3-C	Couple of plane supports for HP AA and HC AA supplied with fixing screws for switch



Article	Description
VF SFH4-C	Couple of plane supports for HC LL supplied with fixing screws for switch



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



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

Accessories See page 287

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

Description



Pizzato Elettrica widens its own range of products with the new HX series of safety hinge switches, where safety and style are melted in one single product.

The electrical switch is completely integrated in the mechanical hinge, to result practically invisible to an inexpert eye. This guarantees a higher safety because a switch hard to identify is consequently also more difficult to defeat. The assembly without visible screws and the pleasant line, make the switch perfectly integrated also with guards of modern design machinery.

The hinge-shaped safety switches of the HX series, being made of stainless steel, can be used in any environment where particular attention is required for cleanliness and hygiene, therefore they are suitable for various applications ranging from the food to the pharmaceutical sectors, as well as the chemical or marine sector.

Maximum safety with a single device

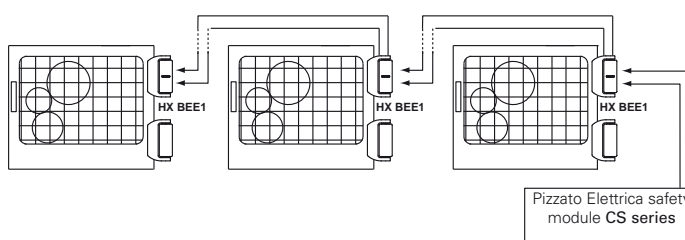
PL e + SIL 3 Constructed with redundant electronic technology, the HX BEE1 series hinge switches make it possible to create circuits having maximum PL e and SIL 3 safety levels by installing just one device on the protection. This avoids expensive wiring on the field and allows quicker installation. Inside the panel, the two electronic safety outputs must be connected to a safety module with OSSD inputs or to a safety PLC.

Connection of several switches in series

PL e + SIL 3 One of the most relevant features of the HX line is the optional connection in series of several switches, up to a maximum number of 32 devices, while maintaining the maximum PL e safety level prescribed by the EN 13849-1 standard and the SIL 3 safety level according to the EN 62061 standard.

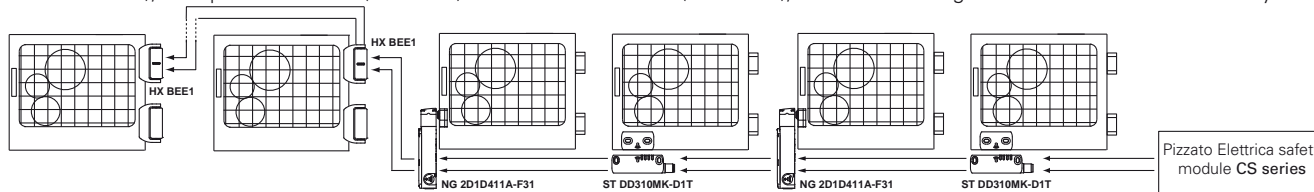
This connection method is permitted in safety systems which, at the end of the chain, feature a safety module evaluating the outputs of last HX switch.

The fact that the PL e safety level can be maintained even with 32 switches connected in series indicates the presence of an extremely safe structure inside each individual device.

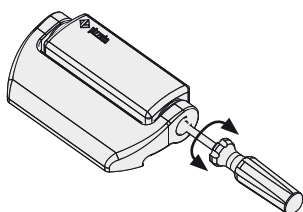


Series connection with other devices

PL e + SIL 3 The HX BEE1 series features two safe inputs and two safe 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 the creation of circuits with connections in series, including stainless steel safety hinges (HX BEE1 series), transponder sensors (ST series) and door lock sensors (NG series), while maintaining maximum PL e and SIL 3 safety levels.



Adjustment of the operating point



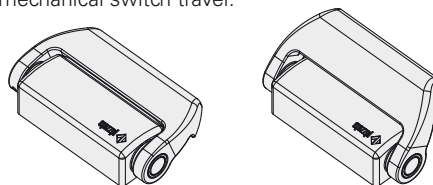
The switches operating point can be regulated through a flat-blade screwdriver.

The operating point regulation allows the setting possibility for large guards. After the setting, it's always necessary to seal the hole with the supplied safety seal plug.

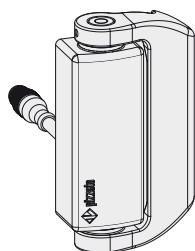
Variations of the activation base angle

New versions with the switch activation angle equal to a multiple of 15° (e.g. 45° or 90°) are available on request.

The different activation angle does not exclude the possibility of finely adjusting the operating point by means of the adjustment screw found in the switch. Any change in the base operating angle does not alter the maximum mechanical switch travel.



Cable with connector at the back

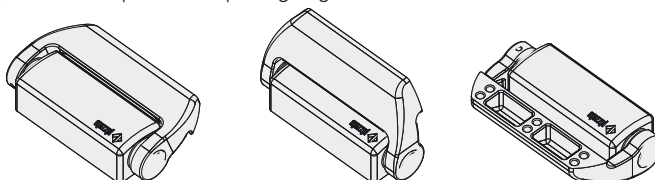


The version with a rear cable and M12 connector is the best combination between aesthetics and connection ease.

This solution makes it possible to hide the wiring and, at the same time, easily connect or disconnect it from inside the machinery.

Opening angle up to 180°

The mechanical design of the switch allows the application also on protections up to 180° opening angle.





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 IEC 60529. They can therefore be used in all environments where the maximum protection of the housing is required. Special measures

also allow devices to be used even in machines which are subjected to washing with high pressure warm water jets. In fact these devices pass the IP69K test according to ISO 20653, using jets of water to 100 atmospheres at a temperature of 80°C.

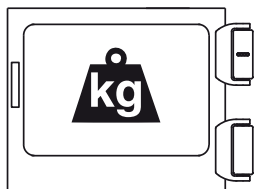
Materials

AISI 316L

With this new series in AISI316L stainless steel, Pizzato Elettrica offers a range of devices suitable for any environment where particular attention is required for cleanliness and hygiene.

Accurate surface finish makes it possible for these devices to be used in various applications ranging from the food to the pharmaceutical sectors, as well as the chemical or marine sector.

For heavy duty applications

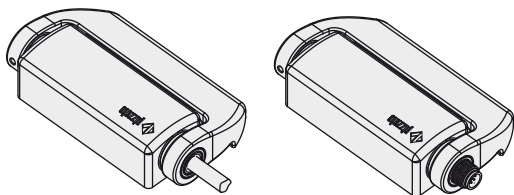


Specifically designed for heavy duty industrial applications, these hinges are made of precision cast materials with increased thickness and high strength mechanical characteristics. The maximum loads indicated in the technical data are those that the hinge supports with no lubrication, for one million opening and

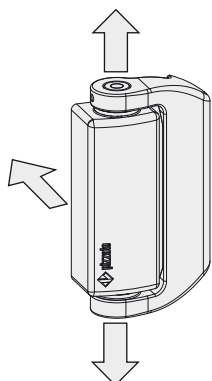
closing cycles, while maintaining its safety device characteristics with perfect efficiency.

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 cable and connector versions are available in mechanical or electronic contact block versions.

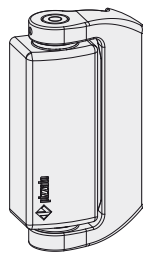


Three different output directions



Designed for flexibility, the HX series safety hinges are equipped with three different output directions for the electrical conductors. The "from bottom" or "from top" directions allow you to maintain the same output direction as the conductor, for both left- and right-facing doors. The "from back" direction obtains the most aesthetic, clean, and hygienic result. All three electrical conductor output directions are available with output cables in various lengths or with M12 connector.

Additional hinges



To complete installation, various types of additional hinges are available, varying in numbers depending on the protection guard weight.

These hinges keep the same aesthetics and mechanical structure but, having no electrical part, they cost less.

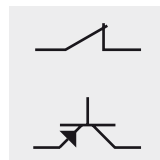
Laser engraving



Pizzato Elettrica has introduced a new laser marking for stainless steel switches of the HX series.

Thanks to this new system which excludes the use of labels, markings on the products are indelible.

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).

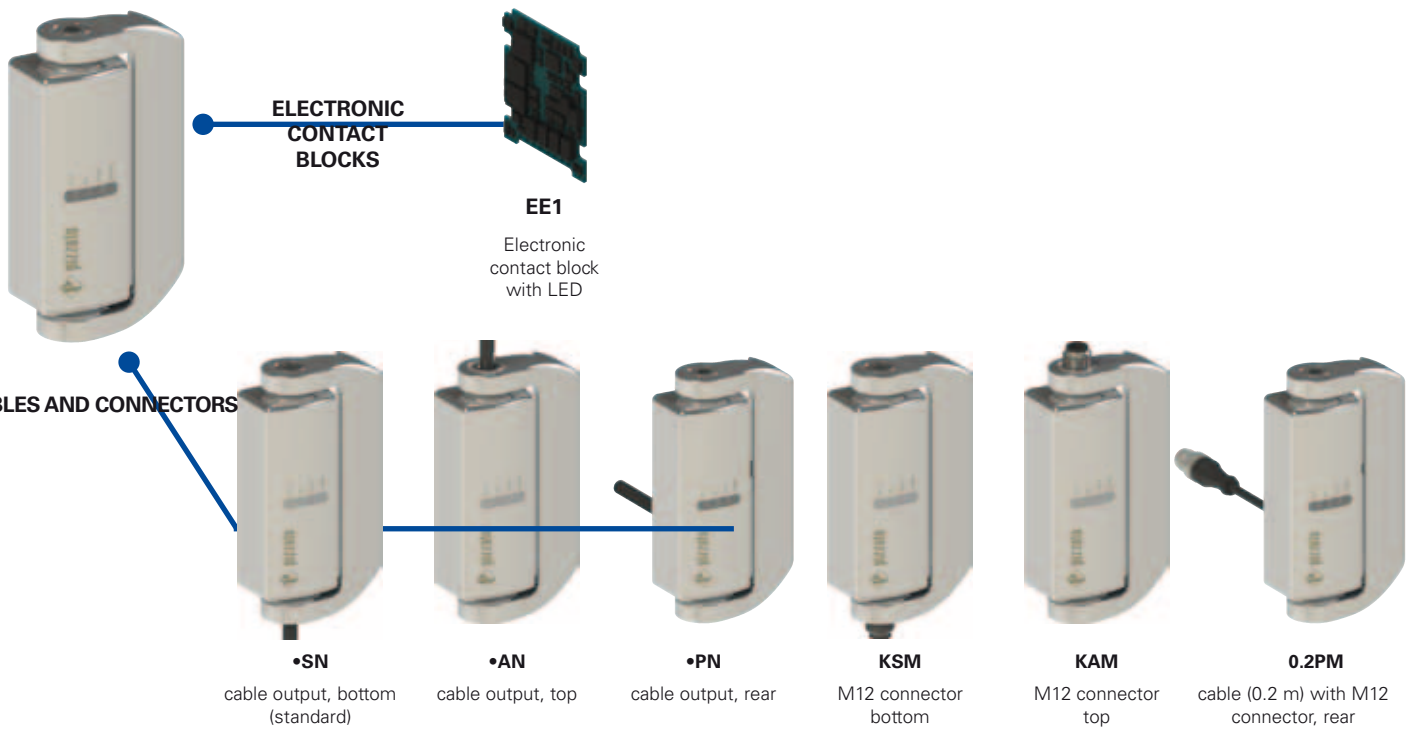
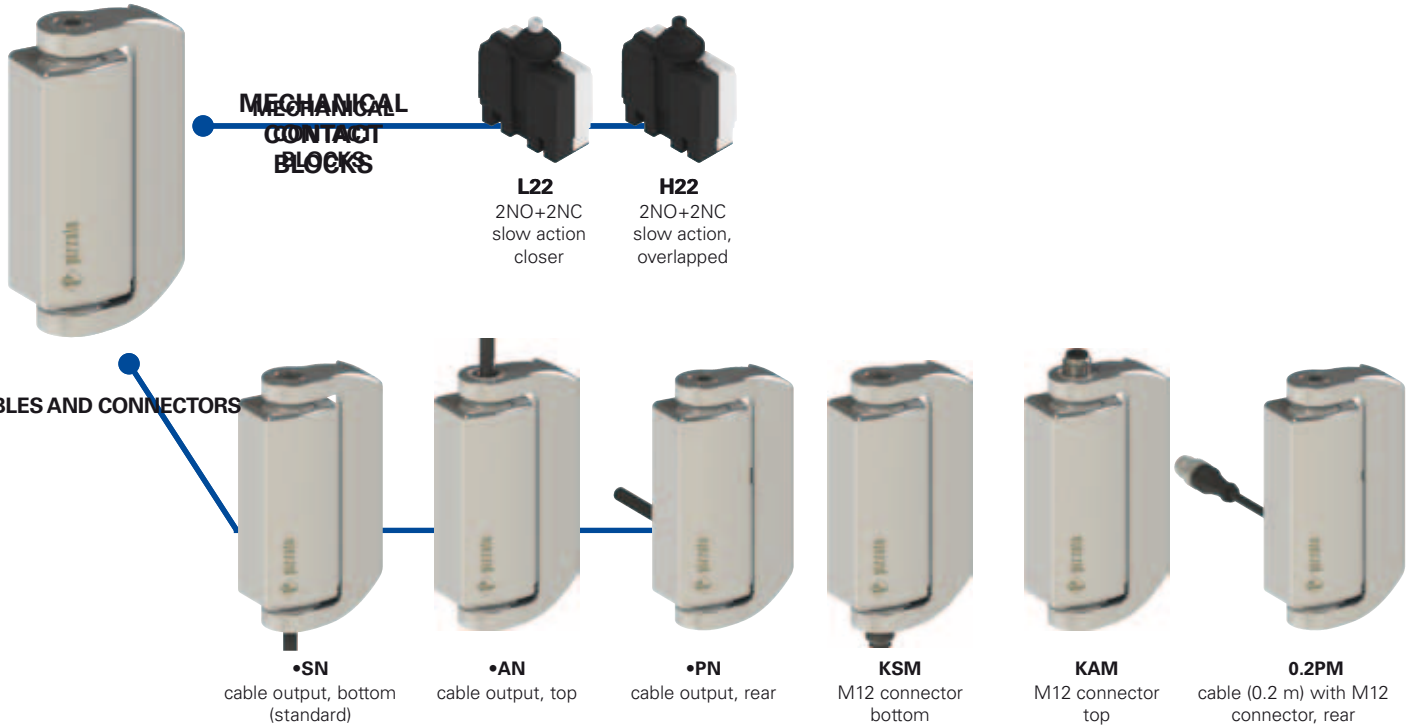
Four LEDs for immediate diagnosis



The versions with electronic contact block are equipped with four signalling LEDs. Each LED represents a specific hinge function, this greatly facilitates operating 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 applica-

tions, this independence enables identification of any interruptions in the safety chain and of any internal errors. All that in a straightforward way without needing to decode complex blinking sequences.

Selection diagram



ADDITIONAL HINGES



HX CB

—●— 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 BL22-2PN GH15

Body and movable part dimensions	
B	126x76x31 mm

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

Connection type	
0.2	cable length 0.2 m (available only for versions 0.2 PM)
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.

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

Cable or connector type	
N	black PVC cable, IEC 60332-1
M	cable with M12 connector

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

HX CB

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



Main features

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

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC
Machinery Directive 2006/42/EC
EMC Directive 2004/108/EC

Positive contact opening in conformity with standards:

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

In conformity 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, UL 508,
CSA 22.2 No.14

Markings and quality marks:



UL approval: E131787
TÜV SÜD approval: Z10 14 03 75157 007
EAC approval: RU C-IT DM94.B.01024

Technical data

Housing

Metal housing, polished, AISI 316L stainless steel

Version with integrated cable, length 2 m, other lengths on request.

Versions with M12 connector

Versions with cable, length 0.2 m, M12 connector

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

For safety applications up to:

SIL 3 acc. to EN 62061
PL e acc. to EN ISO 13849-1
type 1 acc. to EN ISO 14119

Mechanical interlock, not coded:

Safety parameters HX B•22-•••

B_{10g} :

Safety parameters HX BEE1-•••

MTTF_d:

PFH_d:

DC:

Service life:

Ambient temperature:

Max. actuation frequency:

Mechanical endurance:

Max. actuation speed:

Min. actuation speed:

Mounting position:

Tightening torque, M6 screws:

5,000,000 for NC contacts

4018 years

2.29E-11

High

20 years

see table on page 66

600 operating cycles/hour

1 million operating cycles¹

90°/s

2°/s

any

10 ... 12 Nm

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

Electrical data (L22 - H22 mechanical contact blocks)

Rated impulse withstand voltage Uimp:

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 Ue:

24 Vdc -15% ... +10% SELV

Consumption at voltage Ue:

< 1W

Rated impulse withstand voltage Uimp:

1.5 kV

Resettable internal protection fuse:

1.1 A

Overvoltage category:

III

Inputs IS1/IS2

Rated operating voltage Ue:

24 Vdc

Rated current consumption:

5 mA

OS1/OS2 safety outputs

Rated operating voltage Ue:

24 Vdc

Output type:

OSSD, PNP

Utilization category:

DC12; Ue=24Vdc; Ie=0.25A

Short circuit detection:

Yes

Protection against overcurrent:

Yes

Time of deactivation impulses on safe outputs: < 300 μs

Permissible capacitance between outputs: < 200 nF

Permissible cap. between output and ground: < 200 nF

O3 signalling output

Rated operating voltage Ue:

24 Vdc

Output type:

PNP

Utilization category:

DC12; Ue=24Vdc; Ie=0.1A

Short circuit detection:

No

Protection against overcurrent:

Yes

⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see chapter utilization requirements from page 297 to page 308 of the 2015-2016 catalogue.

⚠ 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-pin M12 connector can be used only in PELV circuits.

Characteristics approved by UL

Utilization categories R300 pilot duty (28 VA, 125-250 Vdc)
B300 pilot duty (360 VA, 120-240 Vac)

Data of housing type 1, 4X "indoor use only", 12.
Housing data for versions with 2 contacts and type N cable
type 1, 4X "indoor use only"

In conformity with standard: UL 508, CSA 22.2 No.14

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

Characteristics approved by TÜV SÜD

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

In conformity 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/A1:2012 (SIL CL 3), EN ISO 13849-1:2008 (PL e, Cat. 4), EN 60947-5-1/A1:2009, ISO 14119:2013

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



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

		Cable type N 9x0.34 mm ²	M12 connector 8 poles	
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 500 V 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	/

Utilization temperatures and electrical data for EE1 electronic contact block

		Cable type N 8x0.34 mm ²	M12 connector 8 poles
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 DC12	24 V	0.25 A

Internal connections with cable

L22 / H22 mechanical contact blocks


cable colour	contacts
black	NC
black-white	
red	NC
red-white	
brown	NO
blue	
purple	NO
purple-white	
yellow/green	⏚

EE1 electronic contact block

cable colour	connection
brown	A1
red	IS1
blue	A2
red-white	OS1
black	O3
purple	IS2
black-white	OS2
purple-white	not connected


Internal connections with M12 connector

L22 / H22 mechanical contact blocks



pin	contacts
1	NC
2	
3	NC
4	
5	NO
6	
7	NO
8	
/	⏚

EE1 electronic contact block



pin	connection
1	A1
2	IS1
3	A2
4	OS1
5	O3
6	IS2
7	OS2
8	not connected

Legend

A1-A2	supply
IS1-IS2	safety inputs
OS1-OS2	safety outputs
O3	signalling output
NC	normally closed contact
NO	normally open contact
⏚	ground connection

Sockets See page 287

Dimensional drawings

All measures in the drawings are in mm

Contact type:

- LA** = slow action closer
- LO** = slow action overlapped
- EE1** = electronic PNP

	2 m cable, bottom		2 m cable, top		2 m cable, rear	
Contact blocks						
L22 LA	HX BL22-2SN		2NO+2NC	HX BL22-2AN		2NO+2NC
H22 LO	HX BH22-2SN		2NO+2NC	HX BH22-2AN		2NO+2NC
EE1 EE1	HX BEE1-2SN		PNP	HX BEE1-2AN		PNP
Min. force	0,3 Nm (0,65 Nm		0,3 Nm (0,65 Nm		0,3 Nm (0,65 Nm	

Contact type:

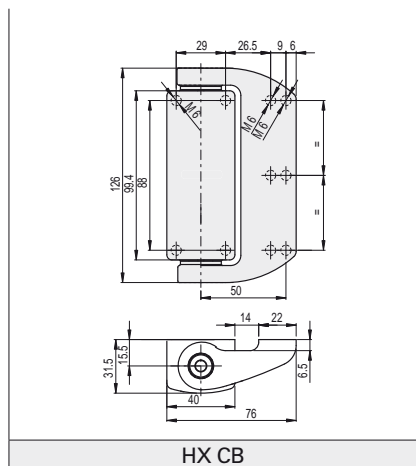
- LA** = slow action closer
- LO** = slow action overlapped
- EE1** = electronic PNP

	M12 connector, bottom		M12 connector, top		cable (0.2 m) and M12 connector, rear	
Contact blocks						
L22 LA	HX BL22-KSM		2NO+2NC	HX BL22-KAM		2NO+2NC
H22 LO	HX BH22-KSM		2NO+2NC	HX BH22-KAM		2NO+2NC
EE1 EE1	HX BEE1-KSM		PNP	HX BEE1-KAM		PNP
Min. force	0,3 Nm (0,65 Nm		0,3 Nm (0,65 Nm		0,3 Nm (0,65 Nm	

To purchase a product with a movable part at the left replace P with Q in the codes shown above.

Example: HX BL22-2PN → HX BL22-2QN

Additional hinges



Travel diagrams

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

The contact operating point indicated in the stroke diagrams can be adjusted to ± 1°.

All measures in the diagrams are in degrees

Legend

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

Accessories See page 287

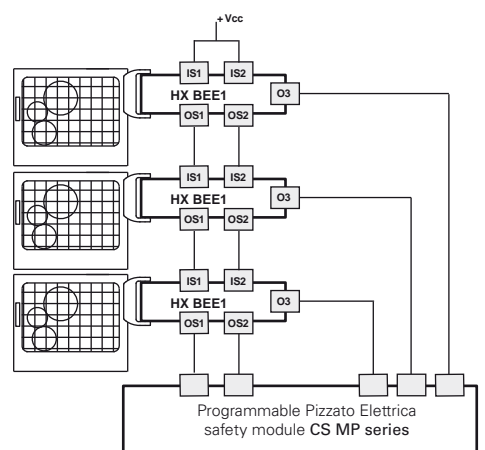
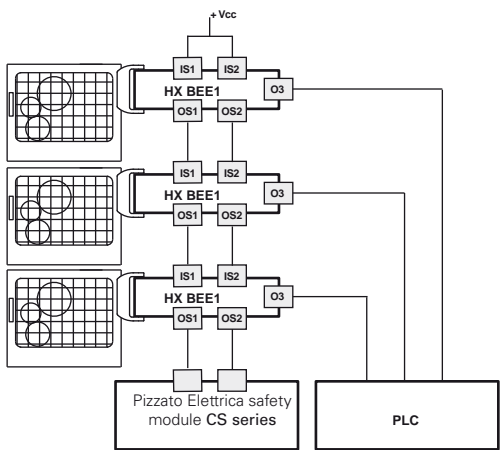
→ The 2D/3D files are available at www.pizzato.com



Complete safety system

The use of complete tested solutions means that the customer can be certain of the electrical compatibility between the ST series sensor and Pizzato Elettrica safety modules, thus ensuring greater reliability. In fact, these sensors have been tested for operation with the modules specified in the table shown on the side.

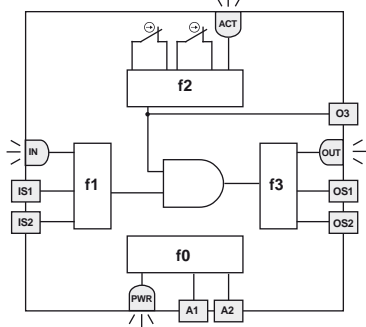
Switch	Compatible safety modules	Safety module output contacts		
		Instantaneous safety contacts	Delayed safety contacts	Signalling contacts
HX BEE1-...	CS AR-05.....	3NO	/	1NC
	CS AR-06.....	3NO	/	1NC
	CS AR-08.....	2NO	/	/
	CS AT-0.....	2NO	2NO	1NC
	CS AT-1.....	3NO	2NO	/
	CS MP.....		see page 243	
CS MF.....		see page 271		



Possible connection in series of several hinges in order to simplify the safety system wiring, after evaluating the outputs from the last hinge in the chain by means of a Pizzato Elettrica safety module (table for safety modules to be combined). Each HX switch is provided with a signalling output, which is activated when the respective guard is closed. This piece of information can be managed by a PLC, depending on the specific requirements of the system installed.

Possible connection in series of several hinges in order to simplify the safety system wiring, after evaluating the outputs from the last hinge in the chain by means of a safety module from Pizzato Elettrica CS MP series, which allows management of both safety and signalling functions.

Internal diagram



The side scheme shows the 4 logical functions interacting inside the switch.

Function f0 is a global function which deals with the device power supply and the internal tests which it cyclically undergoes.

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 macro-function, which controls the above mentioned functions, enables the safety outputs only in presence of active inputs with the actuator within the safe zone limits.

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.

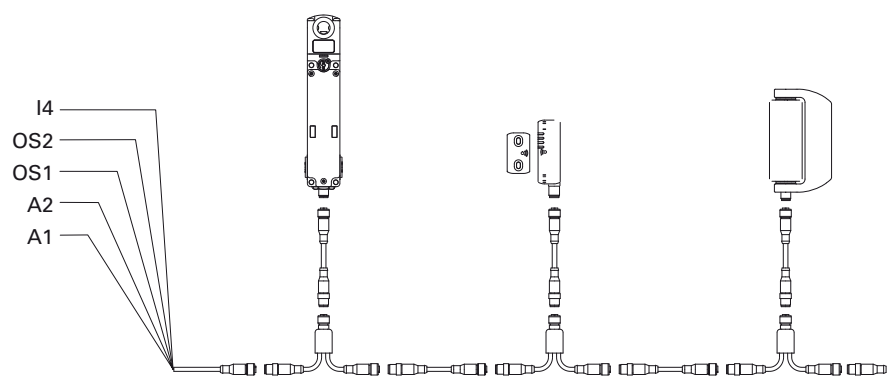
LED	Function
ACT	state of actuator / output O3
IN	status of safety inputs
OUT	status of safety outputs
PWR	power supply/self-diagnosis

Series connection

To simplify serial connections, a series of M12 connectors are available that allow complete wiring.

This solution significantly reduces installation times, whilst maintaining the maximum PL e and SIL 3 safety levels.

For further information see page 290.



Accessories

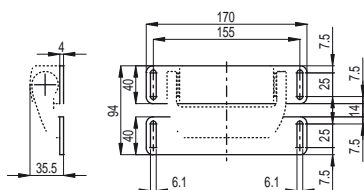
Article	Description
VF AC7032	Protection cap of regulation screw



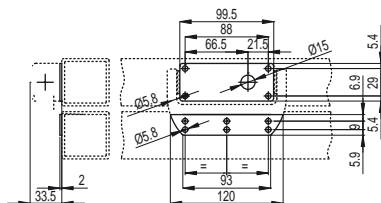
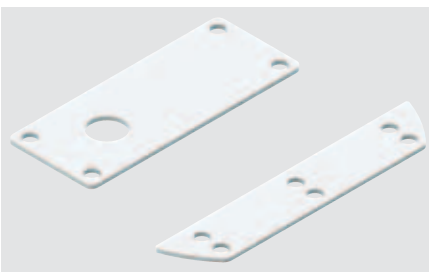
The plug is supplied with every hinge and must always be inserted after the operating point regulation. In case of loss or damage, the cap can be ordered separately.

Fixing plates

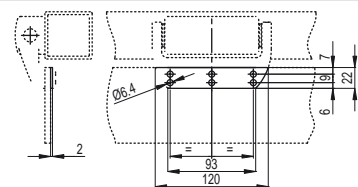
Article	Description
VFSFH10-TX	Couple of stainless steel plane supports supplied with fixing screws for switch



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



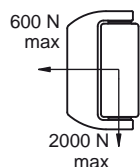
Article	Description
VF SFH8	Mobile part cover in stainless steel



Max. forces and loads HX

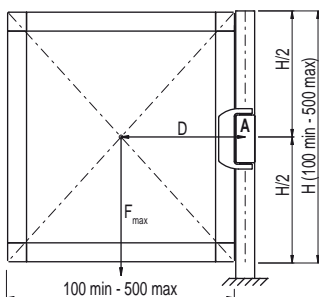
All measures in the drawings are in mm

Admitted max. loads, independent of utilization conditions.

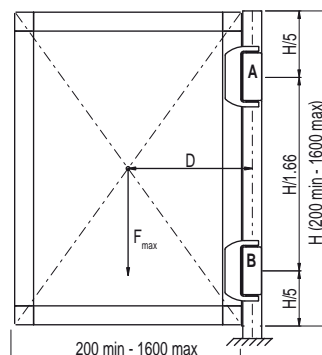


Attention: Never exceed the loads listed above under any circumstances. The loads have been verified by a fatigue test of one million operating cycles with a 90° opening angle.

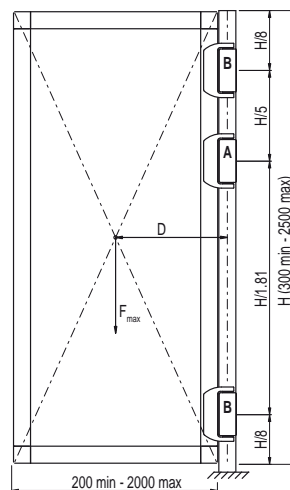
Doors with one safety hinge
 $F_{max} (N) = 50,000/D$ (mm)



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



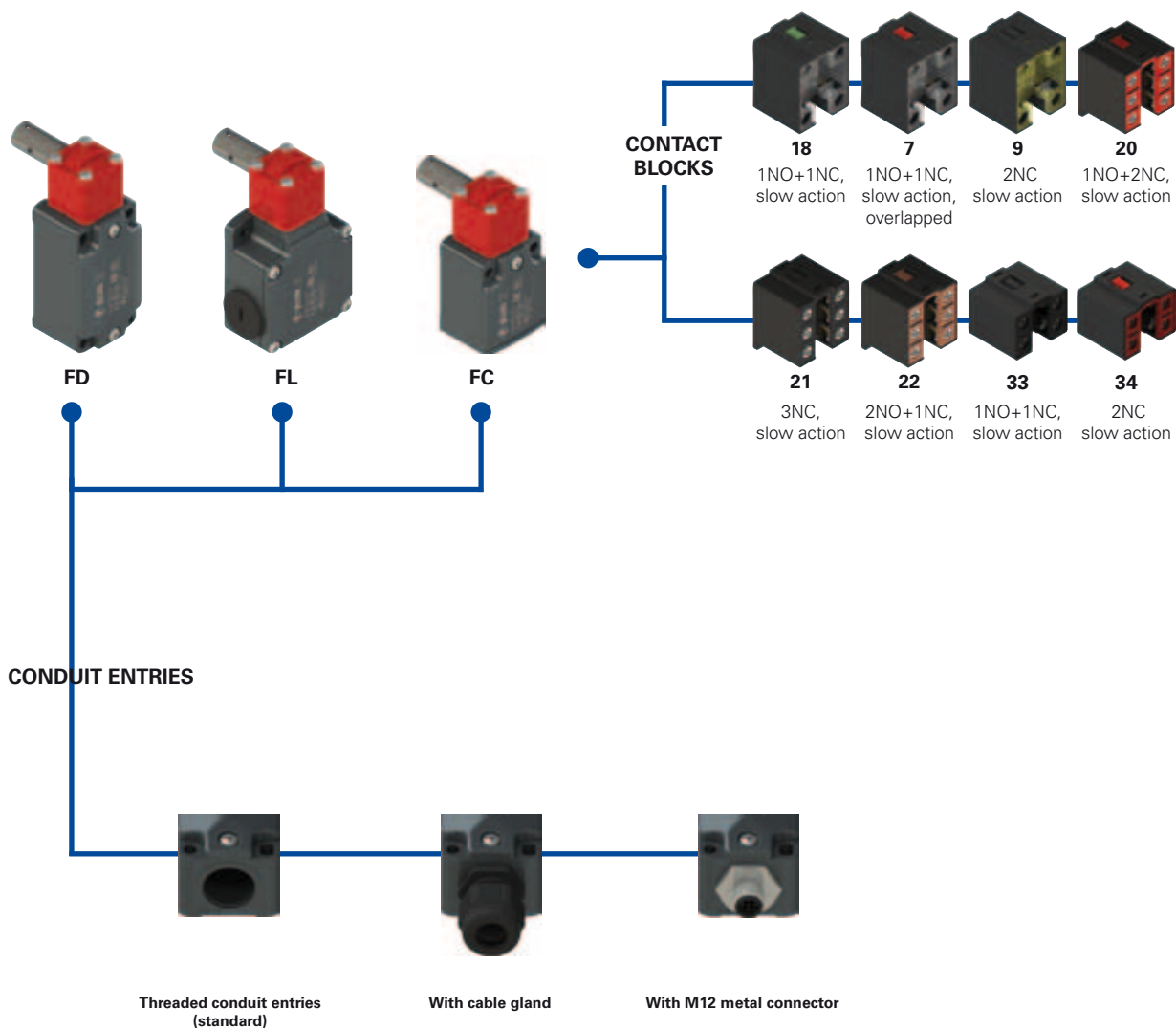
Doors with one safety hinge and two additional hinges
 $F_{max} (N) = 500,000/D$ (mm)



Legend

- F_{max} Force exercised by the door weight (N)
- D Distance from the door barycentre to the hinge axis (mm)
- A Safety hinge
- B Additional hinge

Selection diagram



—●— product option
 —▶— accessory sold separately



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	
18	1NO+1NC, slow action
7	1NO+1NC, slow action, overlapped
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

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K50	M12 metal connector, 5 poles
...

Please contact our technical service for the complete list of possible combinations.

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

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

article options options
FC 3395-GM2K50T6

Housing	
FC	metal, one conduit entry

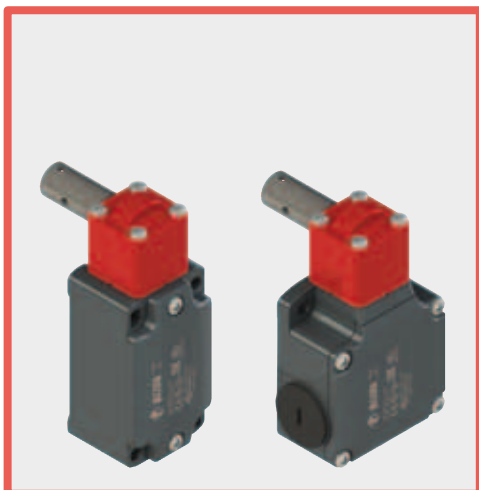
Ambient temperature	
	-25°C ... +80°C (standard)
T6	-40°C ... +80°C

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

Pre-installed cable glands or connectors	
	without cable gland (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
K50	M12 metal connector, 5 poles

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

Markings and quality marks:



IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000
EAC approval:	RU C-IT ДМ94.В.01024

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 having equal or higher protection degree

General data

For safety applications up to:

SIL 3 acc. to EN 62061

PL e acc. to EN ISO 13849-1

type 1 acc. to EN ISO 14119

Mechanical interlock, not coded:

Safety parameters:

B_{10d} :

5,000,00 for NC contacts

Service life:

20 years

Ambient temperature:

-25°C ... +80°C

Max. actuation frequency:

3600 operating cycles¹/hour

Mechanical endurance:

1 million operating cycles¹

Max. actuation speed:

180°/s

Min. actuation speed:

2°/s

Tightening torques for installation:

see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 33, 34:

min. 1 x 0.34 mm² (1 x AWG 22)

max. 2 x 1.5 mm² (2 x AWG 16)

Contact blocks 7, 9, 18:

min. 1 x 0.5 mm² (1 x AWG 20)

max. 2 x 2.5 mm² (2 x AWG 14)

In conformity with standards:

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

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 No.14, GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

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 chapter utilization requirements from page 297 to page 308.

	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)
	Rated impulse withstand voltage (U _{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)
	Conditional short circuit current: Protection against short circuits: Pollution degree:	1000 A acc. to EN 60947-5-1 type aM fuse 10 A 500 V 3
with M12 connector for 4 or 5 poles	Thermal current (I _{th}):	4 A
	Rated insulation voltage (U _i):	250 Vac 300 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 4 A 500 V 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) 6 1.1 0.4
with M12 connector for 8 poles	Thermal current (I _{th}):	2 A
	Rated insulation voltage (U _i):	30 Vac 36 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 2 A 500 V 3
	Utilization category	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



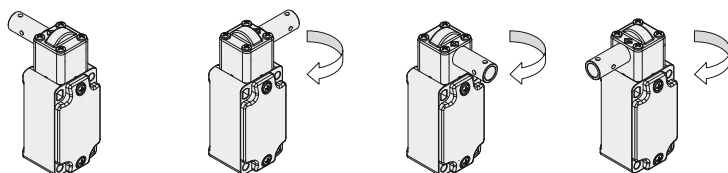
Description



These safety switches are ideal to control gates or doors protecting hazardous parts of machines without inertia. They are very sensitive and positively open the contacts after few degrees of rotation, sending an immediate stop signal. The head adjustable in 90° steps allows their installation in four different positions.

The metal housing and the stainless steel actuator allow this switch to be used even in hard environments where sedimented powder or dirt could block working of safety switches with separated actuator.

Orientable heads



Removing the four fastening screws, in all switches, it is possible to rotate the head in 90° steps. 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 IEC 60529.

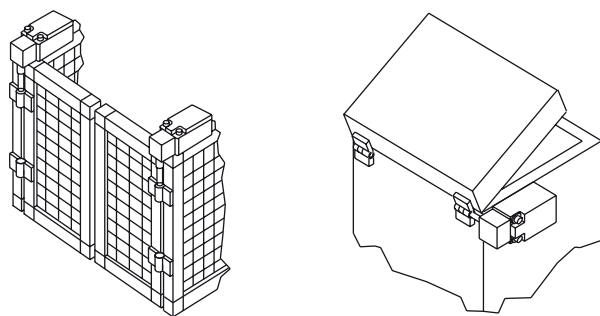
They can therefore be used in all environments where the maximum protection of the housing is required.

Laser engraving



All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Application examples



Extended temperature range

-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.

They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Adjustable operating point



When installing the device, you can adjust the contact operating point over the entire 360° range. By affixing the stud screw, you can check the correct activation angle adjustment, and quickly and easily adjust it if required. Once adjustment is complete, you can render the device tamper-proof against commonly used tools using the supplied lock pin.

Characteristics 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 (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 (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 of contacts on contact blocks 7, 9, 18, 20, 21, 22, 33, 34

In conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

Characteristics approved by UL

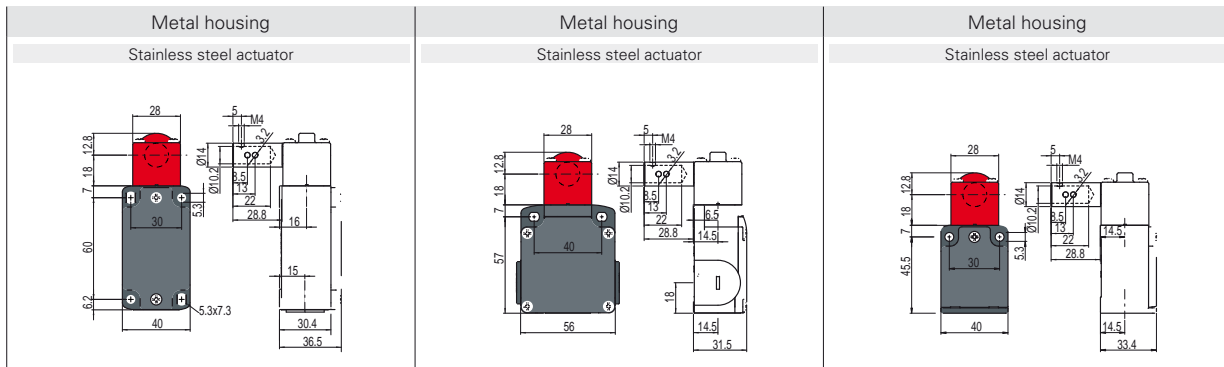
Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).
In conformity with standard: UL 508, CSA 22.2 No. 14

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

Dimensional drawings

All measures in the drawings are in mm

Contact type:
L = slow action
LO = slow action overlapped

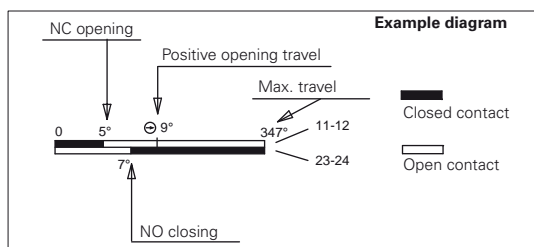


Contact blocks

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

How to read travel diagrams

All measures in the diagrams are in degrees

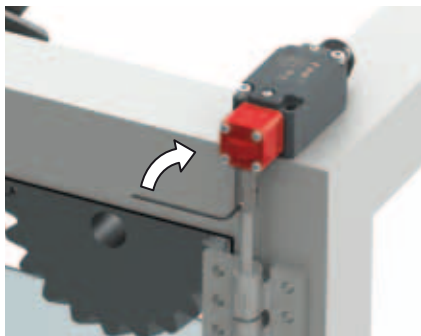


IMPORTANT:

In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol \ominus . Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.



Adjustment of the operating point



Temporary shaft locking
(dowel provided).

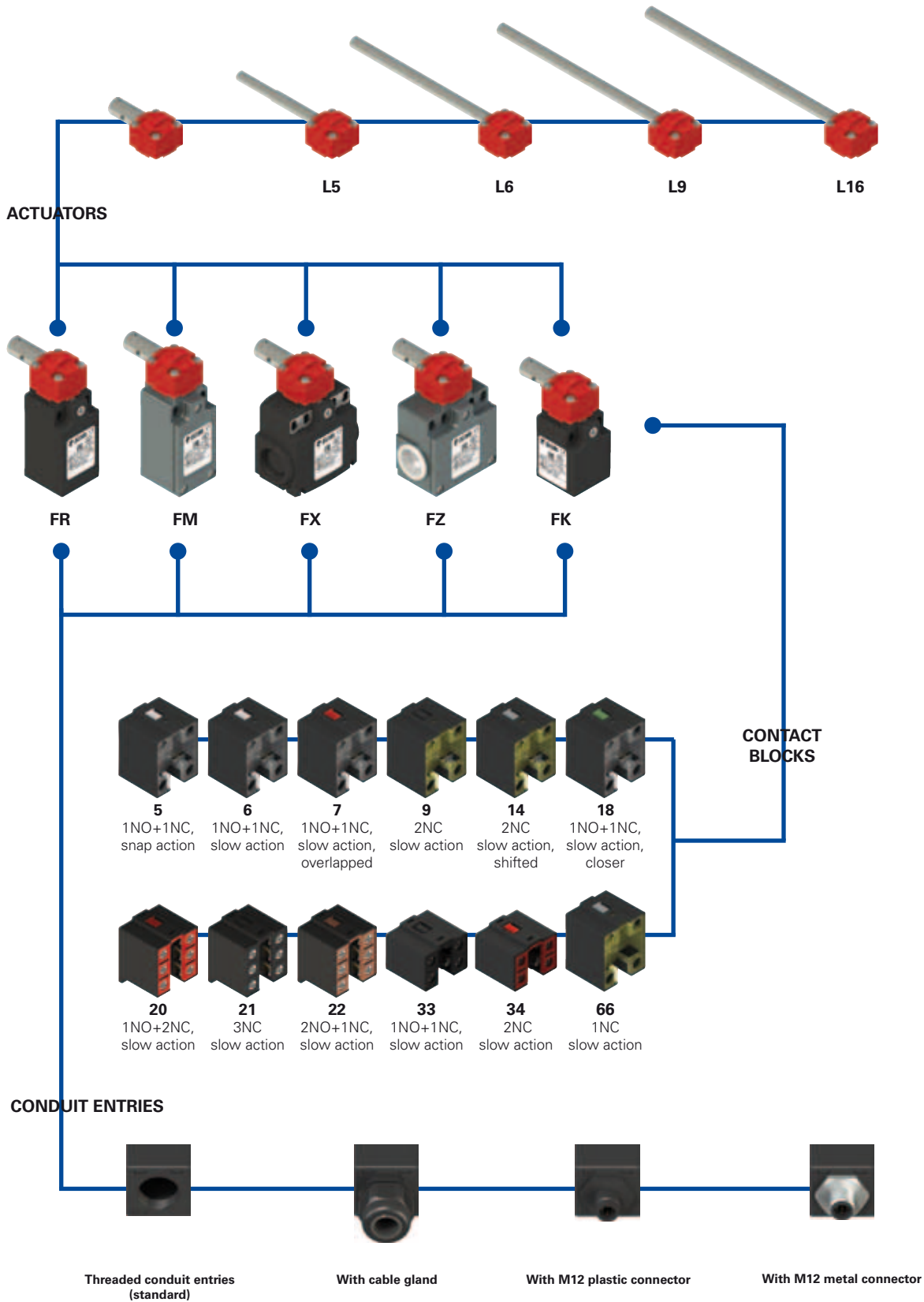


Verify the operating point according to
EN ISO 13857, adjust the
operating point again if necessary.



Switch locking (pin provided).

Selection diagram



—●— product option
 —▶— accessory sold separately



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, overlapped
9	2NC, slow action
14	2NC, slow action, shifted
18	1NO+1NC, slow action, closer
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

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

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K70	M12 plastic connector, 4 poles
...

Please contact our technical service for the complete list of possible combinations.

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

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

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

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

Pre-installed cable glands	
	without cable gland (standard)
K24	cable gland for cables Ø 5...Ø 10 mm
K28	cable gland for cables Ø 3...Ø 7 mm

Threaded conduit entry	
M1	M16x1.5 (standard)
	PG11

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



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

Markings and quality marks:



IMQ approval:	EG610 (FR-FX-FK series) EG609 (FM-FZ series)
UL approval:	E131787
CCC approval:	2007010305230013 (FR-FX-FK series) 2007010305229998 (FM-FZ series)
EAC approval:	RU C-IT ДМ94.В.01024

Technical data

Housing

FR, FX and FK series housing made of glass fiber 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 having equal or higher protection degree

General data

For safety applications up to: SIL 3 acc. to EN 62061
PL e acc. to EN ISO 13849-1
type 1 acc. to EN ISO 14119

Mechanical interlock, not coded:

Safety parameters:

B_{10d} : 5,000,00 for NC contacts

Service life: 20 years

Ambient temperature: -25°C ... +80°C

Max. actuation frequency: 3600 operating cycles¹/hour

Mechanical endurance: 1 million operating cycles¹

Max. actuation speed: 180°/s

Min. actuation speed: 2°/s

Tightening torques for installation: see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 33, 34:	min.	1 x 0.34 mm ²	(1 x AWG 22)
	max.	2 x 1.5 mm ²	(2 x AWG 16)
Contact blocks 5, 6, 7, 9, 14, 18, 66:	min.	1 x 0.5 mm ²	(1 x AWG 20)
	max.	2 x 2.5 mm ²	(2 x AWG 14)

In conformity with standards:

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

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 No.14, GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

Positive contact opening in conformity with standards:

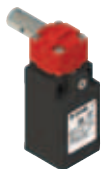
IEC 60947-5-1, EN 60947-5-1.

⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see chapter utilization requirements from page 297 to page 308.

	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) 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	Alternating current: AC15 (50±60 Hz) U _e (V) 250 400 500 I _e (A) 6 4 1 Direct current: DC13 U _e (V) 24 125 250 I _e (A) 6 1.1 0.4
with M12 connector for 4 and 5 poles	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	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) 4 1.1 0.4
with M12 connector 8 poles	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	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

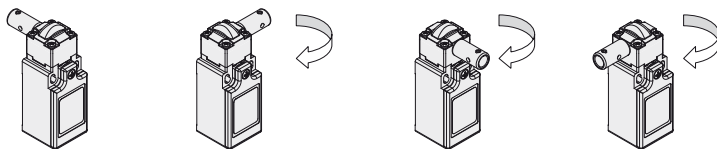


Description



These safety switches are ideal to control gates or doors protecting hazardous parts of machines without inertia. They are very sensitive and positively open the contacts after few degrees of rotation, sending an immediate stop signal. The head adjustable in 90° steps allows their installation in four different positions. Available with technopolymer or metal housings, with protection degree IP67. Its special shape allows to use this type of switches also in those areas where dust and dirt could block working of normal safety switches with separate actuator.

Orientable heads



Removing the four fastening screws, in all switches, it is possible to rotate the head in 90° steps. 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 IEC 60529.

They can therefore be used in all environments where the maximum protection of the housing is required.

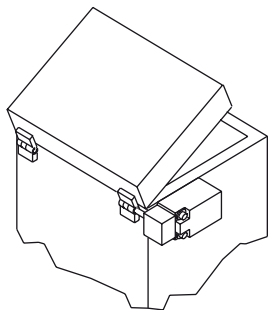
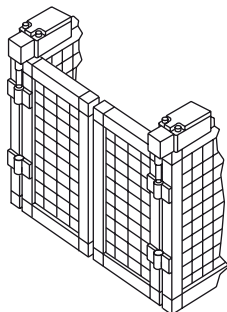
Extended temperature range

-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.

They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Application examples



Adjustable operating point



When installing the device, you can adjust the contact operating point over the entire 360° range. By affixing the stud screw, you can check the correct activation angle adjustment, and quickly and easily adjust it if required. Once adjustment is complete, you can render the device tamper-proof against commonly used tools using the supplied lock pin.

Characteristics 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 (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 (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 of contacts on contact blocks 5, 6, 7, 9, 14, 18, 20, 21, 22, 33, 34, 66

In conformity with standards: EN 60947-1, EN 60947-5-1+A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

Characteristics approved by UL

Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).

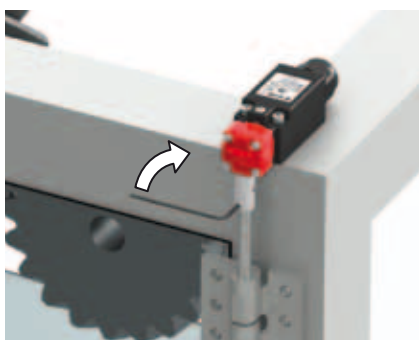
In conformity with standard: UL 508, CSA 22.2 No.14

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

Dimensional drawings for actuators

All measures in the drawings are in mm

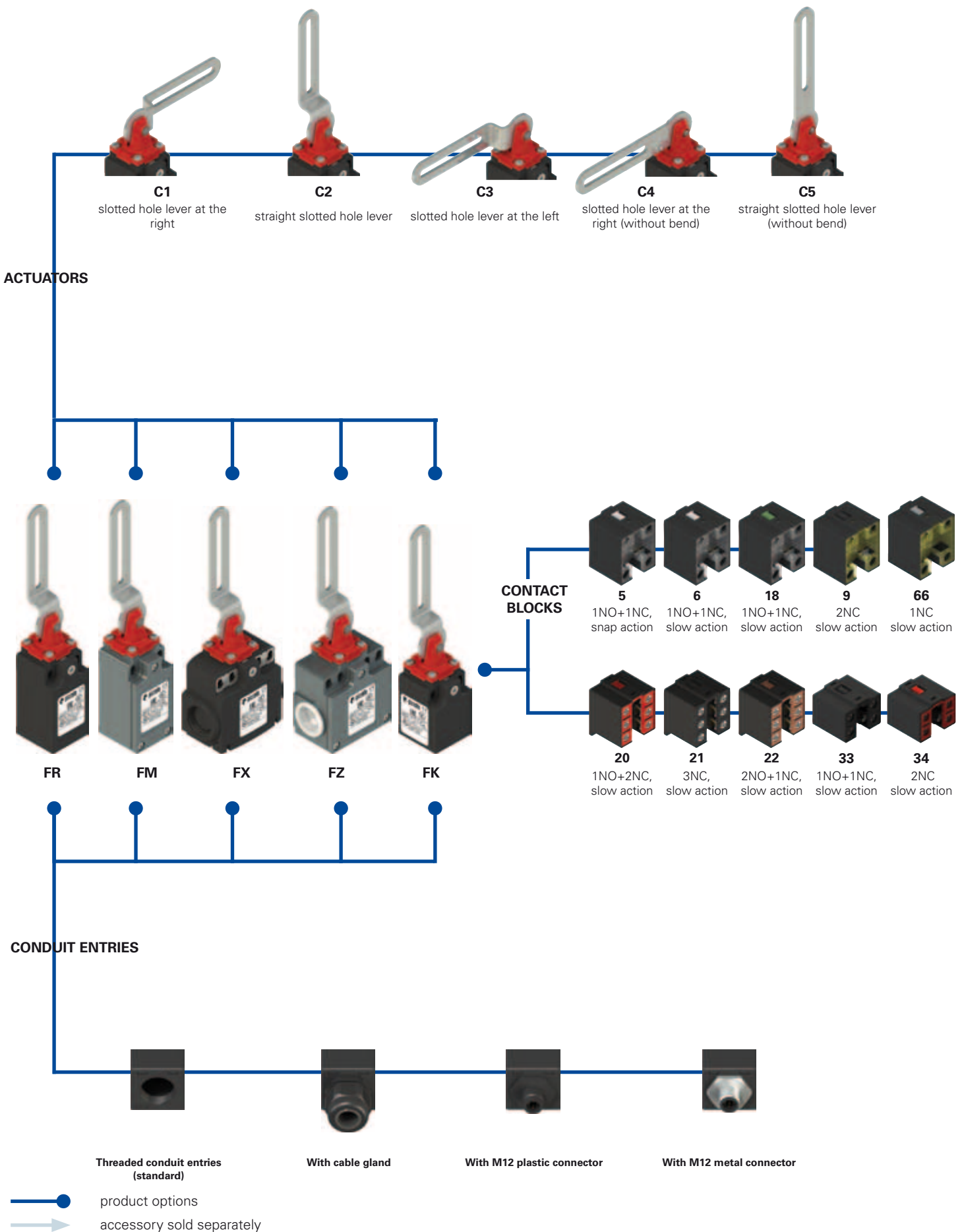
Option	Drawing
L5	
L6	
L9	
L19	

Adjustment of the operating point

 Temporary shaft locking
(dowel provided).

 Verify the operating point according to
EN ISO 13857, adjust the
operating point again if necessary.


Switch locking (pin provided).

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	
18	1NO+1NC, slow action
5	1NO+1NC, snap action
6	1NO+1NC, slow action
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
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)

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

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K70	M12 plastic connector, 4 poles
...

Please contact our technical service for the complete list of possible combinations.

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

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

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)

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

Pre-installed cable glands	
	without cable gland (standard)
K24	cable gland for cables Ø 5...Ø 10 mm
K28	cable gland for cables Ø 3...Ø 7 mm

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

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



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

Markings and quality marks:



IMQ approval:	EG610 (FR-FX-FK series) EG609 (FM-FZ series)
UL approval:	E131787
CCC approval:	2007010305230013 (FR-FX-FK series) 2007010305229998 (FM-FZ series)
EAC approval:	RU C-IT ДМ94.В.01024

Technical data

Housing

FR, FX and FK series housing made of glass fiber 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 having equal or higher protection degree

General data

For safety applications up to: SIL 3 acc. to EN 62061
PL e acc. to EN ISO 13849-1
type 1 acc. to EN ISO 14119

Mechanical interlock, not coded:

Safety parameters:

B_{10d} : 2,000,000 for NC contacts

Service life: 20 years

Ambient temperature: -25°C ... +80°C

Max. actuation frequency: 3600 operating cycles¹/hour

Mechanical endurance: 1 million operating cycles¹

Max. actuation speed: 180°/s

Min. actuation speed: 2°/s

Tightening torques for installation: see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 33, 34:	min.	1 x 0.34 mm ²	(1 x AWG 22)
	max.	2 x 1.5 mm ²	(2 x AWG 16)
Contact blocks 5, 7, 9, 18:	min.	1 x 0.5 mm ²	(1 x AWG 20)
	max.	2 x 2.5 mm ²	(2 x AWG 14)

In conformity with standards:

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

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 No.14, GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

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 chapter utilization requirements from page 297 to page 308.

	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)
	Rated impulse withstand voltage (U _{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)
	Conditional short circuit current: Protection against short circuits: Pollution degree:	1000 A acc. to EN 60947-5-1 type aM fuse 10 A 500 V 3
with M12 connector for 4 and 5 poles	Thermal current (I _{th}):	4 A
	Rated insulation voltage (U _i):	250 Vac 300 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 4 A 500 V 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) 6 1.1 0.4
with M12 connector 8 poles	Thermal current (I _{th}):	2 A
	Rated insulation voltage (U _i):	30 Vac 36 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 2 A 500 V 3
	Utilization category:	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

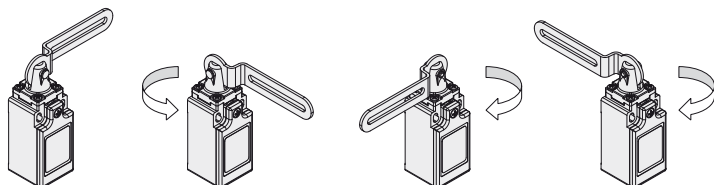


Description



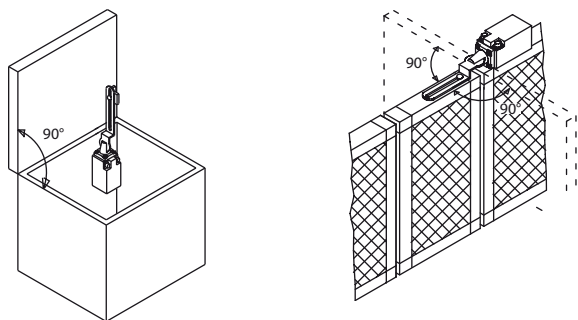
These safety switches are used to control gates or doors with hinge protecting hazardous parts of machines without inertia. Easy to install, they do not need the interaction with the hinge of the guard. They are very sensitive and positively open the contacts after few degrees of rotation, sending an immediate stop signal.

Orientable heads



Removing the four fastening screws, in all switches, it is possible to rotate the head in 90° steps. This allows you to use the same switch on both right- and left-facing door fronts.

Application examples



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 IEC 60529. They can therefore be used in all environments where the maximum protection of the housing is required.

Extended temperature range

-40°C This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C. They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Characteristics 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 (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 (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 of contacts on contact blocks 5, 7, 9, 18, 20, 21, 22, 33, 34, 66

In conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

Characteristics approved by UL

Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).
In conformity with standard: UL 508, CSA 22.2 No.14

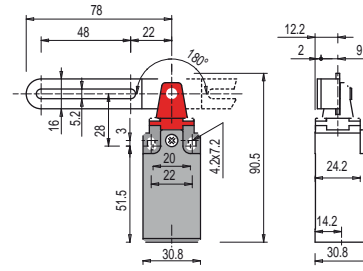
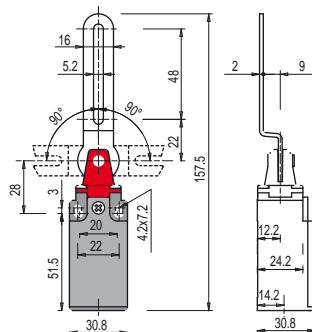
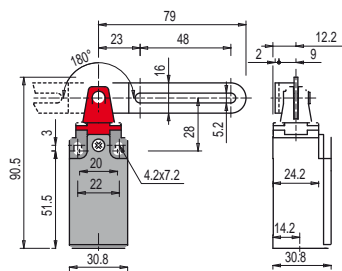
Please contact our technical service for the list of approved products.

Dimensional drawings

All measures in the drawings are in mm

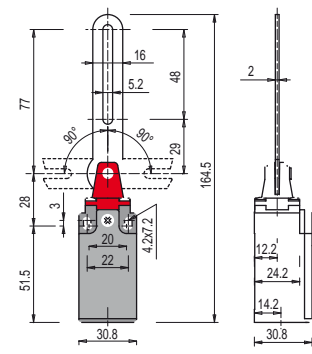
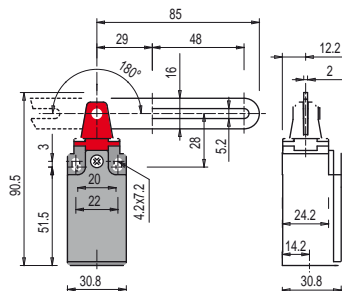
Contact type:

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



Contact blocks

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
Min. force		0.11 Nm (0.15 Nm ⊕)			0.11 Nm (0.15 Nm ⊕)			0.11 Nm (0.15 Nm ⊕)		
Travel diagrams		page 304 - group 10			page 304 - group 11			page 304 - group 10		



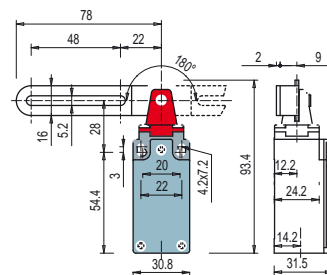
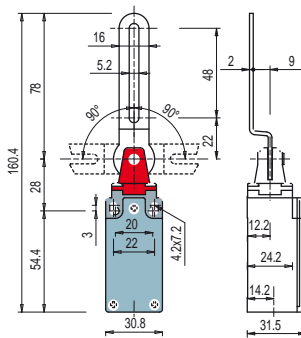
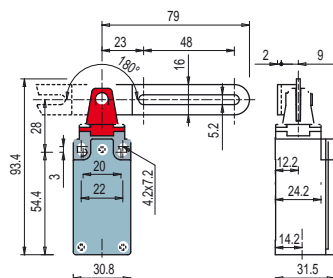
Contact blocks

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			
Min. force		0.11 Nm (0.15 Nm ⊕)			0.11 Nm (0.15 Nm ⊕)					
Travel diagrams		page 304 - group 10			page 304 - group 11					



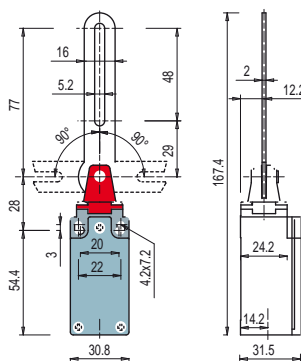
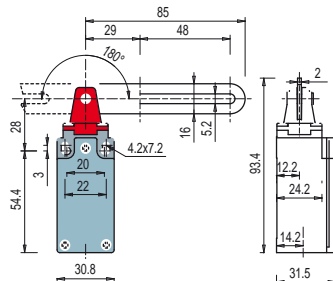
Contact type:

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



Contact blocks

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
Min. force		0.11 Nm (0.15 Nm)		0.11 Nm (0.15 Nm)		0.11 Nm (0.15 Nm)	
Travel diagrams		page 304 - group 10		page 304 - group 11		page 304 - group 10	



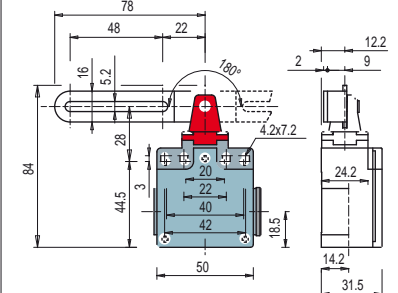
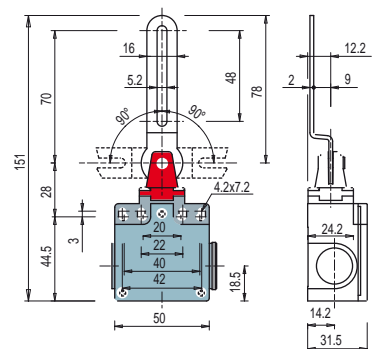
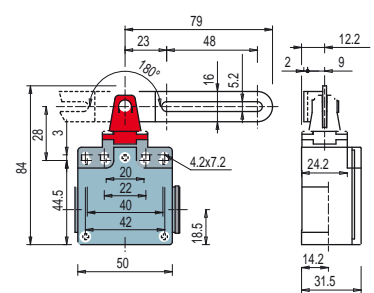
Contact blocks

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		
Min. force		0.11 Nm (0.15 Nm)		0.11 Nm (0.15 Nm)			
Travel diagrams		page 304 - group 10		page 304 - group 11			



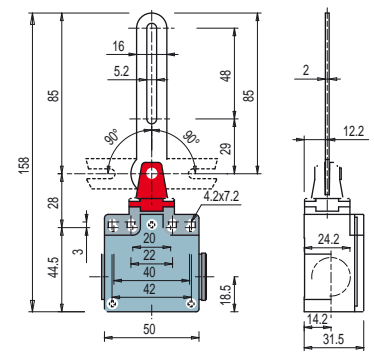
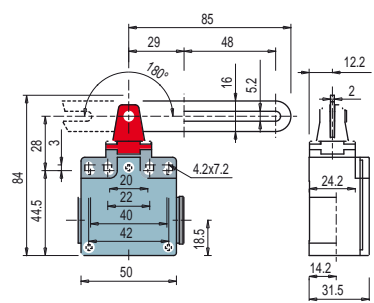
Contact type:

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



Contact blocks


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
Min. force		0.11 Nm (0.15 Nm ⊕)			0.11 Nm (0.15 Nm ⊕)			0.11 Nm (0.15 Nm ⊕)		
Travel diagrams		page 304 - group 10			page 304 - group 11			page 304 - group 10		

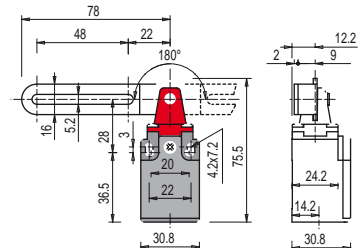
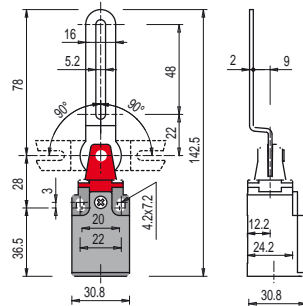
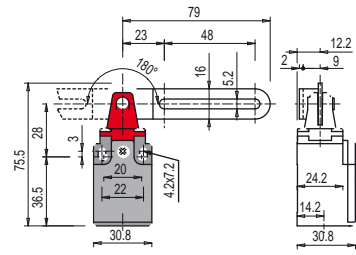


Contact blocks












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			
Min. force		0.11 Nm (0.15 Nm ⊕)			0.11 Nm (0.15 Nm ⊕)					
Travel diagrams		page 304 - group 10			page 304 - group 11					

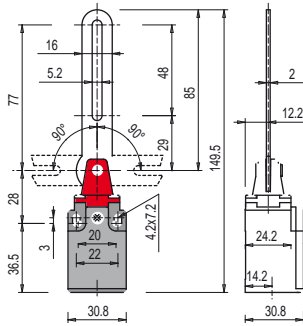
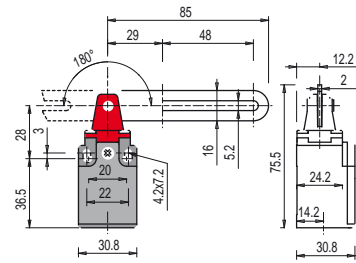
Contact type:

 = slow action











Contact blocks

33		FK 33C1-M1 	1NO+1NC	FK 33C2-M1 	1NO+1NC	FK 33C3-M1 	1NO+1NC
34		FK 34C1-M1 	2NC	FK 34C2-M1 	2NC	FK 34C3-M1 	2NC
Min. force		0.11 Nm (0.15 Nm )		0.11 Nm (0.15 Nm )		0.11 Nm (0.15 Nm )	
Travel diagrams		page 304 - group 10		page 304 - group 11		page 304 - group 10	



Contact blocks

33		FK 33C4-M1 	1NO+1NC	FK 33C5-M1 	1NO+1NC		
34		FK 34C4-M1 	2NC	FK 34C5-M1 	2NC		
Min. force		0.11 Nm (0.15 Nm )		0.11 Nm (0.15 Nm )			
Travel diagrams		page 304 - group 10		page 304 - group 11			

Description

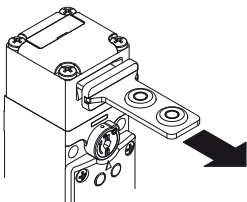


These switches are used on machines where the hazardous conditions remain for a while, even after the machines have been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. They can also be used when it is necessary to control machine guards allowing the opening of protections only under specific conditions.

The versions with solenoid actuated NC contacts are considered interlocks with locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

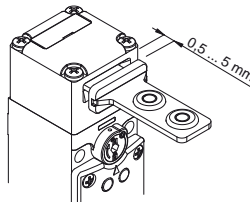


Holding force of the locked actuator



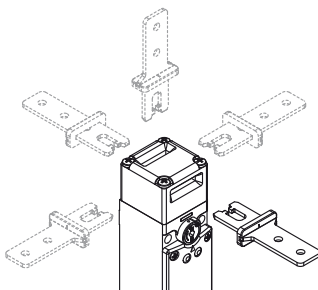
The strong interlocking system guarantees a maximum actuator holding force of $F_{1max} = 2800 \text{ N}$.

Wide-ranging actuator travel



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

Orientable heads and devices



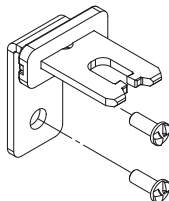
The head can be quickly oriented in four different directions after unscrewing the 4 fixing screws. Also the key release device and the release button can be rotated in 90° steps, thus obtaining as many as 32 different configurations with the same article.

Contact blocks with 4 contacts



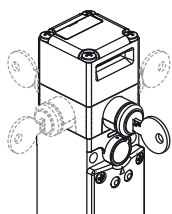
Innovative contact block with 4 contacts, available in different contact configurations to monitor the actuator or the solenoid (patented). The unit is supplied with captive screws and self-lifting plates. Removable finger protection for eyelet terminals. Highly reliable electric contacts with four support points and double interruption

Safety screws for actuators



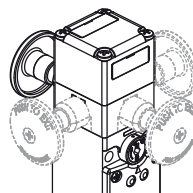
As required by EN ISO 14119, the actuator must be fixed immovably to the door frame. Pan head safety screws with one-way fitting are available for this purpose. With this screw type, the actuators cannot be removed or tampered with using common tools. See accessories on page 295.

Key release device with orientable lock



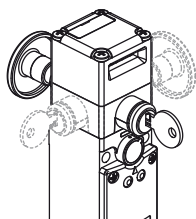
The auxiliary key release device is used to allow the maintenance or the entry into the machinery to authorized personnel only. Rotating the key, will make the same action of the solenoid, that is move solenoid contacts and release the actuator. The device can be rotated allowing the installation of the safety switch inside the machinery and making the release device accessible outside the protection. In this way, the switch is better protected against possible tampering and the external side/surface of the machinery remains smooth.

Emergency release button



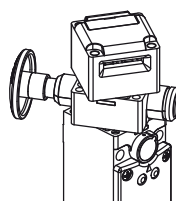
This device is used when the safety switch controls hazardous areas where operators may physically enter with all their body. The release button, oriented towards inside the machinery, allows the exit of the operator accidentally trapped also in case of possible black-out. Pushing the button, it will be actuated the same function of the auxiliary release device. To reset the switch, just return the button to its initial position. The emergency button can be rotated, is available with different lengths and it is fixed to the switch by a screw, so to allow the installation of the switch inside or outside the guards.

Key release device and emergency release button



This device performs the two above mentioned functions at the same time. Also in this case the device can be rotated and the release button can be ordered with different lengths. The activation of the button has the priority on the lock, that is with the closed lock it is still possible to press the button and release the switch. To reset the switch it is necessary to bring lock and button to their initial position.

Not detachable heads and devices



The head and the release device can be adjusted but cannot be detached from each other. This makes the switch more secure since the installer does not need to worry about how to assemble the various pieces, and the switch is less likely to become damaged (small parts being lost, dirt getting in etc.)



Signalling LED type A

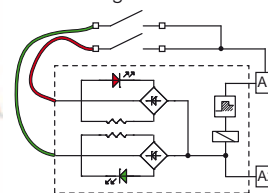


In the version with signalling LED type A, two green LEDs are switched-on directly by the solenoid power supply. Wiring is not necessary.

Signalling LED type B



In the version with signalling LED type B, two LED connection wires are available, one green and one red. Through suitable connections to the contact block, it is possible to see the different states of the switch from the exterior.



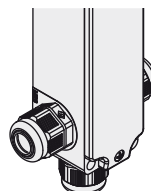
Protection degree IP67

IP67

These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529.

They can therefore be used in all environments where the maximum protection of the housing is required.

Three conduit entries



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

Extended temperature range

-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.

They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Sealable auxiliary release device



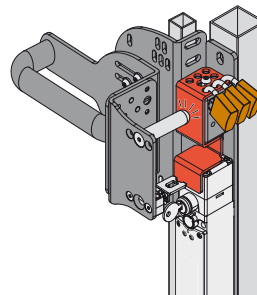
Versions with working principle D are supplied with a sealable auxiliary release device used by technicians during the installation or to access the machine in case of black-out. The auxiliary release device acts on the switch exactly as if the solenoid was energised, actuating therefore also the corresponding 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.

Laser engraving



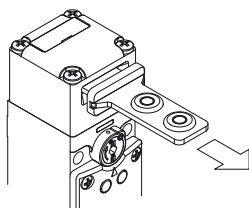
All the FG series switches are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Access monitoring



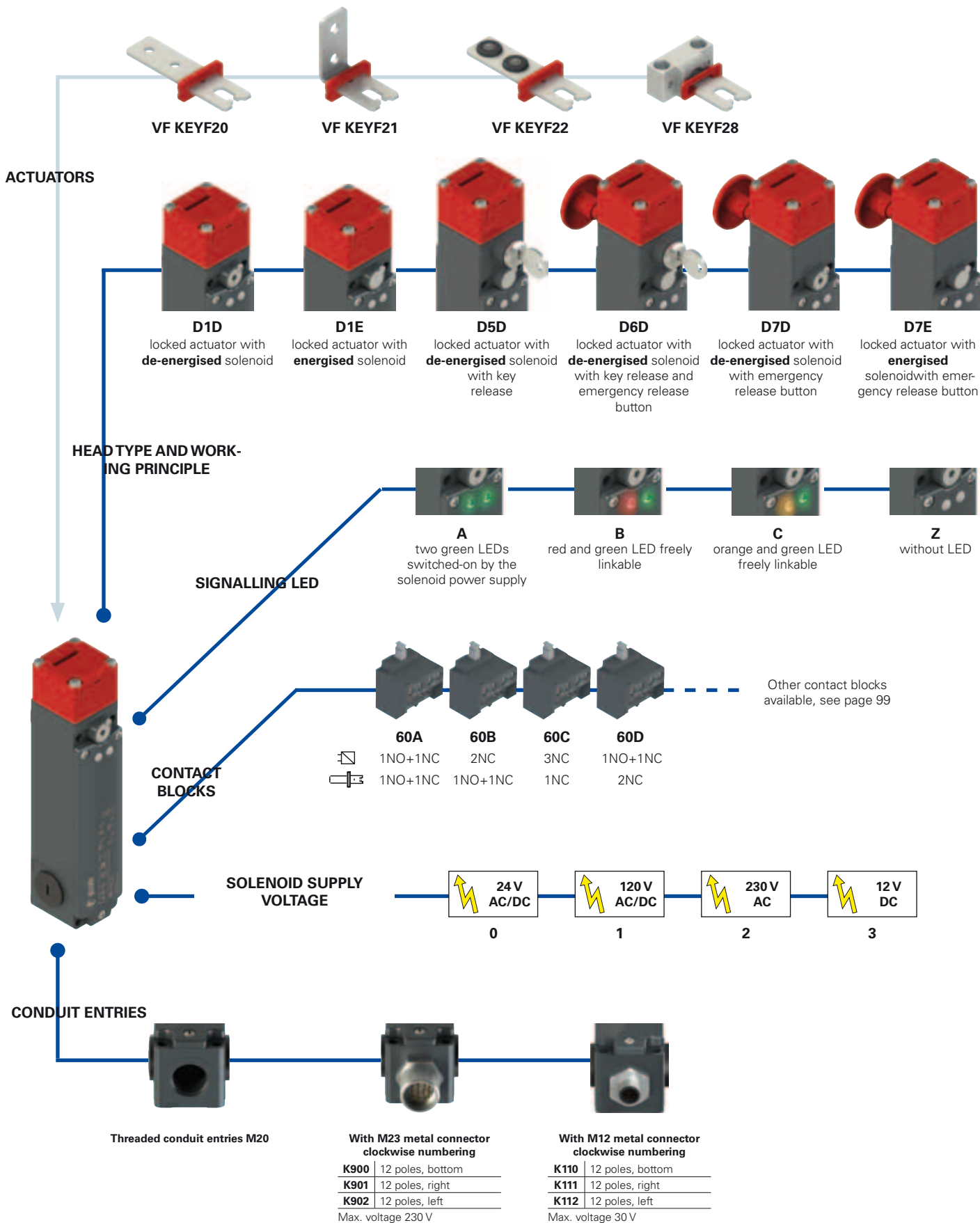
These switches alone cannot protect operators or maintenance men where they may physically enter with all their body in the hazardous area, because a voluntary closing of the protection behind them could allow the restart of the machine. If the authorization to the machine restart is completely granted by these switches, it must be foreseen a system to avoid that risk, as for example the pad lockable device to lock the actuator entry, item VF KB2 at page 104 or a safety handle with padlocks as for example VF AP-P11B-200P (page 143).

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.

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

FG 60AD1D0A-LP30F20GK900T6

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
60 F	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	/	3NC+1NO
61B	/	2NC+2NO
61C	/	1NC+3NO
61D	1NC	3NO
61E	1NO	1NC+2NO
61G	2NO	1NC+1NO
61H	2NO	2NC
61M	3NO	1NC
61R	3NC+1NO	/
61S	1NC+3NO	/

Working 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 emergency release button
D7D	locked actuator with de-energised solenoid. With emergency release button
D7E	locked actuator with energised solenoid. With emergency release button

Ambient temperature

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

Preinstalled connectors

	without connector (standard)
K900	M23 metal connector, 12 poles, bottom
...	...
K110	M12 metal connector, 12 poles, bottom
...	...

Please contact our technical service for the complete list of possible combinations.

Contact type

	silver contacts (standard)
G	silvercontacts with 1µmgoldcoating

Actuators

	without actuator (standard)
F20	straight actuator VF KEYF20
F21	angled actuator VF KEYF21
F22	actuator with rubber mountings VF KEYF22
F28	universal actuator VF KEYF28

Release button length

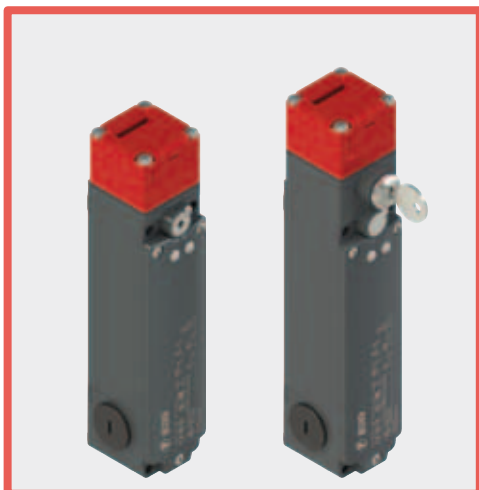
	for max. 15 mm wall thickness (standard)
LP30	for max. 30 mm wall thickness
LP40	for max. 40 mm wall thickness
LP60	for max. 60 mm wall thickness
LPRG	adjustable, for wall thickness from 60 mm to 500 mm

Signalling LED

A	two green LEDs switched-on by the solenoid power supply
B	red and green LED freely linkable
C	orange and green LED freely linkable
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%)



Main features

- Actuator holding force F_{1max} : 2800 N
- 30 contact blocks with 4 contacts
- Metal housing, three conduit entries M20
- Protection degree IP67
- Versions with key release and emergency release button
- 4 stainless steel actuators
- Orientable head and devices, not detachable
- Signalling LED
- Operation with energised or de-energised solenoid

Markings and quality marks:



IMQ approval: CA02.03848
 UL approval: E131787
 CCC approval: 2013010305602309
 EAC approval: RU C-IT ДМ94.В.01024

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 having equal or higher protection degree

General data

For safety applications up to: SIL 3 acc. to EN 62061
 PL e acc. to EN ISO 13849-1
 type 2 acc. to EN ISO 14119
 Low acc. to EN ISO 14119

Interlock with mechanical lock, coded:
 Coding level: Low acc. to EN ISO 14119

Safety parameters:
 B_{10d} : 5,000,000 for NC contacts
 Service life: 20 years
 Ambient temperature: -25°C ... +60°C
 Max. actuation frequency: 600 operating cycles¹/hour
 Mechanical endurance: 1 million operating cycles¹
 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 play of locked actuator: 4.5 mm
 Released actuator extraction force: 30 N
 Tightening torques for installation: see pages 297-308

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

Cable cross section (flexible copper strands)

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

In conformity 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, EN 61000-6-2, EN 61000-6-3, BG-GS-ET-15, UL 508, CSA 22.2 N. 14.

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 N. 14.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

Positive contact opening in conformity with standards:

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

Solenoid

Duty cycle: 100% ED
 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

⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see chapter utilization requirements from page 297 to page 308.

Electrical data

Utilization category

without connector	Thermal current (I _{th}):	10 A	Alternating current: AC15 (50÷60 Hz)			
	Rated insulation voltage (U _i):	400 Vac 300 Vdc	U _e (V)	120	250	400
	Rated impulse withstand voltage (U _{imp}):	6 kV	I _e (A)	6	5	3
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	Direct current: DC13			
	Protection against short circuits:	type gG fuse 10 A 500 V	U _e (V)	24	125	250
Pollution degree:	3	I _e (A)	3	0.7	0.4	

with M23 connector 12 poles	Thermal current (I _{th}):	8 A	Alternating current: AC15 (50÷60 Hz)			
	Rated insulation voltage (U _i):	250 Vac 300 Vdc	U _e (V)	120	250	
	Protection against short circuits:	type gG fuse 8 A 500 V	I _e (A)	6	5	
	Pollution degree:	3	Direct current: DC13			
			U _e (V)	24	125	250
		I _e (A)	3	0.7	0.4	

with M12 connector 12 poles	Thermal current (I _{th}):	1.5 A	Alternating current: AC15 (50÷60 Hz)			
	Rated insulation voltage (U _i):	30 Vac 36 Vdc	U _e (V)	24		
	Protection against short circuits:	type gG fuse 1.5 A	I _e (A)	1.5		
	Pollution degree:	3	Direct current: DC13			
			U _e (V)	24		
		I _e (A)	1.5			



Characteristics approved by IMQ

Rated insulation voltage (Ui): 400 Vac
 Conventional free air thermal current (Ith): 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 (Ue): 400 Vac (50 Hz)
 Operating current (Ie): 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 conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

Characteristics approved by UL

Utilization categories: A300 (720 VA, 120 ... 300 Vac)
 Q300 (69 VA, 125 ... 250 Vdc)

Data of housing type 1, 4X "indoor use only"; 12, 13

In conformity with standard: UL508, CSA 22.2 N. 14

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

Working principle

The working principle of these safety switches allows three different working states:

- state A: with inserted and locked actuator
- state B: with inserted actuator, not locked
- state C: with extracted actuator

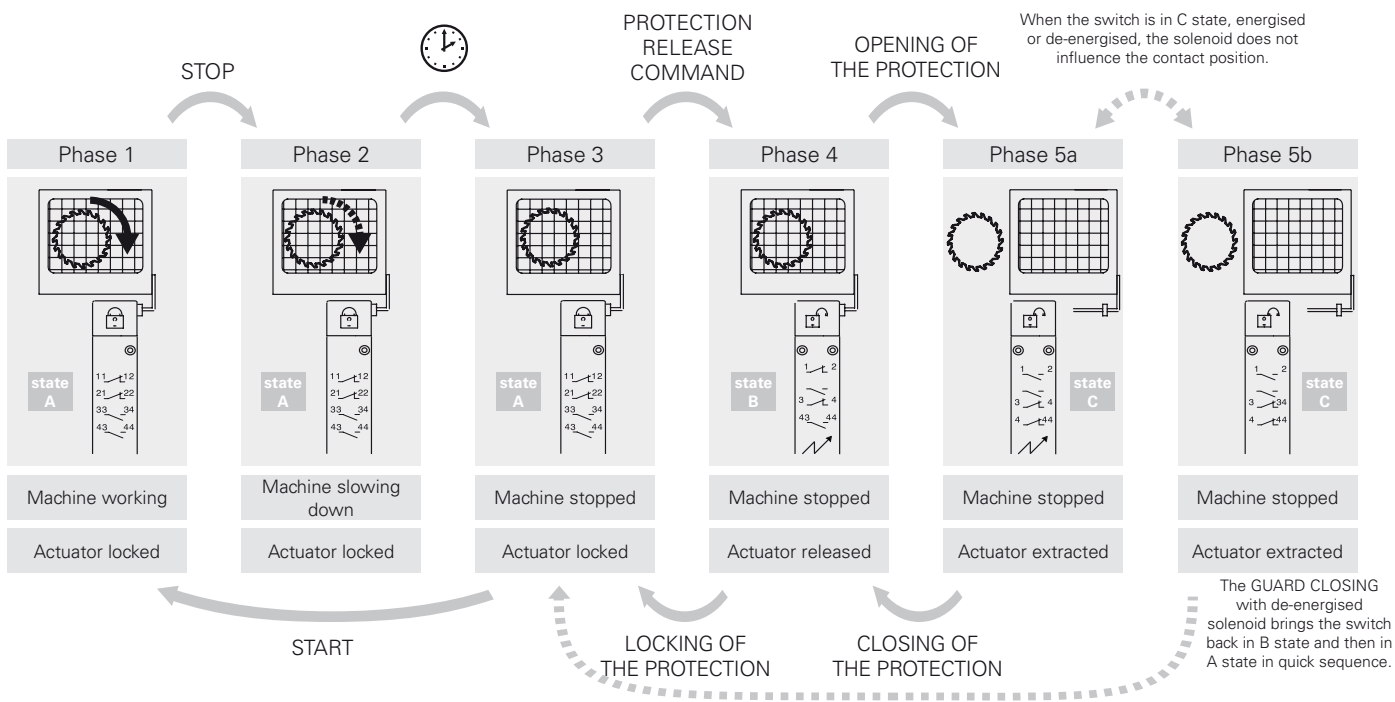
All or some of these states may be controlled through NO contacts or positive opening NC contacts of the internal contact block. In detail, contact blocks that have electric contacts marked with the symbol of the solenoid (⊞) are switched in the transition between the state A and state B, while the electric contacts marked with the symbol of the actuator (⊞) are switched between state B and state C:

Working principle

It is also possible to choose between two working principles for the actuator locking:

- **Working principle D:** Actuator locked with de-energised solenoid. Actuator release is obtained by power supply to the solenoid (see example of working cycle steps).
- **Working principle E:** Actuator locked with energised solenoid. The release of the actuator is obtained by power-off to the solenoid. It is advisable to use this version under special conditions because a blackout will allow the immediate opening of the protection.

Example of working cycle steps with FG 60AD1D0A-F21 (switch with working principle D)

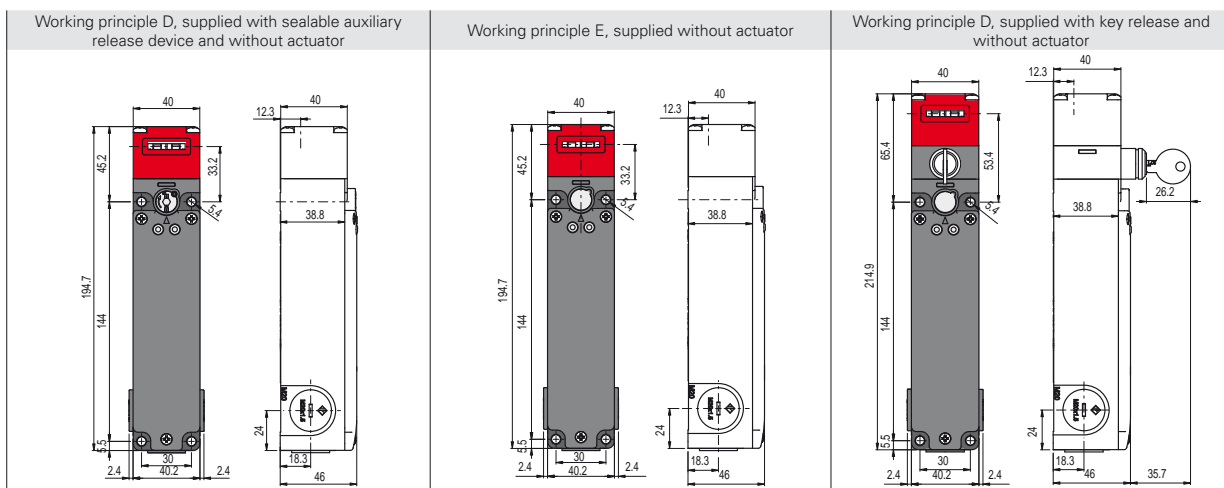


Dimensional drawings

All measures in the drawings are in mm

Contact type:
 = slow action

Contact blocks



60A	FG 60AD1D0A			1NO+1NC	1NO+1NC	FG 60AD1E0A			1NO+1NC	1NO+1NC	FG 60AD5D0A			1NO+1NC	1NO+1NC	
60B	FG 60BD1D0A			2NC	1NO+1NC	FG 60BD1E0A			2NC	1NO+1NC	FG 60BD5D0A			2NC	1NO+1NC	
60C	FG 60CD1D0A			3NC	1NC	FG 60CD1E0A			3NC	1NC	FG 60CD5D0A			3NC	1NC	
60D	FG 60DD1D0A			1NO+1NC	2NC	FG 60DD1E0A			1NO+1NC	2NC	FG 60DD5D0A			1NO+1NC	2NC	
60E	FG 60ED1D0A			1NO+2NC	1NC	FG 60ED1E0A			1NO+2NC	1NC	FG 60ED5D0A			1NO+2NC	1NC	
60F	FG 60FD1D0A			1NO+2NC	1NO	FG 60FD1E0A			1NO+2NC	1NO	FG 60FD5D0A			1NO+2NC	1NO	
60G	FG 60GD1D0A			2NC	2NC	FG 60GD1E0A			2NC	2NC	FG 60GD5D0A			2NC	2NC	
60H	FG 60HD1D0A			4NC	/	FG 60HD1E0A			4NC	/	FG 60HD5D0A			4NC	/	
60I	FG 60ID1D0A			3NC	1NO	FG 60ID1E0A			3NC	1NO	FG 60ID5D0A			3NC	1NO	
60L	FG 60LD1D0A			2NO+1NC	1NC	FG 60LD1E0A			2NO+1NC	1NC	FG 60LD5D0A			2NO+1NC	1NC	
60M	FG 60MD1D0A			2NO+1NC	1NO	FG 60MD1E0A			2NO+1NC	1NO	FG 60MD5D0A			2NO+1NC	1NO	
60N	FG 60ND1D0A			1NO+1NC	2NO	FG 60ND1E0A			1NO+1NC	2NO	FG 60ND5D0A			1NO+1NC	2NO	
60P	FG 60PD1D0A			1NC	3NC	FG 60PD1E0A			1NC	3NC	FG 60PD5D0A			1NC	3NC	
60R	FG 60RD1D0A			2NO+2NC	/	FG 60RD1E0A			2NO+2NC	/	FG 60RD5D0A			2NO+2NC	/	
60S	FG 60SD1D0A			1NC	2NO+1NC	FG 60SD1E0A			1NC	2NO+1NC	FG 60SD5D0A			1NC	2NO+1NC	
60T	FG 60TD1D0A			1NC	1NO+2NC	FG 60TD1E0A			1NC	1NO+2NC	FG 60TD5D0A			1NC	1NO+2NC	
60U	FG 60UD1D0A				4NC	FG 60UD1E0A				4NC	FG 60UD5D0A				4NC	
60V	FG 60VD1D0A			2NC	2NO	FG 60VD1E0A			2NC	2NO	FG 60VD5D0A			2NC	2NO	
60X	FG 60XD1D0A			1NO	3NC	FG 60XD1E0A			1NO	3NC	FG 60XD5D0A			1NO	3NC	
60Y	FG 60YD1D0A			1NO	1NO+2NC	FG 60YD1E0A			1NO	1NO+2NC	FG 60YD5D0A			1NO	1NO+2NC	
61A	FG 61AD1D0A				3NC+1NO	FG 61AD1E0A				3NC+1NO	FG 61AD5D0A				3NC+1NO	
61B	FG 61BD1D0A				2NC+2NO	FG 61BD1E0A				2NC+2NO	FG 61BD5D0A				2NC+2NO	
61C	FG 61CD1D0A				1NC+3NO	FG 61CD1E0A				1NC+3NO	FG 61CD5D0A				1NC+3NO	
61D	FG 61DD1D0A			1NC	3NO	FG 61DD1E0A			1NC	3NO	FG 61DD5D0A			1NC	3NO	
61E	FG 61ED1D0A			1NO	1NC+2NO	FG 61ED1E0A			1NO	1NC+2NO	FG 61ED5D0A			1NO	1NC+2NO	
61G	FG 61GD1D0A			2NO	1NC+1NO	FG 61GD1E0A			2NO	1NC+1NO	FG 61GD5D0A			2NO	1NC+1NO	
61H	FG 61HD1D0A			2NO	2NC	FG 61HD1E0A			2NO	2NC	FG 61HD5D0A			2NO	2NC	
61M	FG 61MD1D0A			3NO	1NC	FG 61MD1E0A			3NO	1NC	FG 61MD5D0A			3NO	1NC	
61R	FG 61RD1D0A			3NC+1NO		FG 61RD1E0A			3NC+1NO		FG 61RD5D0A			3NC+1NO		
61S	FG 61SD1D0A			1NC+3NO		FG 61SD1E0A			1NC+3NO		FG 61SD5D0A			1NC+3NO		
Min. force	30 N (60 N		30 N (60 N		30 N (60 N		30 N (60 N		30 N (60 N		30 N (60 N		30 N (60 N		30 N (60 N	
Travel diagrams	page 103 - group 1		page 103 - group 1		page 103 - group 1		page 103 - group 1		page 103 - group 1		page 103 - group 1		page 103 - group 1		page 103 - group 1	

Legend: With positive opening according to EN 60947-5-1, interlock with lock monitoring in accordance with EN ISO 14119



Contact type: L = slow action	Working principle D, supplied with key release, emergency release button, without actuator		Working principle D, supplied with emergency release button, without actuator		Working principle E, supplied with emergency 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
60U	L	FG 60UD6D0A	4NC	FG 60UD7D0A	4NC	FG 60UD7E0A	4NC
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
61A	L	FG 61AD6D0A	3NC+1NO	FG 61AD7D0A	3NC+1NO	FG 61AD7E0A	3NC+1NO
61B	L	FG 61BD6D0A	2NC+2NO	FG 61BD7D0A	2NC+2NO	FG 61BD7E0A	2NC+2NO
61C	L	FG 61CD6D0A	1NC+3NO	FG 61CD7D0A	1NC+3NO	FG 61CD7E0A	1NC+3NO
61D	L	FG 61DD6D0A	1NC 3NO	FG 61DD7D0A	1NC 3NO	FG 61DD7E0A	1NC 3NO
61E	L	FG 61ED6D0A	1NO 1NC+2NO	FG 61ED7D0A	1NO 1NC+2NO	FG 61ED7E0A	1NO 1NC+2NO
61G	L	FG 61GD6D0A	2NO 1NC+1NO	FG 61GD7D0A	2NO 1NC+1NO	FG 61GD7E0A	2NO 1NC+1NO
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	3NC+1NO	FG 61RD7D0A	3NC+1NO	FG 61RD7E0A	3NC+1NO
61S	L	FG 61SD6D0A	1NC+3NO	FG 61SD7D0A	1NC+3NO	FG 61SD7E0A	1NC+3NO
Min. force		30 N (60 N		30 N (60 N		30 N (60 N	
Travel diagrams		page 103 - group 1		page 103 - group 1		page 103 - group 1	

Travel diagrams table

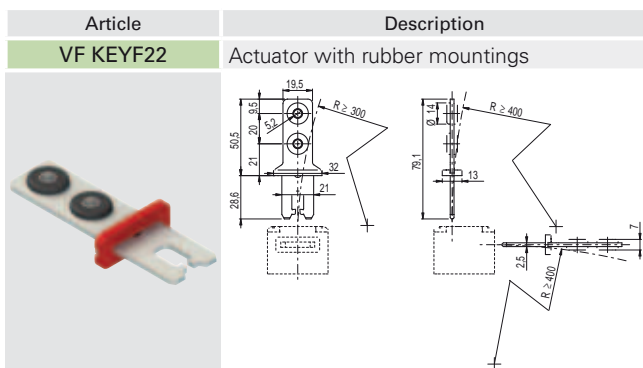
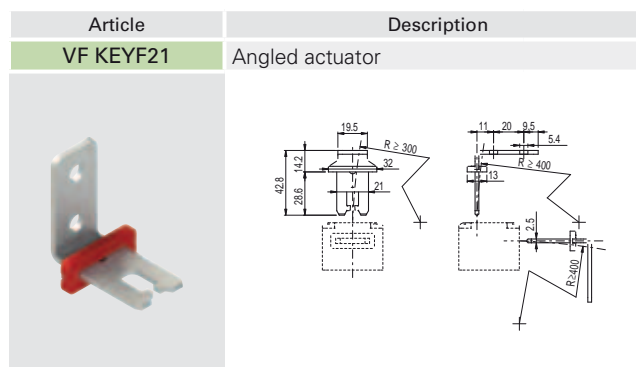
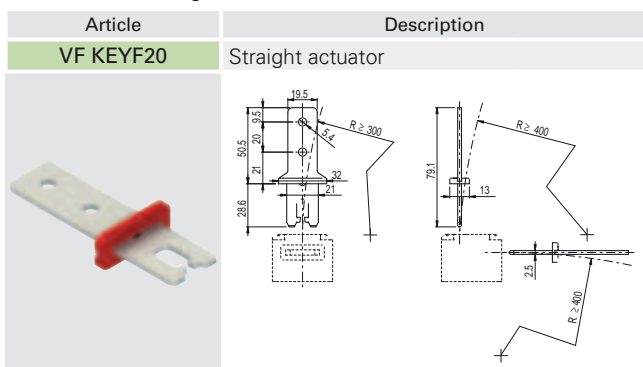
All measures in the drawings are in mm

60A 2NO+2NC		60M 3NO+1NC		61A 1NO+3NC	
60B 1NO+3NC		60N 3NO+1NC		61B 2NO+2NC	
60C 4NC		60P 4NC		61C 3NO+1NC	
60D 1NO+3NC		60R 2NO+2NC		61D 3NO+1NC	
60E 1NO+3NC		60S 2NO+2NC		61E 3NO+1NC	
60F 2NO+2NC		60T 1NO+3NC		61G 3NO+1NC	
60G 4NC		60U 4NC		61H 2NO+2NC	
60H 4NC		60V 2NO+2NC		61M 3NO+1NC	
60I 1NO+3NC		60X 1NO+3NC		61R 1NO+3NC	
60L 2NO+2NC		60Y 2NO+2NC		61S 3NO+1NC	

Legend:
 Closed contact
 Open contact
 Contacts activated by the actuator
 Contacts activated by the solenoid
 Positive opening travel

Stainless steel actuators

IMPORTANT: These actuators must be used with items of the FG series only (e.g. FG 60AD1D0A).
 Low level of coding acc. to EN ISO 14119.



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

Accessories See page 287

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

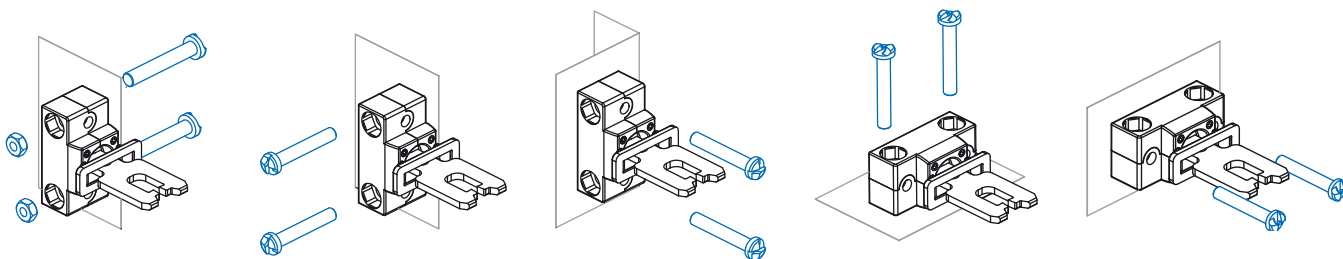
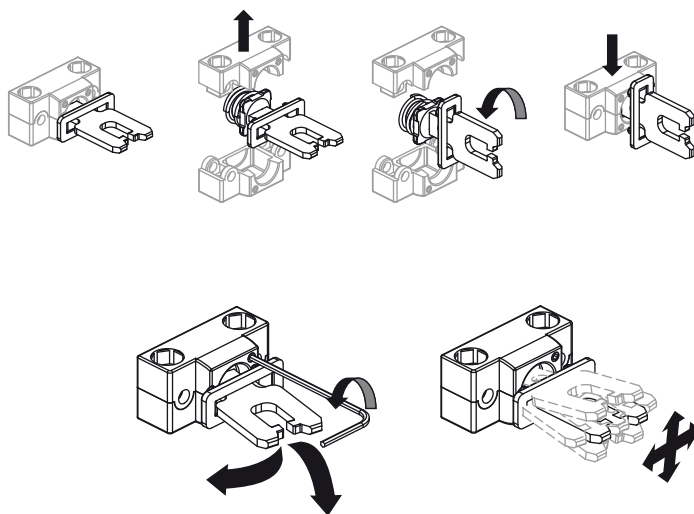


Universal actuator VF KEYF28

IMPORTANT: These actuators must be used with items of the FG series only (e.g. FG 60AD1D0A).
Low level of coding acc. to EN ISO 14119.

Article	Description
VF KEYF28	Universal actuator

Joined and two directions adjustable actuator for doors with reduced dimensions.
The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.



Accessories for sealing



Pliers, steel wire and lead seals used to seal the auxiliary release device (versions D1D and D7D only).

Article	Description
VF FSPB-200	Pack of 200 lead seals
VF FSPB-10	Pack of 10 lead seals
Article	Description
VF FSFI-400	400 metre wire roll
VF FSFI-10	10 metre wire roll
Article	Description
VF FSPZ	Pliers without logo



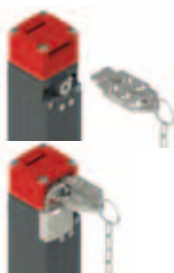
Utilization limits

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 the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific Pizzato catalogue).

Accessories

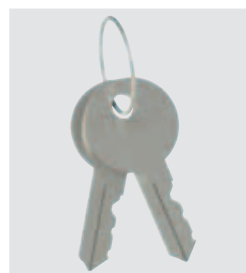
Article	Description
VF KB2	Actuator entry locking device

Padlockable device to lock the actuator entry (patented) in order to prevent the accidental closing of the door behind operators while they are inside the machine. 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.

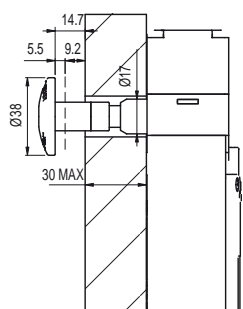


Items with code on **green** background are stock items

Accessories See page 287

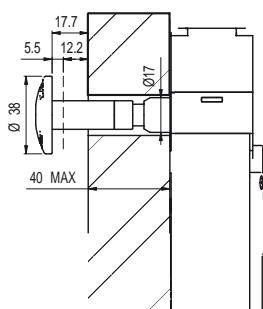
→ The 2D and 3D files are available at www.pizzato.com

Other release button lengths



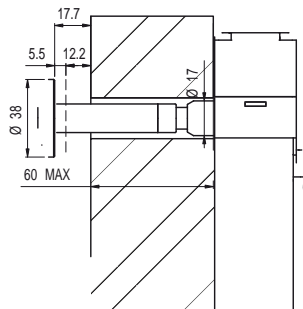
-LP30

For wall thickness
15 ... 30 mm



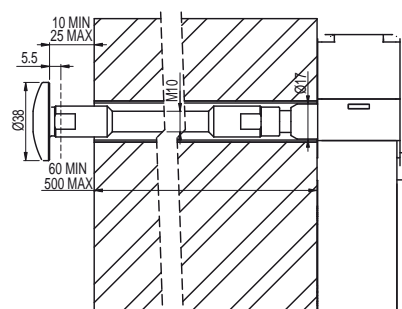
-LP40

For wall thickness
30 ... 40 mm



-LP60

For wall thickness
40 ... 60 mm



-LPRG

For wall thickness
60 ... 500 mm

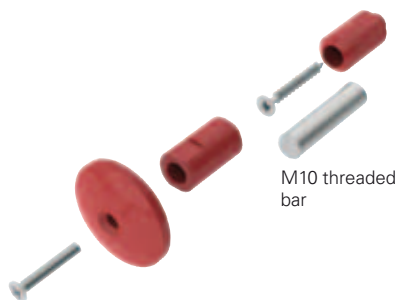
- Avoid torsion and bending on the release button bar.
- To guarantee the correct device operation, keep a distance of 10 to 25 mm between the wall and the release button.
- Keep clean the release button slipping area. The guide bushing or tube must be cleaned inside, since dirt or chemical products could compromise the device operation.
- Periodically check for correct device operation.

- Avoid torsion and bending on the release button bar.
- Use a bushing or a tube with $18 \pm 0,5$ mm diameter as a guide inside the wall.
- The M10 threaded bar has to be inserted into the guide in order to avoid its bending. The M10 threaded bar is not supplied with the device.
- Do not exceed an overall length of 500 mm between the release button and the switch.
- To guarantee the correct device operation, keep a distance of 10 to 25 mm between the wall and the release button.
- Keep clean the release button slipping area. The guide bushing or tube must be cleaned inside, since dirt or chemical products could compromise the device operation.
- Periodically check for correct device operation.

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



M10 threaded
bar

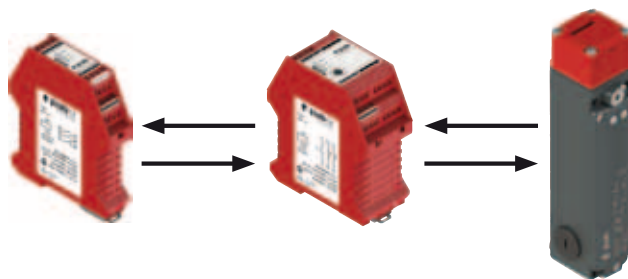
Article	Description
VF FG-LPRG	Metal release button for wall thickness from 60 to 500 mm, supplied with 2 supports and 2 screws, without M10 threaded bar.

The M10 bar can be supplied in zinc-plated steel with 1 m length. Article: AC 8512.

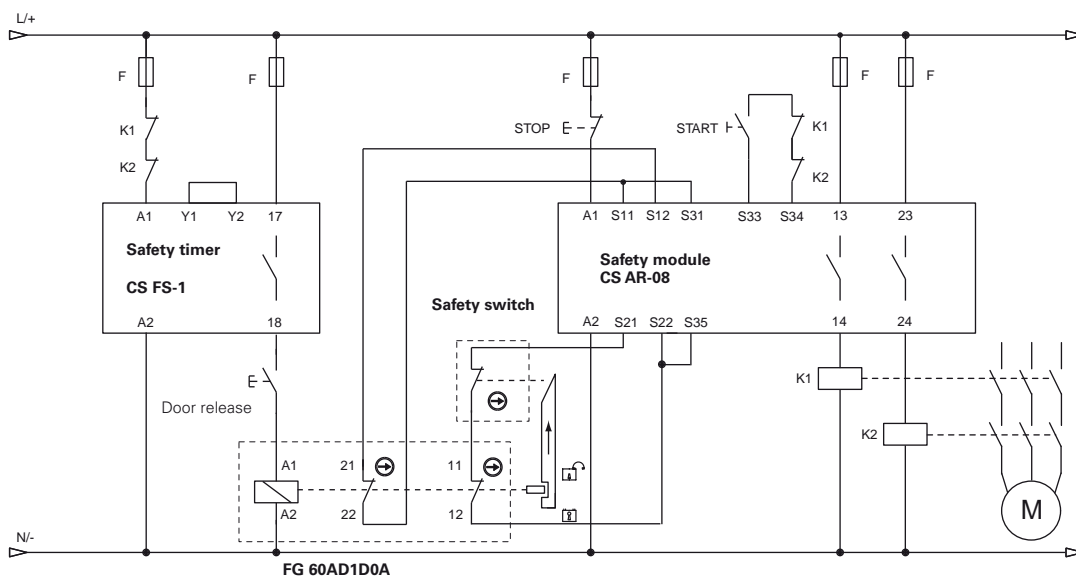
Safety modules

Pizzato Elettrica s.r.l. offers its customers a wide range of safety modules made considering the typical problems about the control of the safety switches and their real use conditions. Safety modules with instantaneous or delayed contacts are available for the realization of emergency circuits type 0 (immediate stop) or type 1 (monitored stop).

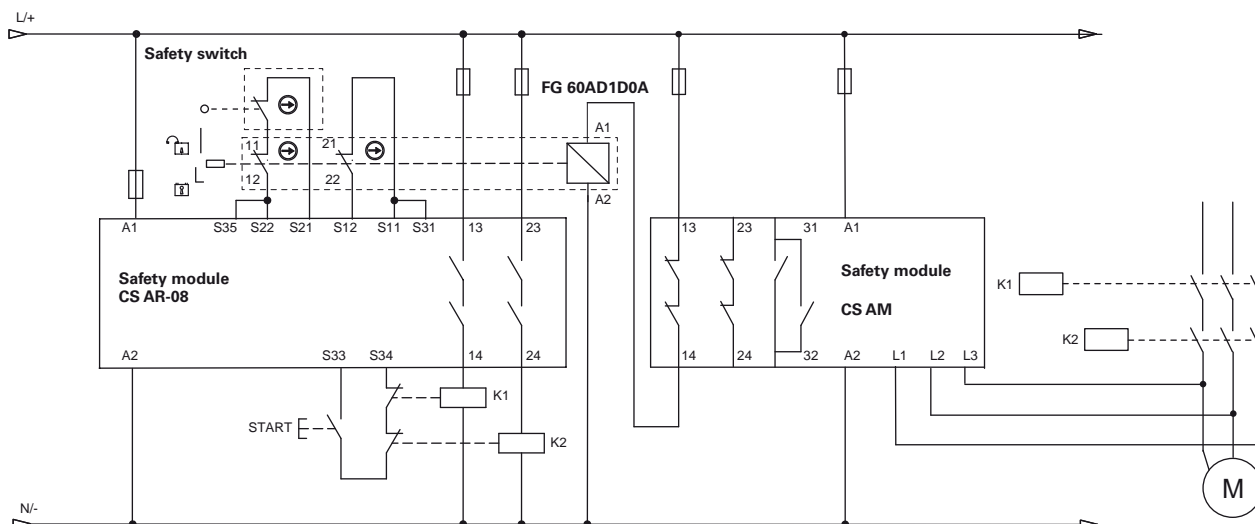
Safety switches with solenoid series FG can be connected to safety modules in order to obtain safety circuits up to PL e in accordance with EN ISO 13849. For any technical information or wiring diagram please contact the technical department.



Application example with safety timer



Application example with standstill monitor



Description

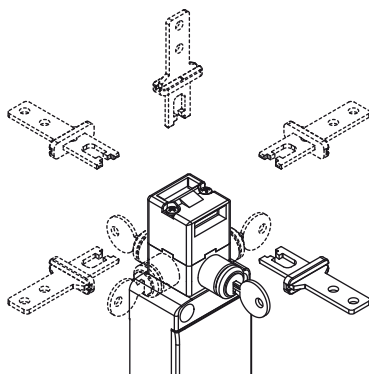


These switches are used on machines where the hazardous conditions remain for a while, even after the machines have been switched off, for example because of mechanical inertia of pulleys, saw disks, parts under pressure or with high temperatures. They can also be used when it is necessary to control machine guards allowing the opening of protections only under specific conditions.

The versions with solenoid actuated NC contacts are considered interlocks with locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.



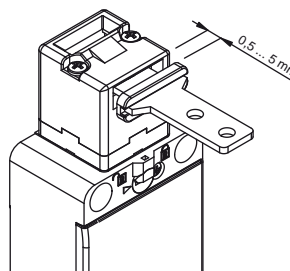
Orientable head and release device



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

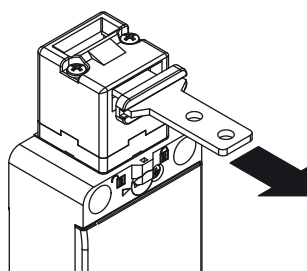
The auxiliary key release device can be rotated in 90° steps as well. This enables the switch to assume 32 different configurations.

Wide-ranging actuator travel



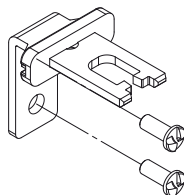
The head of this switch is equipped with an actuator with a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5mm) without causing unwanted machine shutdowns. This extensive travel is available in all actuators, in order to ensure maximum device reliability.

Holding force of the locked actuator



The strong interlocking system guarantees a maximum actuator holding force of $F_{1max} = 1100 \text{ N}$ (head 96).

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 with using common tools. See accessories on page 295.

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 IEC 60529.

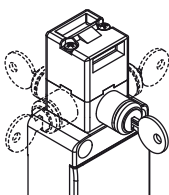
They can therefore be used in all environments where the maximum protection of the housing is required.

Contact blocks



Contact blocks with captive screws, finger protection, twin bridge contacts and double interruption for a higher contact reliability. Versions with gold-plated contacts available. Available in multiple variants activated by actuator or by solenoid.

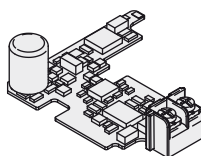
Key release device with orientable lock



The auxiliary key release device is used to allow the maintenance or the entry into the machinery to authorized personnel only. Rotating the key, will make the same action of the solenoid, that is move solenoid contacts and release the actuator. The device can be rotated allowing the installation of the safety switch inside the machinery and making the release device accessible outside

the protection. In this way, the switch is better protected against possible tampering and the external side/surface of the machinery remains smooth.

Electronic control board for solenoids power consumption



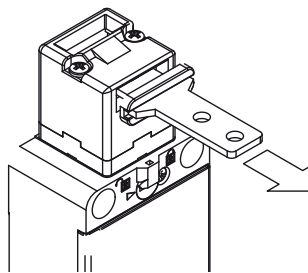
This technical solution resolves the problems that may derive from not stable power supply (machine distance from main transformers, tension variation between night/day hours), allowing also a low solenoid power consumption and consequently enlarging the working temperatures range of the switch.

Laser engraving



All the FG series switches are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant 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 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.

Two working principles

D or E

The safety switches with solenoid offer two different operating principles for the actuator locking:

Working principle D: locked actuator with de-energised solenoid. Actuator release is obtained by power supply to the solenoid.

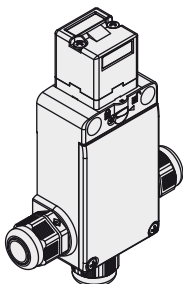
Working principle E: locked actuator with energised solenoid. The release of the actuator is obtained by power-off to the solenoid. It is advisable to use this version under special conditions because a blackout will allow the immediate opening of the protection.

Sealable auxiliary release device



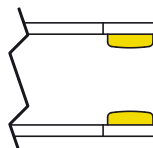
Versions with working principle D are supplied with a sealable auxiliary release device used by technicians during the installation or to access the machine in case of black-out. The auxiliary release device acts on the switch exactly as if the solenoid was energised, actuating therefore also the corresponding 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



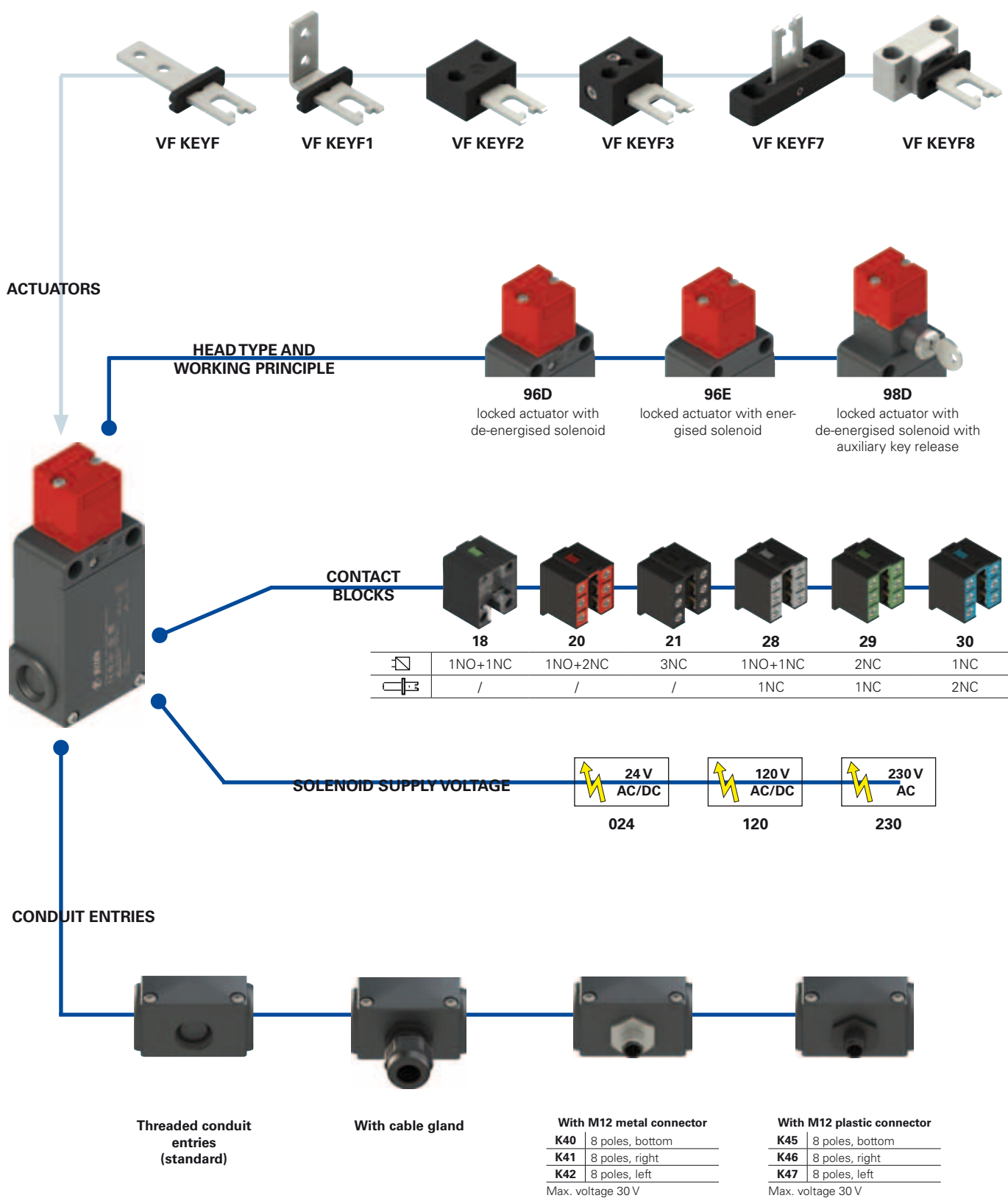
The switch is equipped with three cable entries in different directions. This allows its application in series connections or in narrow places.

Gold-plated contacts



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

Selection diagram



● product option
 → accessory sold separately

**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-F1GM2K40

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 working 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

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K40	M12 metal connector, 8 poles
...
K45	M12 plastic connector, 8 poles
...

Please contact our technical service for the complete list of possible combinations.

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

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



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 orientable auxiliary release device or key release
- Versions with energised or de-energised solenoid

Markings and quality marks:



IMQ approval:	CA02.00792
UL approval:	E131787
CCC approval:	2007010305230011
EAC approval:	RU C-IT DM94.B.01024

Technical data

Housing

Housing made of glass fiber 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 having equal or higher protection degree

General data

For safety applications up to:	SIL 3 acc. to EN 62061 PL e acc. to EN ISO 13849-1 type 2 acc. to EN ISO 14119 Low acc. to EN ISO 14119
Interlock with mechanical lock, coded:	
Coding level:	
Safety parameters:	
B_{10d} :	4,000,000 for NC contacts
Service life:	20 years
Ambient temperature:	-25°C ... +60°C
Max. actuation frequency:	600 operating cycles ¹ /hour
Mechanical endurance:	800,000 operating cycles ¹
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Maximum force before breakage F_{Tmax} :	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 play of locked actuator:	4.5 mm
Released actuator extraction force:	30 N
Tightening torques for installation:	see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 28, 29, 30:	min.	1 x 0,34 mm ²	(1 x AWG 22)
	max.	2 x 1,5 mm ²	(2 x AWG 16)
Contact block 18:	min.	1 x 0,5 mm ²	(1 x AWG 20)
	max.	2 x 2,5 mm ²	(2 x AWG 14)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, EN 61000-6-2, EN 61000-6-3, BG-GS-ET-15, UL 508, CSA 22.2 N. 14.

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 N. 14, GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

Positive contact opening in conformity with standards:

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

Solenoid

Duty cycle:	100% ED
Solenoid inrush:	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
Medium total 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 solenoid power. Please consider the inrush solenoid power in order to avoid intervention of overload-protection in case of electronic power supply.

⚠ If not expressly indicated in this chapter, for correct installation and utilization of all articles see chapter utilization requirements from page 297 to page 308.

**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, 28, 29, 30)	U _e (V)	250	400	500
	Rated impulse withstand voltage (U _{imp}):	6 kV 4 kV (contact blocks 20, 21, 28, 29, 30)	I _e (A)	6	4	1
	Conditional short circuit current:	1000 A acc. to EN 60947-5-1	Direct current: DC13			
	Protection against short circuits:	type aM fuse 10 A 500 V	U _e (V)	24	125	250
Pollution degree:	3	I _e (A)	6	1.1	0.4	

with M12 connector 8 poles	Thermal current (I _{th}):	2 A	Alternating current: AC15 (50÷60 Hz)		
	Rated insulation voltage (U _i):	30 Vac 36 Vdc	U _e (V)	24	
	Protection against short circuits:	type gG fuse 2 A 500 V	I _e (A)	2	
	Pollution degree:	3	Direct current: DC13		
			U _e (V)	24	
		I _e (A)	2		

Characteristics approved by IMQ

Rated insulation voltage (U_i): 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: IP66

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 of contacts on contact blocks 18, 20, 21, 28, 29, 30

In conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

Characteristics approved by UL

Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)

Data of housing type 1, 4X "indoor use only", 12, 13

For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).

In conformity with standard: UL 508, CSA 22.2 N. 14

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

Working principle

The working principle of these safety switches allows three different working states:

state A: with inserted and locked actuator

state B: with inserted actuator, not locked

state C: with extracted actuator

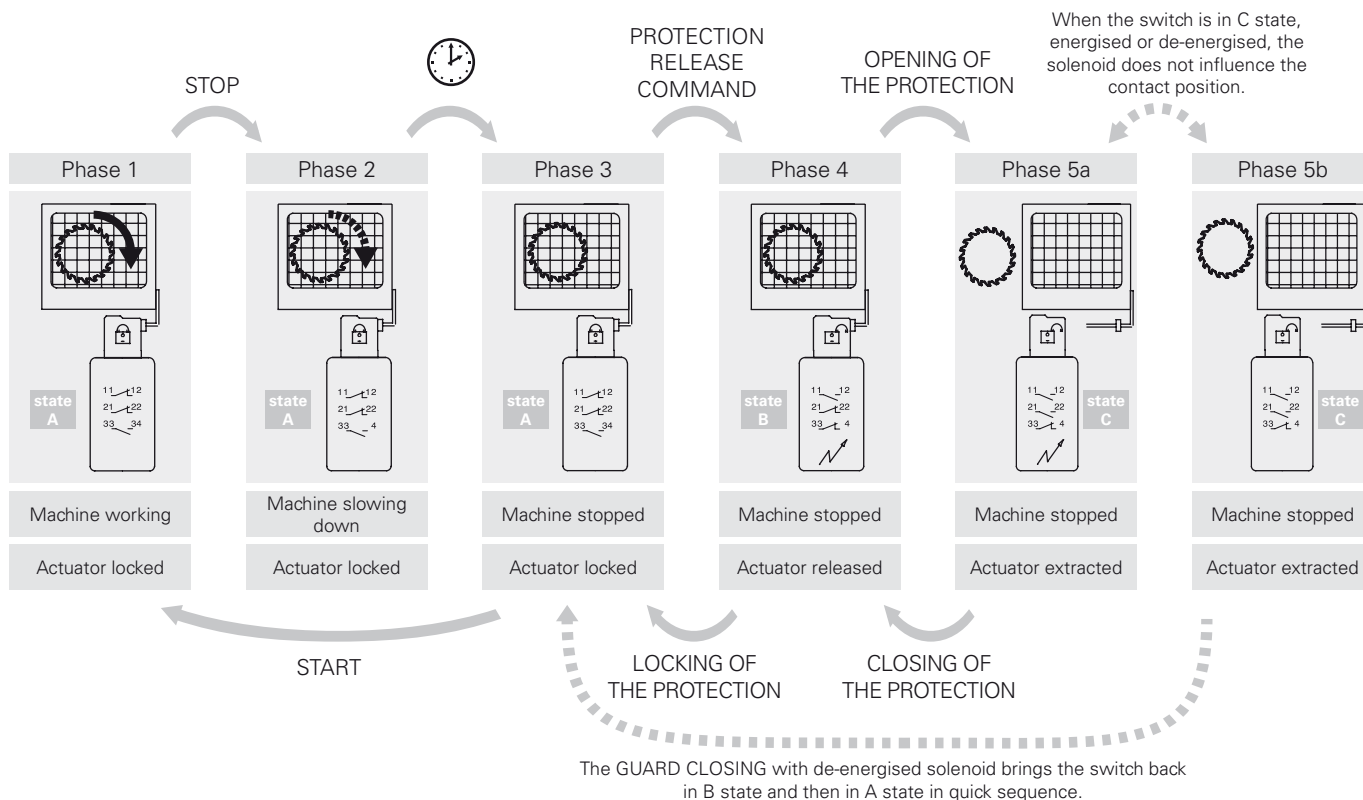
All or some of these states may be controlled through the positive opening contacts of the internal contact block. In detail, contact blocks that have electric contacts marked with the symbol of the solenoid (☐) are switched in the transition between the state A and state B, while the electric contacts marked with the symbol of the actuator (☐) are switched between state B and state C:

It is also possible to choose between two working principles for the actuator locking:

- **Working principle D:** Actuator locked with de-energised solenoid. Actuator release is obtained by power supply to the solenoid (see example of working cycle steps).

- **Working principle E:** Actuator locked with energised solenoid. The release of the actuator is obtained by power-off to the solenoid. It is advisable to use this version under special conditions because a blackout will allow the immediate opening of the protection.

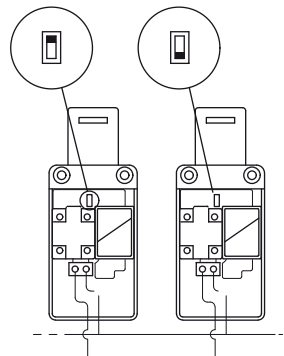
Example of working cycle steps with FS 2896D024-F1 (switch with working principle D)



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 results of the solenoid inrush current on the power supply and has to be executed only if necessary and with special care.
- Switch off the power supply.
- Open the switch cover.
- Remove the black plastic protection that covers the solenoid by unscrewing the two screws which fix the protection to the switch body.
- Move the dip-switch with a tool so that each switch has a different combination (see figure beside). If more than two switches are installed, repeat the combinations for any next set of two switches.
- Reposition the black plastic protection and tighten the two screws with a torque of 0.8 Nm.





Contact positions related to switch states

Operating state	Working principle D locked actuator with de-energised solenoid			Working principle E locked actuator with energised solenoid		
	state A	state B	state C	state A	state B	state C
	Inserted and locked	Inserted and released	Extracted	Inserted and locked	Inserted and released	Extracted
Actuator						
Solenoid	De-energised	Energised	-	Energised	De-energised	-
FS 18 1NC+1NO controlled by the solenoid						
FS 20 2NC+1NO controlled by the solenoid						
FS 21 3NC controlled by the solenoid						
FS 28 1NO+1NC controlled by the solenoid 1NC controlled by the actuator						
FS 29 2NC controlled by the solenoid 1NC controlled by the actuator						
FS 30 1NC controlled by the solenoid 2NC controlled by the actuator						

Utilization limits

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 the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific 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 this case the entry locking device VF KB1 shown on page 115 must be used.

Dimensional drawings

All measures in the drawings are in mm

Contact type:
L = slow action

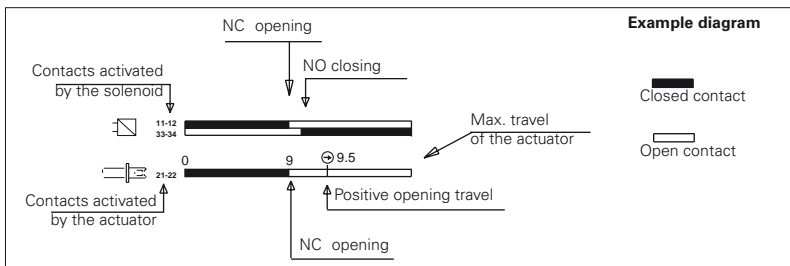
Contact blocks

	Working principle D, supplied with sealable auxiliary release device and without actuator	Working principle E, and without actuator	Working principle D, supplied with auxiliary key release and without actuator
18			
20			
21			
28			
29			
30			
Min. 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 in accordance with EN ISO 14119

How to read travel diagrams

All measures in the diagrams are in mm



IMPORTANT:

NC contact has to be considered with inserted actuator and lock. In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol ⊕. Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.

Accessories

Article	Description
VF KB1	Actuator entry locking device
	Padlockable device to lock the actuator entry in order to prevent from the accidental closing of the door behind operators while they are inside the machine. 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.

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

Accessories See page 287

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

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. They can also be used when it is necessary to control machine guards allowing the opening of protections only under specific conditions.



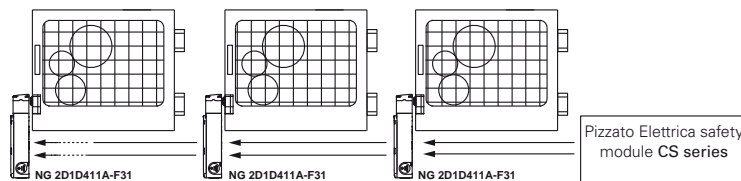
The mode 1 (active safety outputs with closed and locked guard) versions are considered interlocks with locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.

Connection of several switches in series

PL e+ SIL 3 One of the most relevant features of the NG line is the optional connection in series of several switches, up to a maximum number of 32 devices, while maintaining the maximum PL e safety level prescribed by the EN 13849-1 standard and the SIL 3 safety level according to the EN 62061 standard.

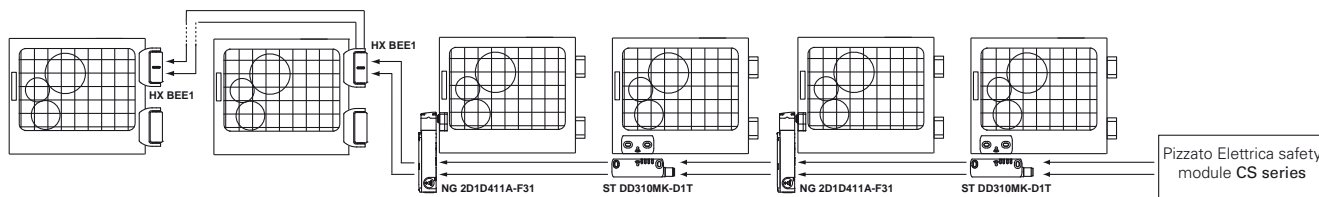
This connection method is permitted in safety systems which, at the end of the chain, feature a safety module evaluating the outputs of last NG switch.

The fact that the PL e safety level can be maintained even with 32 devices connected in series indicates the presence of an extremely safe structure inside each individual device.



Series connection with other devices

PL e+ SIL 3 The NG series features two safe inputs and two safe 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 the creation of circuits with connections in series, including stainless steel safety hinges (HX BEE1 series), transponder sensors (ST series) and door lock sensors (NG series), while maintaining maximum PL e and SIL 3 safety levels.



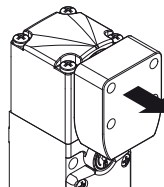
RFID actuators with high coding level



The NG series features an electronic system based on RFID technology to detect the actuator. This system gives a different coding to each actuator and makes it impossible to tamper with a device by using another actuator belonging to the same series. The actuators may have millions of different coding combinations, and are therefore classified as actuators with a high coding level, according to ISO 14119.

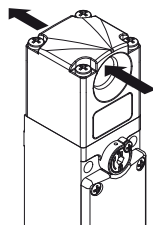
The NG series features an electronic system based on RFID technology to detect the actuator. This system gives a different coding to each actuator and makes it impossible to tamper with a device by using another actuator belonging to the same series. The actuators may have millions of different coding combinations, and are therefore classified as actuators with a high coding level, according to ISO 14119.

Holding force of the locked actuator



7500 N The sturdy interlocking system guarantees the actuator a maximum holding force F_{Zn} of 7500 N which corresponds to a breaking force F_{1max} of 9750 N. This is one of the highest values available on the market today, making this device suitable for severe heavy-duty applications.

Dustproof



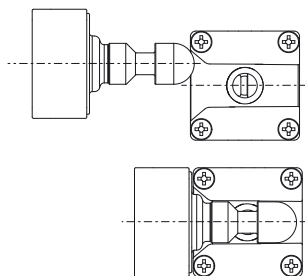
The switch is provided with a through hole for inserting the actuator and, thanks to this peculiarity, any dust which may go inside the actuator hole can always come out of the opposite side instead of being left there. Moreover, the lock pin is provided with an external diaphragm gasket which makes it suitable for any environment where dust is present.

High protection degree

**IP69K
IP67**

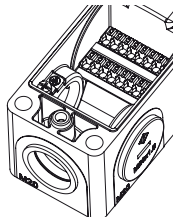
These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529. They can therefore be used in all environments where the maximum protection of the housing is required. Special measures also allow devices to be used even in machines which are subjected to washing with high pressure warm water jets. In fact these devices pass the IP69K test according to ISO 20653, using jets of water to 100 atmospheres at a temperature of 80°C.

Centering



The switch is provided with a wide centering inlet for the actuator pin. Such solution makes it easier to align the actuator with the hole found in the head during the fitting stage. Moreover, this solution drastically reduces any probable collisions between the actuator and the switch, also allowing it to be fitted on inaccurate doors.

Push-in spring connections



The switch is provided with a PUSH-IN type spring connection system on the inside. This technology allows a very handy quick wiring procedure, since the wire just needs to be inserted into the appropriate hole in order to be secured and to establish the electrical connection. The said operation can be carried out without the help of any tool, but simply using rigid or flexible wires with wire-end sleeves. Release is obtained by pressing the appropriate wire-releasing button.

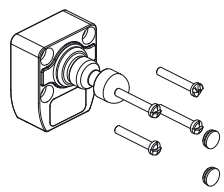


Six LEDs for immediate diagnosis



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 safe chain, which device is released, which door is opened and any errors inside the device. All that in a straightforward way without needing to decode complex blinking sequences.

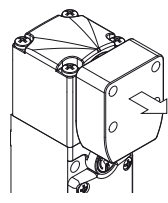
Double anti-tampering safety



Each NG series actuator is supplied with four stainless steel tamper-proof screws, for it to be fitted on the protection. Four protection insert caps are also supplied together with the screws. Besides preventing any deposit from building up and making it easy to clean the actuator, these caps help to prevent any tampering as they obstruct access to the tamper-proof screws.

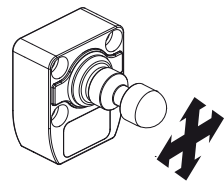
as they obstruct access to the tamper-proof screws.

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 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.

Articulated joint for inaccurate doors



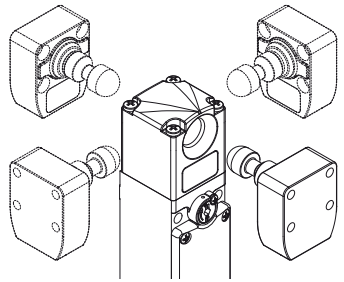
All the NG series actuators are jointed and allow the pin to match the centering hole of the switch. This way there is no need for precise actuator-switch aligning operations during the fitting stage. Moreover, thanks to its flexibility, this device can be used on doors with an activating range up to 150 mm, without having to tilt the pin beforehand.

Laser engraving



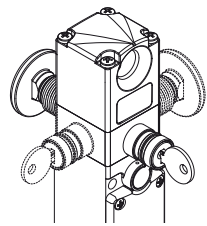
All the NG series switches are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Orientable heads and devices



The head can be quickly oriented in four different directions after unscrewing the 4 fixing screws. Also the key release device and the emergency release button can be positioned in 90° steps, thus obtaining as many as 16 different configurations with the same article.

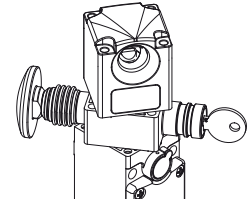
Key release device and emergency release button



The auxiliary lock release device is used to permit unlocking of the actuator only by personnel in possession of the key. It also works with no power supply and once actuated, prevents the guard from locking. The emergency release button allows actuator release and immediate opening of the door. 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 black out. Equipped with bistable function, it can be freely extended with suitable extensions (see accessories). Both these devices can be positioned on the four switch sides, thus allowing its installation both to the interior and to the exterior of the machine.

Not detachable head and devices



The head and the release device can be adjusted but cannot be detached from each other. This makes the switch more secure since the installer does not need to worry about how to assemble the various pieces, and the switch is less likely to become damaged (small parts being lost, dirt getting in etc.).

Two safety output actuation modes

**CLOSED
OR
CLOSED & LOCK**

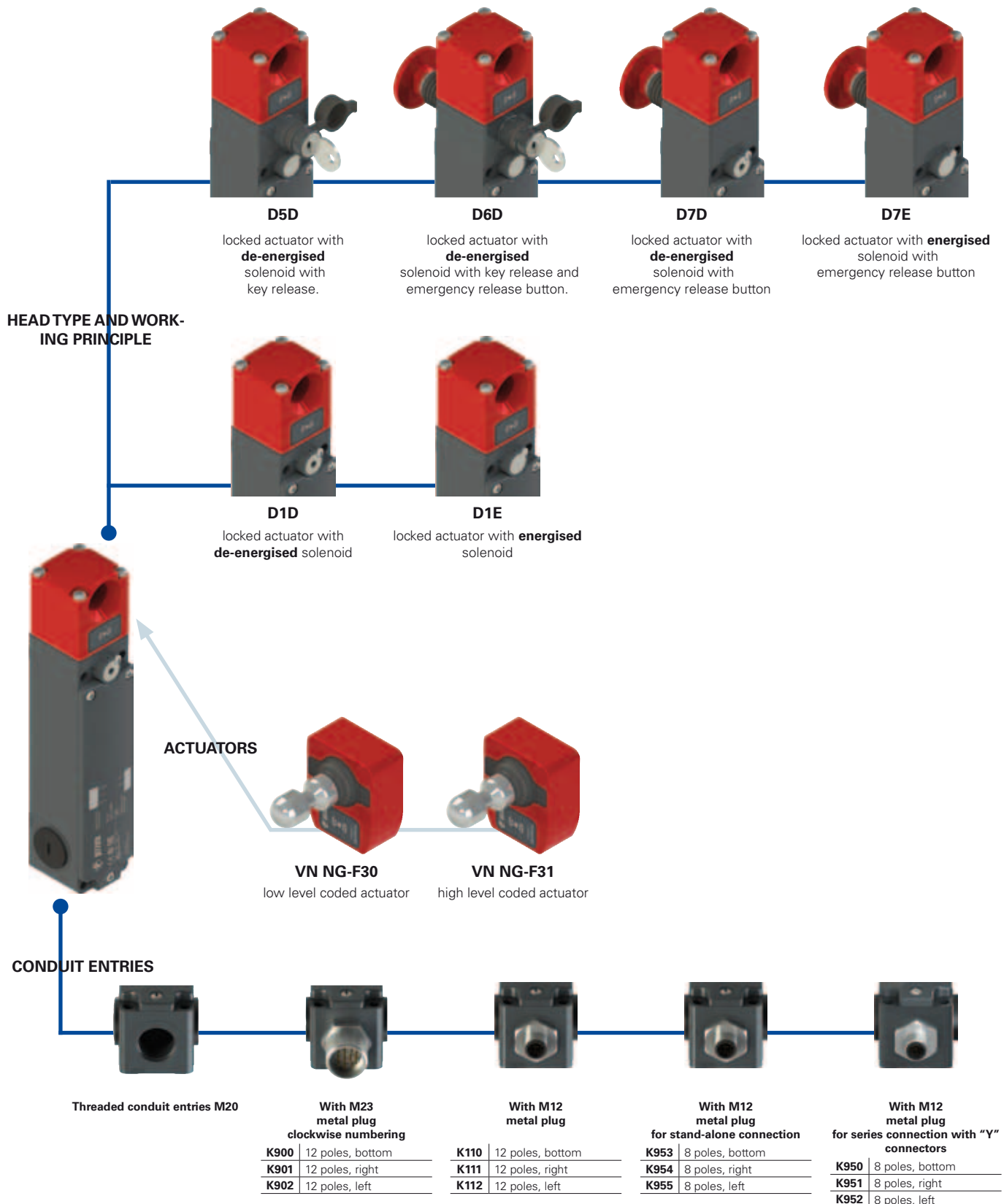
The switch can be selected from two different safety output activation modes: safety outputs active with protection closed and locked (mode 1) for machines with inertia or safety outputs active with protection closed (mode 2) for machines without inertia.

External device monitoring

EDM

On request we can supply the device with EDM (External Device Monitoring) function, so that the device itself can check the integrity of the relays connected to the safety outputs. These safety relays or safety contactors send a feedback signal to the EDM input, which verifies the consistency of the received signal with the safety outputs state.

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

NG 2D1D411A-F31E34K900LP30

Working 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 emergency release button
D7D	locked actuator with de-energised solenoid. With emergency release button
D7E	locked actuator with energised solenoid. With emergency release button

Release button length	
	for wall thickness max. 15 mm (standard)
LP30	for wall thickness max. 30 mm
LP40	for wall thickness max. 40 mm
LP50	for wall thickness max. 50 mm
LP60	for wall thickness max. 60 mm
...	Other wall thicknesses on request

Inputs and outputs	
3	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: closed protection 1 signalling output O4: locked protection 1 solenoid activation input I4
4	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: closed protection 1 signalling output O4: locked protection 1 solenoid activation input I4 1 programming input I3
5	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: closed protection 1 signalling output O4: locked protection 1 solenoid activation input I4 1 programming input I3 1 EDM input I5
6	2 safety inputs IS1, IS2 2 safety outputs OS1, OS2 1 signalling output O3: closed protection 1 signalling output FAULT O4 1 solenoid activation input I4 1 programming input I3

Preinstalled connectors	
	without connector (standard)
K110	M12 metal connector, 12 poles, bottom
K900	M23 metal connector, 12 poles, bottom
K953	M12 metal connector, 8 poles, bottom, for stand-alone connection
K950	M12 metal connector, 8 poles, bottom, for series connection
...	other connectors on request

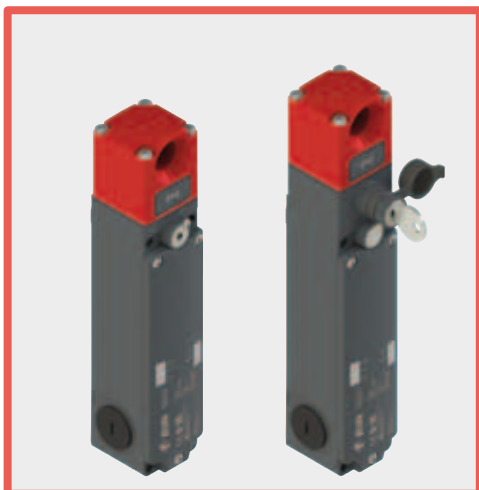
Actuator extraction force	
	actuator extraction force 30 N (standard)
E34	actuator freely removable

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 actuator

Activation of OS outputs	
1	mode 1: OS safety outputs active with locked protection
2	mode 2: OS safety outputs active with closed protection

Actuator code structure**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 actuator



Main features

- Actuation without contact, using RFID technology
- Digitally coded actuator
- Actuator holding force 7500 N
- SIL 3 and PL e with a single device
- Metal housing, three conduit entries M20
- Protection degrees IP67 and IP69K
- Versions with key release and emergency release button
- PL e also in series of up to 32 devices
- Signalling LED

Markings and quality marks:



UL approval: E131787
 TÜV SÜD approval: Z10 15 01 75157 005
 EAC approval: RU C-IT ДМ94.В.01024

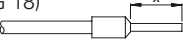
In conformity with standards:

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, ETSI 301 489-1, ETSI 301 489-3, ETSI 300 330-2, UL 508, CSA 22.2 No.14

In conformity with the requirements of:

Machinery Directive 2006/42/EC
 EMC Directive 2004/108/EC
 R&TTE Directive 1999/05/EC
 FCC Part 15

Connection terminals

Connection system: PUSH-IN spring type
 Cross-section of rigid wires and flexible wires with 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

Technical data

Housing

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
 with cable gland having equal or higher protection degree

General data

SIL level (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 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

Safety parameters:

MTTF_d: 1883 years
 PFH_d: 8.07 E-10
 DC: High
 Ambient temperature: -20°C ... +50°C
 Max. actuation frequency: 600 operating cycles¹/hour
 with actuator lock and release: 1 million operating cycles¹
 Mechanical endurance: 0.5 m/s
 Max. actuation speed: 1 mm/s
 Min. actuation speed: 9750 N acc. to EN ISO 14119
 Maximum force before breakage F_{1max}: 7500 N acc. to EN ISO 14119
 Max. holding force F_{zh}: 4 mm
 Maximum play of locked actuator: 30 N
 Released actuator extraction force:

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

Electrical data of inputs IS1/IS2/I3/I4/I5/EDM

Rated operating voltage U_{e1}: 24 Vdc
 Rated current consumption: 5 mA

Electrical data of safety outputs OS1/OS2

Rated operating voltage U_{e1}: 24 Vdc
 Output type: OSSD, PNP
 Maximum current per output I_{e1}: 0.25 A
 Minimum current per output I_{e1}: 0.5 mA
 Utilization category: DC13; U_e=24 Vdc, I_e=0,25 A
 Short circuit detection: Yes
 Protection against overcurrent: Yes
 Internal self-resetting protection fuse: 1.1 A
 Duration of the deactivation impulse 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 signalling output O3/O4

Rated operating voltage U_{e1}: 24 Vdc
 Output type: PNP
 Maximum current per output I_{e1}: 0.1 A
 Utilization category: DC12; U_e=24 Vdc, I_e=0,1 A
 Short circuit detection: No
 Protection against overcurrent: Yes
 Internal self-resetting protection fuse: 1.1 A

RFID sensor data

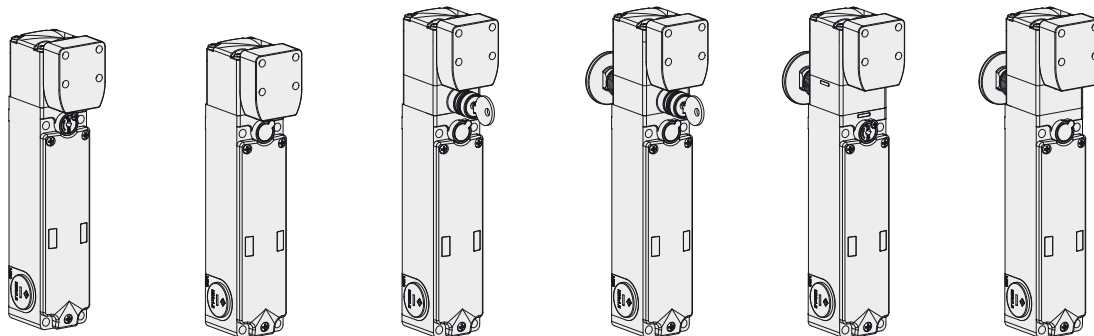
Assured operating distance S_{ao}: 2 mm
 Assured release distance S_{ar}: 4 mm (actuator not locked)
 10 mm (locked actuator)
 Rated operating distance S_n: 2.5 mm
 Repeat accuracy: ≤ 10 % S_n
 Differential travel: ≤ 20 % S_n
 Max. switching frequency: 1 Hz

Electrical data

Rated operating voltage U_e: 24 Vdc ±10% SELV
 Operating current at voltage U_e:
 - minimum: 40 mA
 - with activated solenoid: 0.4 A
 - with activated solenoid and all outputs at maximum power: 1.2 A
 Rated insulation voltage U_i: 32 Vdc
 Thermal current I_{th}: 0.25 A
 Rated impulse withstand voltage U_{imp}: 1.5 kV
 External protection fuse: 1.5 A type F
 Overvoltage category: III
 Electrical endurance: 1 million operating cycles
 Solenoid duty cycle: 100% ED
 Solenoid consumption: 9 W



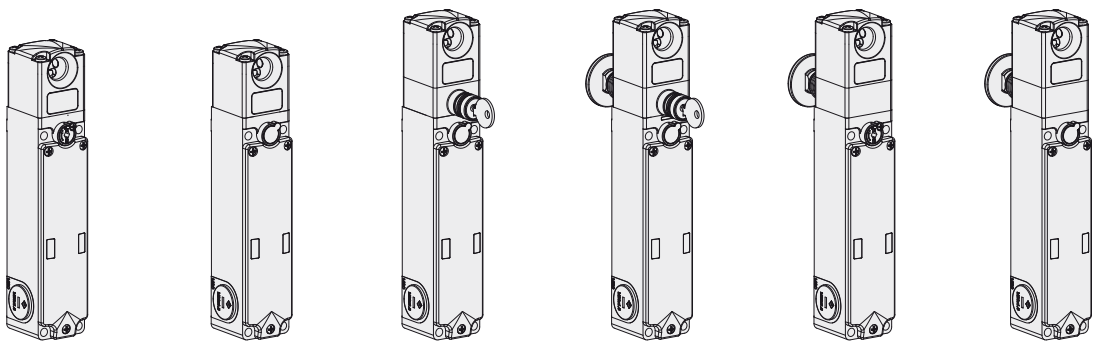
Selection table for switches with actuators



	Working principle D, with sealable auxiliary release device	Working principle E	Working principle D, with key release	Working principle D, with key release and emergency release button	Working principle D, with emergency release button and sealable auxiliary release device	Working principle E, with emergency release button	
Mode 1	OS safety outputs active with locked and closed protection	NG 2D1D411A-F3•	NG 2D1E411A-F3•	NG 2D5D411A-F3•	NG 2D6D411A-F3•	NG 2D7D411A-F3•	NG 2D7E411A-F3•
Mode 2	OS safety outputs active with closed protection	NG 2D1D421A-F3•	NG 2D1E421A-F3•	NG 2D5D421A-F3•	NG 2D6D421A-F3•	NG 2D7D421A-F3•	NG 2D7E421A-F3•

To purchase a product with EDM input replace number 4 with number 5 in the codes shown above. Example: NG 2D1D411A-F3• → NG 2D1D511A-F3•

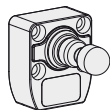
Switch selection table



	Working principle D, with sealable auxiliary release device	Working principle E	Working principle D, with key release	Working principle D, supplied with key release and emergency release button	Working principle D, with emergency release button and sealable auxiliary release device	Working principle E, with emergency release button	
Mode 1	OS safety outputs active with locked and closed protection	NG 2D1D411A	NG 2D1E411A	NG 2D5D411A	NG 2D6D411A	NG 2D7D411A	NG 2D7E411A
Mode 2	OS safety outputs active with closed protection	NG 2D1D421A	NG 2D1E421A	NG 2D5D421A	NG 2D6D421A	NG 2D7D421A	NG 2D7E421A

To purchase a product with EDM input replace number 4 with number 5 in the codes shown above. Example: NG 2D1D411A → NG 2D1D511A **Legend:** interlock with lock monitoring in accordance with EN ISO 14119

Actuator selection table



Type of coding	Level of coding acc. to EN ISO 14119	Article
encoded unequivocally	low	VN NG-F30
encoded	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.

Characteristics approved by UL

Utilization categories: 24 Vdc, 0.25 A (resistive load).

Inputs supplied by remote class 2 source or limited voltage and limited energy.

In conformity with standard: UL 508, CSA 22.2 No.14

Characteristics 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

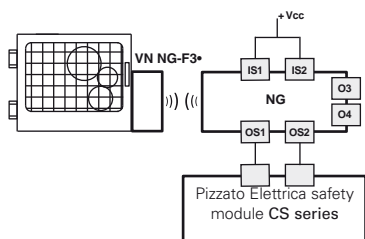
In conformity with standards: 2006/42/EC, EN 60947-1/A1:2011, EN 60947-5-2/A1:2012, EN 60947-5-3:2013, EN 14119:2013, EN 61508-1:2010 (SIL 3), EN 61508-2:2010 (SIL 3), EN 61508-3:2010 (SIL 3), EN 61508-4:2010 (SIL 3), EN 62061/A1:2013 (SIL CL 3), EN ISO 13489-1:2008 (PL e, Cat 4).

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

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

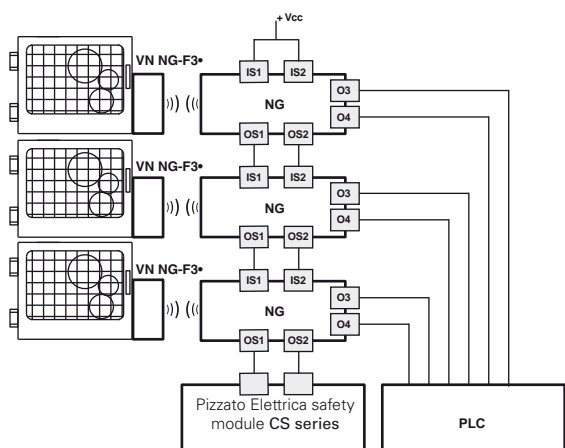
Complete safety system

The use of complete tested solutions means that the customer can be certain of the electrical compatibility between the NG series switch and Pizzato Elettrica safety modules, thus ensuring greater reliability. In fact, these sensors have been tested for operation with the modules specified in the table shown on the side.

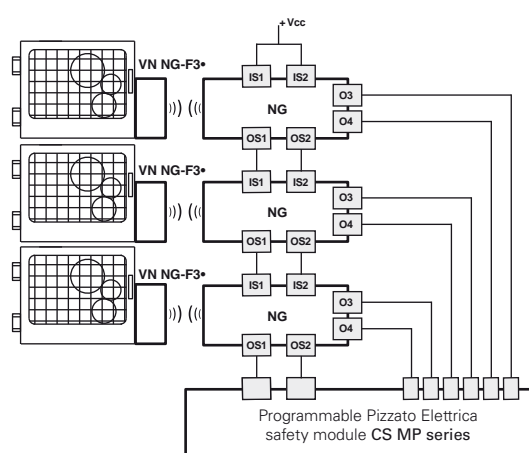


Switches	Compatible safety modules	Safety module output contacts		
		Instantaneous safety contacts	Delayed safety contacts	Signalling contacts
NG 2•••••1A	CS AR-05•••••	3NO	/	1NC
	CS AR-06•••••	3NO	/	1NC
	CS AR-08•••••	2NO	/	/
	CS AT-0•••••	2NO	2NO	1NC
	CS AT-1•••••	3NO	2NO	/
	CS MP•••••		see page 243	
	CS MF•••••		see page 271	

The NG series switch can be used individually, prior evaluation of the safe outputs by means of a Pizzato Elettrica safety module (see table for safety modules to be combined).



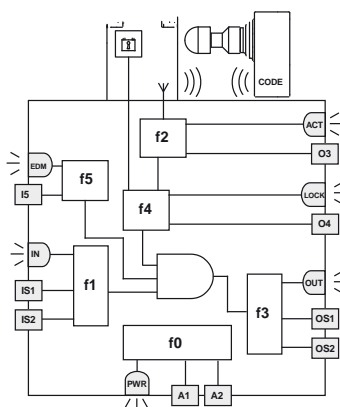
Possible connection in series of several switches in order to simplify the safety system wiring, after evaluating the outputs from the last switch in the chain by means of a Pizzato Elettrica safety module (table for safety modules to be combined). Each NG series switch is provided with two signalling outputs which are activated when the guard is closed (O3) or locked (O4). This piece of information can be managed by a PLC, depending on the specific requirements of the system installed.



Possible connection in series of several switches in order to simplify the safety system wiring, after evaluating the outputs from the last switch in the chain by means of a safety module from Pizzato Elettrica CS MP series, which allows management of both safety and signalling functions.

The examples listed above refer to applications with NG 2•••••4•1A.

Internal diagram



The diagram on the side represents the 6 logic functions which interact inside the device.

Function f0 is a global function which deals with the device power supply and the internal tests which it cyclically undergoes. The task of function f1 is to evaluate the status of the device inputs, whereas function f2 checks the presence of the actuator inside the switch operating areas.

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.

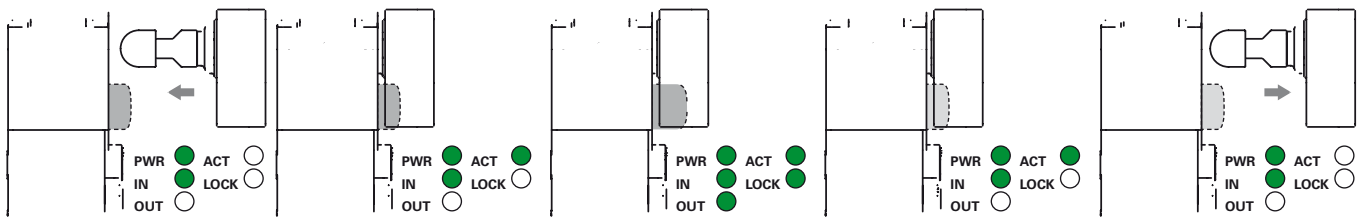
In the EDM versions, the f5 function verifies the consistency of the EDM signal during safety output state changes.

The macro-function, which controls the above mentioned functions, enables the safety outputs only in the presence of active inputs, of the actuator within the safe zone, and where locking of the actuator has taken place, for mode 2 switches, for mode 1 switches, the safety outputs enable only in the presence of active inputs and with the actuator within the safe zone. 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.

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 (NG 2D•••5•1A)



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 on the outside of the activation zone (LED ACT off).

When the actuator is brought inside the safe activation area (dark grey area), the switch turns on the ACT LED (green). In this position, the O3 door-closed signalling output 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 safe outputs are enabled (OUT LED on, green). The O4 signalling output is activated at the same time. The safe activation 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 activation area returns to the initial values.

When the actuator leaves the activation limit area, the device turns off the ACT LED and the O3 signalling output.

Actuation sequence in mode 2

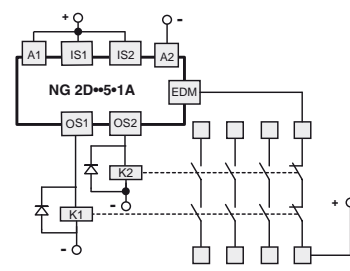
In contrast to the above mode 2 description, the safety outputs OS1 and OS2 enable when the actuator is detected, and disable when the actuator is no longer detectable.

Operating states

PWR LED	IN LED	OUT LED	ACT LED	LOCK LED	EDM LED (a)	Device status	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	State of the safety inputs not coherent. 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.
●	*	●	*	*	*	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 for physical integrity of the device, if faulty 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 fault persists, replace the device.
●	*	○	*	*	●	RUN	EDM signal active (external relay off) ^a
●	●	●	●	●	○	RUN	EDM signal not active (external relay on) ^a
●	○	○	○	○	●	ERROR	Error in function EDM ^a

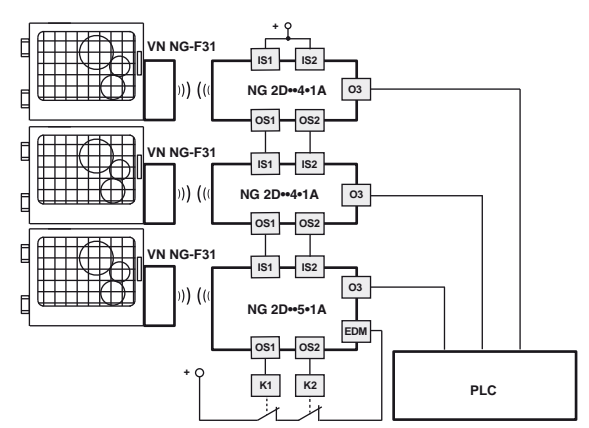
Legend: ○ = off ● = on ● = blinking ● = alternating colours * = indifferent (a) Available only in versions NG 2D••5•1A

External device monitoring (EDM)



The NG 2D••5•1A 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 235. 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 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.

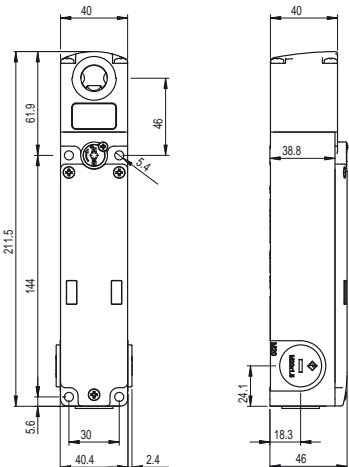
This solution allows you to dispense with the safety module connected to the last device in the chain.

Dimensional drawings

All measures in the drawings are in mm

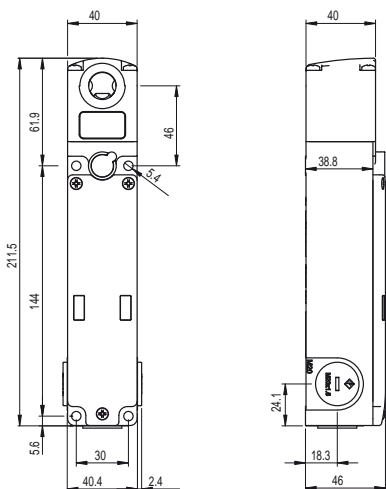
Switch NG 2D1D••1A

Working principle D, supplied with sealable auxiliary release device, without actuator



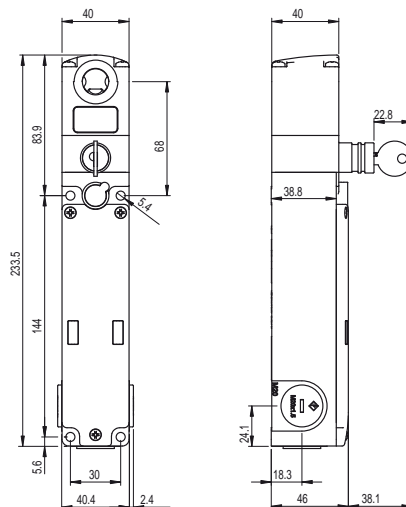
Switch NG 2D1E••1A

Working principle E, without actuator



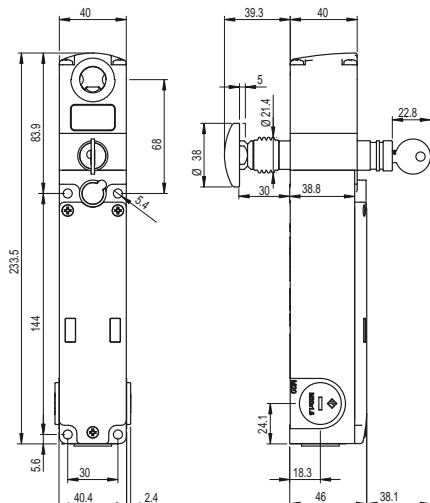
Switch NG 2D5D••1A

Working principle D, with key release, without actuator



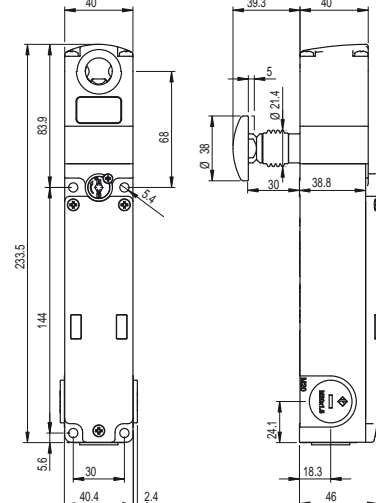
Switch NG 2D6D••1A

Working principle D, with key release, emergency release button, without actuator



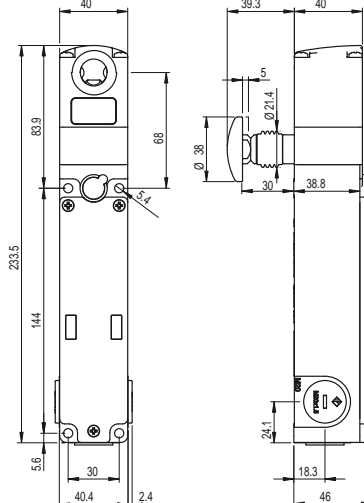
Switch NG 2D7D••1A

Working principle D, with emergency release button, without actuator

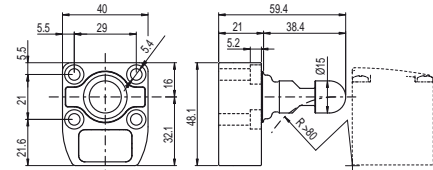


Switch NG 2D7E••1A

Working principle E, with emergency release button, without actuator



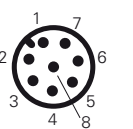
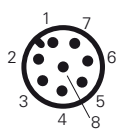
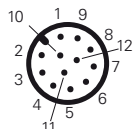
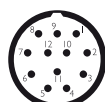
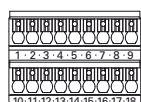
Actuator VN NG-F3•



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

Internal connections

Internal terminal strip	M23 connector 12 poles	M12 connector 12 poles	M12 connector 8 poles stand-alone connection	M12 connector 8 poles series connection with "Y" connectors	Connection
1	3	3	3	3	A2 0 V supply input
2	/	/	/	/	B2 0 V auxiliary supply output
3	10	10	8	8	I4 Solenoid activation input
4	5	5	2	/	O3 Signalling output, actuator inserted
5	9	9	5	5	O4 Signalling output, actuator inserted and locked (b)
6	8	8	6	/	I3 Actuator programming input
10	1	1	1	1	A1 +24 Vdc supply input
11	/	/	/	/	B1 Auxiliary supply output +24 Vdc, 8 A max.
12	2	2	/	2	IS1 Safety input
13	6	6	/	6	IS2 Safety input
14	11	11	/	/	I5 EDM input (a)
15	4	4	4	4	OS1 Safety output
16	7	7	7	7	OS2 Safety output



Important: terminals 7, 8, 9, 17, 18 of the internal terminal strip cannot be used.

(a) Available only in version NG 2D••5•1A.

(b) For NG 2D••6•1A the output signals the device FAULT condition.

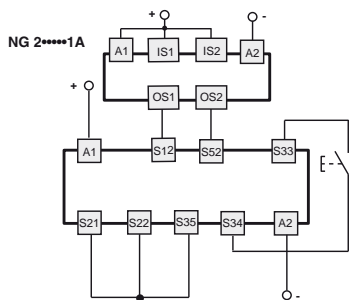
Sockets See page 287



Connection with safety modules

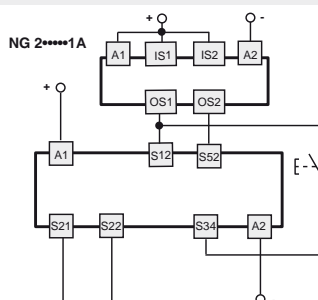
Connection with safety modules
CS AR-08●●●●

Input configuration with monitored start
2 channels / Category 4 / up to SIL 3 / PL e



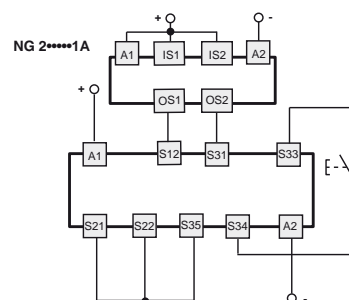
Connection with safety modules
CS AR-05●●●● / CS AR-06●●●●

Input configuration with manual start (CSAR-05●●●●)
or monitored start (CS AR-06●●●●)
2 channels / Category 4 / up to SIL 3 / PL e



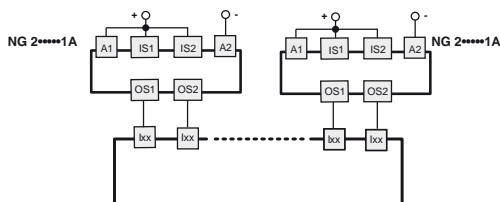
Connection with safety modules
CS AT-0●●●●● / CS AT-1●●●●●

Input configuration with monitored start
2 channels / Category 4 / up to SIL 3 / PL e



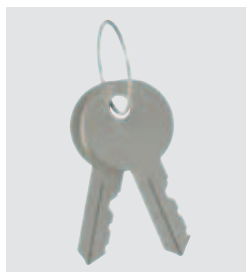
Connection with safety modules CS MF●●●●●, CS MP●●●●●

The connections vary according to the program of the module
Category 4/ up to SIL 3 / PL e



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.

Adhesive labels for emergency release button

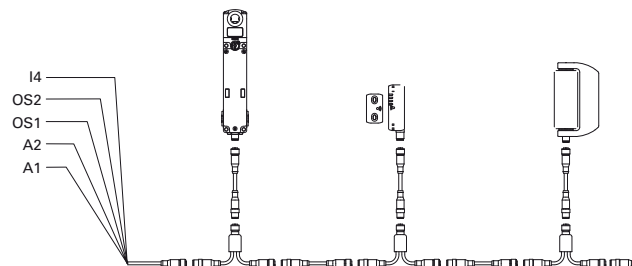


Polycarbonate yellow adhesive, rectangular 300x32 mm, red writing. Applied on the internal part of the jamb it helps finding the emergency release button.

Article	Description
VF AP-A1AGR01	PREMERE PER USCIRE
VF AP-A1AGR02	PUSH TO EXIT
VF AP-A1AGR04	ZUM OFFNEN DRUCKEN
VF AP-A1AGR05	POUSSER POUR SORTIR
VF AP-A1AGR06	PULSAR PARA SALIR
VF AP-A1AGR07	НАЖАТЬ ДЛЯ ВЫХОДА
VF AP-A1AGR08	NACISNAĆ ABY WYJŚĆ
VF AP-A1AGR09	PRESSIÓNAR PARA SAIR

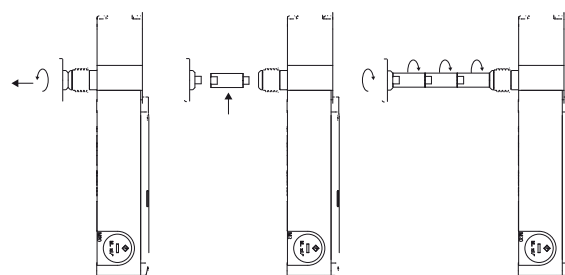
Series connection

To simplify serial connections, a series of M12 connectors are available that allow complete wiring. This solution significantly reduces installation times, whilst maintaining the maximum PL e and SIL 3 safety levels. For further information see page 290.



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	

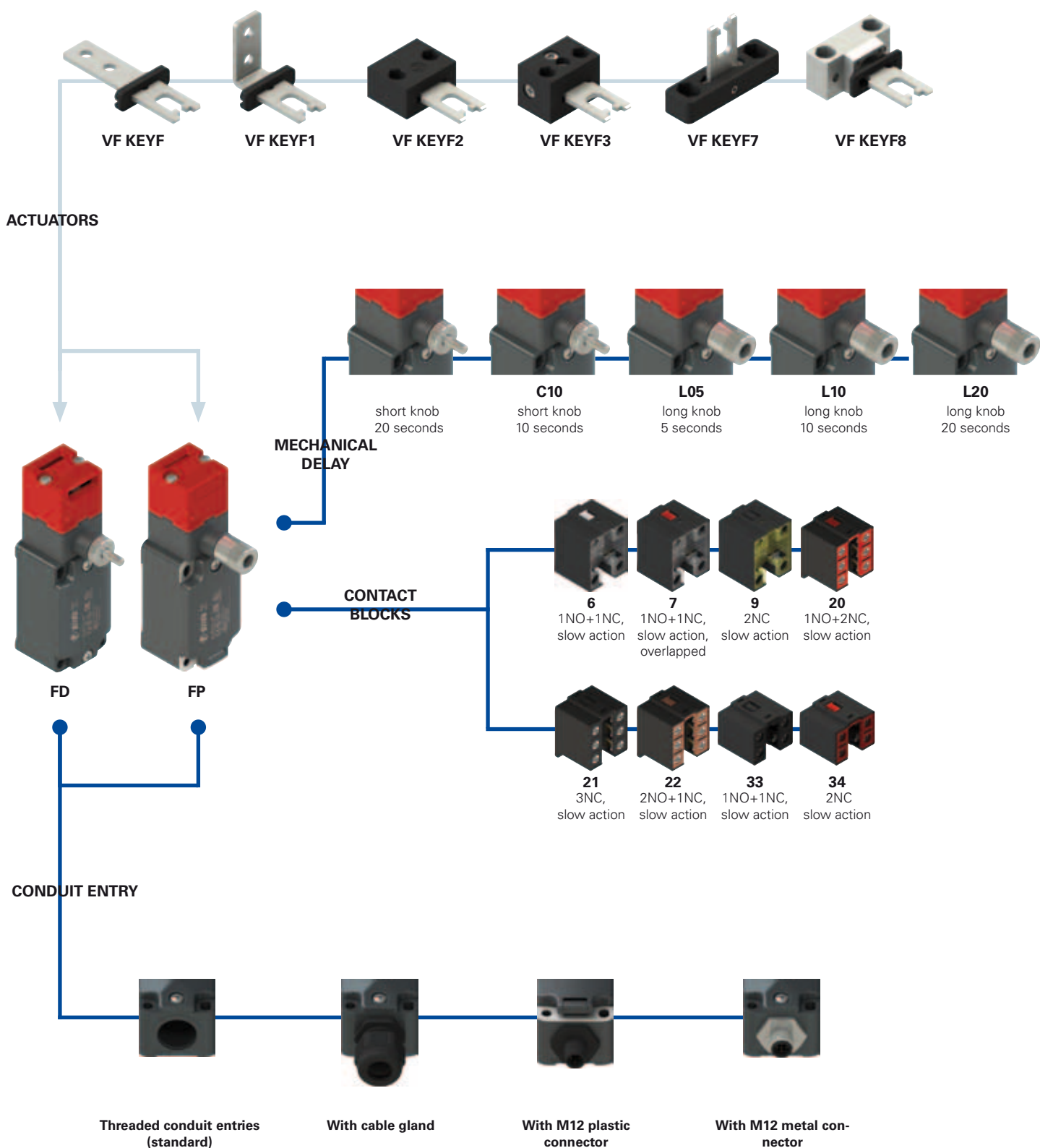


Metal extensions can be combined together until the required length is obtained. Do not exceed an overall length of 500 mm between the release button and the switch.

Items with code on green background are stock items

Accessories See page 287

Selection diagram



● product option
 → accessory sold separately

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

article
options
options

FD 6R2-L10F1GM2K50T6

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

Contact blocks	
6	1NO+1NC, slow action
7	1NO+1NC, slow action, overlapped
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	short knob, 5 s
L10	short knob, 10 s
L20	short 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

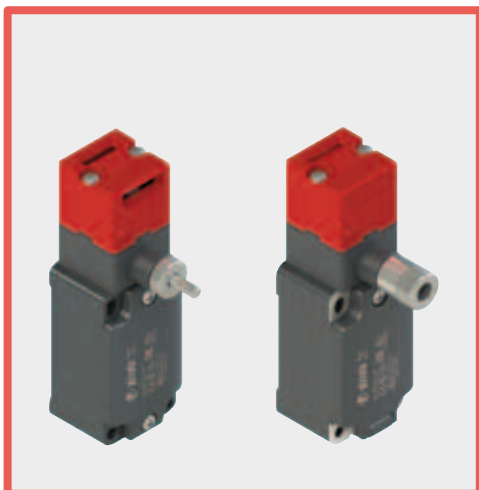
Ambient temperature	
	-25°C ... +80°C (standard)
T6	-40°C ... +80°C

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K50	M12 metal connector, 5 poles
...

Please contact our technical service for the complete list of possible combinations.

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

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



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 unlocking
- Versions with different release delay times

Markings and quality marks:



IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000 (FD series) 2007010305230014 (FP series)
EAC approval:	RU C-IT DM94.B.01024

Technical data

Housing

FP series housing made of glass fiber 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 having equal or higher protection degree

General data

For safety applications up to: SIL 3 acc. to EN 62061
 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
 Service life: 20 years
 Ambient temperature: -25°C ... +80°C
 Version for operation in ambient temperature from -40°C to +80°C on request
 Max. actuation frequency: 360 operating cycles¹/hour
 Mechanical endurance: 500,000 operating cycles¹
 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 according to EN ISO 14119
 Max. backlash of the actuator: 4.5 mm
 Tightening torques for installation: see pages 297-308
 (1) One operation cycle means two movements, one to close and one to open contacts, as defined in EN 60947-5-1.

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 33, 34:	min.	1 x 0.34 mm ²	(1 x AWG 22)
	max.	2 x 1.5 mm ²	(2 x AWG 16)
Contact blocks 6, 7, 9:	min.	1 x 0.5 mm ²	(1 x AWG 20)
	max.	2 x 2.5 mm ²	(2 x AWG 14)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, BG-GS-ET-15, UL 508, CSA 22.2 No.14 .

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 No.14 , GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

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 chapter utilization requirements from page 297 to page 308.

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
	Rated impulse withstand voltage (U _{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)	I _e (A)	6	4	1
	Conditional short circuit current: Protection against short circuits: Pollution degree:	1000 A acc. to EN 60947-5-1 type aM fuse 10 A 500 V 3	Direct current: DC13	U _e (V)	24	125

I_e (A) 6 1.1 0.4

with M12 connector for 4 and 5 poles	Thermal current (I _{th}):	4 A	Alternating current: AC15 (50±60 Hz)			
	Rated insulation voltage (U _i):	250 Vac 300 Vdc	U _e (V)	24	120	250
	Protection against short circuits: Pollution degree:	type gG fuse 4 A 500 V 3	I _e (A)	4	4	4
			Direct current: DC13	U _e (V)	24	125

I_e (A) 4 1.1 0.4

with M12 connector 8 poles	Thermal current (I _{th}):	2 A	Alternating current: AC15 (50±60 Hz)		
	Rated insulation voltage (U _i):	30 Vac 36 Vdc	U _e (V)	24	
	Protection against short circuits: Pollution degree:	type gG fuse 2 A 500 V 3	I _e (A)	2	
			Direct current: DC13	U _e (V)	24

I_e (A) 2



Description

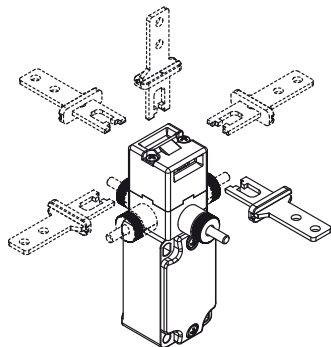


These switches are used on machines where the hazardous conditions remain for a while, even after the machine has been switched off, for example because of mechanical inertia of the pulleys, saw disks, mills. This switch has its ideal application where the guard is not open frequently and the installation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

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



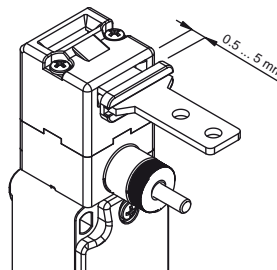
Orientable heads and knobs



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

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

Actuator regulation zone



The head of this switch is equipped with an actuator with a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5mm) without causing unwanted machine shutdowns. This extensive 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 IEC 60529.

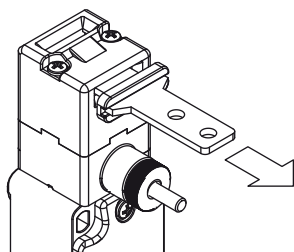
They can therefore be used in all environments where the maximum protection of the housing is required.

Contact blocks



Contact blocks with captive screws, finger protection, twin bridge contacts and double interruption for a higher contact reliability. Available in multiple variants with shifted activation strokes, which can be simultaneous or overlapping, they are suited to a variety of 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.

Extended temperature range

-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.

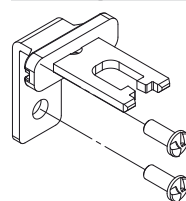
They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Laser engraving



All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

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 with using common tools. See accessories on page 295.

Characteristics 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 (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 (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 of contacts on contact blocks 6, 7, 9, 20, 21, 22, 33, 34

In conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

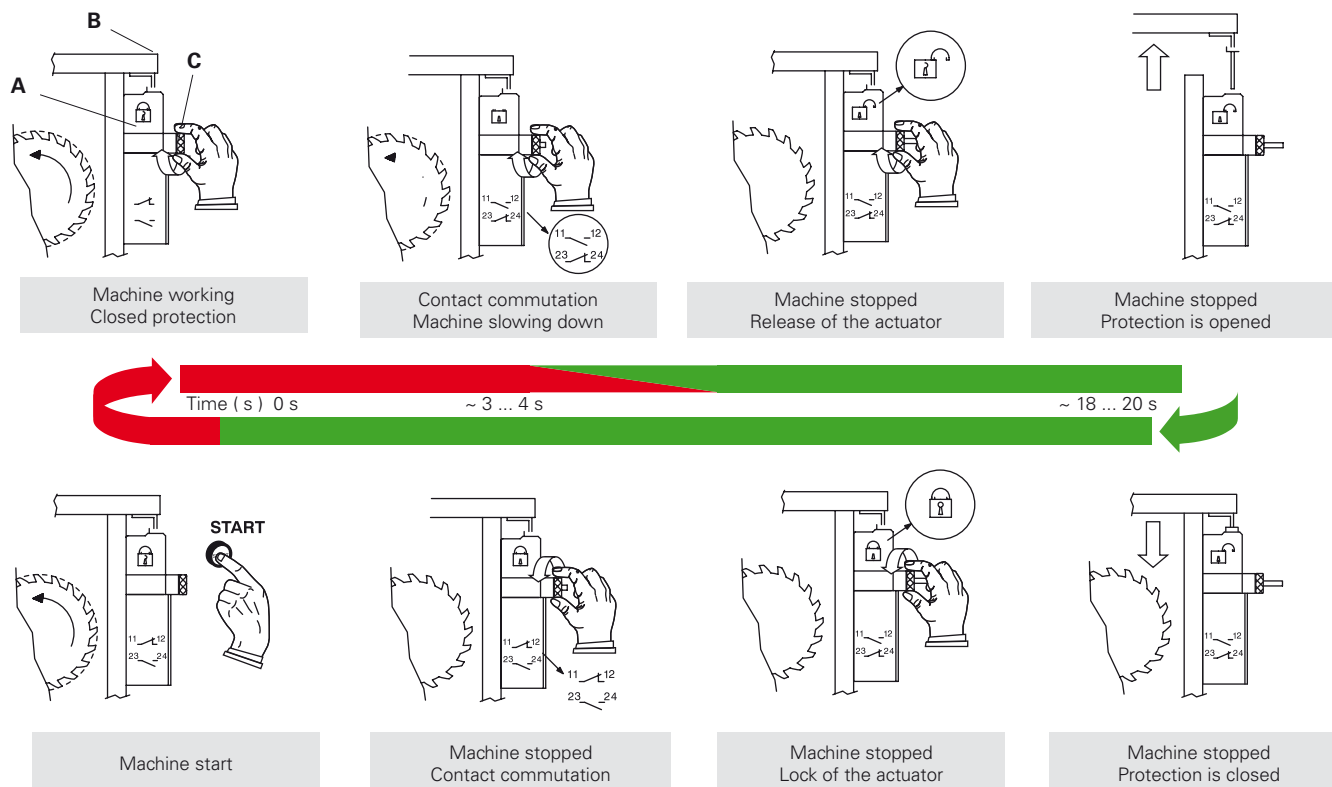
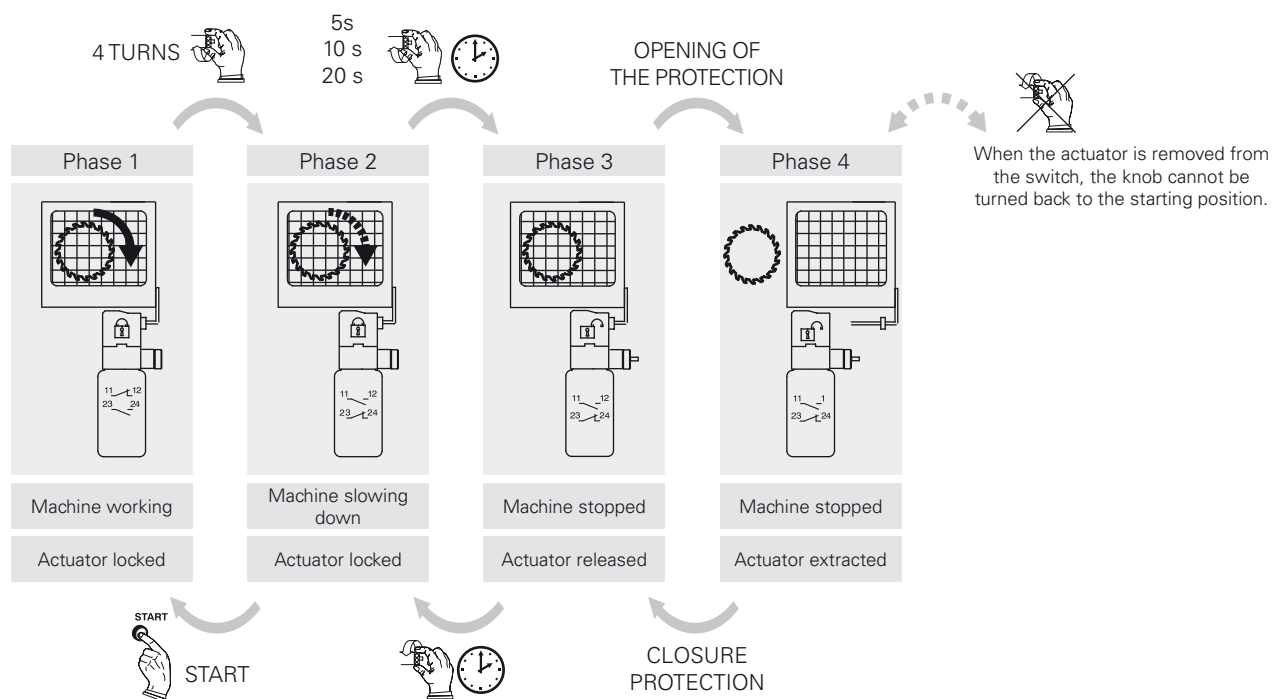
Characteristics approved by UL

Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).
In conformity with standard: UL 508, CSA 22.2 No.14

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

Operation (FP 6R2-M2F1)

The switch is fixed 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 knob 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.

**Working cycle steps (FD 6R2-M2F1)**



Dimensional drawings

All measures in the drawings are in mm

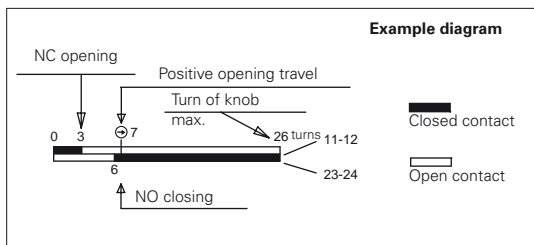
Contact type:	Technopolymer housing		Metal housing		Metal housing	
	Without actuator		Without actuator		Without actuator	
L = slow action LO = slow action overlapped						
Contact blocks						
6 L	FP 6R2-M2 1NO+1NC	FD 6R2-M2 1NO+1NC	FD 6R2-L10M2 1NO+1NC			
7 LO	FP 7R2-M2 1NO+1NC	FD 7R2-M2 1NO+1NC	FD 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			
Min. force	10 N (18 N)	10 N (18 N)	10 N (18 N)			

All measures in the diagrams are in turns of the knob

Legend: With positive opening according to EN 60947-5-1, interlock with lock monitoring in accordance with EN ISO 14119

How to read travel diagrams

All measures in the diagrams are in turns of the knob



IMPORTANT:

NC contact has to be considered with inserted and blocked actuator and with the knob turned anti-clockwise up to the end of the travel. In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol . Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.

Utilization limits

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 the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific 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 this case the entry locking device VF KB1 shown on page 134 must be used.

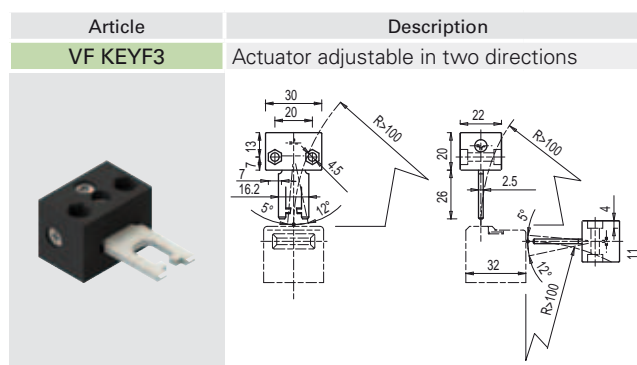
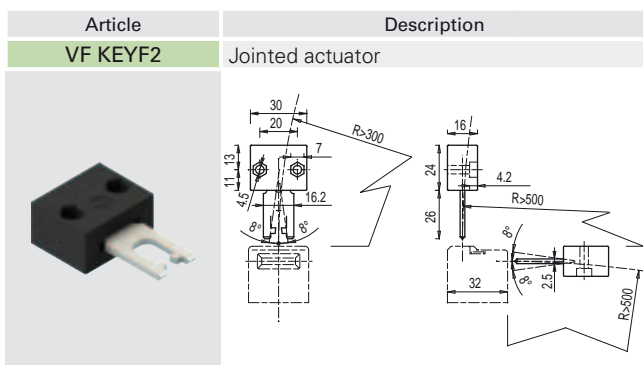
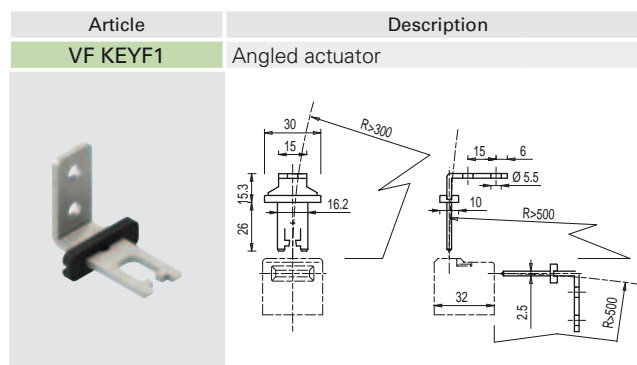
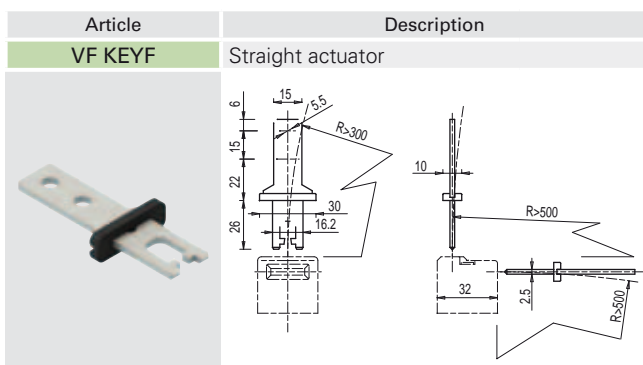
Items with code on **green** background are stock items

Accessories See page 287

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

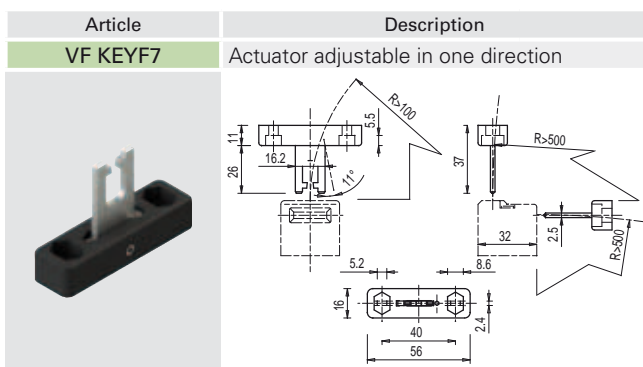
Stainless steel actuators

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



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

Actuator adjustable in two directions for doors with reduced dimensions.



Actuator adjustable in one direction for doors with reduced dimensions.

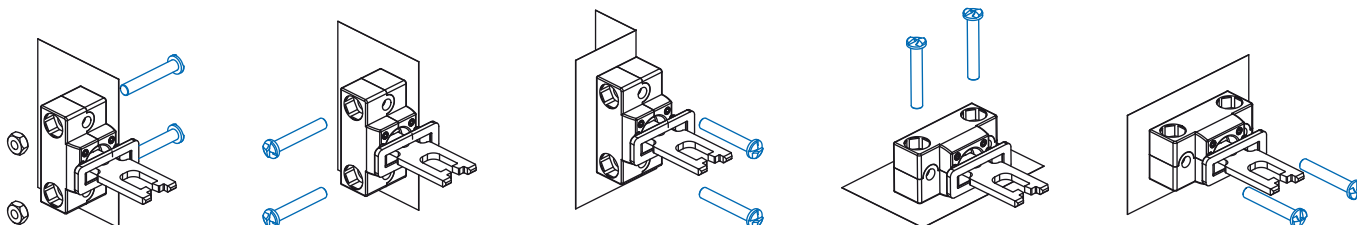
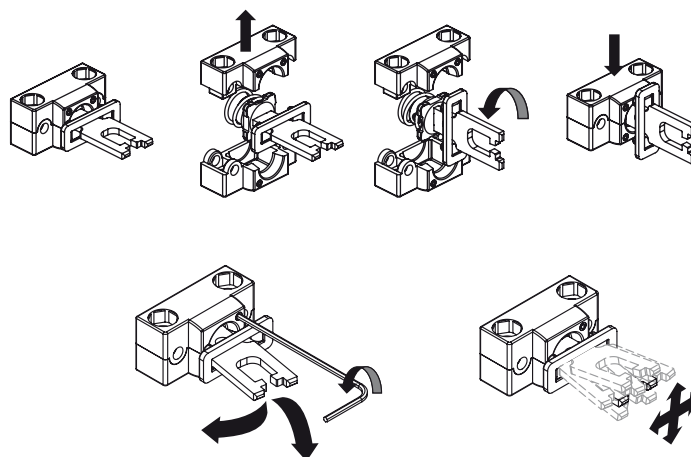


Universal actuator VF KEYF8

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

Article	Description
VF KEYF8	Universal actuator

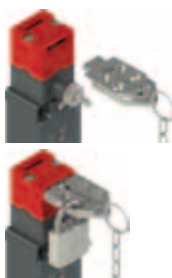
Joined and two directions adjustable actuator for doors with reduced dimensions.
The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.



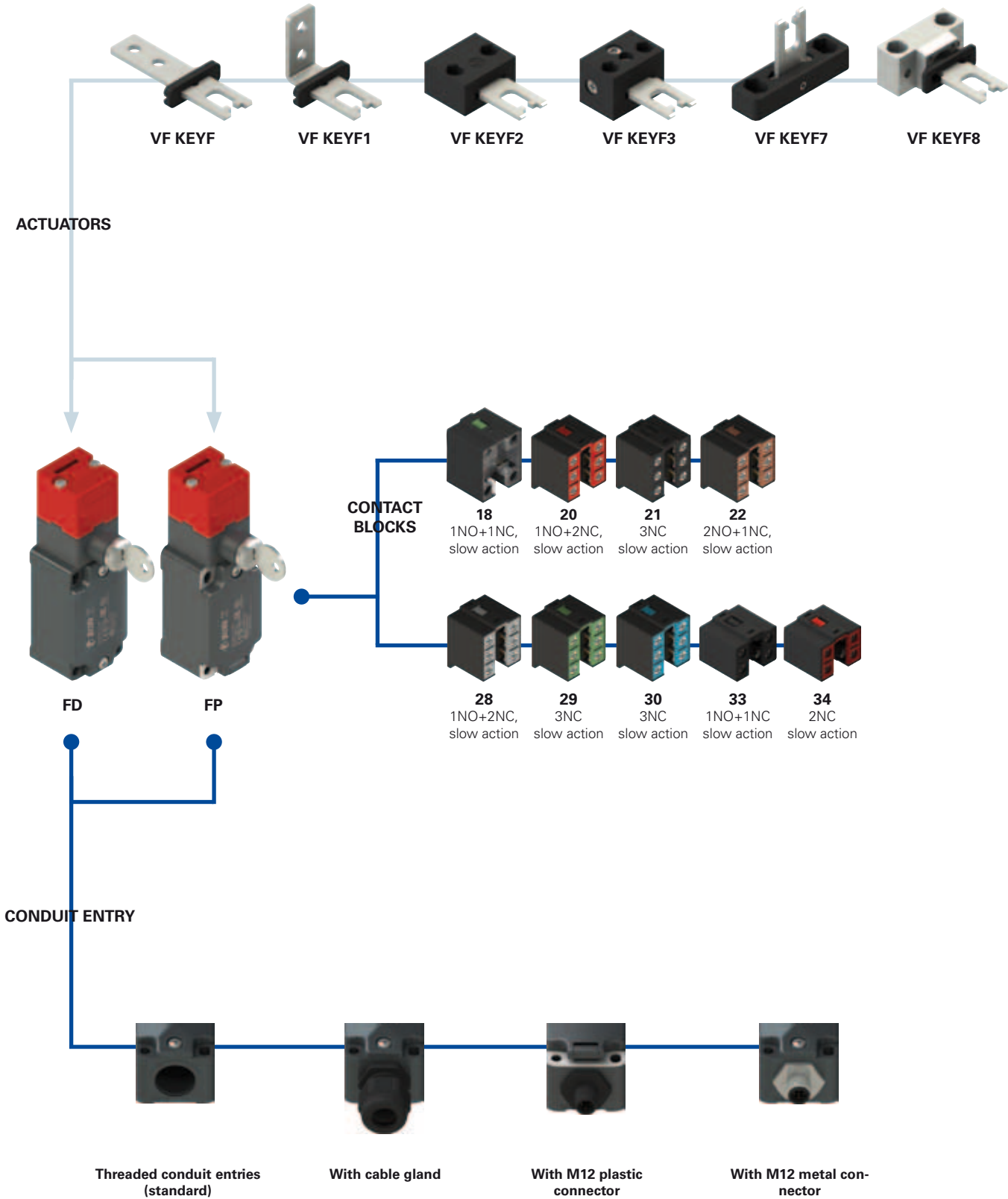
Accessories

Article	Description
VF KB1	Actuator entry locking device

Padlockable device to lock the actuator entry in order to prevent from the accidental closing of the door behind operators while they are inside the machine.
Hole diameter for padlocks 9 mm.



Selection diagram



—●— product option
 —▶— accessory sold separately



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-F1GM2K50V200T6

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

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

Contact blocks		
	Contacts activated by the lock	Contact 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	

Lock key coding	
	one standard key coding (371)
V200	up to 50 different key codings

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

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K50	M12 metal connector, 5 poles
...

Please contact our technical service for the complete list of possible combinations.

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

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



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

Markings and quality marks:



IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000 (FD series) 2007010305230014 (FP series)
EAC approval:	RU C-IT ДМ94.В.01024

Technical data

Housing

FP series housing made of glass fiber reinforced technopolymer, self-extinguishing, shock-proof and with double insulation: □

FD series: metal housing, baked powder coating.

Metal head, coated with baked epoxy powder.

One threaded conduit entry:

M20x1.5 (standard)

Protection degree:

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

General data

For safety applications up to:

SIL 3 acc. to EN 62061

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

Service life:

20 years

Ambient temperature:

-25°C ... +80°C

Max. actuation frequency:

3600 operating cycles¹/hour

Mechanical endurance:

500,000 operating cycles¹

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 according to EN ISO 14119

Max. backlash of the actuator:

4.5 mm

Actuator extraction force:

30 N

Tightening torques for installation:

see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 28, 29, 30, 33, 34:	min.	1 x 0.34 mm ²	(1 x AWG 22)
	max.	2 x 1.5 mm ²	(2 x AWG 16)
Contact block 18:	min.	1 x 0.5 mm ²	(1 x AWG 20)
	max.	2 x 2.5 mm ²	(2 x AWG 14)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, BG-GS-ET-15, UL 508, CSA 22.2 No.14 .

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 No.14 , GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

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 chapter utilization requirements from page 297 to page 308.

	Electrical data	Utilization category
without connector	Thermal current (I _{th}):	10 A
	Rated insulation voltage (U _i):	500 Vac 600 Vdc 400Vac500Vdc (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)
	Rated impulse withstand voltage (U _{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 28, 29, 30, 33, 34)
	Conditional short circuit current: Protection against short circuits: Pollution degree:	1000 A acc. to EN 60947-5-1 type aM fuse 10 A 500 V 3
		Alternating current: AC15 (50±60 Hz) U _e (V) 250 400 500 I _e (A) 6 4 1 Direct current: DC13 U _e (V) 24 125 250 I _e (A) 6 1.1 0.4
with M12 connector for 4 and 5 poles	Thermal current (I _{th}):	4 A
	Rated insulation voltage (U _i):	250 Vac 300 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 4 A 500 V 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) 4 1.1 0.4
with M12 connector 8 poles	Thermal current (I _{th}):	2 A
	Rated insulation voltage (U _i):	30 Vac 36 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 2 A 500 V 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

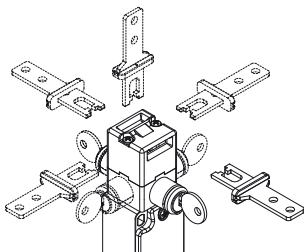
Description



This type of switches **is applied on fences or protections where entrance is allowed to authorized personnel only. They have been studied 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. During the key rotation, electrical contacts are switched, and the actuator will be released only after NC contacts are positively opened. Contacts activated by the key locking device will be reset to the initial position only with inserted actuator and with key in 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 locking in accordance with ISO 14119, and the product is marked on the side with the symbol shown.



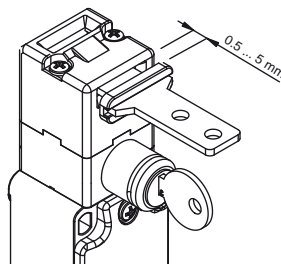
Orientable head and release device



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

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

Actuator regulation zone



The head of this switch is equipped with an actuator with a wide range of travel. In this way the guard can oscillate along the direction of insertion (4.5mm) without causing unwanted machine shutdowns. This extensive 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 IEC 60529.

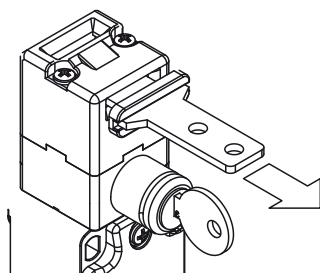
They can therefore be used in all environments where the maximum protection of the housing is required.

Contact blocks



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

Extended temperature range

-40°C

This range of switches is also available in a special version of switches with an ambient operating temperature range of -40°C to +80°C.

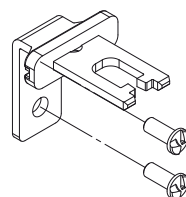
They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Laser engraving



All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

Safety screws for actuators



As required by 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 with using common tools. See accessories on page 295.

Characteristics 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 (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 (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 of contacts on contact blocks 18, 20, 21, 22, 28, 29, 30
In conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

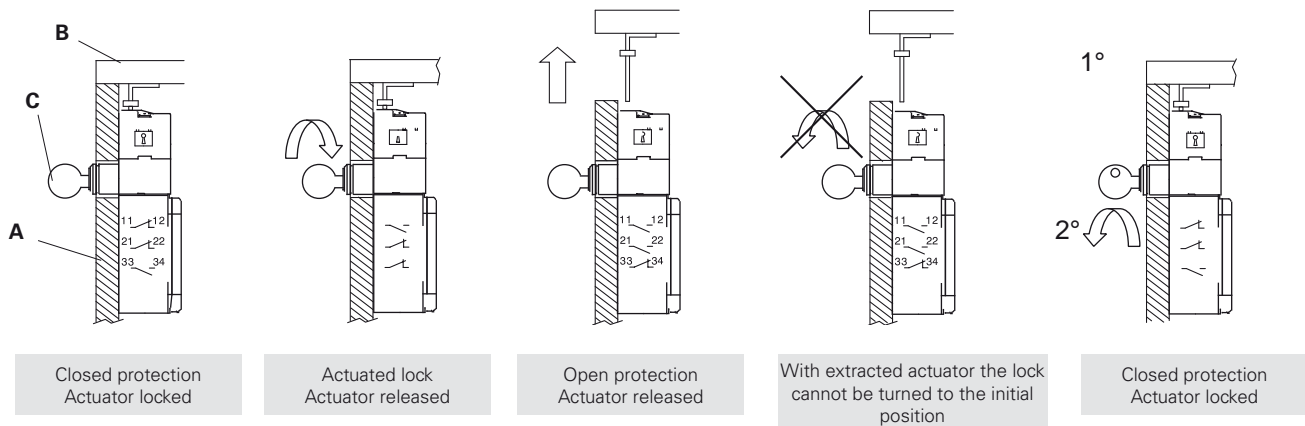
Characteristics approved by UL

Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).
In conformity with standard: UL 508, CSA 22.2 No.14

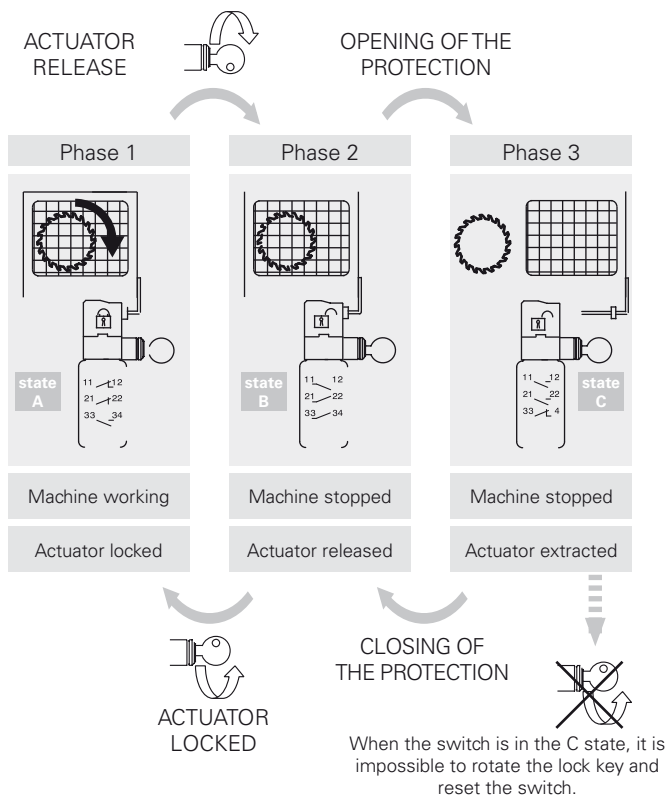
Please contact our technical service for the list of approved products.

Operation

The switch is fixed 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, it is necessary to unlock the key locking device rotating the key (C). When the actuator is removed, the key cannot be put into the initial position anymore. In the example is pointed out how it is possible to have contacts moved by the key lock or by the actuator and how it is possible to install the switch inside the machine, keeping externally visible only the release device.



Working cycle steps



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	state A	state B	state C
FD 1899 1NC+1NO controlled by the lock			
FD 2099 2NC+1NO controlled by the lock			
FD 2199 3NC controlled by the lock			
FD 2299 1NC+2NO controlled by the lock			
FD 2899 1NO+1NC controlled by the lock 1NC controlled by the actuator			
FD 2999 2NC controlled by the lock 1NC controlled by the actuator			
FD 3099 1NC controlled by the lock 2NC controlled by the actuator			

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

Utilization limits

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 ISO 14119 requirements regarding low level of coding for interlocks. Do not use in environments with the presence of explosive or flammable gas. In these cases, use ATEX products (check the specific 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 this case the entry locking device VF KB1 shown on page 142 must be used.



Dimensional drawings

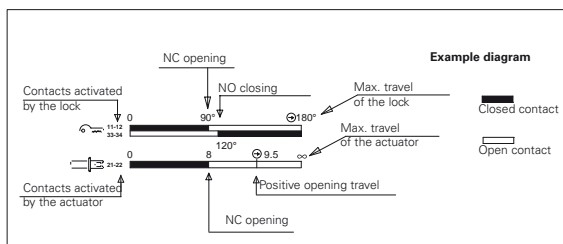
All measures in the drawings are in mm

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

Legend: With positive opening according to EN 60947-5-1, interlock with lock monitoring in accordance with EN ISO 14119

How to read travel diagrams

All measures in the diagrams are in mm or in degrees



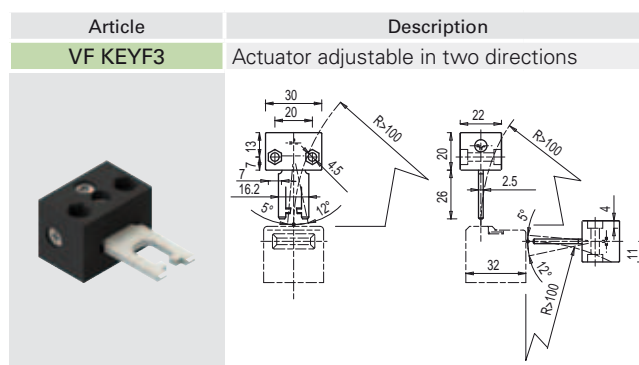
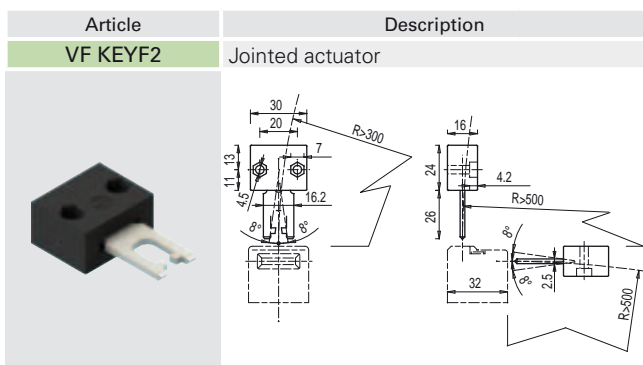
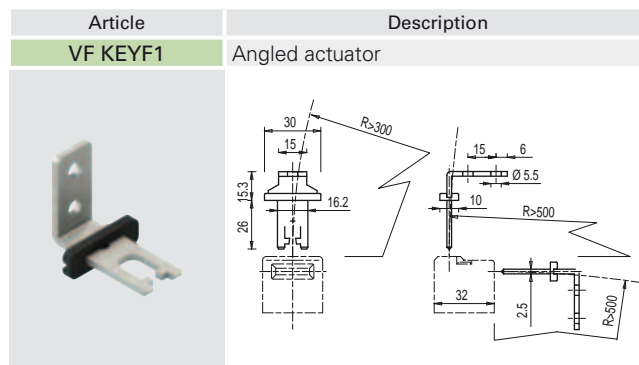
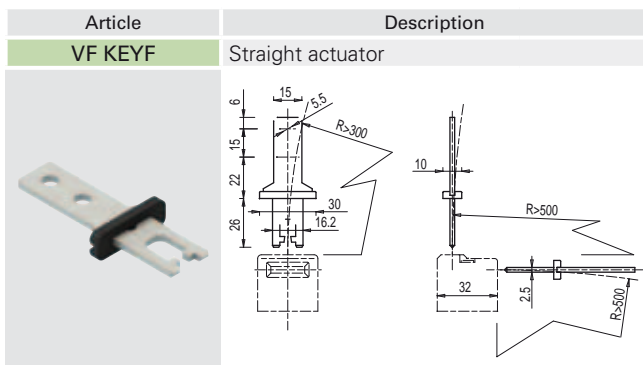
IMPORTANT:
NC contact has to be considered with inserted actuator and lock by the lock. In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol . Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.

Accessories See page 287

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

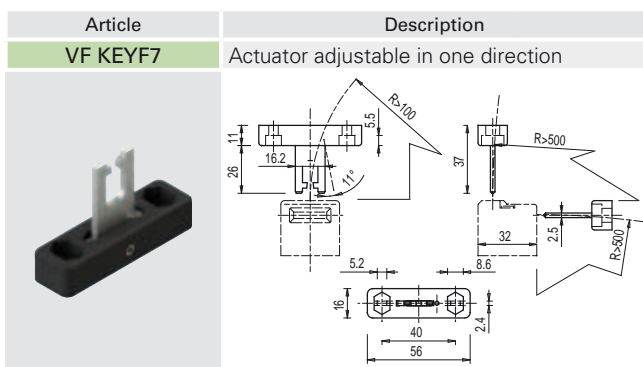
Stainless steel actuators

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



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

Actuator adjustable in two directions for doors with reduced dimensions.



Actuator adjustable in one direction for doors with reduced dimensions.

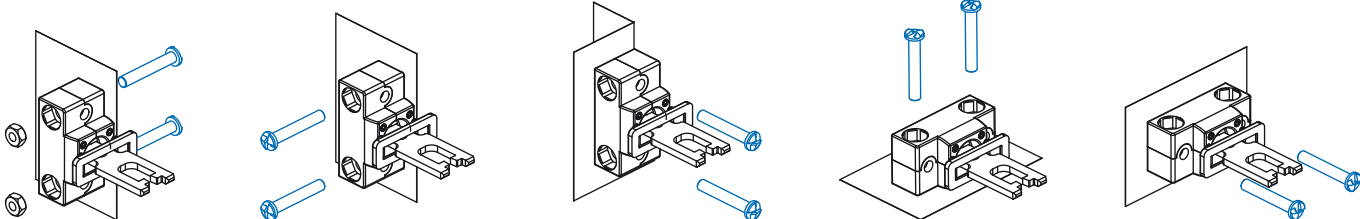
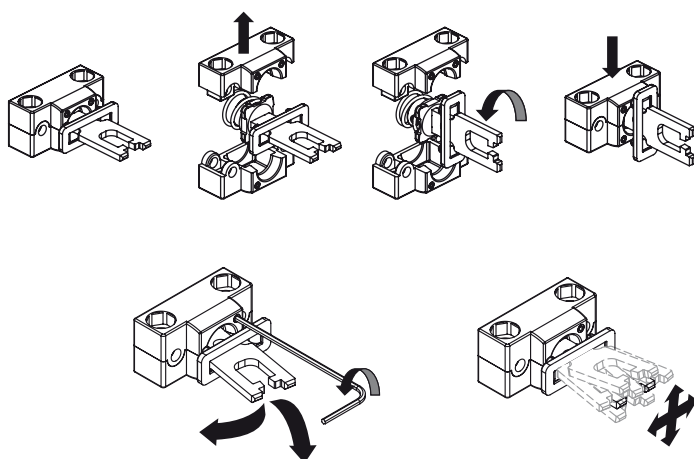


Universal actuator VF KEYF8

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

Article	Description
VF KEYF8	Universal actuator

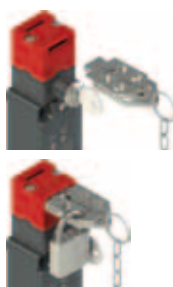
Joined and two directions adjustable actuator for doors with reduced dimensions.
The actuator has two couples of fixing holes and it is possible to rotate by 90° the actuator-working plan.



Accessories

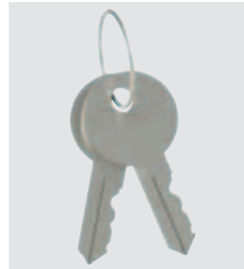
Article	Description
VF KB1	Actuator entry locking device

Padlockable device to lock the actuator entry in order to prevent from the accidental closing of the door behind operators while they are inside the machine.
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.



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

Accessories See page 287

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

Description



To apply safety switches on machinery guards it is necessary to confront with practical issues relating to ease of installation, precise mechanical movements of the guard, the occurrence of critical environmental conditions. Moreover, frequently the guards are used by clumsy operators and in some cases even by persons not qualified or not familiar with the operative principles of machineries.

These problems become important when the guard is a door to a protected area. The physical dimensions of this type of guard and the related construction tolerances cause problems of alignment with the consequent risk of damage to the security devices. The possibility that

one or more operators access physically within the protected zone introduces further problems of management and the analysis of the risks of the machine must forecast situations such as accidental trapping of an operator within the danger zone, sometimes even unauthorized operators as employees cleaners.

From its experience in this field, Pizzato Elettrica has created an innovative safety handle called P-KUBE with all the characteristics necessary to decrease the risks for the machinery manufacturers, make life simpler for the installers and make easier and more intuitive the operations for the operators getting in and out of the area.

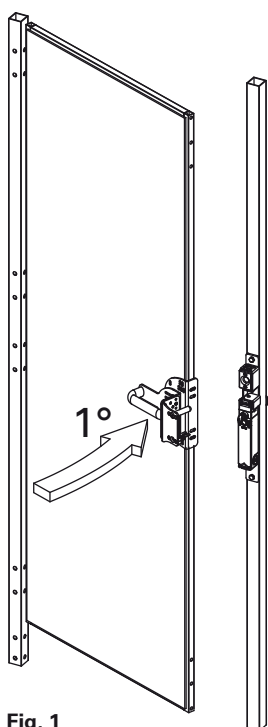


Fig. 1

The basic principle of this series of products provides a system of centering and mechanical stopping along the direction of movement of the door (Fig. 1).

This way the operator is allowed to go in and out of the danger area with simple and natural movements. Especially in the case of staff trapped, with people taken by panic or not instructed, to avoid complex movements to escape the danger zone greatly reduces the likelihood of accidents. The centering device is extremely sturdy and can also be used for heavy applications or in presence of inattentive staff.

These handles are designed for use with equally sturdy switches, capable of withstanding the heaviest axial loads, such as FG series switches with solenoid with holding force up to 2800 N or FD series metal switches. The safety handle mounted in combination with a FG or FD series switch, creates an integrated system of guards closure with the relative access control to dangerous areas, which prevents the restart of the machine in case of protection open.

Some versions are provided with a "lock-out" device to block the door in open position and to prevent an unexpected restart of the system when a maintenance man enter the area.

Thanks to their adjustable structure the handles can be applied to different types of doors or barriers: swing or sliding, right or left and on different profiles.

The handle is supplied with all the components ready to be fixed at the correct mechanical distances by means of anti-tampering screws. The installer should only assemble the parts according to the application, set the chosen switch (provided separately) and make centering adjustments.

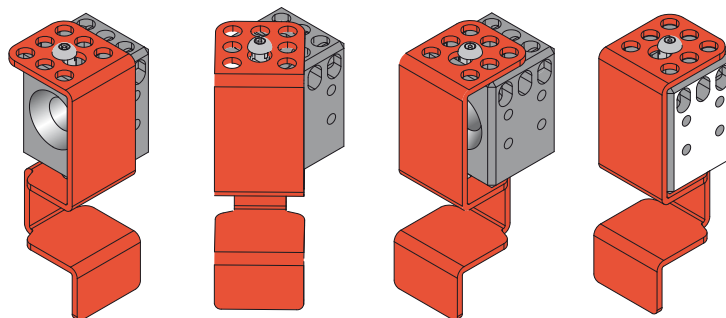
Main features

- Easy functioning. To open or close the door there are no specific sequences needed but only intuitive actions
- Handle provided with a self-centering sturdy metal pin in order to have the alignment between the jamb and the door. This device works also as a mechanical door stop.
- Possibility to assemble it on swing and sliding doors.
- Possibility to adjust the handle on 3 different axis through slotted brackets.
- Easy installation.
- Optional Lock-out device with padlocks to avoid the unwanted or accidental closing of the protection by the insertion of the actuator in the switch.
- In case of door blocked by a FG series switch provided with a release push button, you can open it in a single operation even if under strain (panic situation).
- Sturdy painted brackets (thickness of 4 and 5 mm), stainless steel components.
- Compatible with FD series safety switches with separate actuator and with FG series safety switches with solenoid.

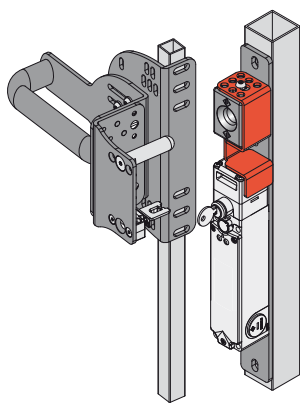
LOCK OUT (patent pending)

By means of one single operation, the "lock-out" device can close both the centring hole and the slot for the actuator fitted in the switch, therefore making it impossible for the door to be closed mechanically and for the switch contacts to be switched electrically.

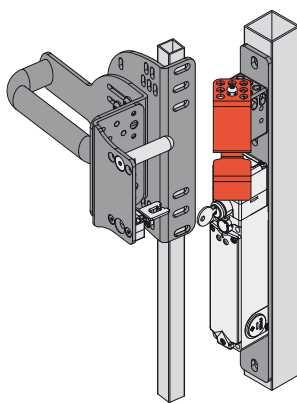
The "lock-out" device translates the red cover in such a way that the holes found in the cover do not coincide with the holes found in the underlying metal block. This makes it impossible for the device to be padlocked in its open position. Hole diameter for padlocks 6.4 mm.



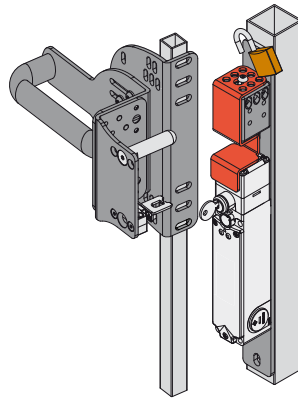
Working principle of the LOCK OUT device



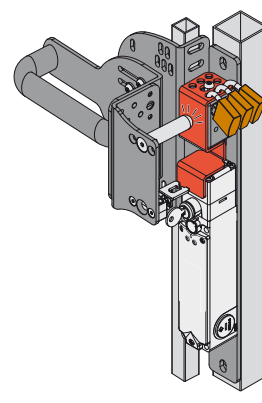
Lock-out device open
Safety switch accessible



Closing of lock-out device

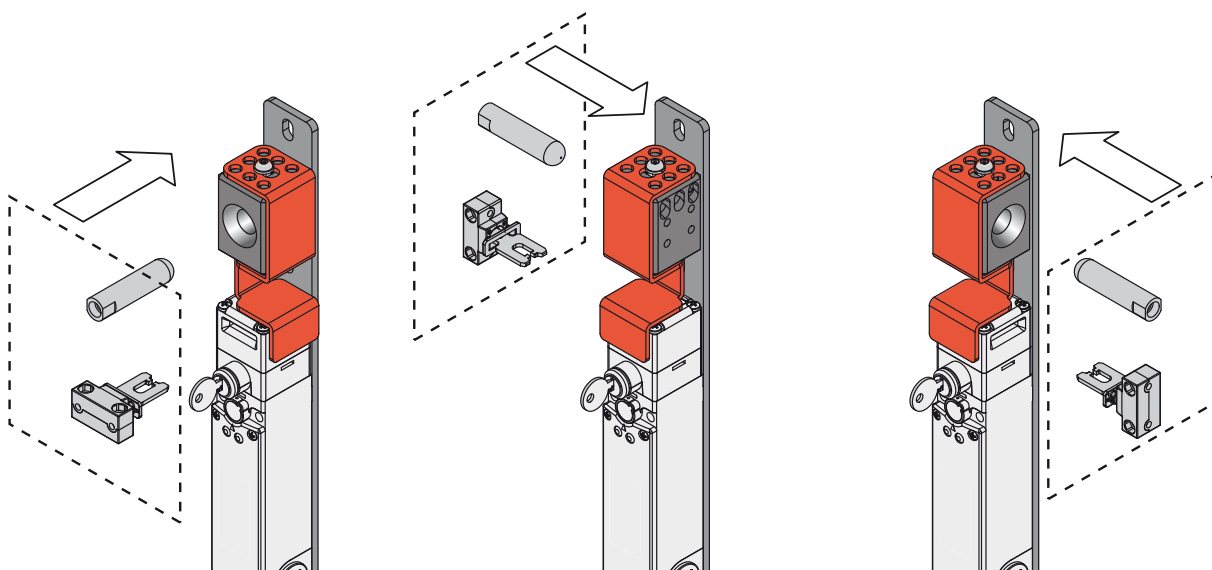


Lock-out device closed
Insertion of padlock



Lock-out device locked
Padlock locked
Safety switch not accessible

Turnable centering block

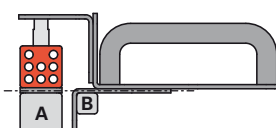
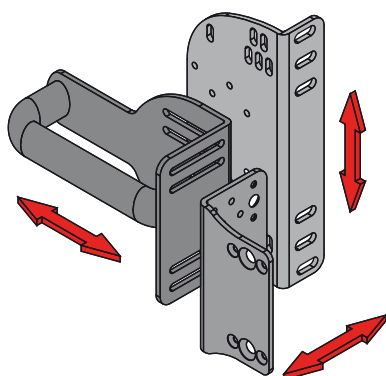


The symmetrical shape of the Lock-out device allows it to be applied on swing and sliding doors, both right and left, not altering either its centering function nor the possibility to apply one or more padlocks

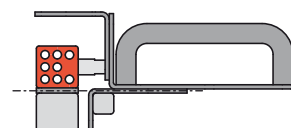
Adaptability and installation on different profiles

The slots on the three brackets applied on the door allow independent adjustments on 3 axis, in order to provide an extremely easy assembling without any modification on the protection structure. The adjustments allow to apply the handle on door profiles of different dimensions, from 40x40 mm to 60x60 mm (A) on posts and from 20x20 mm to 40x40 mm (B) on the door. The brackets are joined between them through anti-tampering screws.

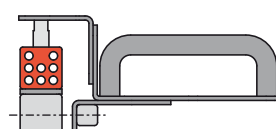
Thanks to its vertical design, the bracket containing the safety switch and the Lock-out device doesn't stick out more than the posts.



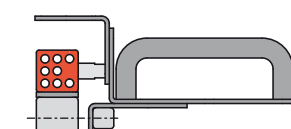
Swing door and jamb frontally aligned



Sliding door and jamb frontally aligned



Swing door and jamb axially aligned



Sliding door and jamb axially aligned

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

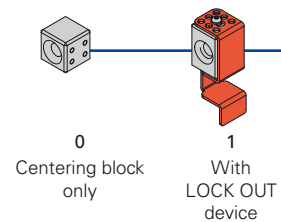
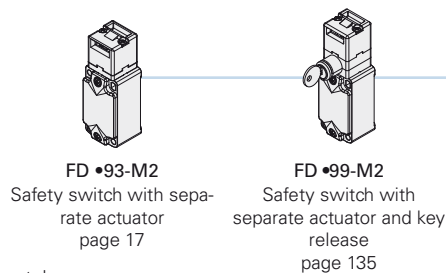
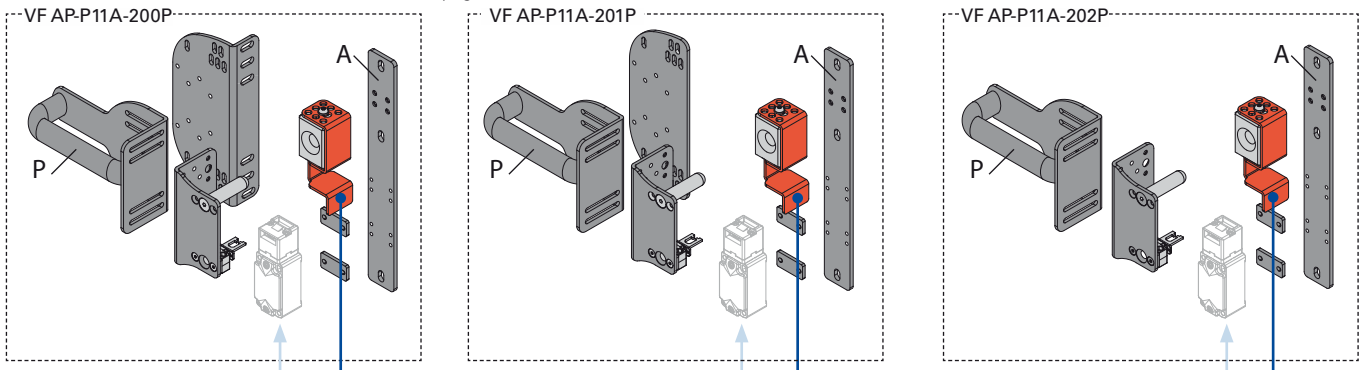
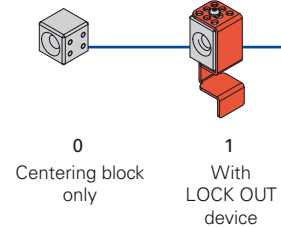
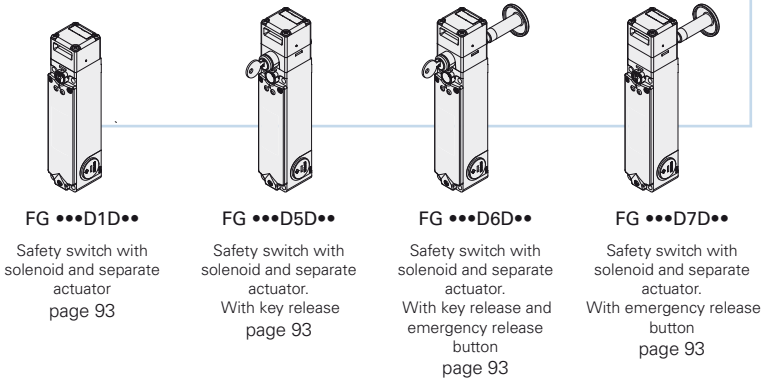
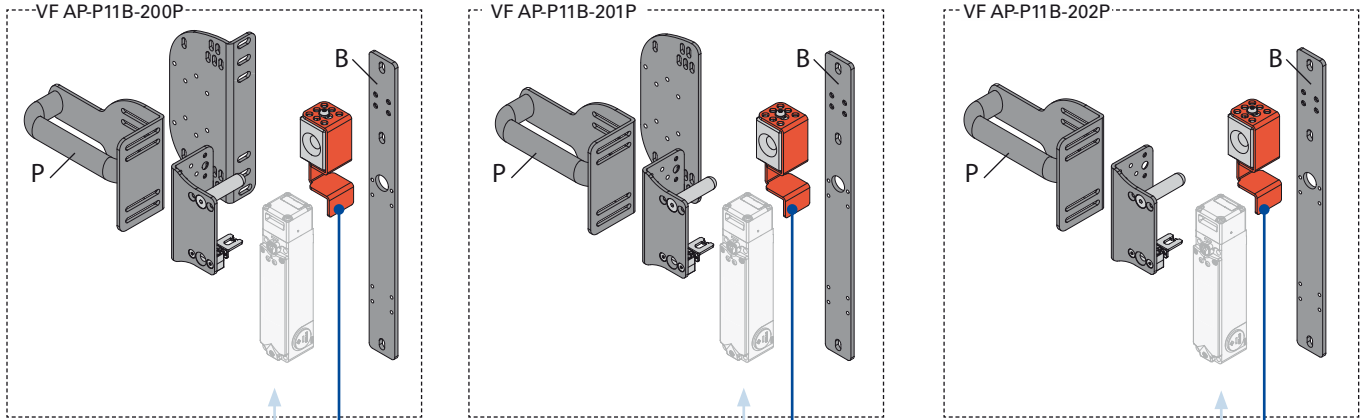
LOCK OUT device	
1	LOCK OUT device
0	centering block only
2	LOCK OUT device with 100 N holding force

Handle	
P	plastic handle
M	metal handle

Brackets for installation purposes	
A	FD ●●●
B	FG ●●●●●●
Z	without plate (B) for brackets FG
Y	without plate (A) for brackets FD

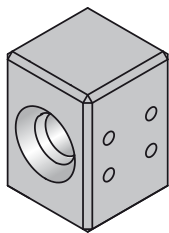
Plate configuration	
200	configuration with adjustable "L" plate for door profiles
201	configuration with adjustable plain plate for door profiles
202	configuration without adjustable plate for door profiles

Note: the handle is supplied complete with switch actuator and fixing screws for the handle, the switch, the actuator, and between the plates.



● product options
 → accessory sold separately

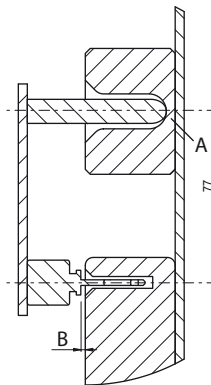
Sturdiness and simplicity



Its special design and materials allow the safety handle to be used in heavy applications or with sturdy wide-ranging (700 mm minimum) protections. In particular:

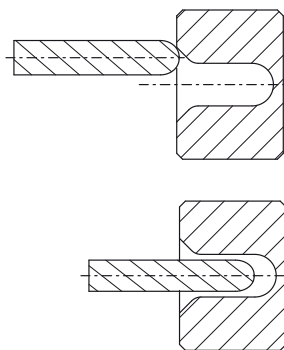
- 4 and 5 mm sturdy painted brackets.
- Stainless steel single body centering block
- Stainless steel centering pin with a large diameter.
- Actuator maximum holding force equal to 2500N (versions with FG switches).
- Stainless steel anti-tampering bolts and screws and elastic washers (safety inserts excluded, see page 147).

Mechanical stop



When the door closes the metal pin goes to the bottom of the centering block (A) before the actuator hits the housing of the switch, leaving a distance of security (B), thus avoiding any damage. The metal pin only hits surfaces which transmit the shock to the structure but not to the switch, regardless of whether the lock-out device is open or closed.

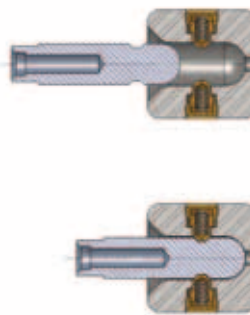
Centering



The centering of the pin on the block, both made of stainless steel, forces the alignment between actuator and switch, ensuring a proper insertion without risk of collisions.

It allows to safely realign the protection to the frame, even with heavy misalignment.

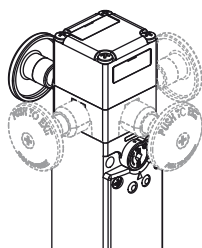
Holding force 100 N



A version of the lock-out device with a holding force equal to 100 N is available on request. This new optional function keeps the handle in its limit-stop closed position, and makes it necessary to exert a moderately energetic pull to open the door. Ideal for all those applications where several doors are unlocked simultaneously, but only one is actually opened, this device keeps all the unlocked doors in position, preventing them from being opened by any vibration or gusts of wind. Machine restarting

will therefore be very quick, since it will no longer be necessary to reposition to their limit stop the unlocked doors which may have been inadvertently opened.

Emergency release button (FG series)

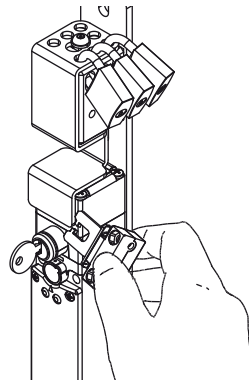


For FG series switches with actuator lock is available an emergency push button which, oriented towards the inside of the machinery, allows the exit of the operator accidentally trapped, even in case of total blackout.

Pushing the button, it will be actuated the same function of the auxiliary release device. To reset the switch, just return the button to its initial position.

The emergency button can be rotated, is available with different lengths and it is fixed to the switch by a screw, so to allow the installation of the switch inside or outside the guards.

Bypassing with single actuators not possible



Once operated and locked the lock-out device, the actuator entry of the switch is no longer accessible.

An operator who has a second separate actuator can not by-pass the device block and operate the switch.

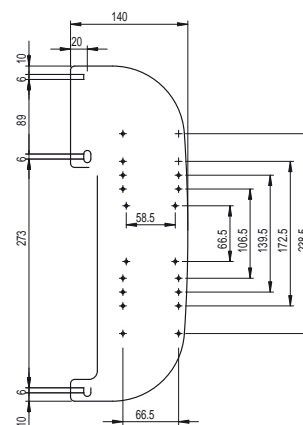
Shaped plate



Article	Description
VF AP-C001	Lateral shaped plate for button panel



The shaped plate can be applied under the switch fixing plate. It can be fitted at the right or at the left, it is supplied with holes and used to fasten the boxes for Pizzato Elettrica EROUND push-button panels by means of commercial self-threading screws. See ES series on page 105 of the Pizzato Elettrica general catalogue HMI.



Safety inserts kit



Kit with 3 pcs hexagonal 1/4" safety inserts. Connection DIN 3126, C 6.35. Hexagonal impression with hole. The P-Kube safety handle is provided with tamper-proof screws. Use of the 3 safety inserts of the kit is compulsory.

Article composition VF AP-K01

Qty	Description	Length
1	Hexagonal 1/4" insert for M5 screws	3 mm
1	Hexagonal 1/4" insert for M6 screws	4 mm
1	Hexagonal 1/4" insert for M8 screws	5 mm

Adhesive labels for emergency release button



Polycarbonate yellow adhesive, rectangular 300x32 mm, red writing. Applied on the internal part of the jamb it helps finding the emergency release button.

Article	Description and language	
VF AP-A1AGR01	PREMERE PER USCIRE	ita
VF AP-A1AGR02	PUSH TO EXIT	eng
VF AP-A1AGR04	ZUM OFFNEN DRUCKEN	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	NACISNAĆ ABY WYJŚĆ	pol
VF AP-A1AGR09	PRESSIONAR PARA SAIR	por

Complete housings for shaped plate



ES AC32010

Description	Features	Diagram
Button - 1NO E2 1PU2R421L35 Contacts 1x E2 CF10G2V1	flush, spring-return, green pos. 2 / pos. 3 1NO pos. 1 /	
Button - 1NC E2 1PU2S321L1 Contacts 1x E2 CF01G2V1	projecting, spring-return, red pos. 2 / pos. 3 1NC pos. 1 /	

ES AC32043

Description	Features	Diagram
Indicator light E2 1ILA210 LED unit E2 LF1A2V1	white White LED, 12 ... 30 Vac/dc	
Button - 1NO E2 1PU2R4210 Contacts 1x E2 CF10G2V1	flush, spring-return, green pos. 2 / pos. 3 1NO pos. 1 /	

ES AC33047

Description	Features	Diagram
Illuminated button - 1NO E2 1PL2R2210 LED unit E2 LF1A2V1 Contacts 1x E2 CP10G2V1	flush, spring-return, white White LED, 12 ... 30 Vac/dc pos. 2 / pos. 3 LED pos. 1 1NO	
Illuminated button - 1NO E2 1PL2R5210 LED unit E2 LF1A2V1 Contacts 1x E2 CP10G2V1	flush, spring-return, yellow White LED, 12 ... 30 Vac/dc pos. 2 / pos. 3 LED pos. 1 1NO	
Emergency button Ø 40 mm- 2NC E2 1PERZ4531 Contacts 2x E2 CF01G2V1	rotary release, Ø 40 mm, red pos. 2 1NC pos. 3 / pos. 1 1NC	

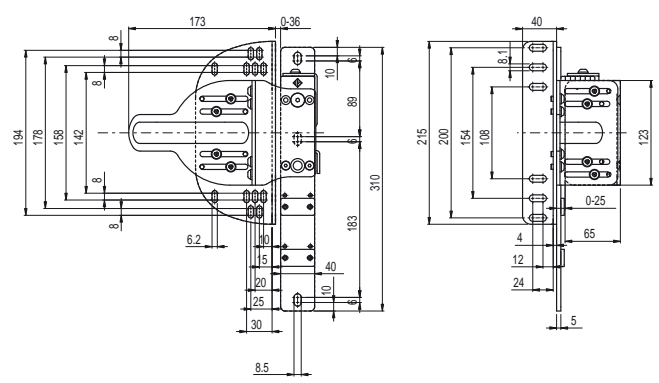
Accessories See page 287



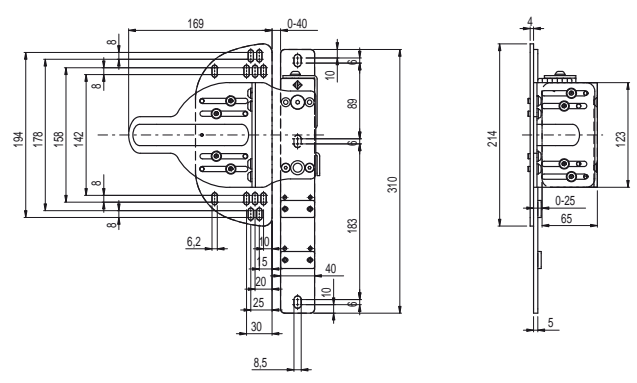
Dimensional drawings

All measures in the drawings are in mm

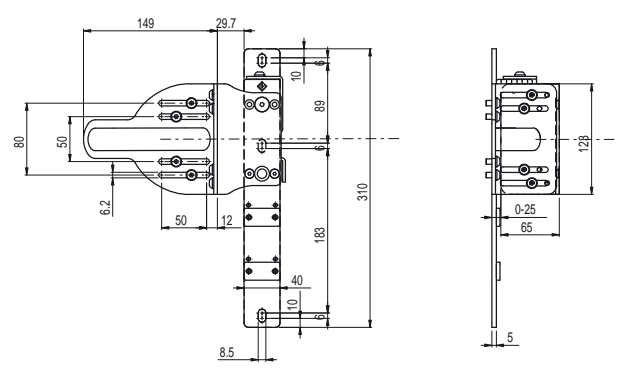
Safety handle VF AP-P1•A-200•



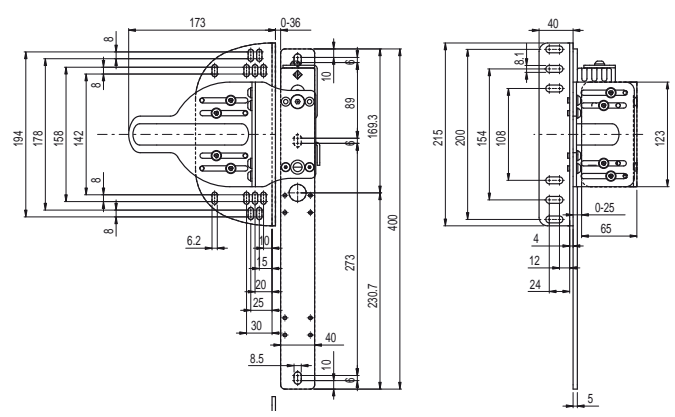
Safety handle VF AP-P1•A-201•



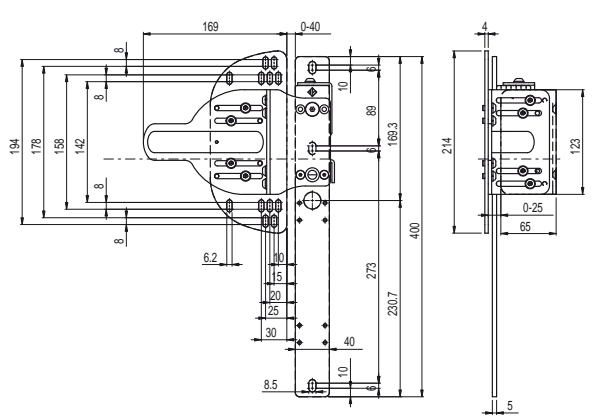
Safety handle VF AP-P1•A-202•



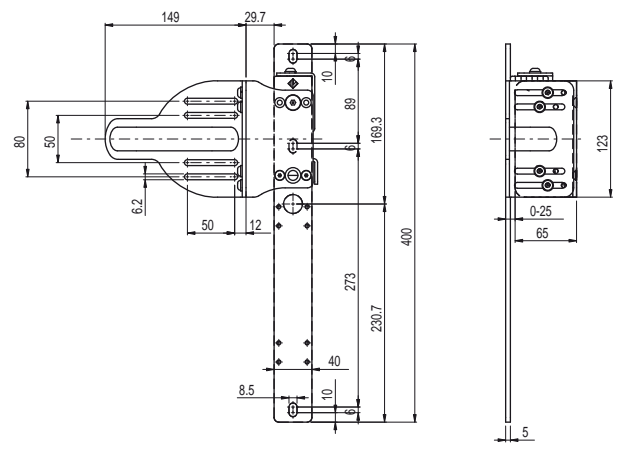
Safety handle VF AP-P1•B-200•



Safety handle VF AP-P1•B-201•



Safety handle VF AP-P1•B-202•



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

Description



To apply safety switches on machinery guards we must confront with practical issues relating to ease of installation, precise mechanical movements of the guard, the occurrence of critical environmental conditions. Moreover, frequently the guards are used by clumsy operators and in some cases even by persons not qualified or not familiar with the operative principles of machineries.

These problems become important when the guard is a door to a protected area. The physical dimensions of this type of guard and the related construction tolerances cause problems of alignment with the consequent risk of damage to the security devices.

The new safety handle VF AP-S arises from Pizzato Elettrica twenty-five-year experience in safety sector.

This integrated closing device can be applied on guards or protections of perimetric safety barriers, where it is required control on access to dangerous areas of a machinery or plant.

The new safety handle VF AP-S unlike other products on the market, combines its own characteristics of compactness and lightness deriving from its sliding movement, with its sturdiness, this last one being a characteristic present in superior models which, though, are heavier, bigger and structurally more complex.

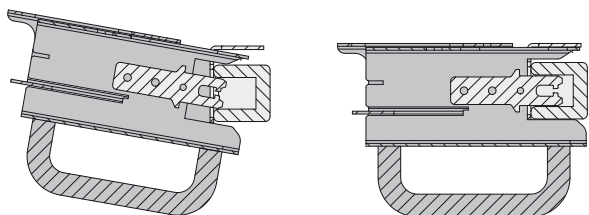
Structure

The light and compact VF AP-S handle has a metallic structure, galvanized and painted, and a plastic or aluminium handle ergonomically studied to give a more comfortable hold and to ease the use of the handle itself.

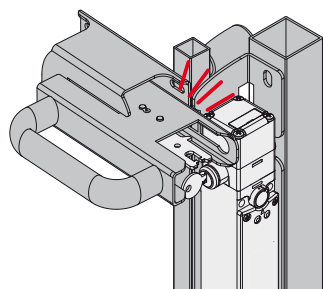
The absence of screws and detachable components prevent any tampering.

Centering

The "C" shape of the handle final part allows the device centering in case of misalignment between guard and frame. This way there is the best alignment between switch and actuator preventing any damage due to possible collisions.



Actuator and switch protection

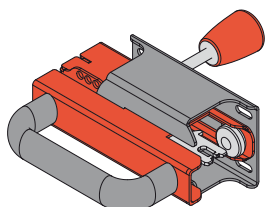


The structure of the handle and of the switch fixing bracket allows the positioning of both the switch and the actuator safe from dangerous collisions. Impacts due to wrong operation are completely discharged on the handle structure.

Handle lock positions

There is a snapping device which keeps the handle locked in two positions: when it is open, in order to increase the actuator holding force and when it's retracted to avoid unwanted opening due to machinery vibrations.

Internal lever for emergency opening



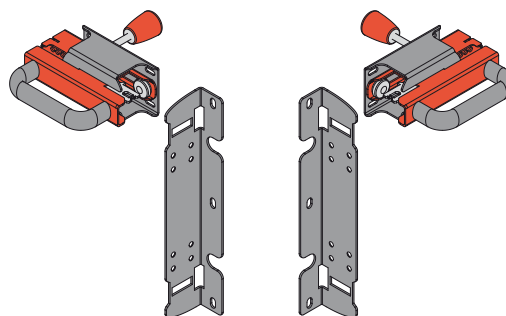
Optional lever for emergency opening from inside: it allows the exit of staff accidentally trapped inside the dangerous area. Only to be combined with switches without lock (e.g. FD ●93-M2) or with emergency release button (e.g. FG ●●D6D●●).

Accessories See page 287

Flexibility during installation

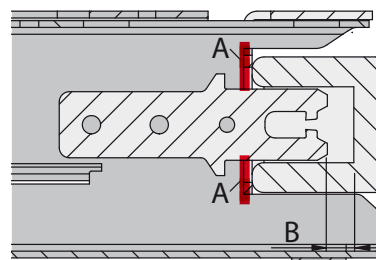
The symmetrical design allows the application on swing and sliding doors with right or left closing, no adjustment needed.

The slotted brackets and the wide actuator extraction travel (60 mm) allow to assemble and adjust the device on different profiles.



Mechanical stop

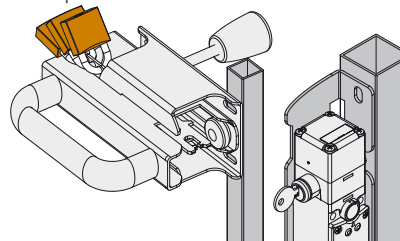
When closing the door there is a mechanical stop (A) whose function is to avoid possible impacts between actuator and switch leaving a safety distance (B) between these two elements and the switch housing.



Padlocking option

It is possible to apply up to 6 padlocks whose function is to prevent the door mechanical closing and consequently the casual switching of the contacts.

Hole diameter for padlocks 7 mm.





Code structure

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

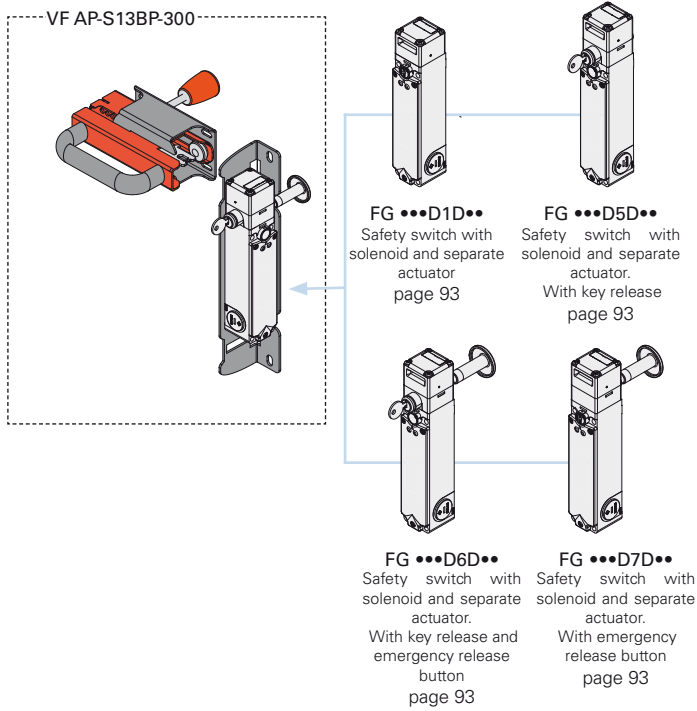
VF AP-S13BP-200

Brackets for installation purposes	
A	FD ●●●●
B	FG ●●●●●●

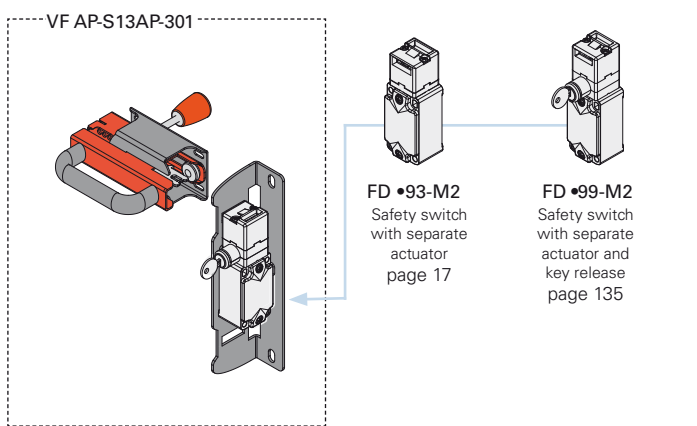
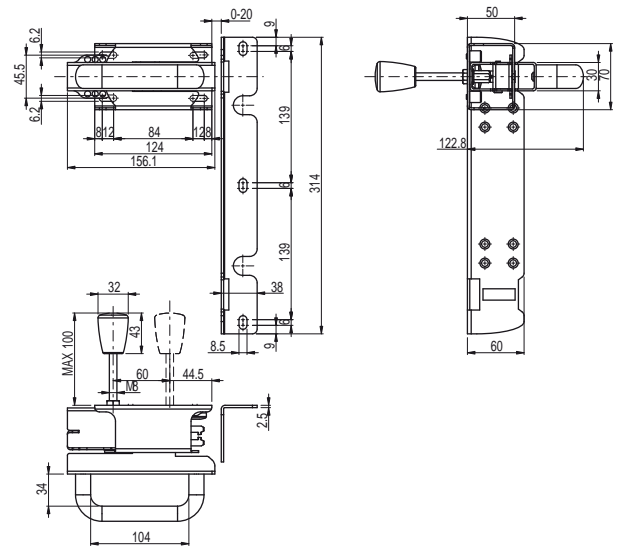
Internal lever for emergency opening	
P	internal lever for emergency opening
Z	without internal lever for emergency opening

Plate configuration	
001	without plate with aluminium handle
002	without plate with plastic handle
200	with plate for FG: with screwed aluminium handle
201	with plate for FD: with screwed aluminium handle
300	with plate for FG: with screwed plastic handle
301	with plate for FD: with screwed plastic handle

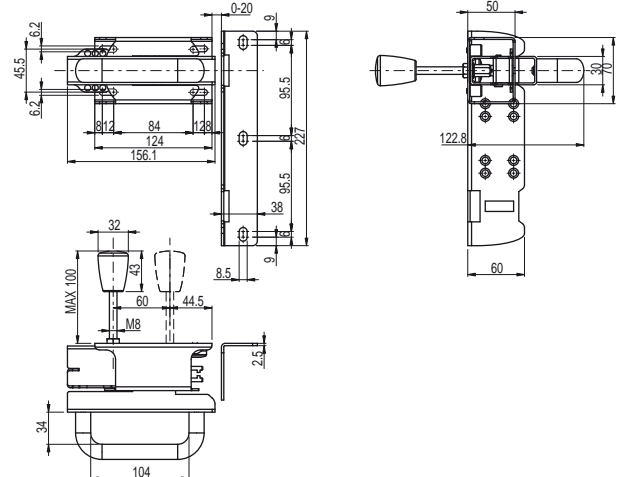
Note: the handle is supplied complete with switch actuator and fixing screws to affix the switch to the plate.



Safety handle VF AP-S13BP-300



Safety handle VF AP-S13AP-301



Safety switches FD and FG series

Safety switch with separate actuator **FD series**



Main features

- Metal housing, one conduit entry
- Protection degree IP67
- 9 contact blocks available
- Versions with assembled M12 connector
- Versions with gold-plated silver contacts

Safety switch with solenoid and separate actuator **FG series**



Main features

- Actuator holding force 2800 N
- 30 contact blocks with 4 contacts
- Metal housing, three conduit entries M20
- Protection degree IP67
- Versions with key release and emergency release button
- Signalling LED
- Operation with energised or de-energised solenoid

Description



This integrated closing device can be applied on guards or protections of perimetric safety barriers, where it is required control on access to dangerous areas of a machinery or plant.

The new safety handle P-KUBE 2, which is installed in combination with the RFID safety switch with NG series block, provides an integrated locking system of the protections with related access control to dangerous areas; this new combination makes it possible to obtain, with a single device, an access control function with the maximum PL e safety level according to EN 13849-1 or SIL 3 according to EN 62061.

Maximum safety with a single device

PL e + SIL 3

Constructed with redundant electronic technology, the NG series switches in combination with the P-KUBE 2 handle make it possible to create circuits having maximum PL e and SIL 3 safety levels by installing just one device on the protection. This avoids expensive wiring on the field and allows quicker installation. Inside the panel, the two electronic safety outputs must be connected to a safety module with OSSD inputs or to a safety PLC.

Connection of several switches in series

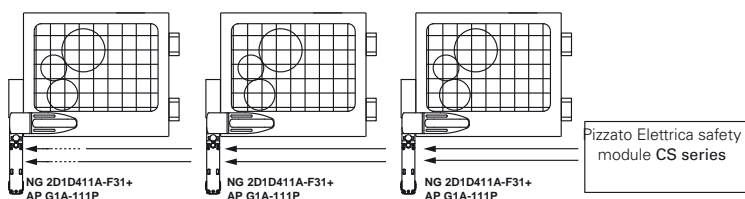
PL e + SIL 3

One of the most relevant features of the NG in combination with the P-KUBE 2 handle line is the optional connection in series of several switches, up to a maximum number of 32 devices, while maintaining the maximum PL e safety level

prescribed by the EN 13849-1 standard and the SIL 3 safety level according to the EN 62061 standard.

This connection method is permitted in safety systems which, at the end of the chain, feature a safety module evaluating the outputs of last NG switch.

The fact that the PL e safety level can be maintained even with 32 switches connected in series indicates the presence of an extremely safe structure inside each individual device.

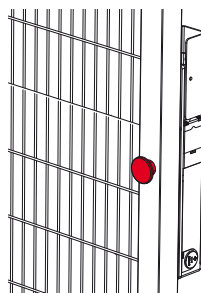


RFID actuators with high coding level

The NG series features an electronic system based on RFID technology to detect the actuator. This system gives a different coding to each actuator and makes it impossible to tamper with a device by using another actuator belonging to the same series. The actuators may have millions of different coding combinations, and are therefore classified as actuators with a high coding level, according to EN ISO 14119.



Emergency release button



The release button, oriented towards inside the machinery, allows the exit of the operator accidentally trapped also in case of possible black-out and in any other state of operation. To reset the switch, just return the button to its initial position.

The anti-panic button can be freely lengthened by means of appropriate extensions, so that it can also be mounted on very thick uprights (see accessories).

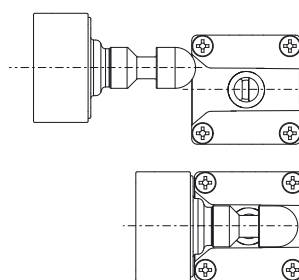
High protection degree

IP69K IP67

The NG series switches by Pizzato Elettrica, besides having an IP67 protection degree, have passed the test proving their IP69K protection degree according to the prescriptions established by the ISO 20653 standard.

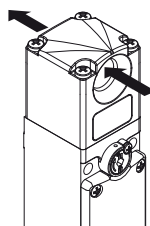
Therefore they are suitable for use in machineries subjected to intense washing with high pressure and high temperature water jets and for any condition or environment where a particular attention for cleanness and hygiene is required, such as in food or pharmaceutical industry.

Centering



The switch is provided with a wide centering inlet for the actuator pin. Such solution makes it easier to align the actuator with the hole found in the head during the fitting stage. Moreover, this solution drastically reduces any probable collisions between the actuator and the switch, also allowing it to be fitted on inaccurate doors.

Dustproof



The switch is provided with a through hole for inserting the actuator and, thanks to this peculiarity, any dust which may go inside the actuator hole can always come out of the opposite side instead of being left there. Moreover, the lock pin is provided with an external diaphragm gasket which makes it suitable for any environment where dust is present.

Six LEDs for immediate diagnosis

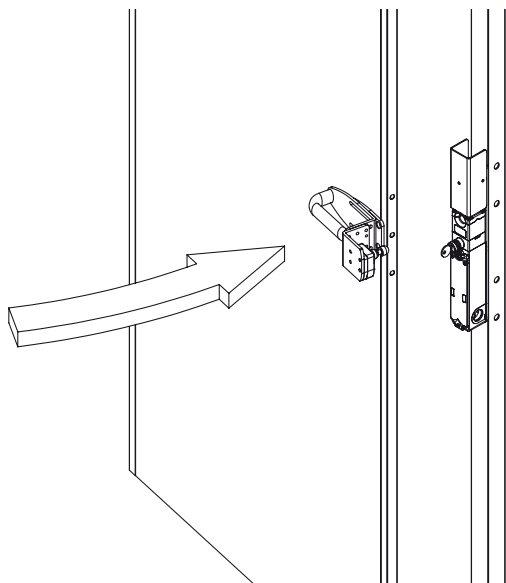


As the LEDs have been designed for quick immediate diagnosis, the status of each input and output is highlighted by one specific LED. This makes it possible to quickly identify the interruption points in the safe chain, which device is released, which door is opened and any errors inside the device. All that in a straightforward way without needing to decode complex blinking sequences.



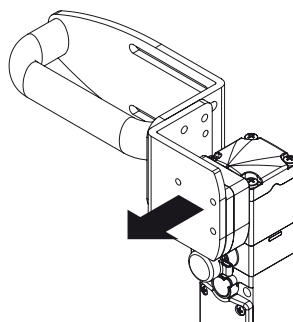
Easy functioning

No specific action sequences are required to open or close the door, but just one opening/closing movement.
In case of door blocked by a handle provided with a release button, you can open it in a single operation even if under strain (panic situation).



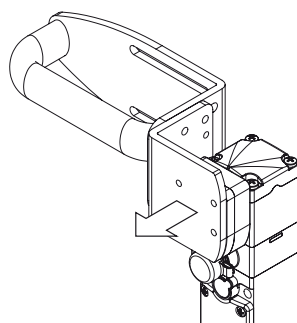
Holding force of the locked actuator

7500 N The sturdy interlocking system guarantees the actuator a maximum holding force F_{zh} of 7500 N. This is one of the highest values available on the market today, making this device suitable for severe heavy-duty applications.



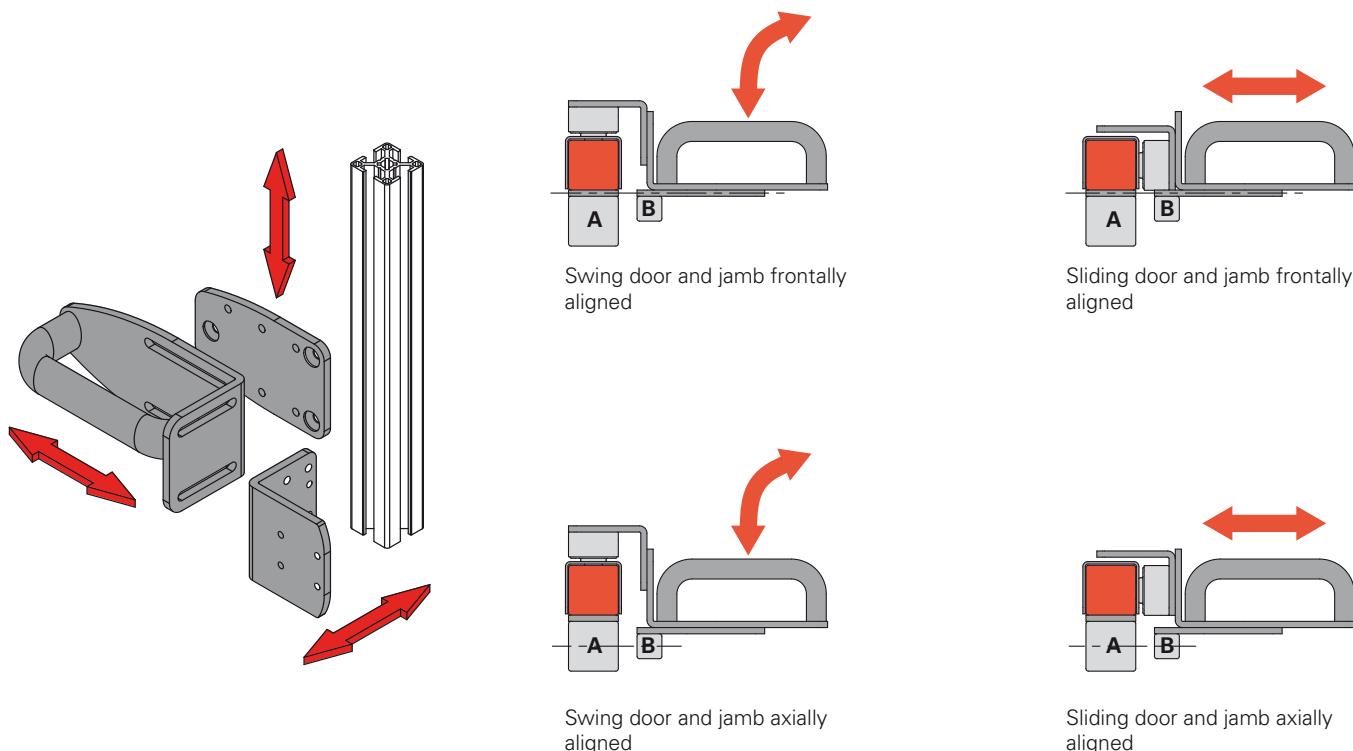
Holding force of the unlocked actuator

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.



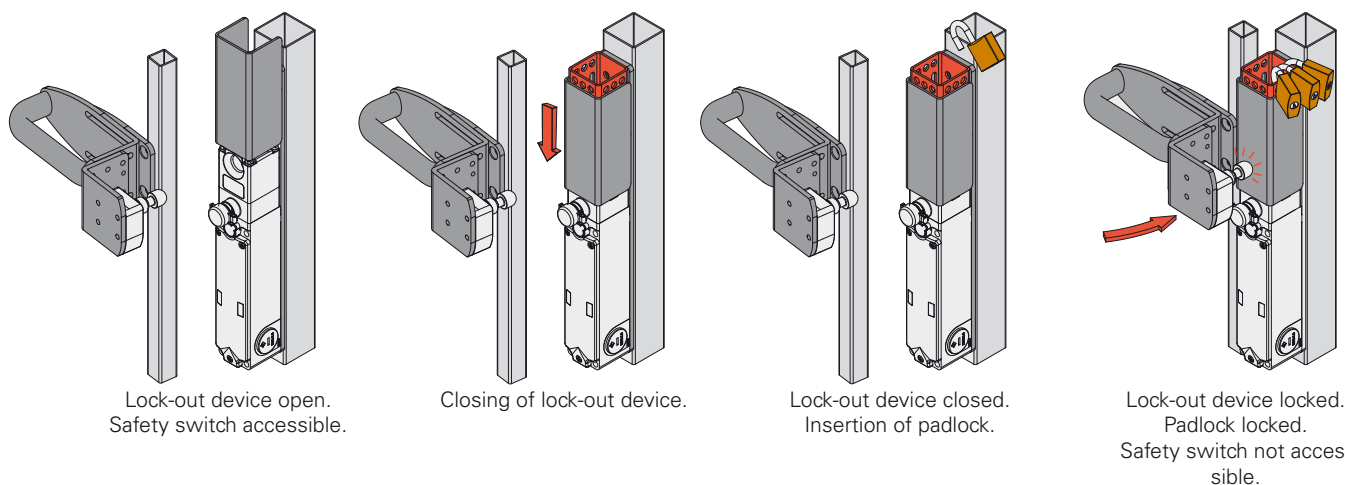
Sturdiness and easy installation

The handle has been manufactured with 5 mm thick brackets in painted steel. The slots found in the brackets enable independent adjustments, so as to guarantee extremely easy mounting, without needing to modify the existing protection structure.
The adjustments make it possible to apply the handle on aluminium profiles or steel frame having various dimensions, from 40x40 mm to 80x80 mm for the frame jamb (A) and from 20x20 mm to 40x40 mm for the door (B).
Mounting can be carried out indifferently on swing doors and sliding doors, either right-handed or left-handed.
The handle is supplied with all the components ready to be fixed at the correct distances by means of anti-tampering screws. The installer should only assemble the parts according to the application, set the chosen switch (provided separately) and make centering adjustments.



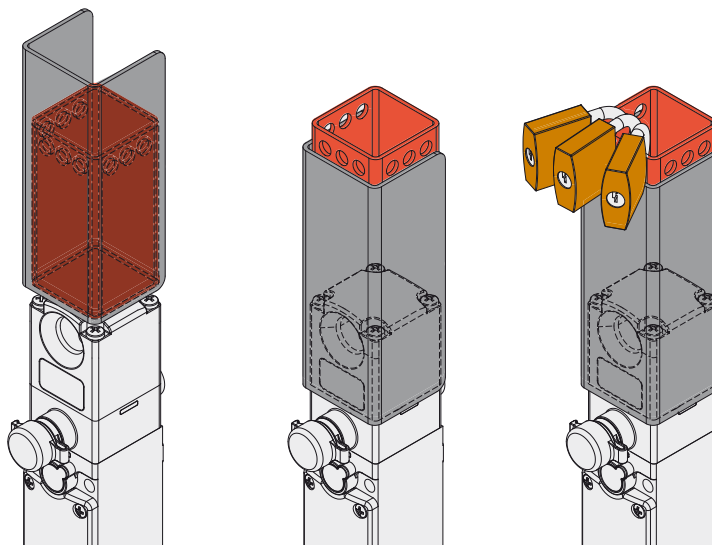
Error-proof padlockable option

The lock-out device is activated by means of a simple vertical sliding action; such movement makes the padlock holes only accessible in a fully screened position, so as to exclude incorrect fitting of the padlocks. The padlock hole diameter is 7 mm and up to 9 padlocks can be fitted. Screening on 3 sides allows the lock-out device to be used, without any adaptation, on swing and sliding doors, either right or left-handed, also thanks to the fact that the switch head can be quickly rotated on all four sides by turning the fixing screws.



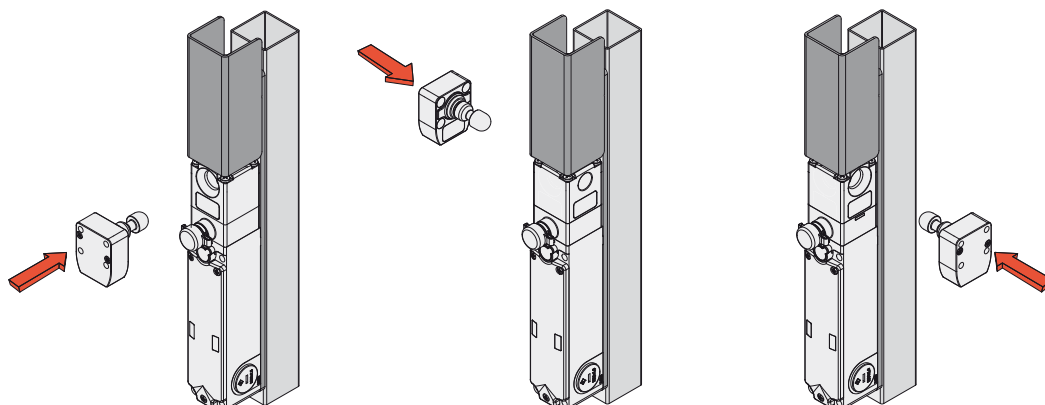
LOCK OUT: maximum safety with just one movement

With one single operation, the lock-out device can close the centring hole found in the NG switch as well as screen the RFID recognition system, therefore locking both mechanical door closing and electrical switch commutation, and consequently preventing any accidental closing of the guard.



Turning of the head

Screening on 3 sides allows the lock-out device to be used, without any adaptation, on swing and sliding doors, either right or left-handed.





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

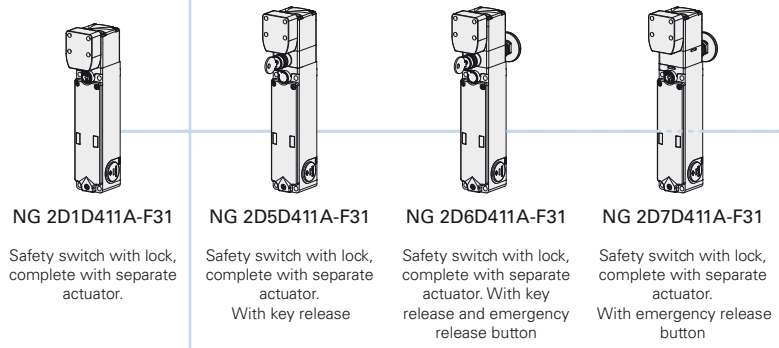
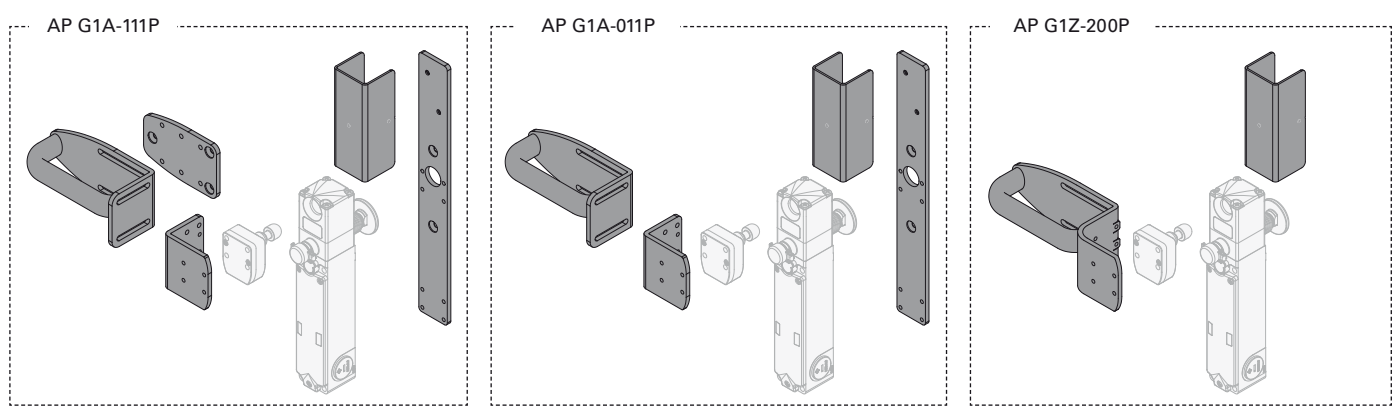
LOCK OUT device	
1	LOCK OUT device
0	without LOCK OUT device

Handle	
P	plastic handle
M	metal handle
Z	without handle

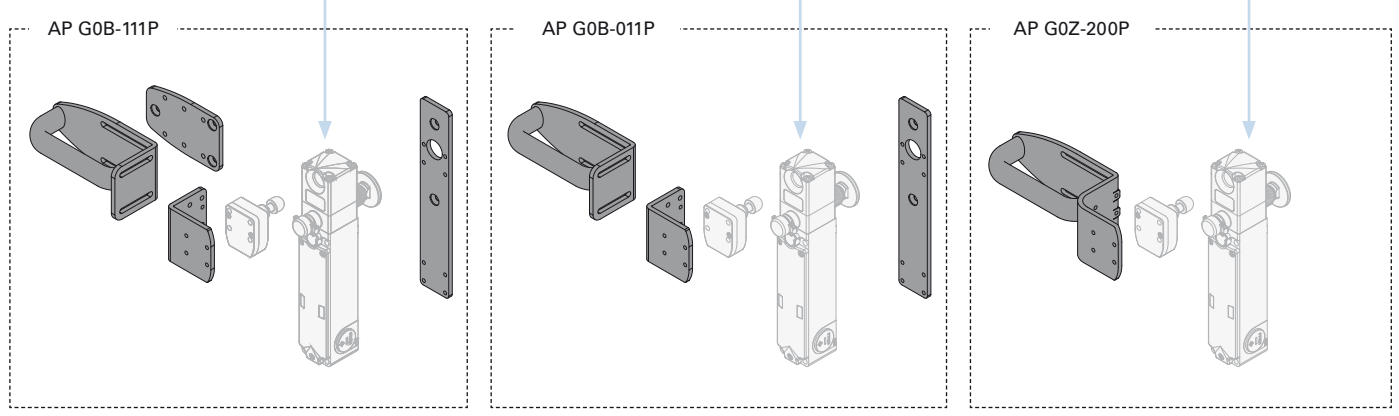
Fixing on frame	
A	long plate
B	short plate
Z	without plate

Configuration of plates on doors	
111	configuration with 3 adjustable plates
011	configuration with 2 adjustable plates
200	configuration with 1 fixed plate

Note: the handle is supplied complete with fixing screws for the handle, the switch, and between the plates.
For certain applications the LOCK OUT device is available separately: item AP G1Z-000Z.

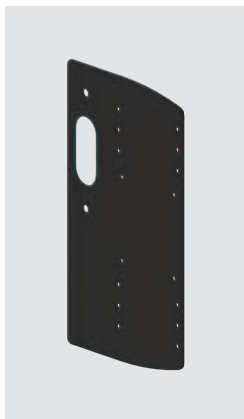


The NG series safety switch is also available in other versions. For further information see page 117.



→ accessory sold separately

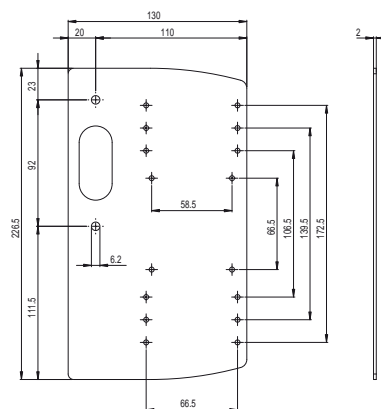
Shaped plate



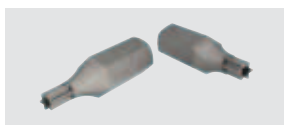
Article	Description
AP A001	Lateral shaped plate for button panel



The shaped plate can be applied under the switch fixing plate. It can be fitted at the right or at the left, it is supplied with holes and used to fasten the boxes for Pizzato Elettrica EROUND push-button panels by means of commercial self-threading screws.



Safety screws bits



Bits for safety screws with pin with 1/4" hexagonal connection

Article	Description
VF VAIT1T25	Bits for M5 screws with Torx T25 fitting
VF VAIT1T30	Bits for M6 screws with Torx T30 fitting

Adhesive labels for emergency release button



Polycarbonate yellow adhesive, rectangular 300x32 mm, red writing. Applied on the internal part of the jamb it helps finding the emergency release button.

Article	Description and language	
VF AP-A1AGR01	PREMERE PER USCIRE	ita
VF AP-A1AGR02	PUSH TO EXIT	eng
VF AP-A1AGR04	ZUM OFFNEN DRUCKEN	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	NACISNAĆ ABY WYJŚĆ	pol
VF AP-A1AGR09	PRESSIONAR PARA SAIR	por

Complete housings for shaped plate

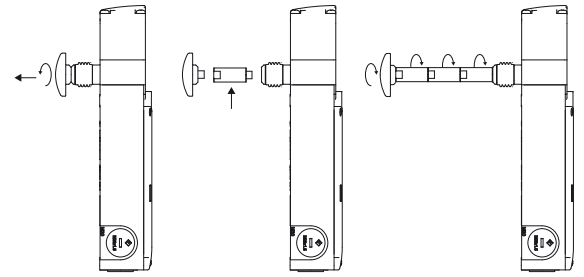


ES AC32010				
Description	Features			Diagram
Button - 1NO E2 1PU2R421L35 Contacts 1x E2 CF10G2V1	flush, spring-return, green			
	pos. 2 /	pos. 3 1NO	pos. 1 /	
Button - 1NC E2 1PU2S321L1 Contacts 1x E2 CF01G2V1	projecting, spring-return, red			
	pos. 2 /	pos. 3 1NC ⊖	pos. 1 /	
ES AC32043				
Description	Features			Diagram
Indicator light E2 1ILA210 LED unit E2 LF1A2V1	white			
	White LED, 12 ... 30 Vac/dc			
Button - 1NO E2 1PU2R4210 Contacts 1x E2 CF10G2V1	flush, spring-return, green			
	pos. 2 /	pos. 3 1NO	pos. 1 /	
ES AC33047				
Description	Features			Diagram
Illuminated button - 1NO E2 1PL2R2210 LED unit E2 LF1A2V1 Contacts 1x E2 CP10G2V1	flush, spring-return, white			
	White LED, 12 ... 30 Vac/dc			
	pos. 2 /	pos. 3 LED	pos. 1 1NO	
Illuminated button - 1NO E2 1PL2R5210 LED unit E2 LF1A2V1 Contacts 1x E2 CP10G2V1	flush, spring-return, yellow			
	White LED, 12 ... 30 Vac/dc			
	pos. 2 /	pos. 3 LED	pos. 1 1NO	
Emergency button Ø 40 mm - 2NC E2 1PER4531 Contacts 2x E2 CF01G2V1	rotary release, Ø 40 mm, red			
	pos. 2 1NC ⊖	pos. 3 /	pos. 1 1NC ⊕	



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	

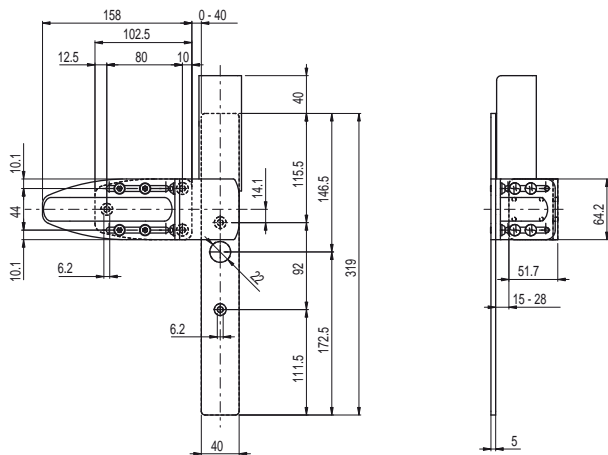


Metal extensions can be combined together until the required length is obtained. Do not exceed an overall length of 500 mm between the release button and the switch.

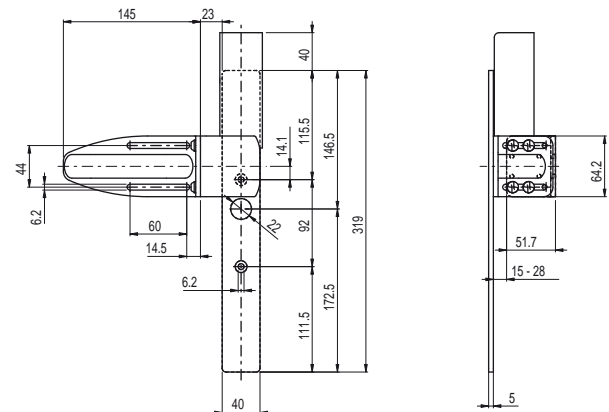
Dimensional drawings

All measures in the drawings are in mm

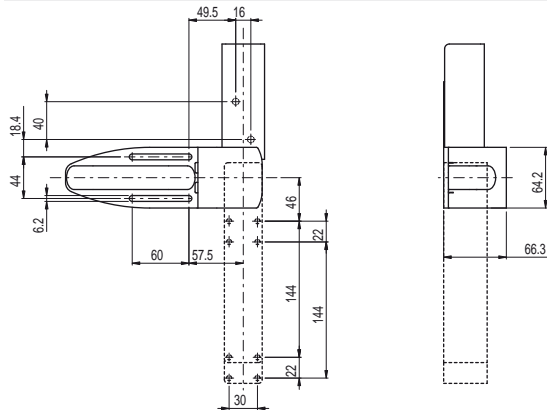
Safety handle AP G1A-111•



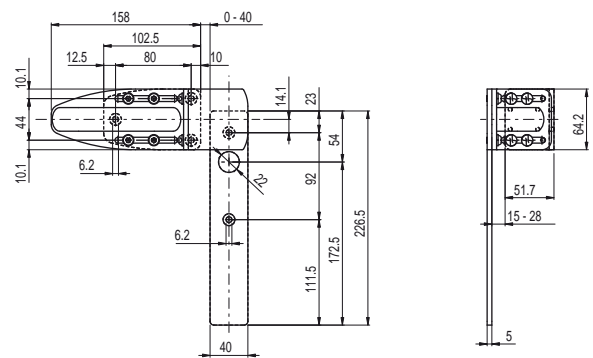
Safety handle AP G1A-011•



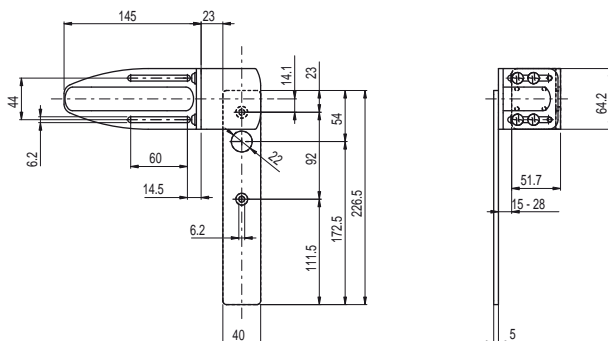
Safety handle AP G1Z-200•



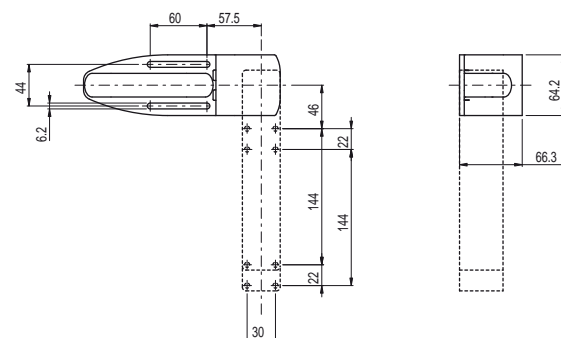
Safety handle AP G0B-111•



Safety handle AP G0B-011•



Safety handle AP G0Z-200•



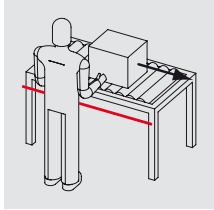
Items with code on **green** background are stock items

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

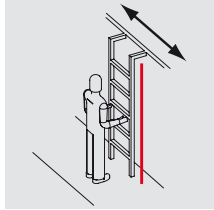
Description



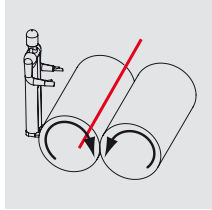
Pizzato Elettrica rope switches are the result of thirty years of experience and cooperation with the major industrial machine constructors. The range of products cover almost all industrial and many niche applications offering solutions for emergency stop as well as general start/stop commands. Emergency stop rope switches have been the first products to introduce in a small size, with patented solutions, the approval EN ISO 13850. Pizzato Elettrica offers also some accessories that have been designed and produced for safe and lasting utilisation, even under difficult environment conditions. Among the latest news we indicate the rope tightening and locking system type FAST (patented). These accessories have been designed to be easy to install as well as aesthetically pleasant for utilisation on machines of the last generation.



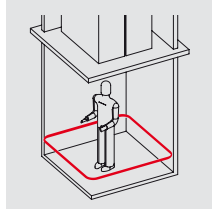
Conveyors



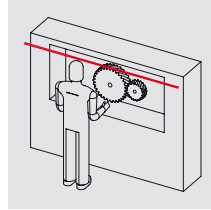
Moving stairs



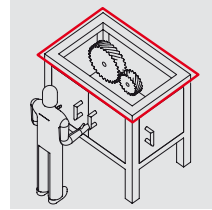
Benders



Lift compartment









Long bay machinery



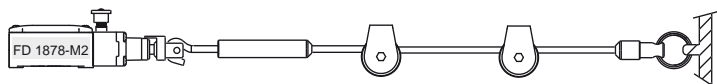
Complete perimeter protection

Rope switches are used to give different types of command:

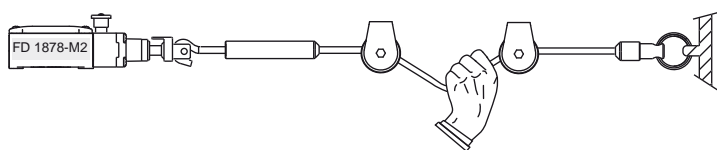
- **For stop commands** rope switches with positive contact opening are used, where the rope is tensioned in an intermediate position, so that even the control of its incidental breaking is possible.
- **For emergency stop** rope switches with positive contact opening in conformity with EN ISO 13850 are used, where the mechanical reset system that opens the contacts is independent from the rope actuating speed, regardless whether the rope is actuated or loosening. With this type of switch the reset system has to be restored by hand after each intervention.

	Prescriptions	Colours	How to install:
Stop commands  example: FD 1879-M2	Positive contact opening is required 	Black is the colour suggested by standards for stop operations.	 It is suggested to put the rope in tension, so it will be possible to notice its breaking or loosening.
Emergency stops  example: FD 1878-M2	Positive contact opening is required  Conformity to EN ISO 13850 is required.	For emergency stops red rope is compulsory. A yellow background is recommended (see function indicator).	 It is mandatory to put the rope in tension, so it will be possible to notice its breaking or loosening.

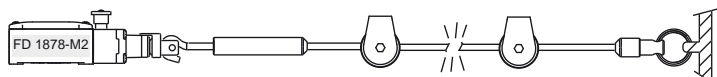
Detection of pulled or cut rope



Rope correctly mounted and in resting position, electric contacts closed.



Rope pulled by operator, electric contacts open.



Rope cut, electric contacts open.

New accessories for rope locking and tightening, FAST system

Pizzato Elettrica has designed and patented accessories specifically for faster installation of the rope of safety switches and to obtain an aesthetically more pleasant system.

The new accessories, in comparison with the traditional fixing system through carpentry material, have the following advantages:

- The installation is faster because only one screw is used for the fastening of every rope extremity, and the parts are prepared to ease the installation. Some practical tests have pointed out that the installation time is halved, reason for which it is named 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 folds, thus reducing the rope stabilisation time and the possible re-calibrations of the rope tightening.

The system has been tested for correct function only if used with steel ropes of high quality like the ones Pizzato Elettrica usually supplies. See page 175.



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.



Indicator lights

Sometimes it is useful to have a visible local signal to identify when or which rope switch has been actuated. The Pizzato Elettrica signal lamps have been created for this requirement, and they have been designed to be directly fixed on the treaded entries of the switches. These light indicators are sturdy, have IP67 protection degree and accept any BA9 electric bulb connection with power up to 3 W. The light indicators are decomposable in two parts for bulb replacement without removing the lamp holder from the switch, and their inner part can rotate in such a way that it can be wired without any risk of kinking the wires. Three different semitransparent or transparent cover colours are available.



The possibility to have rope switches with 3 pole contacts allows the building of plants where each switch has two NC contacts with positive opening for the safety chain, and one NO contact for the light indicator.

Safety springs

Some rope safety switch applications require ropes with particularly long rope lengths. 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. As the safety switches have to be installed stretching the rope inside the working area of the switch, it is possible that for particularly long ropes or particularly high changes of temperature there will be the unwanted activation of the switch. 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. The safety spring has also a stop ring that, in case of emergency actuation, let the rope traction to work only on the switch. See page 175.



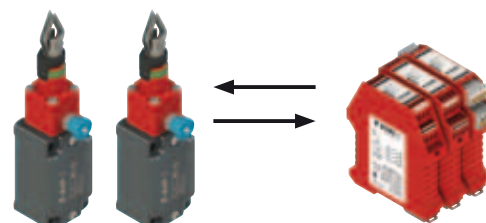
Pulleys for rope in stainless steel



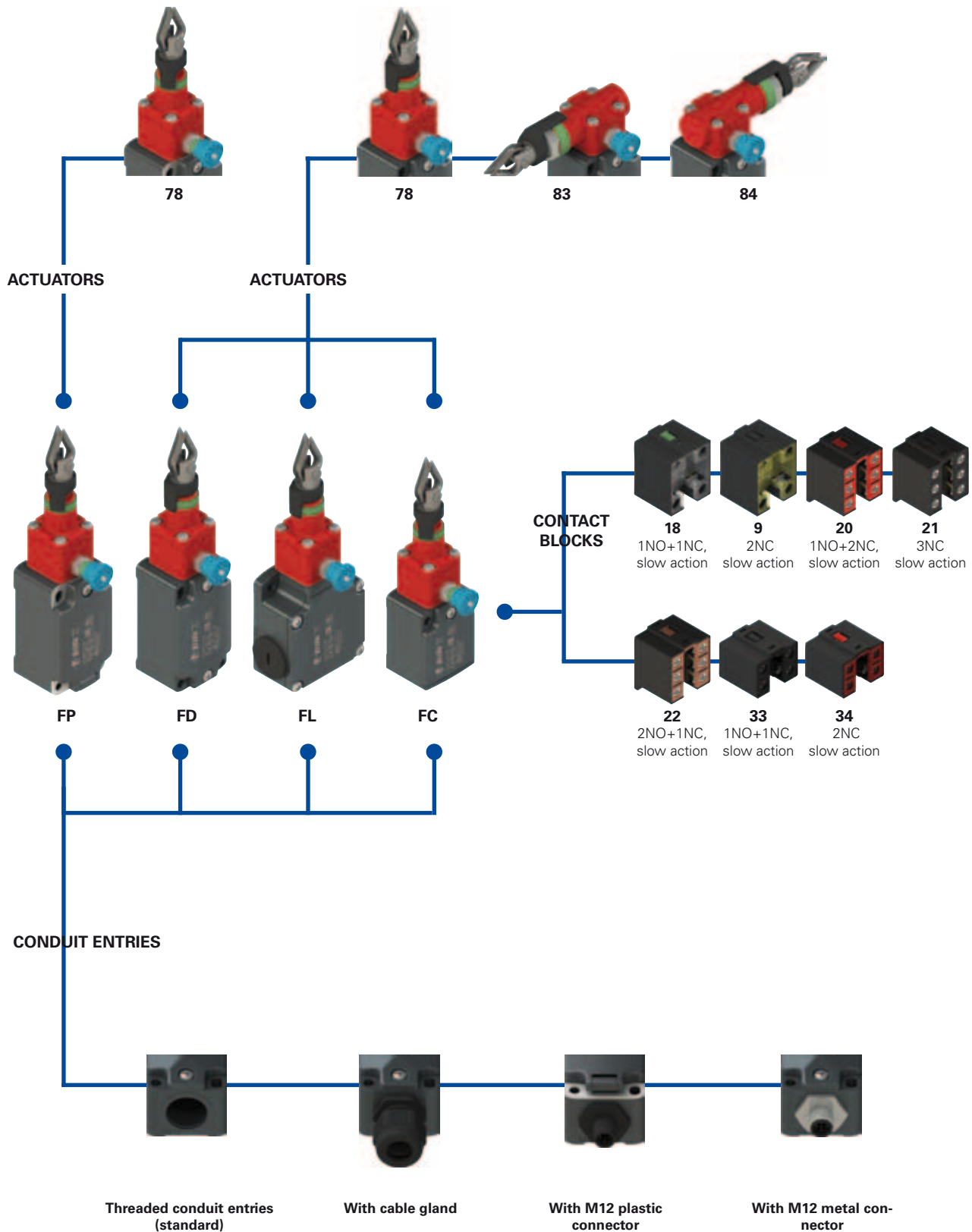
The pulleys in stainless steel are used in applications where the rope is too long, to support its length or bend its route. Two sturdy pulleys have been designed to avoid the deformation and allow the rope to remain in its seat also when it's activated energetically. The angular pulley has been designed with a particular shape and with a slotted fixing hole to make the installation easier and to maintain the rope to a correct distance from guard edges.

Safety modules

The rope safety switches and the mushroom-head push buttons 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



—●— product option
 —▶— accessory sold separately



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

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

Contact blocks	
18	1NO+1NC, slow action
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

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K50	M12 metal connector, 5 poles
...

Please contact our technical service for the complete list of possible combinations.

Actuating head	
78	longitudinal head
83	left transversal head (FD-FL housing only)
84	right transversal head (FD-FL housing only)

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

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

article options options
FC 3378-E7GM2K50T6

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

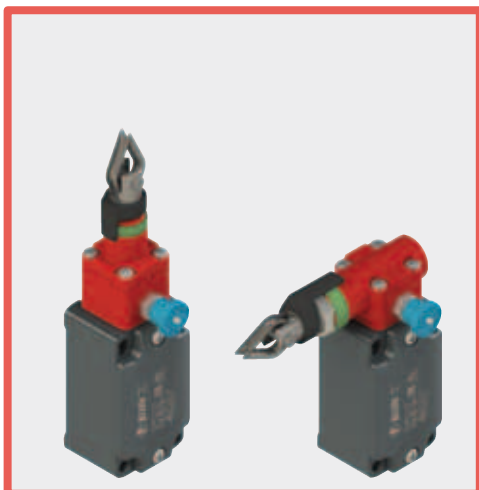
Pre-installed cable glands or connectors	
	without cable gland (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
K50	M12 metal connector, 5 poles

Actuating head	
78	longitudinal head
83	left transversal head
84	right transversal head

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

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



Main features

- Metal or plastic housing, from one to three conduit entries
- Protection degree IP67
- In conformity 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


Markings and quality marks:



IMQ approval:	EG605
UL approval:	E131787
CCC approval:	2007010305230000 (FD-FL-FC series) 2007010305230014 (FP series)
EAC approval:	RU C-IT DM94.B.01024

Technical data

Housing

FP series housing made of glass fiber 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

For safety applications up to: SIL 3 acc. to EN 62061
 PL e acc. to EN ISO 13849-1

Safety parameters:

B_{10d} : 2,000,000 for NC contacts
 Service life: 20 years
 Ambient temperature: -25°C ... +80°C
 Max. actuation frequency: 1 cycle / 6 s
 Mechanical endurance: 1 million operating cycles¹
 Max. actuation speed: 0.5 m/s
 Min. actuation speed: 1 mm/s
 Tightening torques for installation: see pages 297-308

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

Max. cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 33, 34:	min.	1 x 0.34 mm ²	(1 x AWG 22)
	max.	2 x 1.5 mm ²	(2 x AWG 16)
Contact blocks 18, 9:	min.	1 x 0.5 mm ²	(1 x AWG 20)
	max.	2 x 2.5 mm ²	(2 x AWG 14)

In conformity with standards:

IEC 60947-5-1, EN 60947-5-1, EN 60947-1, IEC 60204-1, EN 60204-1, EN ISO 14119, EN ISO 12100, IEC 60529, EN 60529, EN ISO 13850, EN 418, UL 508, CSA 22.2 No.14 .

Approvals:


IEC 60947-5-1, UL 508, CSA 22.2 No.14 , GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/122/EC.

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 chapter utilization requirements from page 297 to page 308.

	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)
	Rated impulse withstand voltage (U _{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)
	Conditional short circuit current: Protection against short circuits: Pollution degree:	1000 A acc. to EN 60947-5-1 type aM fuse 10 A 500 V 3
with M12 connector for 4 and 5 poles	Thermal current (I _{th}):	4 A
	Rated insulation voltage (U _i):	250 Vac 300 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 4 A 500 V 3
with M12 connector for 8 poles	Thermal current (I _{th}):	2 A
	Rated insulation voltage (U _i):	30 Vac 36 Vdc
	Protection against short circuits: Pollution degree:	type gG fuse 2 A 500 V 3

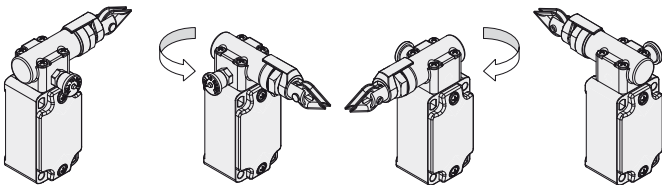


Description



These rope operated safety switches are installed on machines or conveyor belts, to activate the emergency stop of the machine on every hand intervention on the rope, from any point. They allow cost savings on machines of medium-large size, where normally many emergency stop push buttons can be replaced by one single switch. Provided with **self-control function**, they constantly check their correct operation, signalling with the opening of the contacts an eventual loosening or breaking of the rope. These safety switches keep the contacts open after their activation, even if the rope is left free, until they are reset.

Orientable heads



Removing the four fastening screws, in all switches, it is possible to rotate the head in 90° steps.

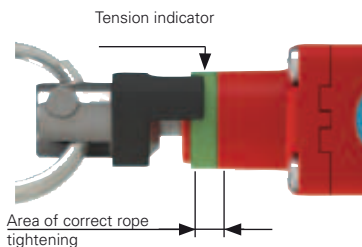
Extended temperature range

-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.

They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

Adjustment point indicator of the rope



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. In this position it is possible to reset the switch, pulling the blue button, and to close the

electrical safety contacts.

If a traction (or loosening) of the rope it is high enough to permit the black indicator to go outside the correct tension area, the safety contacts are opened and the reset device is triggered.

Characteristics 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 (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 (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 of contacts on contact blocks 18, 9, 20, 21, 22, 33, 34

In conformity with standards: EN 60947-1, EN 60947-5-1 + A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

Laser engraving



All devices are indelibly marked with a dedicated laser system that allows the marking to be also suitable for extreme environments. This system that does not use labels, prevents the loss of plate data and the marking is more resistant over time.

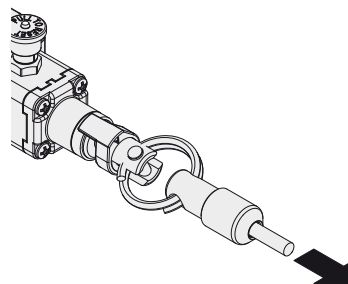
Protection degree IP67

IP67

These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to IEC 60529.

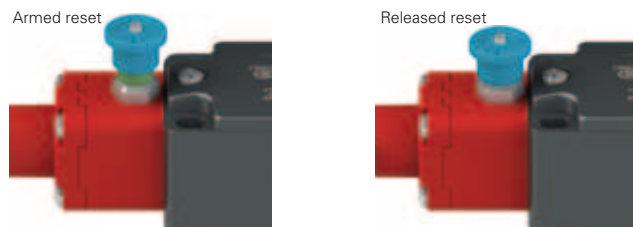
They can therefore be used in all environments where the maximum protection of the housing is required.

Reduced actuating force



These switches can be supplied with reduced hardness internal springs on request. This makes it possible to reduce the physical effort required to actuate the switch, whilst maintaining the actuating stroke of the electrical contacts unchanged. Particularly suitable for spans of reduced dimensions, they must always be matched to the suspension of the rope pulley.

Indicator for the state of the reset



If the rope stretching indicator is in the correct operation area, it is possible to close the electric safety contacts pulling the blue reset button. The green ring signal allows to know the reset condition quickly.

Characteristics approved by UL

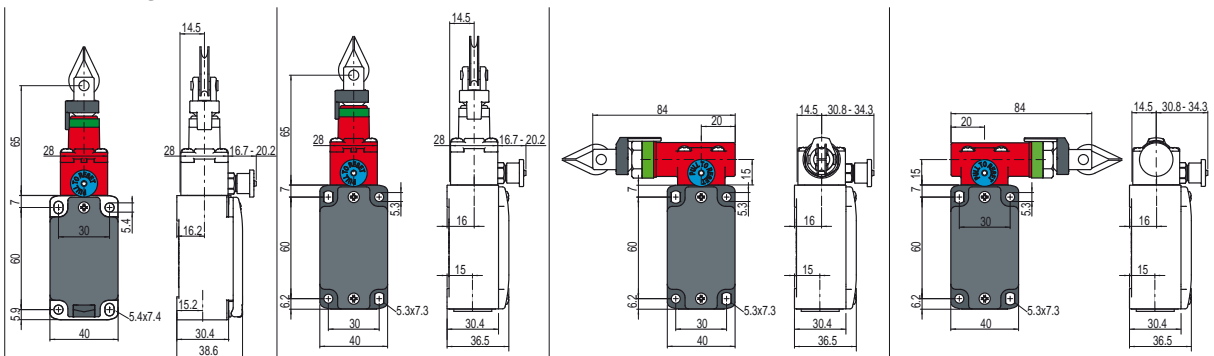
Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).

In conformity with standard: UL 508, CSA 22.2 No.14

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

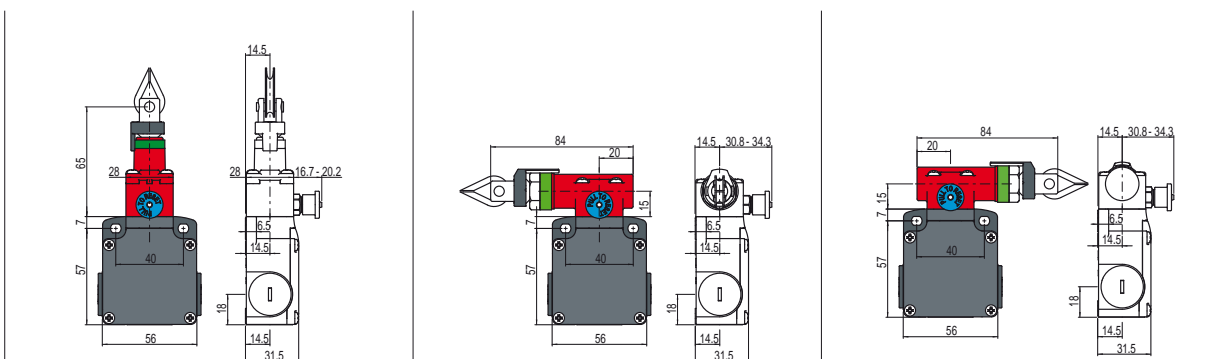
Dimensional drawings

All measures in the drawings are in mm

Contact type:
L = slow action

Contact blocks

18	L	FP 1878-M2	→	1NO+1NC	FD 1878-M2	→	1NO+1NC	FD 1883-M2	→	1NO+1NC	FD 1884-M2	→	1NO+1NC
9	L	FP 978-M2	→	2NC	FD 978-M2	→	2NC	FD 983-M2	→	2NC	FD 984-M2	→	2NC
20	L	FP 2078-M2	→	1NO+2NC	FD 2078-M2	→	1NO+2NC	FD 2083-M2	→	1NO+2NC	FD 2084-M2	→	1NO+2NC
21	L	FP 2178-M2	→	3NC	FD 2178-M2	→	3NC	FD 2183-M2	→	3NC	FD 2184-M2	→	3NC
22	L	FP 2278-M2	→	2NO+1NC	FD 2278-M2	→	2NO+1NC	FD 2283-M2	→	2NO+1NC	FD 2284-M2	→	2NO+1NC
33	L	FP 3378-M2	→	1NO+1NC	FD 3378-M2	→	1NO+1NC	FD 3383-M2	→	1NO+1NC	FD 3384-M2	→	1NO+1NC
34	L	FP 3478-M2	→	2NC	FD 3478-M2	→	2NC	FD 3483-M2	→	2NC	FD 3484-M2	→	2NC
Min. 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 →)		Initial 147 N...final 235 N (250 N →)		Initial 147 N...final 235 N (250 N →)		Initial 147 N...final 235 N (250 N →)	
Travel diagrams		page 164 - group 1		page 164 - group 1		page 164 - group 2		page 164 - group 2		page 164 - group 2		page 164 - group 2	



Contact blocks

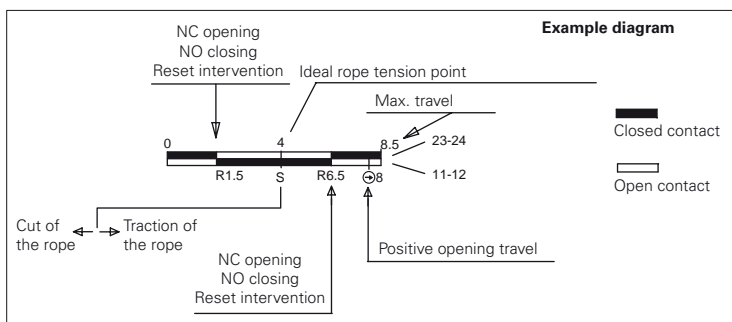
18	L	FL 1878-M2	→	1NO+1NC	FL 1883-M2	→	1NO+1NC	FL 1884-M2	→	1NO+1NC	
9	L	FL 978-M2	→	2NC	FL 983-M2	→	2NC	FL 984-M2	→	2NC	
20	L	FL 2078-M2	→	1NO+2NC	FL 2083-M2	→	1NO+2NC	FL 2084-M2	→	1NO+2NC	
21	L	FL 2178-M2	→	3NC	FL 2183-M2	→	3NC	FL 2184-M2	→	3NC	
22	L	FL 2278-M2	→	2NO+1NC	FL 2283-M2	→	2NO+1NC	FL 2284-M2	→	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	
Min. force		Initial 63 N...final 83 N (90 N →)		Initial 147 N...final 235 N (250 N →)		Initial 147 N...final 235 N (250 N →)		Initial 147 N...final 235 N (250 N →)		Initial 147 N...final 235 N (250 N →)	
Travel diagrams		page 164 - group 1		page 164 - group 2		page 164 - group 2		page 164 - group 2		page 164 - group 2	



Contact type: <input type="checkbox"/> L = slow action			
Contact blocks	33 <input type="checkbox"/> L FC 3378-M2 \ominus 1NO+1NC 34 <input type="checkbox"/> L FC 3478-M2 \ominus 2NC	FC 3383-M2 \ominus 1NO+1NC FC 3483-M2 \ominus 2NC	FC 3384-M2 \ominus 1NO+1NC FC 3484-M2 \ominus 2NC
Min. force	Initial 63 N...final 83 N (90 N \ominus)	Initial 147 N...final 235 N (250 N \ominus)	Initial 147 N...final 235 N (250 N \ominus)
Travel diagrams	page 164 - group 1	page 164 - group 2	page 164 - group 2

How to read travel diagrams

All measures in the diagrams are in mm



Travel diagrams table

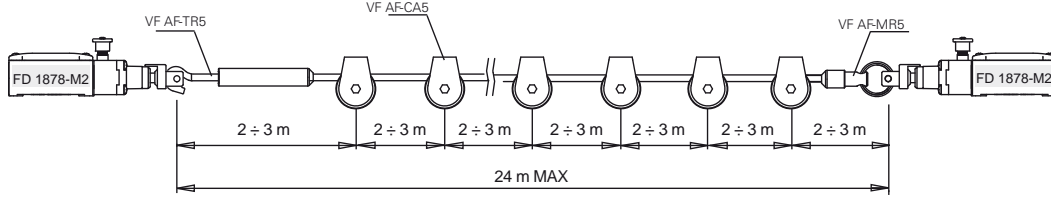
Contact blocks	Group 1	Group 2
18 1NO+1NC 11 23 7 - 24 12		
9 2NC 11 21 7 - 22 12		
20 1NO+2NC 11 21 33 7 - 22 34 12		
21 3NC 11 21 31 7 - 22 32 12		
22 2NO+1NC 11 23 33 7 - 24 34 12		
33 1NC+1NO 13 21 7 - 22 14		
34 2NC 11 21 7 - 22 12		

IMPORTANT:

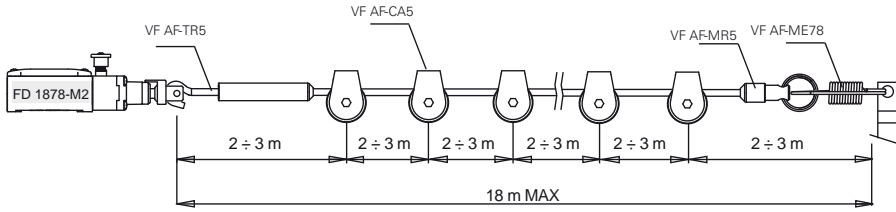
In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol \ominus . Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.

Application examples and max. rope length for switches with longitudinal head

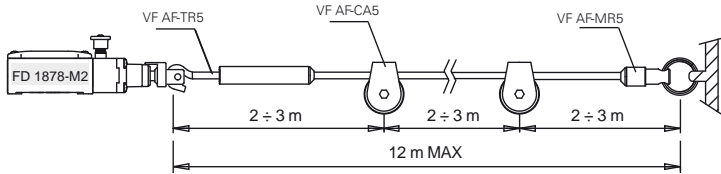
Example A



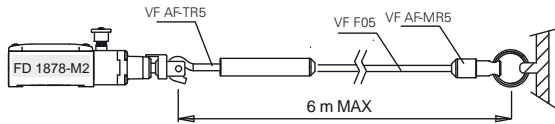
Example B



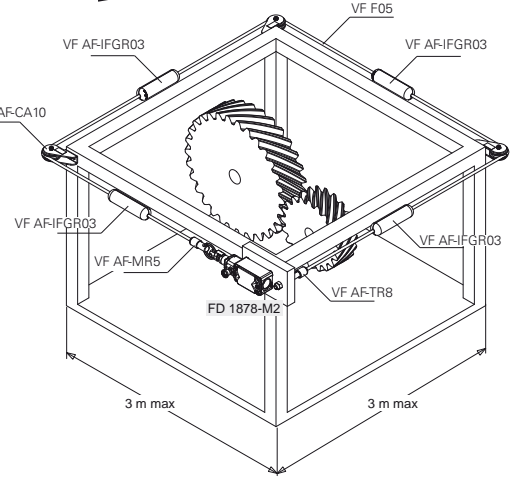
Example C



Example D

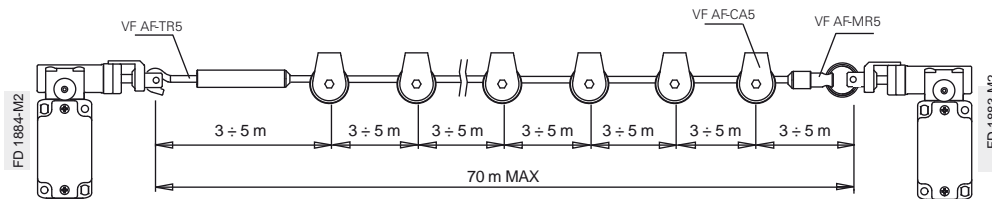


Example E

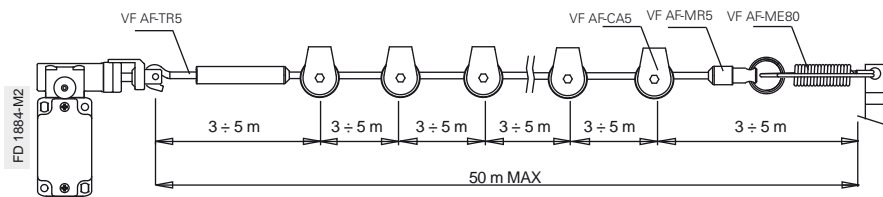


Application examples and max. rope length for switches with transversal head

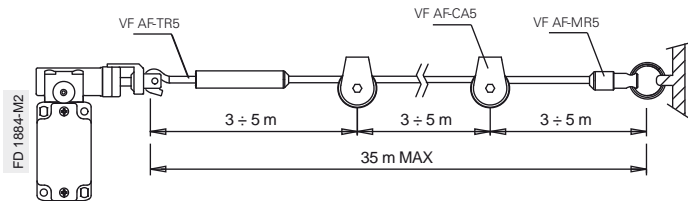
Example F



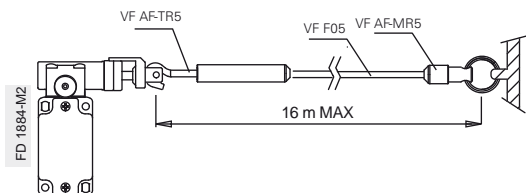
Example G



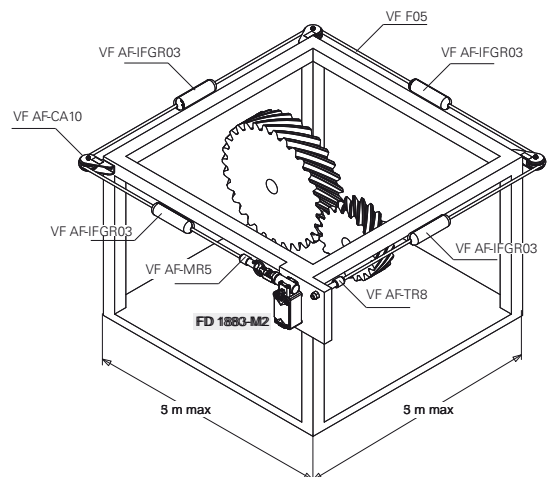
Example H



Example I

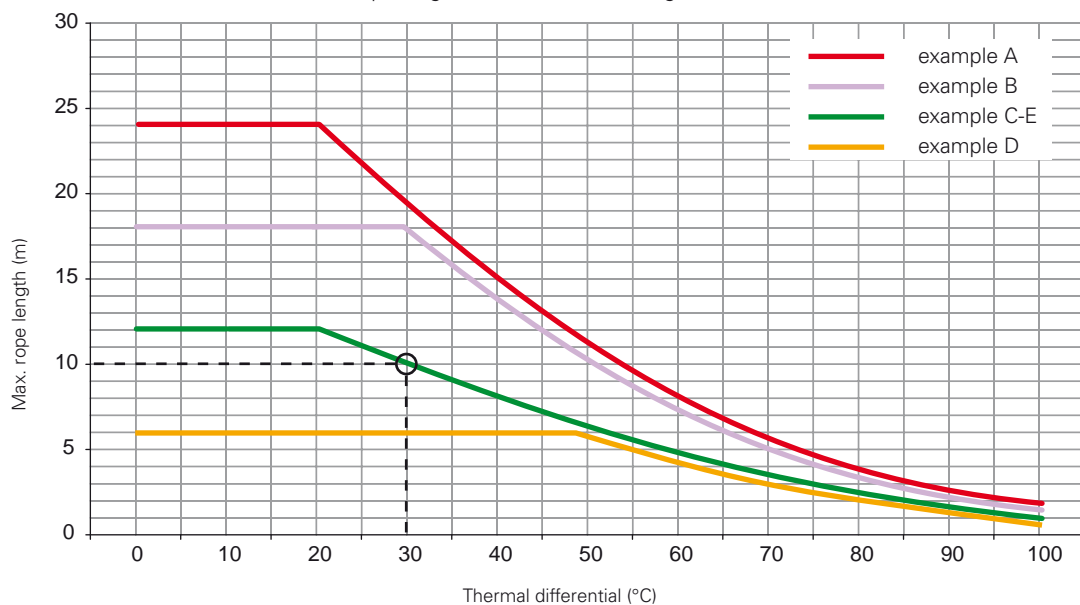


Example J



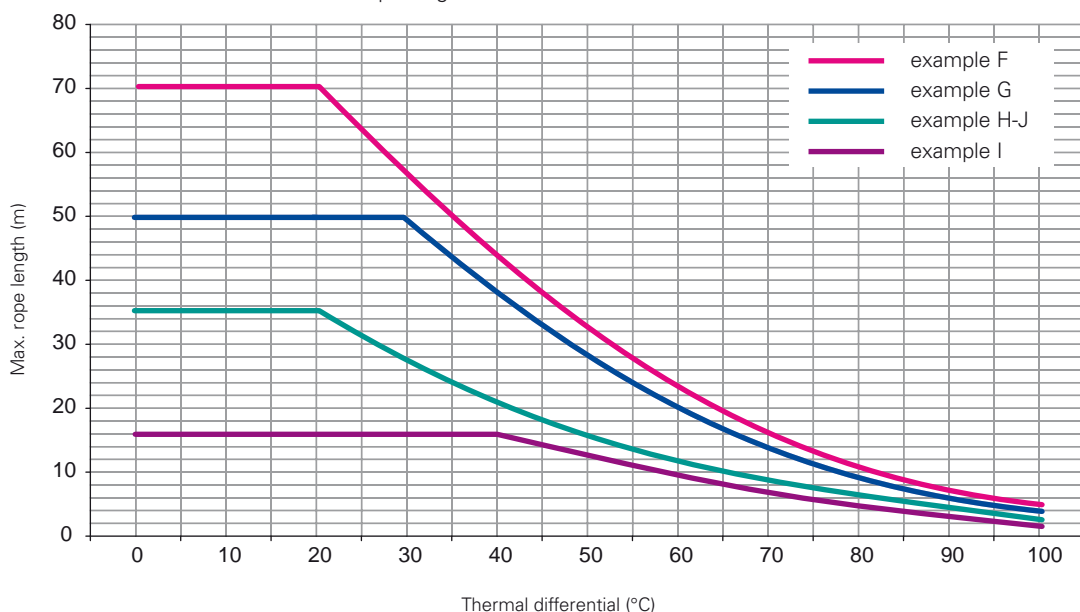
Max. rope length

Max. rope length for switches with longitudinal head



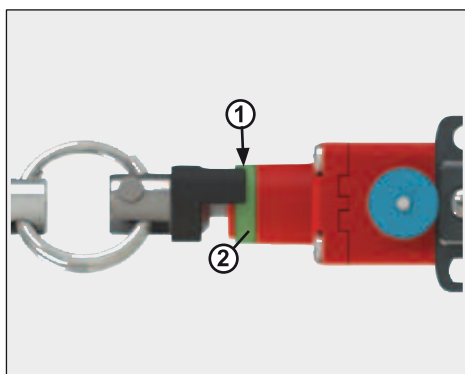
In the diagram, the suggested max. rope lengths with regard to changes of temperature (thermal differential) to which the switch is expected to be exposed in the working area are indicated. For instance, for an installation acc. to example C which expects a thermal differential of 30°C, a max. rope length of 10 meters is suggested.

Max. rope length for switches with transversal head

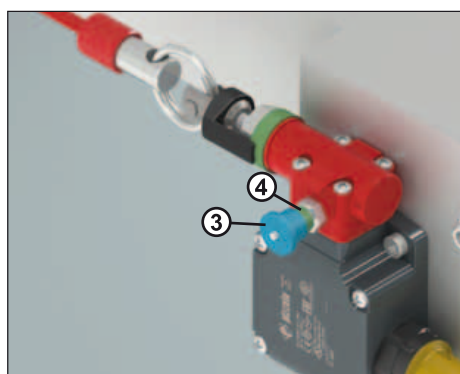


Important: The above data are guaranteed only using original rope and accessories. See page 175.

Adjustment of the operating point

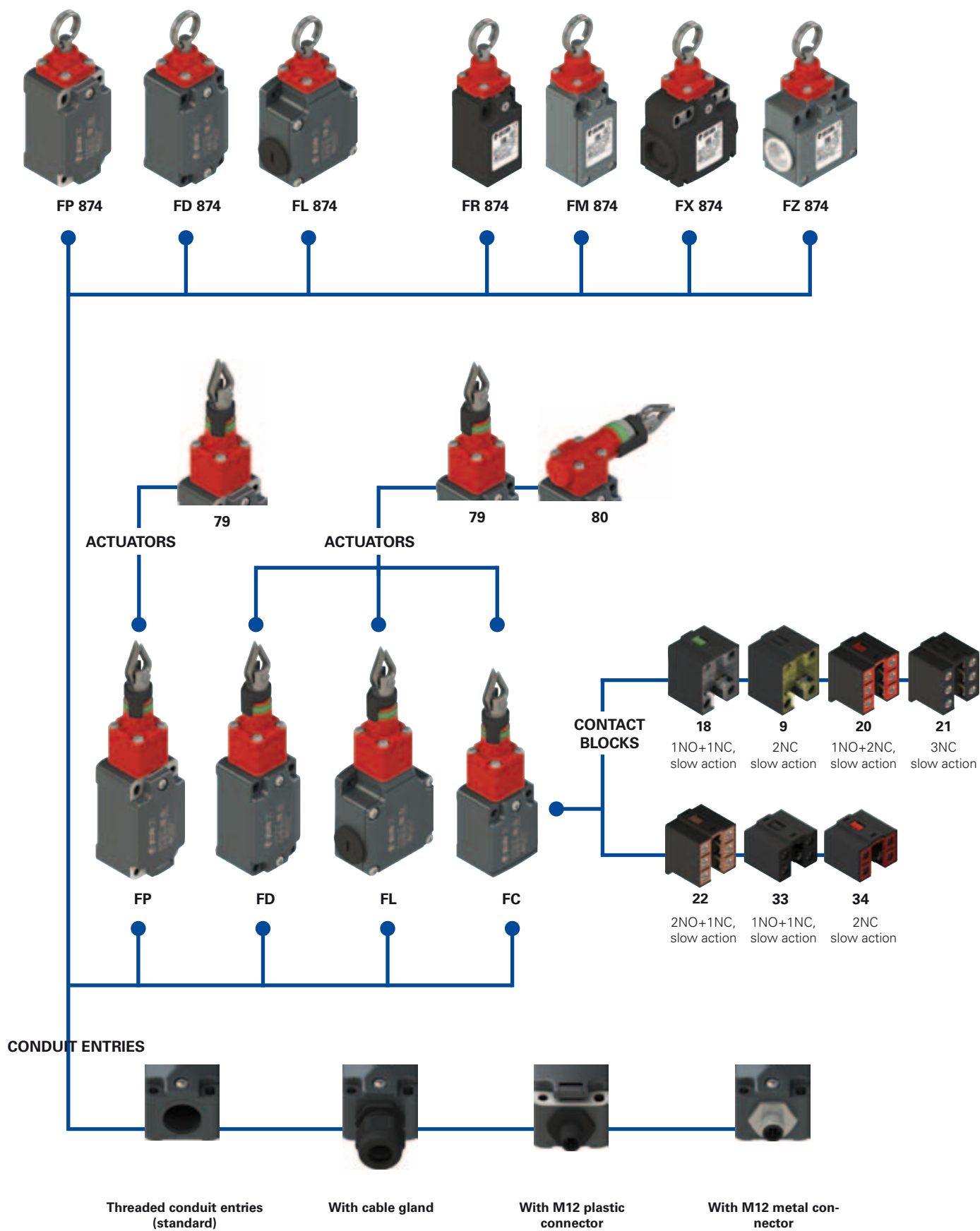


Tighten the rope connected to the switch, until the end of the indicator (1) reaches about the middle of the green ring (2).



Pull the knob (3) in order to close the safety contacts inside the switch. Below the knob a green ring (4) will be disclosed.

Selection diagram



● product option
 → accessory sold separately



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	
18	1NO+1NC, slow action
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

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	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K50	M12 metal connector, 5 poles
...

Please contact our technical service for the complete list of possible combinations.

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

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

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	
	without cable gland (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
K50	M12 metal connector, 5 poles

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

Pre-installed cable glands or connectors	
	without cable gland or connector (standard)
K23	cable gland for cables Ø 6...Ø 12 mm
...
K50	M12 metal connector, 5 poles
...

Please contact our technical service for the complete list of possible combinations.

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



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


Markings and quality marks:



IMQ approval:	EG605 (FD-FLFP-FC series) EG610 (FR-FX series) EG609 (FM-FZ series)
UL approval:	E131787
CCC approval:	2007010305230000 (FD-FL-FC series) 2007010305230014 (FP series) 2007010305230013 (FR-FX series) 2007010305229998 (FM-FZ series)
EAC approval:	RU C-IT ДМ94.В.01024

Technical data

Housing

FP, FR, FX series housing made of glass fiber 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 having equal or higher protection degree

General data

For safety applications up to:	SIL 3 acc. to EN 62061 PL e acc. to EN ISO 13849-1
Safety parameters:	
B _{10d} :	2,000,000 for NC contacts
Service life:	20 years
Ambient temperature:	-25°C ... +80°C
Max. actuation frequency:	1 cycle / 6 s
Mechanical endurance:	1 million operating cycles ¹
Max. actuation speed:	0.5 m/s
Min. actuation speed:	1 mm/s
Tightening torques for installation:	see pages 297-308

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

Cable cross section (flexible copper strands)

Contact blocks 20, 21, 22, 33, 34:	min.	1 x 0.34 mm ²	(1 x AWG 22)
	max.	2 x 1.5 mm ²	(2 x AWG 16)
Contact blocks 18, 8, 9:	min.	1 x 0.5 mm ²	(1 x AWG 20)
	max.	2 x 2.5 mm ²	(2 x AWG 14)

In conformity with standards:

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

Approvals:

IEC 60947-5-1, UL 508, CSA 22.2 No.14, GB14048.5-2001.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC, Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

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 chapter utilization requirements from page 297 to page 308.

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
	Rated impulse withstand voltage (U _{imp}):	6 kV 4 kV (contact blocks 20, 21, 22, 33, 34)	I _e (A)	6	4	1
	Conditional short circuit current: Protection against short circuits: Pollution degree:	1000 A acc. to EN 60947-5-1 type aM fuse 10 A 500 V 3	Direct current: DC13	U _e (V)	24	125

with M12 connector for 4 and 5 poles	Thermal current (I _{th}):	4 A	Alternating current: AC15 (50÷60 Hz)			
	Rated insulation voltage (U _i):	250 Vac 300 Vdc	U _e (V)	24	120	250
	Protection against short circuits: Pollution degree:	type gG fuse 4 A 500 V 3	I _e (A)	4	4	4
			Direct current: DC13	U _e (V)	24	125

with M12 connector 8 poles	Thermal current (I _{th}):	2 A	Alternating current: AC15 (50÷60 Hz)			
	Rated insulation voltage (U _i):	30 Vac 36 Vdc	U _e (V)	24		
	Protection against short circuits: Pollution degree:	type gG fuse 2 A 500 V 3	I _e (A)	2		
			Direct current: DC13	U _e (V)	24	

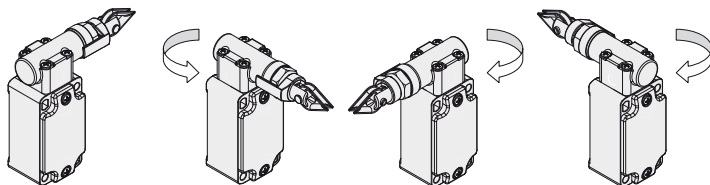
Description



These rope operated safety switches are installed on machines or conveyor belts, to activate the simple stop of the machine on every hand intervention on the rope, from any point.

Provided with **self-control function**, they constantly check their correct operation, signalling with the opening of the contacts an eventual loosening or breaking of the rope.

Orientable heads



Removing the four fastening screws, in all switches, it is possible to rotate the head in 90° steps.

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 IEC 60529.

They can therefore be used in all environments where the maximum protection of the housing is required.

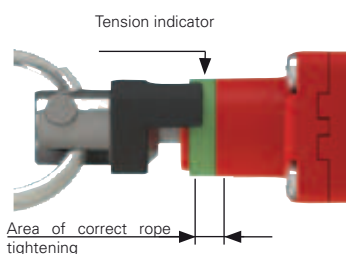
Extended temperature range

-40°C

This range of switches is also available in a special version with an ambient operating temperature range of -40°C to +80°C.

They can be used for applications in cold stores, sterilisers and other devices with low temperature environments. Special materials that have been used to realize these versions, maintain unchanged their features also in these conditions, widening the installation possibilities.

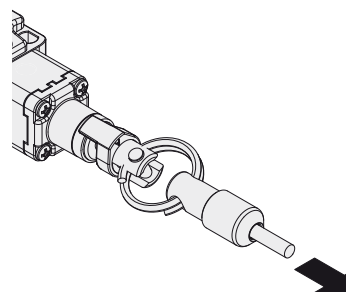
Adjustment point indicator of the rope



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 a traction (or loosening) of the rope it is high enough to permit the black indicator to go outside

the correct tension area, the safety contacts will open.

Actuating forces



These switches can be supplied with reduced hardness internal springs on request. This makes it possible to reduce the physical effort required to actuate the switch, whilst maintaining the actuating stroke of the electrical contacts unchanged. Particularly suitable for spans of reduced dimensions, they must always be matched to the suspension of the rope pulley.

Characteristics 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 (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 (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 of contacts on contact blocks 18, 8, 9, 20, 21, 22, 33, 34

In conformity with standards: EN 60947-1, EN 60947-5-1+ A1:2009, fundamental requirements of the Low Voltage Directive 2006/95/EC.

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

Characteristics approved by UL

Utilization categories Q300 (69 VA, 125 ... 250 Vdc)
A600 (720 VA, 120 ... 600 Vac)
Data of housing type 1, 4X "indoor use only", 12, 13
For all contact blocks use 60 or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 12-14. Terminal tightening torque of 7.1 lb in (0.8 Nm).

In conformity with standard: UL 508, CSA 22.2 No.14

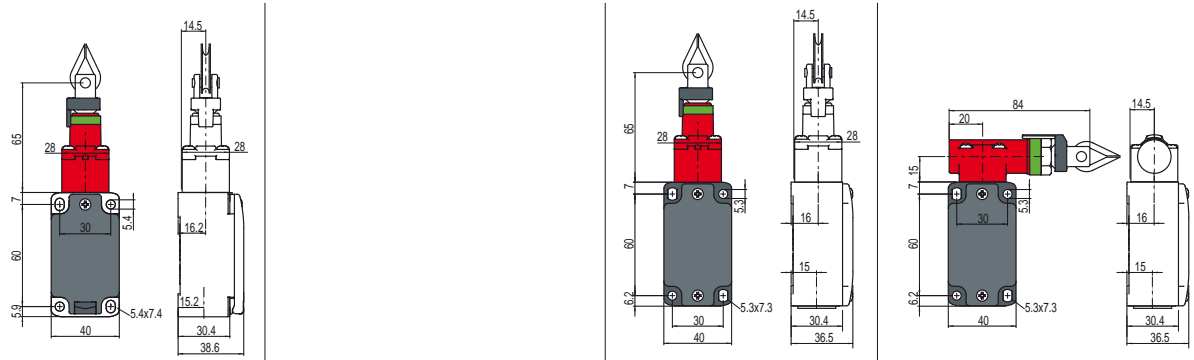
Please contact our technical service for the list of approved products.

Dimensional drawings

All measures in the drawings are in mm

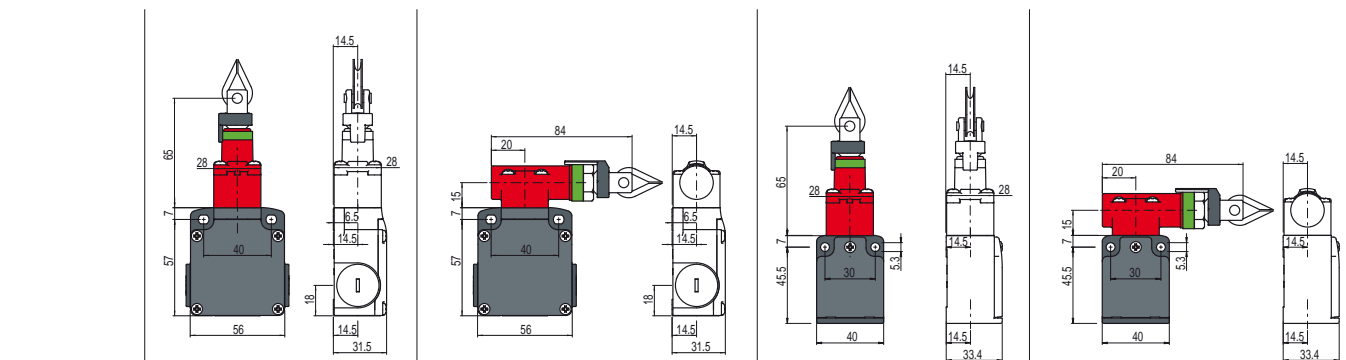
Contact type:

L = slow action



Contact blocks

18	L	FP 1879-M2	1NO+1NC	FD 1879-M2	1NO+1NC	FD 1880-M2	1NO+1NC
9	L	FP 979-M2	2NC	FD 979-M2	2NC	FD 980-M2	2NC
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
Min. 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 172 - group 1		page 172 - group 1		page 172 - group 2	

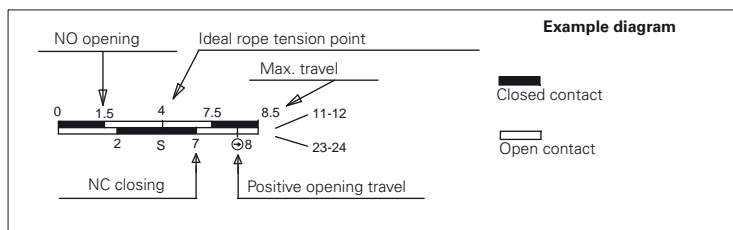


Contact blocks

18	L	FL 1879-M2	1NO+1NC	FL 1880-M2	1NO+1NC		
9	L	FL 979-M2	2NC	FL 980-M2	2NC		
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
34	L	FL 3479-M2	2NC	FL 3480-M2	2NC	FC 3479-M2	2NC
Min. 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)	
Travel diagrams		page 172 - group 1		page 172 - group 2		page 172 - group 1	

How to read travel diagrams

All measures in the diagrams are in mm



IMPORTANT:

In **safety applications**, actuate the switch **at least up to the positive opening travel** shown in the travel diagrams with symbol . Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.



Contact type:
L = slow action

Contact blocks	8 L FP 874-M2 1NC	FD 874-M2 1NC	FL 874-M2 1NC	
Min. 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 172 - group 3	page 172 - group 3	page 172 - group 3	

Contact blocks	8 L FR 874-M2 1NC	FM 874-M2 1NC	FX 874-M2 1NC	FZ 874-M2 1NC
Min. 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 172 - group 3	page 172 - group 3	page 172 - group 3	page 172 - group 3

Travel diagrams table

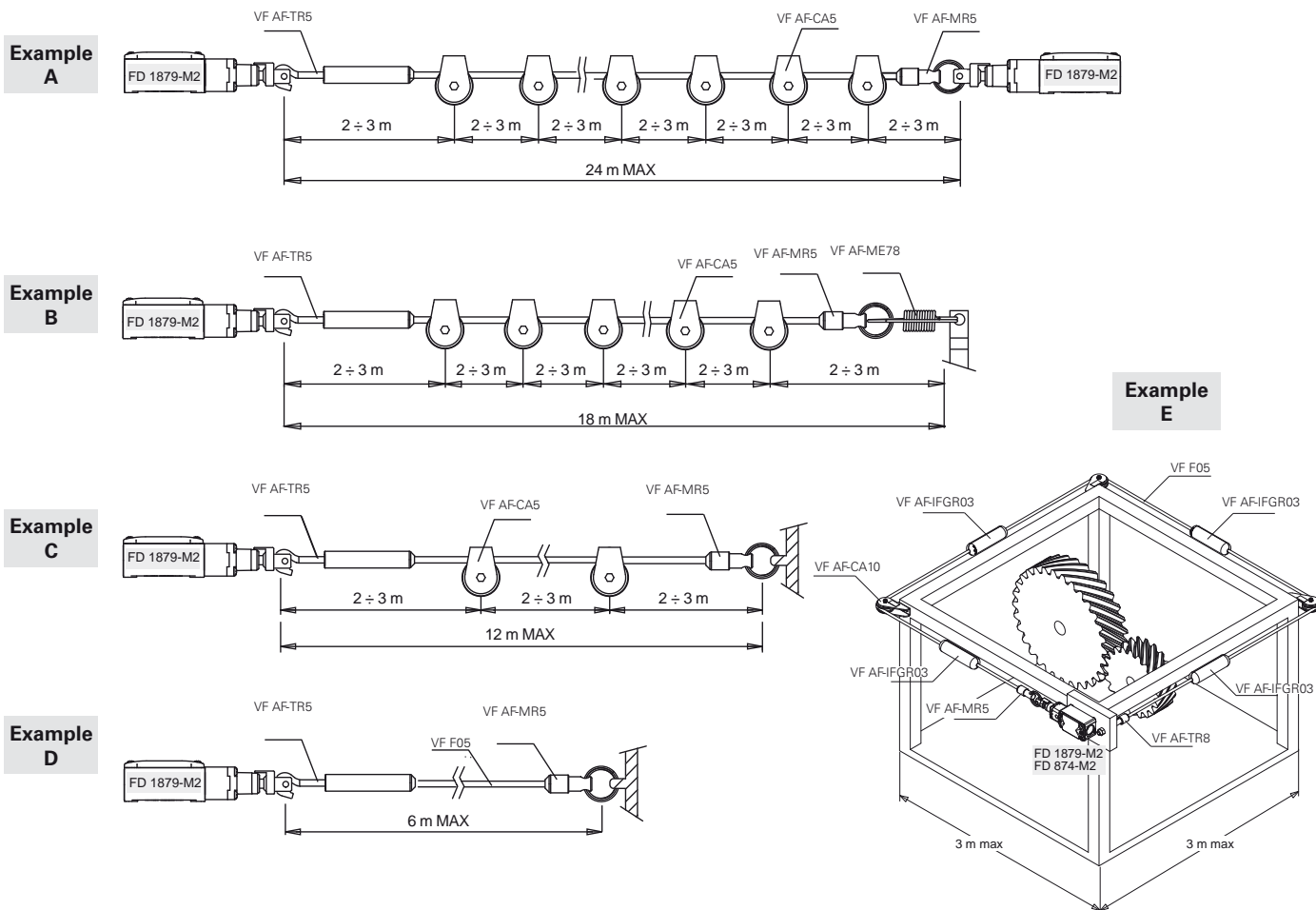
Contact blocks	Group 1	Group 2	Group 3
18 1NO+1NC			
8 1NC			
9 2NC			
20 1NO+2NC			
21 3NC			
22 2NO+1NC			
33 1NC+1NO			
34 2NC			

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.

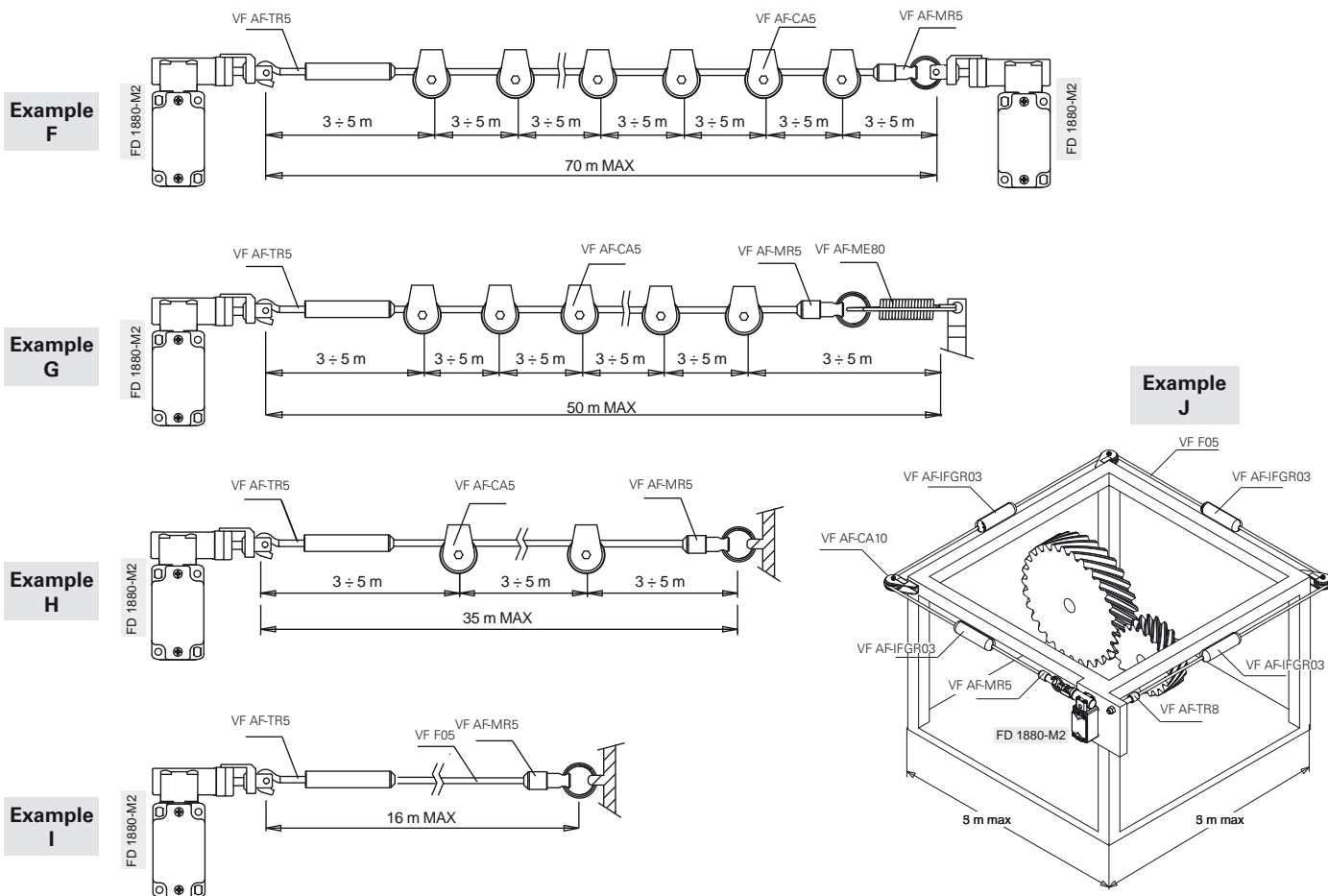
Accessories See page 287

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

Application examples and max. rope length for switches with longitudinal head

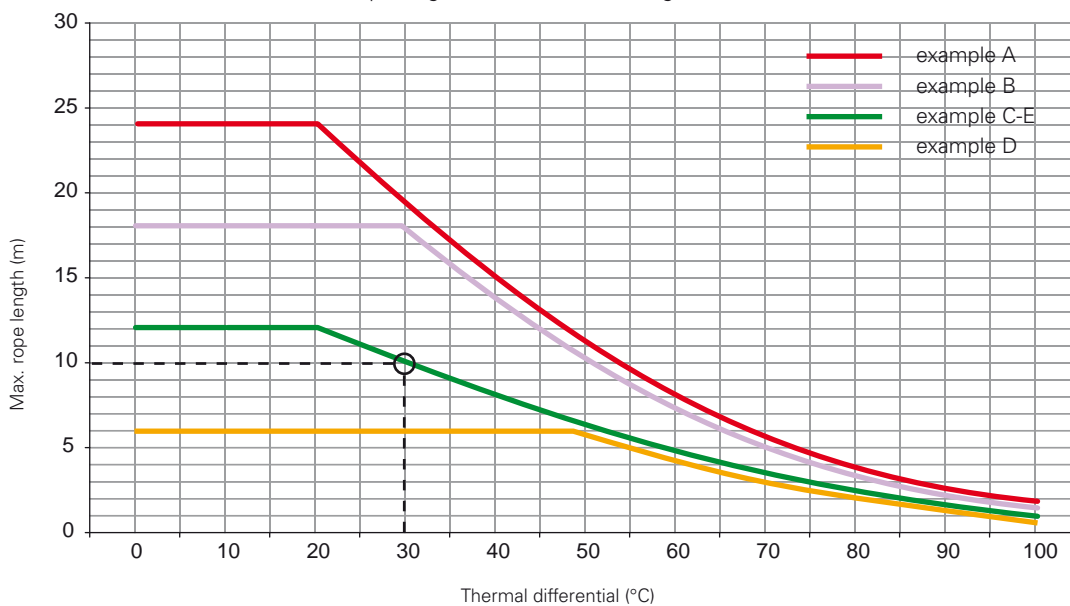


Application examples and max. rope length for switches with transversal head



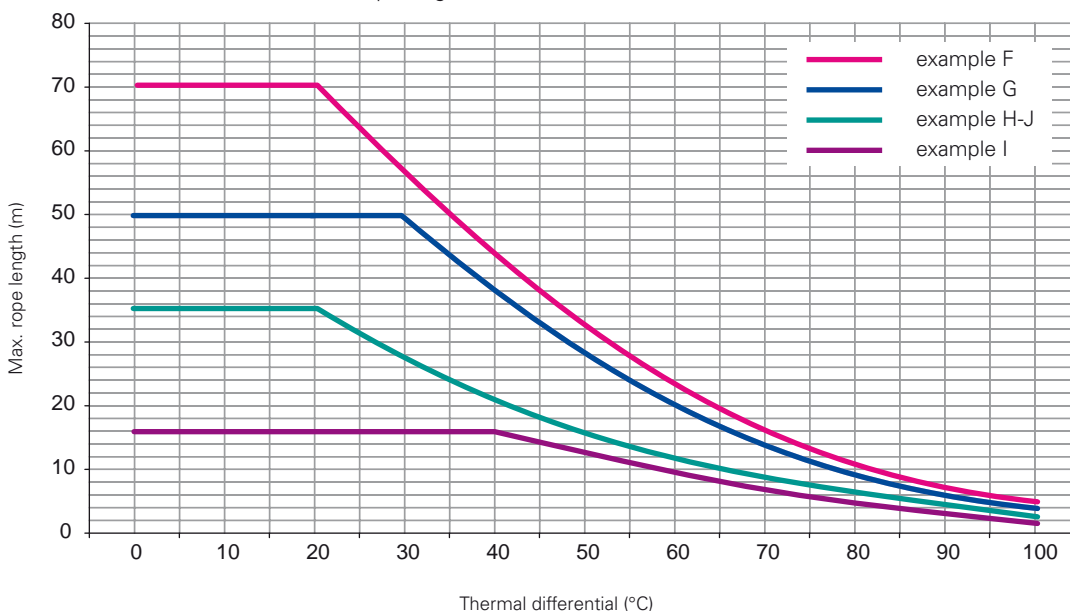
Max. rope length

Max. rope length for switches with longitudinal head



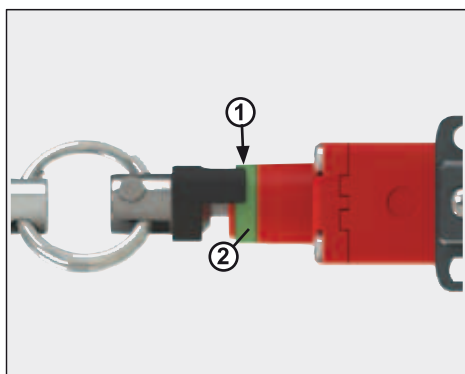
In the diagram, the suggested max. rope lengths with regard to changes of temperature (thermal differential) to which the switch is expected to be exposed in the working area are indicated. For instance, for an installation acc. to example C which expects a thermal differential of 30°C, a max. rope length of 10 meters is suggested.

Max. rope length for switches with transversal head

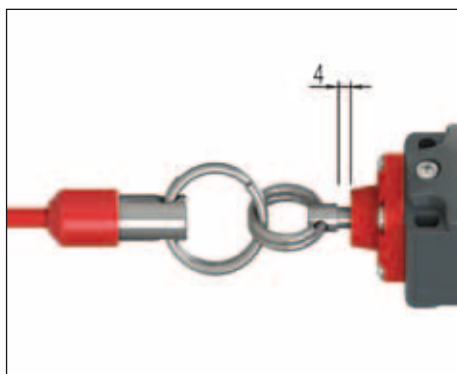


Important: The above data are guaranteed only using original rope and accessories. See page 175.

Adjustment of the operating point


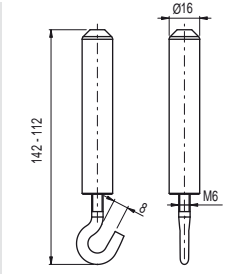

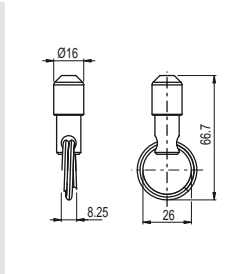

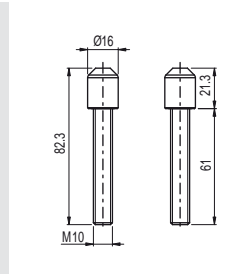


For switches with head 79 and 80: Tighten the rope connected to the switch, until the end of the indicator (1) reaches about the middle of the green ring (2).


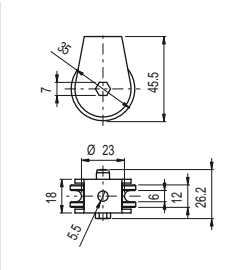

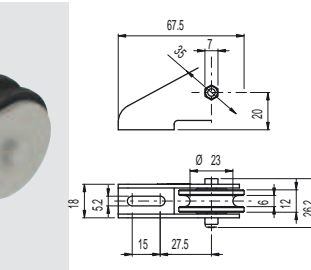


For switches with head 74: Tighten the rope connected to the switch until the thimble will be at about 4 mm from the head.


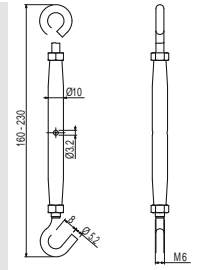
Rope installation accessories, FAST line

Article	Description	Article	Description	Article	Description
VF AF-TR5	Adjustable stay bolt	VF AF-MR5	End clamp	VF AF-TR8	Stay bolt
					


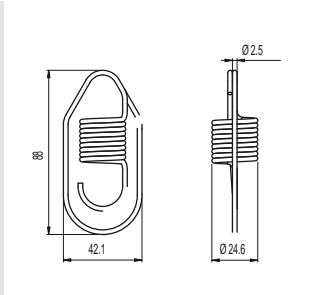

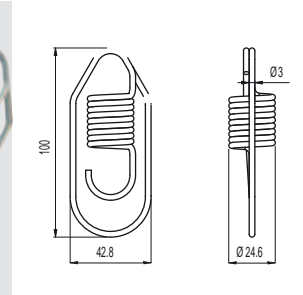
Pulley

Article	Description	Article	Description
VF AF-CA5	Stainless steel pulley	VF AF-CA10	Angular pulley, stainless steel
			

Accessories for rope installation

Article	Description
VF AF-TR2X	Stainless steel adjustable stay bolt
	


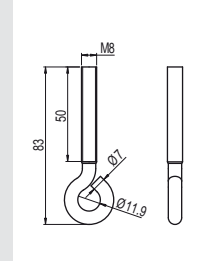
Safety springs

Article	Description	Article	Description
VF AF-ME78	Stainless steel safety spring	VF AF-ME80	Stainless steel safety spring
			

For switches with longitudinal head.

For switches with transversal head.

Accessories for rope installation

Article	Description
VFT870	Stay bolt
	

Indicator lights

Article	Description
VF ILI024GM	Yellow, 24 Vac/dc
VF ILI024RM	Red, 24 Vac/dc
VF ILI024VM	Green, 24 Vac/dc
VF ILI024WM	White, 24 Vac/dc
VF ILX000GM	Yellow, without bulb
VF ILX000RM	Red, without bulb
VF ILX000VM	Green, without bulb
VF ILX000WM	White, without bulb



These indicator lights are used for visualizing a change of the state of an electric contact inside the switch. These can be installed to switches by screwing them on one of the conduit entries which is not used for electric cables. Protection degree IP67.

Function indicators

Article	Description and language
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 spa
VF AF-IF1GR07	NODSTOP dan
VF AF-IF1GR08	⊕ STOP ⊗ eng

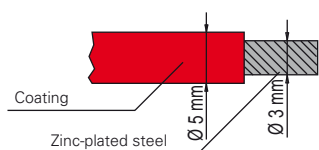
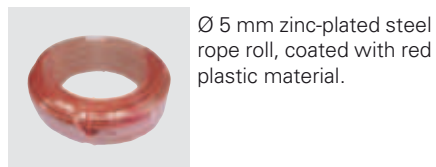


Rope function indicator in conformity with standard EN ISO 13850.



Ropes and other accessories

Article	Description	Weight (Kg)
VF F05-100	100 m rope	5,1
VF F05-035	35 m rope	1.8
VF F05-020	20 m rope	1.0
VF F05-010	10 m rope	0.5



The rope has been selected for long-term resistance against negligence and atmospheric agents.

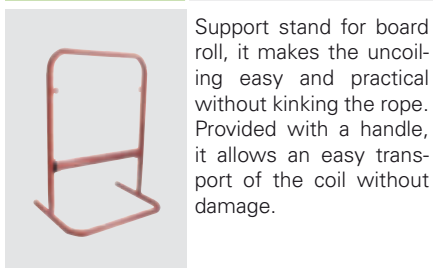
Article	Description
VF F05-400	Rope



Article	Description
VF F05-500B	Rope



Article	Description
VF SB400	Rope dispenser



Article	Description
VF SFP2	Ceiling fixing plate

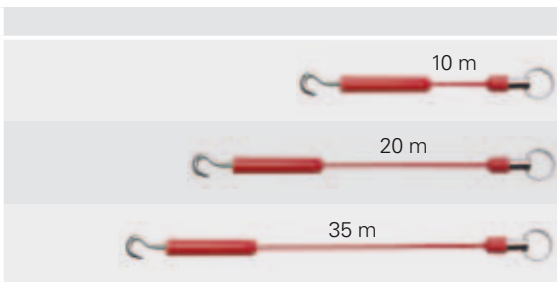


Rope installation accessory kits, FAST line

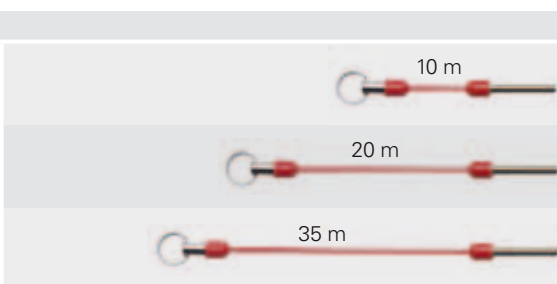
Practical installation kits containing stay bolts and rope in the same package.



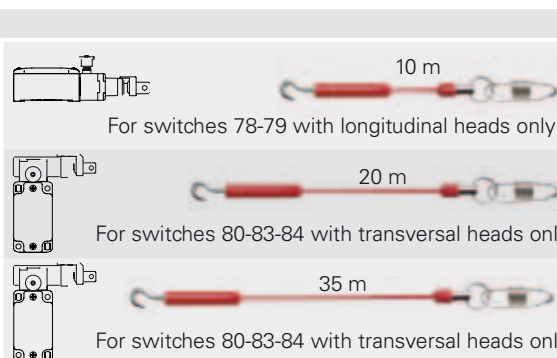
Article	Kit content
VF AF-KT10M0	1x VF AF-TR5 1x VF AF-MR5 1x VF F05-010
VF AF-KT20M0	1x VF AF-TR5 1x VF AF-MR5 1x VF F05-020
VF AF-KT35M0	1x VF AF-TR5 1x VF AF-MR5 1x VF F05-035



Article	Kit 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



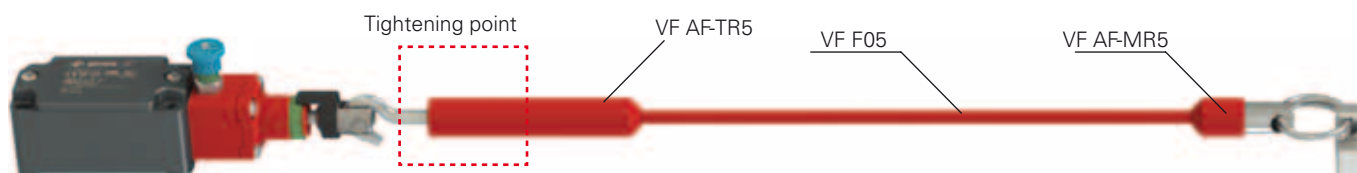
Article	Kit content
VF AF-KT10M7	1x VF AF-TR5 1x VF AF-MR5 1x VF F05-010 1x VF AF-ME78
VF AF-KT20M8	1x VF AF-TR5 1x VF AF-MR5 1x VF F05-020 1x VF AF-ME80
VF AF-KT35M8	1x VF AF-TR5 1x VF AF-MR5 1x VF F05-035 1x VF AF-ME80



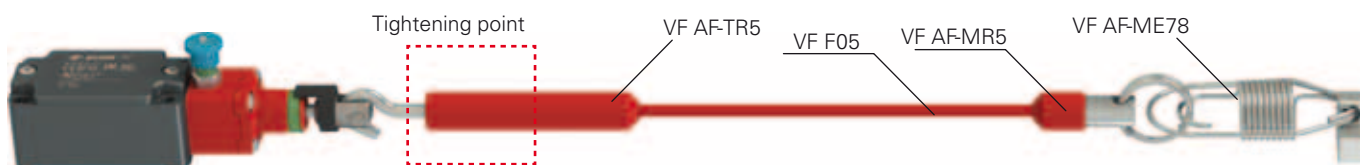
Items with code on **green** background are stock items

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

Combination examples



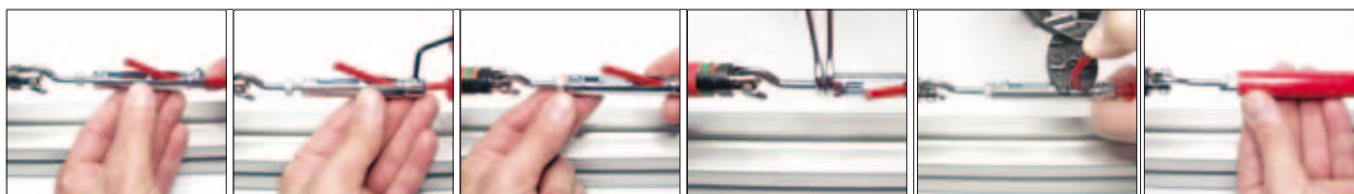
This combination of accessories is suitable for medium rope lengths, where the two rope ends are far away from each other.



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 the adjustable stay bolt VF AF-TR5

Rope insertion

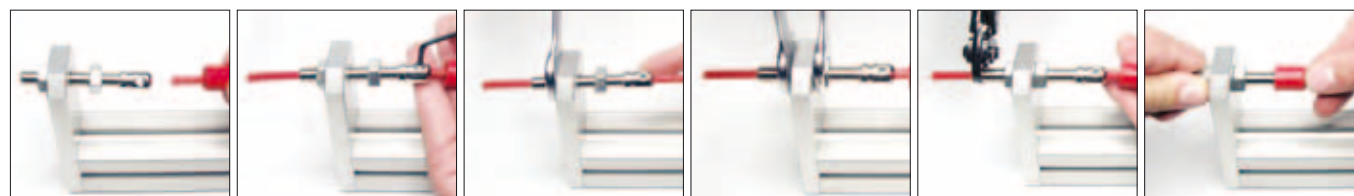
Rope fixing

Rope tightening

Stay bolt blocking

Cutting of the rope in excess

Stay bolt covering

B Installation of the stay bolt VF AF-TR8

Rope insertion

Rope fixing

Rope tightening

Stay bolt blocking

Cutting of the rope in excess

Stay bolt covering

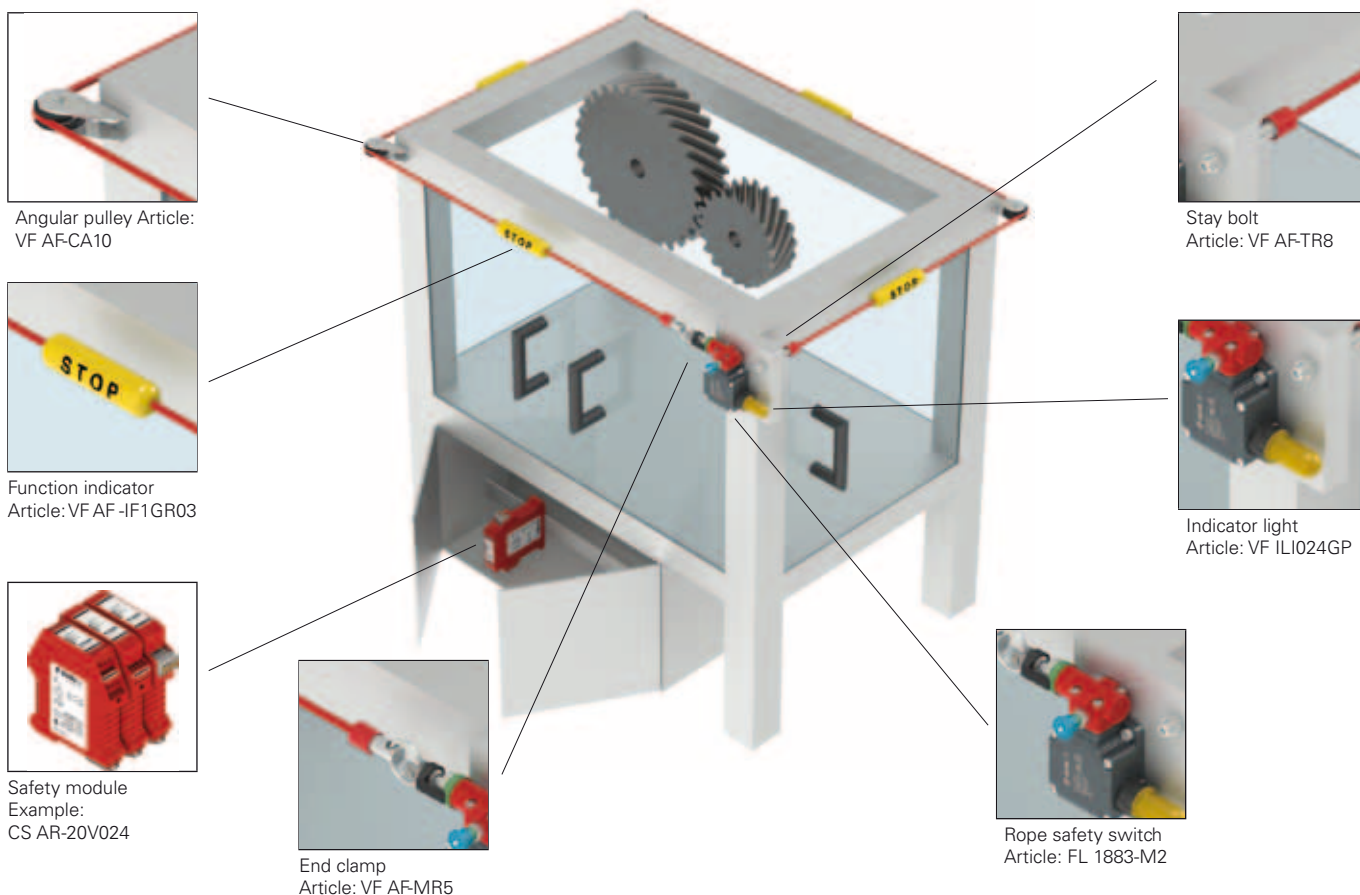
C Installation of the end clamp VF AF-MR5

Rope insertion

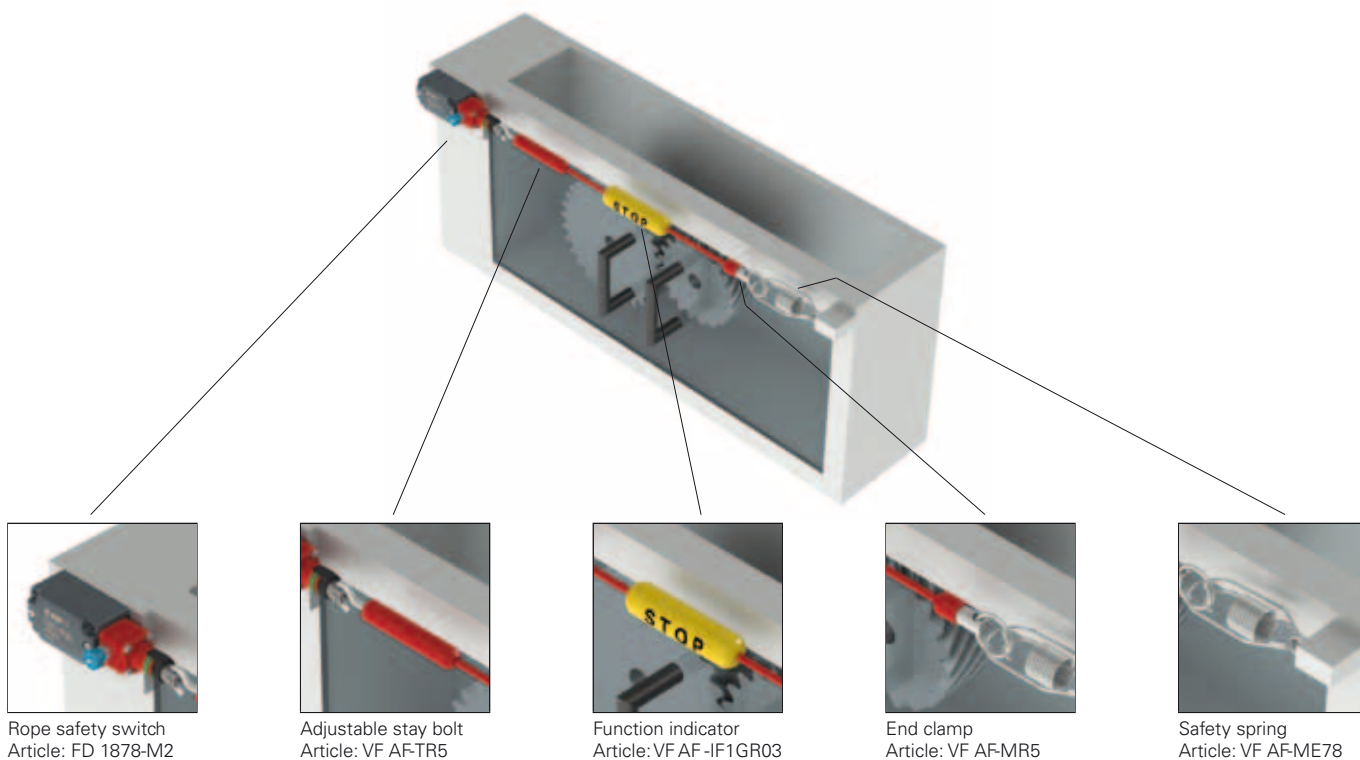
Rope fixing

Clamp covering

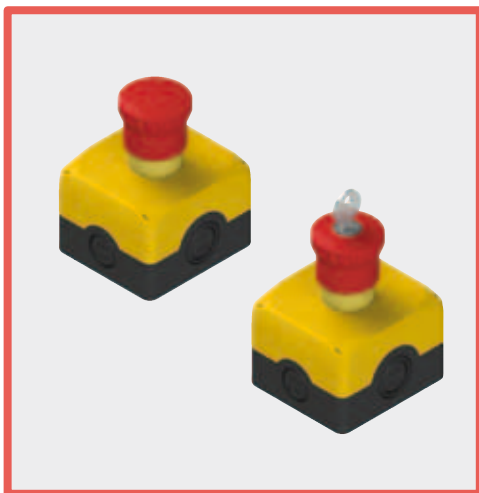
Application example: possibility of emergency stop along the whole perimeter of the machine. Rope supported by angular pulleys.



Application example: availability of emergency stop along the frontal section of the machine.



Any information or application example, included the connection diagrams, 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.



Main features

- Protection degrees IP67 and IP69K
- Stainless steel captive screws
- 4 lateral cable inlets
- Comes with caps for screws

Markings and quality marks:



EAC approval: RU C-IT DM94.B.01024

Technical data

Housing

Material:

Self-extinguishing shock-proof polycarbonate with double insulation, UV resistant fibreglass reinforced, with increased shock resistance.

Screw material:

- stainless steel
- 2 upper and lower inputs with knock out M20 - 1/2 NPT
- 2 side inputs with knock out M20 - 1/2 NPT - M25
- 2 base inputs with knock out M16

Emergency button

Mechanical endurance:

300,000 operating cycles¹

Max. actuation frequency:

3600 operating cycles¹/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

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

General data

Protection degree:

IP67 acc. to IEC 60529 with cable gland having equal or higher protection degree
IP69K acc. to ISO 20653

Ambient temperature:

-25 °C +80 °C

Tightening torque of the cover screws:

1 ... 1.4 Nm

Utilization requirements:

see page 124 of the general catalogue HMI.

In conformity with standards:

IEC 60947-1, IEC 60947-5-1, IEC 60204-1, EN 574, EN 60947-1, EN 60947-5-1, EN 60204-1, UL 508, CSA 22-2 N°14.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC

Machinery Directive 2006/42/EC

EMC Directive 2004/108/EC.

General data

Protection degrees IP67 and IP69K

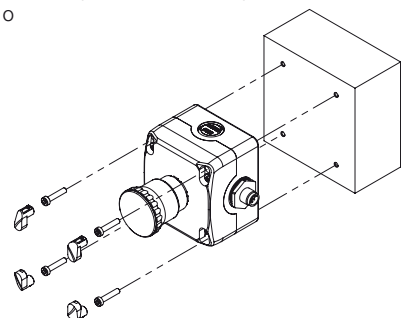
IP69K
IP67

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

of the housing is required. Special measures also allow devices to be used even in machines which are subjected to washing with high pressure warm water jets. In fact these devices pass the IP69K test according to ISO 20653, using jets of water to 100 atmospheres at a temperature of 80°C.

Fixing of EROUND housing

The new 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 through insertion of the screws, without the need to



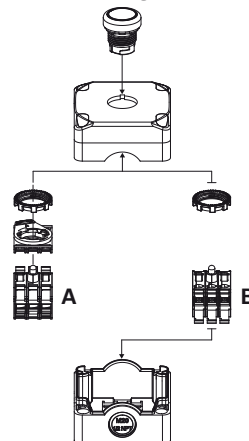
open the cover to access the holes.

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.

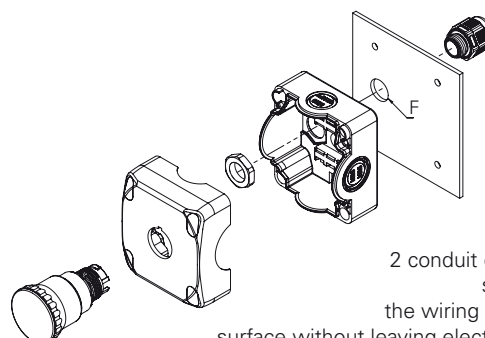
The external fixing of the housing is particularly suitable for already wired housings, because the whole installation is simplified: you can simply fix the housing and connect the connector that, thanks to the presence of cable inputs on the four sides of the housing, can be orientated in the preferred direction.

One housing, two solutions



The same 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 attachment directly on the bottom of the housing (B).

Wiring through the lower surface



cable gland	F
M16	Ø 25
M20	Ø 28

The housings have 2 conduit entries on the lower surface. These allow the wiring through the support surface without leaving electrical cables in sight.



Complete units with housings with emergency buttons



Cover housing colour	Actuator design and colour	Contacts			Emergency button Push-Pull	Emergency button rotary release	Emergency button key release
		pos. 2	pos. 3	pos. 1			
yellow RAL 1023	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 1023	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 1023	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 1023	red	1NC	-	1NO	ES AC31010 ES 31001 + E2 1PEPZ4531 + E2 CF01G2V1 + E2 CF10G2V1	ES AC31006 ES 31001 + E2 1PERZ4531 + E2 CF10G2V1 + E2 CF10G2V1	ES AC31011 ES 31001+ E2 1PEBZ4531 + E2 CF01G2V1 + E2 CF10G2V1
yellow RAL 1023	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 CF10G2V1	ES AC31024 ES 31001+ E2 1PEBZ4531 + E2 CF01G2V1 + E2 CF01G2V1 + E2 CF10G2V1

Other combinations on request.
 The standard colour of the base in the above-mentioned codes is RAL 9005.
 → For the characteristics of the contact blocks and LED units, refer to the respective chapters.



Cover housing colour	Actuator design and colour	Contacts			Emergency button Push-pull Yellow illuminated disc, blinking Ø 60 mm, 24 Vac/dc	Emergency button rotary release Yellow illuminated disc, blinking Ø 60 mm, 24 Vac/dc	Emergency button key release Yellow illuminated disc, blinking Ø 60 mm, 24 Vac/dc
		pos. 2	pos. 3	pos. 1			
grey RAL 7035	red	1NO	1NC	LOCKING DI CONNECTION	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	LOCKING DI CONNECTION	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	LOCKING DI CONNECTION	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

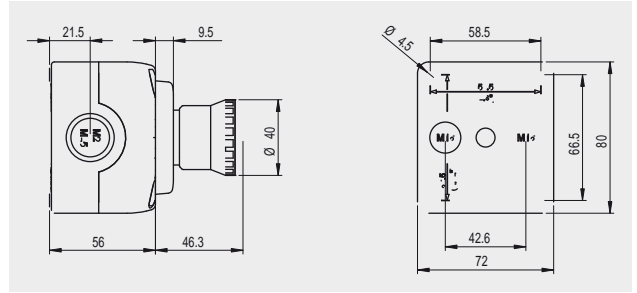
Other combinations on request.
 The standard colour of the base in the above-mentioned codes is RAL 9005.
 → For the characteristics of the contact blocks and LED units, refer to the respective chapters.

Spare caps

Article	Description
VETS35RA1	4 spare caps for cover of ES series housings. Colour: yellow
VETS39RA1	4 spare caps for cover of ES series housings. Colour: grey

Dimensions

All measures in the drawings are in mm



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

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

Product code	Supply voltage	For applications up to			Output contacts			Housing dimensions
		PL	SIL	Safety category	instantaneous	delayed	feedback	
Safety modules for emergency stop and gate monitoring								
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 PNP	-	-	22,5 x 114 mm

Module for emergency stop, gate monitoring, 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
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Safety modules for emergency stop and gate monitoring with delayed contacts at the opening of the input channels

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

Standstill monitor safety module

CS AM-0	24 ... 230 Vac/dc	d	2	3	2 NO + 1 NC	-	-	45 x 114 mm
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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 with this product
- Not available with this product
- ① Dependent from the base module
- ② Safety category 4 for instantaneous contacts, category 3 for delayed contacts

- ③ Delayed contacts releasing time
 - 0 fixed time
 - 1 from 0.3 to 3 s, step 0.3 s
 - 2 adjustable from 1 to 10 s, 1 s step
 - 3 adjustable from 3 to 30 s, step 3 s
 - 4 adjustable from 30 to 300 s, step 30 s

- ④ Connection type
 - V screw terminals
 - M connector with screw terminals
 - X connector with spring terminals

- ⑤ Releasing 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. and manual start	Monitored start	Inputs with opposite potentials	Equipotential inputs	Parallel start (24 Vdc only)	Input type (7)				Connection type (4)			Page
										V	M	X	
CS AR-01	■	■	■	-	■	■	-	⑧	-	■	■	■	183
CS AR-02	■	■	■	-	■	■	-	⑧	-	■	■	■	185
CS AR-04	■	■	■	-	■	■	-	⑧	-	■	■	■	187
CS AR-05	■	-	■	■	■	■	■	■	-	■	■	■	189
CS AR-06	-	■	■	■	■	■	■	■	-	■	■	■	189
CS AR-07	■	■	■	-	■	■	-	-	-	-	■	■	191
CS AR-08	■	■	■	■	■	■	■	■	-	■	■	■	193
CS AR-20	■	-	-	-	-	■	-	-	-	■	■	■	195
CS AR-21	-	■	-	-	-	■	-	-	-	■	■	■	195
CS AR-22	■	-	-	-	-	■	-	-	-	■	■	■	197
CS AR-23	-	■	-	-	-	■	-	-	-	■	■	■	197
CS AR-24	■	-	-	-	-	■	-	-	-	■	■	■	199
CS AR-25	-	■	-	-	-	■	-	-	-	■	■	■	199
CS AR-40	■	-	-	-	-	■	-	-	-	■	■	■	201
CS AR-41	-	■	-	-	-	■	-	-	-	■	■	■	201
CS AR-46	■	-	■	-	-	■	-	■	-	■	■	■	203
CS AR-91	■	■	■	-	■	■	-	■	-	■	■	■	205
CS AR-51	■	■	■	-	-	■	-	-	■	■	■	■	207
CS AT-0③	■	■	■	■	■	■	■	■	-	■	■	■	209
CS AT-1③	■	■	■	■	■	■	■	■	-	■	■	■	211
CS AT-3③	■	■	■	-	-	■	-	■	-	■	■	■	213
CS FS-1③	-	-	-	-	-	■	-	-	-	■	■	■	215
CS FS-2③	-	-	-	-	-	■	-	-	-	■	■	■	217
CS FS-3③	-	-	-	-	-	■	-	-	-	■	■	■	219
CS FS-5③	■	■	-	■	-	■	-	■	-	■	■	■	221
CS DM-01	-	-	■	-	-	■	-	-	-	■	■	■	223
CS DM-02	-	-	■	-	-	■	-	-	-	■	■	■	225
CS DM-20	-	-	■	-	-	■	-	-	-	■	■	■	227
CS AM-01	-	-	-	-	-	■	-	-	-	■	■	■	229
CS ME-01	-	-	①	①	-	■	-	-	-	■	■	■	231
CS ME-02	-	-	①	①	-	■	-	-	-	■	■	■	233
CS ME-03	-	-	-	■	-	■	■	-	-	■	■	■	235
CS ME-20VU24-⑤	-	-	①	①	-	■	-	-	-	■	■	■	237
CS ME-30VU24-⑥	-	-	①	①	-	■	-	-	-	■	■	■	239
CS ME-31VU24-TS12	-	-	①	①	-	■	-	-	-	■	■	■	239

③ Releasing time in absence of power supply
 TF1 1 s fixed time

 TF12 12 s fixed time

⑦ Input type
 Electromechanical contacts
 solid state output circuits (e.g. light curtains)
 magnetic safety sensors
 safety mats and bumpers with 4-wire technology

⑧ Modules compatible with magnetic sensors, starting June 2014



Module for emergency stop, gate monitoring 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 the input channels to opposite potentials
- Small 22.5 mm housing
- 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 op. cycles/minute)

Ue (V) 24

Ie (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EC type examination certificate: IMQ CP 432 DM

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (Uimp):

4 kV

Rated insulation voltage (Ui):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (Un):

10 ... 30 Vdc
24 Vac/dc; 50...60 Hz
120 Vac; 50...60 Hz
230 Vac; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of Un

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Min. duration of start impulse t_{MIN}:

> 100 ms

Operating time t_A:

< 50 ms

Releasing time t_{R1}:

< 20 ms

Releasing time in absence of power supply t_R:

< 70 ms

Simultaneity time t_C:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1,
EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

2 NO safety contacts,
1 NC auxiliary contact
forcibly guided

Contact type:

gold-plated silver alloy

Contact material:

230/240 Vac; 300 Vdc

Maximum switching voltage:

6 A

Max. current per contact:

6 A

Conventional free air thermal current I_{th}:

72 A²

Max. total current Σ I_{th}²:

10 mA

Minimum current:

≤ 100 mΩ

Contact resistance:

4 A

External protection fuse:

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 231-240.

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	±15%
120	120 Vac	±15%
230	230 Vac	±15%
E02	10 ... 30 Vdc	

Stock items

CS AR-01V024

Characteristics approved by UL

Rated supply voltage (Un): 24 Vac/dc; 50...60 Hz
120 Vac; 50...60 Hz
230 Vac; 50...60 Hz
AC consumption: < 5 VA
DC consumption: < 2 W
Maximum switching voltage: 230 Vac
Max. current per contact: 6 A
Utilization category: C300

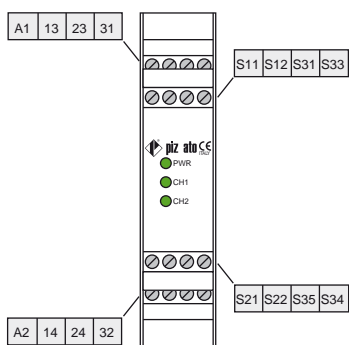
Notes:

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

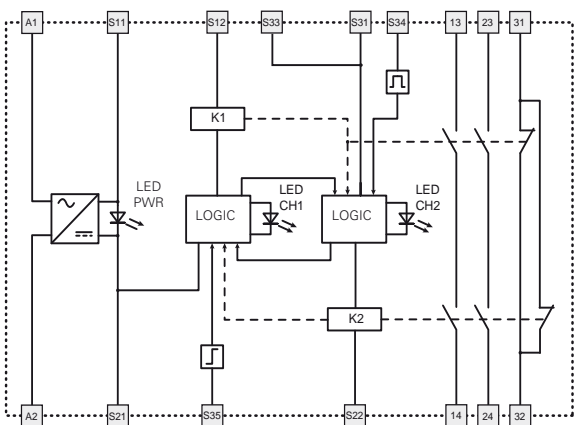


Safety module CS AR-01

Terminal layout

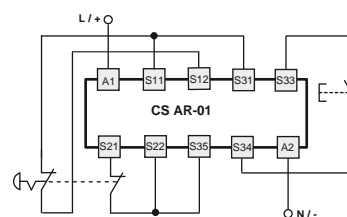
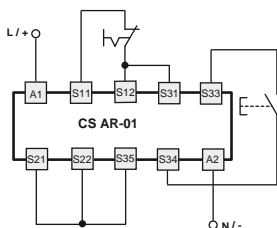


Internal diagram



Input configuration

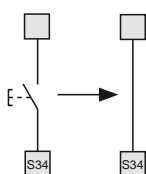
Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels



The diagram does not show the exact position of terminals in the product

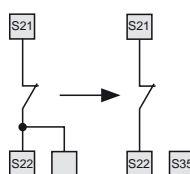
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



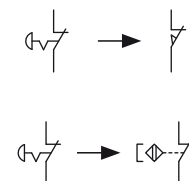
Monitored start

With regard to the indicated diagrams, it is necessary to remove the connection between S22 and S35 in order to activate the monitored start module.



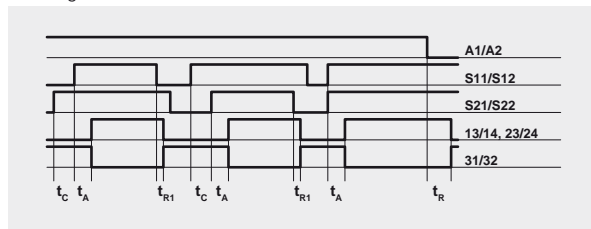
Movable guard monitoring and magnetic safety sensors

The safety module can control emergency stop circuits, movable guard monitoring circuits or magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. The sensors can only be used in 2-channel configuration.

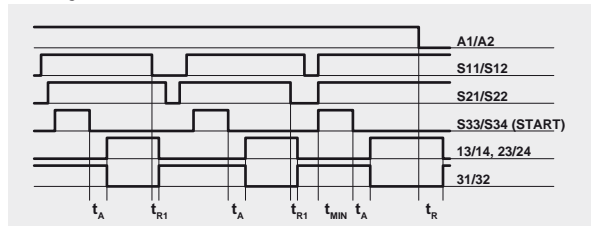


Operation diagrams

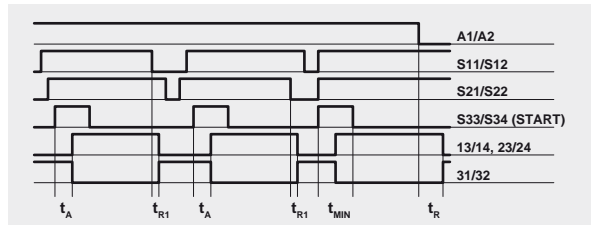
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



- Legend:
- t_{MIN} : Min. duration of start impulse
 - t_C : simultaneity time
 - t_A : operating time
 - t_{R1} : releasing time
 - t_R : releasing time in absence of power supply

Notes: The configurations with one channel are obtained taking into consideration only the S11/S12 input. 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.



Module for emergency stop, gate monitoring 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 the input channels to opposite potentials
- Small 22.5 mm housing
- 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 op. cycles/minute)

Ue (V) 24

Ie (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EC type examination certificate: IMQ CP 432 DM

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (Uimp):

4 kV

Rated insulation voltage (Ui):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (Un):

10 ... 30 Vdc

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of Un

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Min. duration of start impulse t_{MIN}:

> 100 ms

Operating time t_A:

< 50 ms

Releasing time t_{RI}:

< 20 ms

Releasing time in absence of power supply t_R:

< 70 ms

Simultaneity time t_c:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

3 NO safety contacts,

Contact type:

forcibly guided

Contact material:

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:

72 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 231-240.

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	±15%
120	120 Vac	±15%
230	230 Vac	±15%
E02	10 ... 30 Vdc	

Characteristics approved by UL

Rated supply voltage (Un):	24 Vac/dc; 50...60 Hz 120 Vac; 50...60 Hz 230 Vac; 50...60 Hz
AC consumption:	< 5 VA
DC consumption:	< 2 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

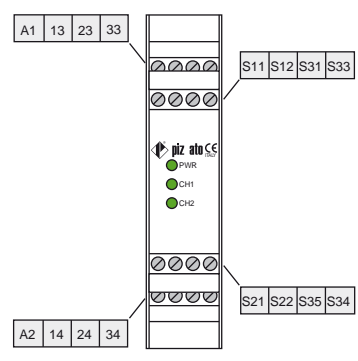
Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

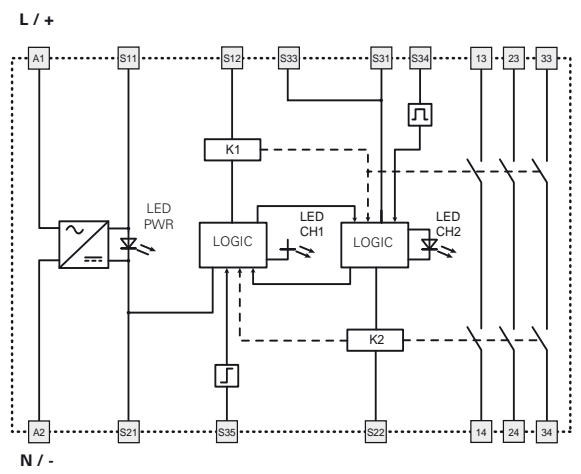


Safety module CS AR-02

Terminal layout

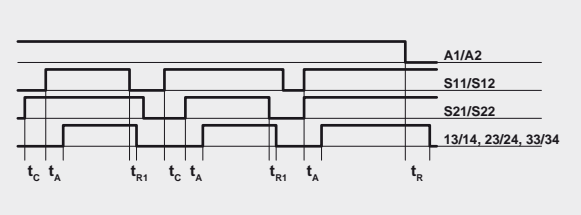


Internal diagram

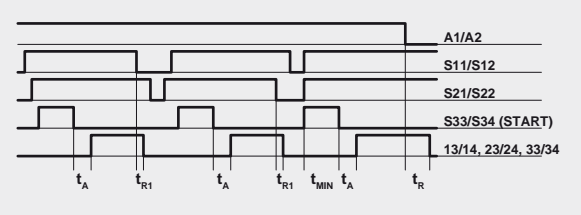


Operation diagrams

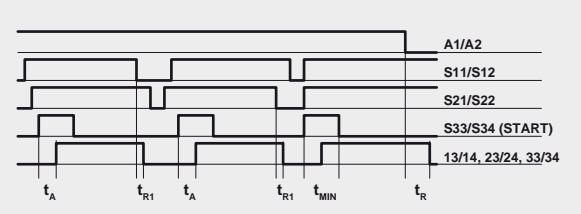
Configuration with automatic start



Configuration with monitored start



Configuration with manual start

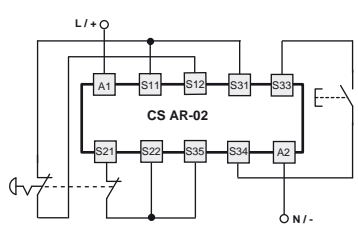
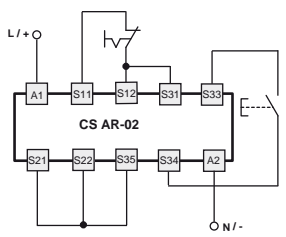


Legend: t_min: min. duration of start impulse; t_c: simultaneity time; t_a: operating time; t_r1: releasing time; t_r: releasing time in absence of power supply

Notes: The configurations with one channel are obtained taking into consideration only the S11/S12 input. 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

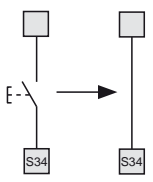
Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels



The diagram does not show the exact position of terminals in the product

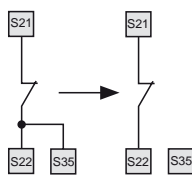
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



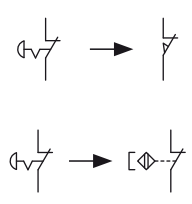
Monitored start

With regard to the indicated diagrams, it is necessary to remove the connection between S22 and S35 in order to activate the monitored start module.



Movable guard monitoring and magnetic safety sensors

The safety module can control emergency stop circuits, movable guard monitoring circuits or magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. The sensors can only be used in 2-channel configuration.





Module for emergency stop, gate monitoring 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 the input channels to opposite potentials
- Small 22.5 mm housing
- 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EC type examination certificate: IMQ CP 432 DM

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Min. duration of start impulse t_{MIN}:

> 100 ms

Operating time t_A:

< 50 ms

Releasing time t_{R1}:

< 20 ms

Releasing time in absence of power supply t_R:

< 70 ms

Simultaneity time t_C:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

3 NO safety contacts

1 NC auxiliary contact

forcibly guided

Contact type:

gold-plated silver alloy

Contact material:

230/240 Vac; 300 Vdc

Maximum switching voltage:

6 A

Max. current per contact:

6 A

Conventional free air thermal current I_{th}:

64 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 231-240.

Code structure

CS AR-04V024

Connection type	
V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Supply voltage		
024	24 Vac/dc	±15%
120	120 Vac	±15%
230	230 Vac	±15%

Stock items

CS AR-04V024

Characteristics approved by UL

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

< 5 VA

AC consumption:

DC consumption:

Maximum switching voltage:

Max. current per contact:

Utilization category

230 Vac

6 A

C300

Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

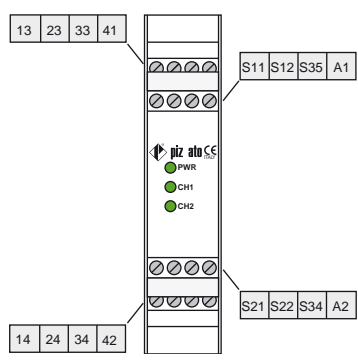
- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

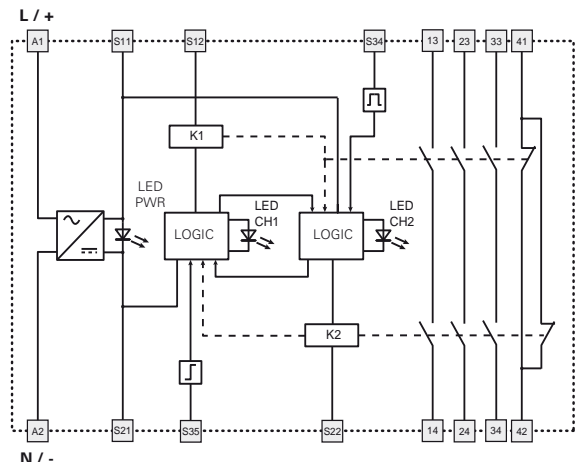


Safety module CS AR-04

Terminal layout

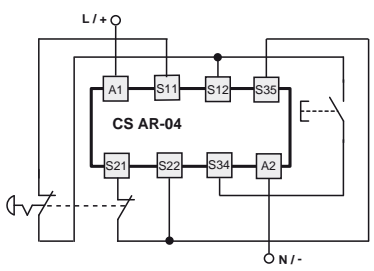
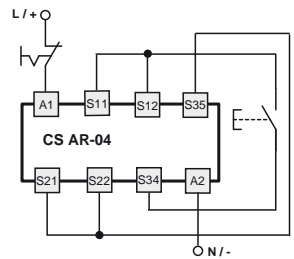


Internal diagram



Input configuration

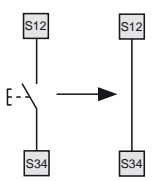
Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels



The diagram does not show the exact position of terminals in the product

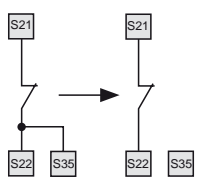
Automatic start

With regard to the indicated diagrams, bridge the start button between S12 and S34 in order to activate the automatic start module.



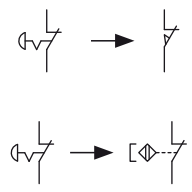
Monitored start

With regard to the indicated diagrams, it is necessary to remove the connection between S22 and S35 in order to activate the monitored start module.



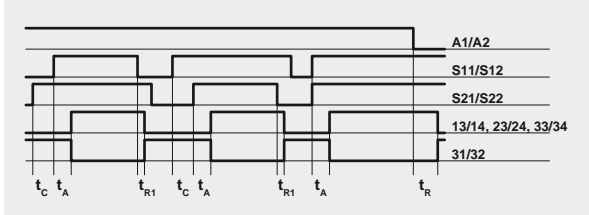
Movable guard monitoring and magnetic safety sensors

The safety module can control emergency stop circuits, movable guard monitoring circuits or magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. The sensors can only be used in 2-channel configuration.

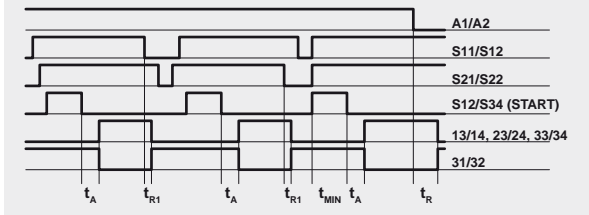


Operation diagrams

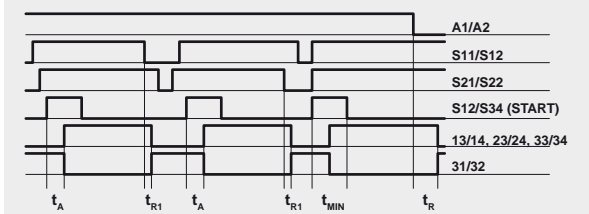
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



- Legend:
- t_{MIN} : min. duration of start impulse
 - t_C : simultaneity time
 - t_A : operating time
 - t_{R1} : releasing time
 - $t_{R'}$: releasing time in absence of power supply

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} .



Module for emergency stop, gate monitoring, solid-state output circuits (e.g. light curtains) and magnetic safety sensor

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 solid-state output circuits (e.g. light curtains), 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EC type examination certificate: IMQ CP 432 DM

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

10%

DC maximum residual ripple:

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Min. duration of start impulse t_{MIN}:

> 250 ms

Operating time t_A:

< 200 ms

Releasing time t_{R1}:

< 20 ms

Releasing time in absence of power supply t_R:

< 70 ms

Simultaneity time t_C:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

3 NO safety contacts

1 NC auxiliary contact

forcibly guided

gold-plated silver alloy

230/240 Vac; 300 Vdc

6 A

Contact type:

Contact material:

Maximum switching voltage:

Max. current per contact:

6 A

Conventional free air thermal current I_{th}:

64 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 231-240.

Code structure

CS AR-05V024

Start type

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 ±15%

120 120 Vac ±15%

230 230 Vac ±15%

Stock items

CS AR-05V024

Characteristics approved by UL

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

< 5 VA

AC consumption:

DC consumption:

Maximum switching voltage:

230 Vac

Max. current per contact:

6 A

Utilization category

C300

Notes:

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).



Module for emergency stop and gate monitoring

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 the input channels to opposite potentials
- Small 22.5 mm housing
- Output contacts:
 - 4 NO safety contacts,
 - 1 NC auxiliary contact
- Supply voltage: 24 Vac/dc

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EC type examination certificate: IMQ CP 432 DM

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design B

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overtoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Min. duration of start impulse t_{MIN}:

> 100 ms

Operating time t_A:

< 70 ms

Releasing time t_{R1}:

< 40 ms

Releasing time in absence of power supply t_R:

< 80 ms

Simultaneity time t_c:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

4 NO safety contacts

1 NC auxiliary contact

forcibly guided

Contact type:

gold-plated silver alloy

Contact material:

230/240 Vac; 220 Vdc

Maximum switching voltage:

6 A

Max. current per contact:

6 A

Conventional free air thermal current I_{th}:

72 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 231-240.

Code structure

CS AR-07M024

Connection type

M connector with screw terminals

X connector with spring terminals

Supply voltage

024 24 Vac/dc ±15%

Stock items

CS AR-07M024

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vac/dc; 50...60

Hz

AC consumption: < 5 VA

DC consumption: < 2 W

Maximum switching voltage: 230 Vac

Max. current per contact: 6 A

Utilization category C300

Notes:

- Use 60° or 75° C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

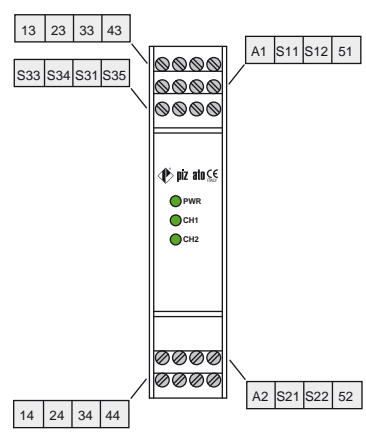
- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

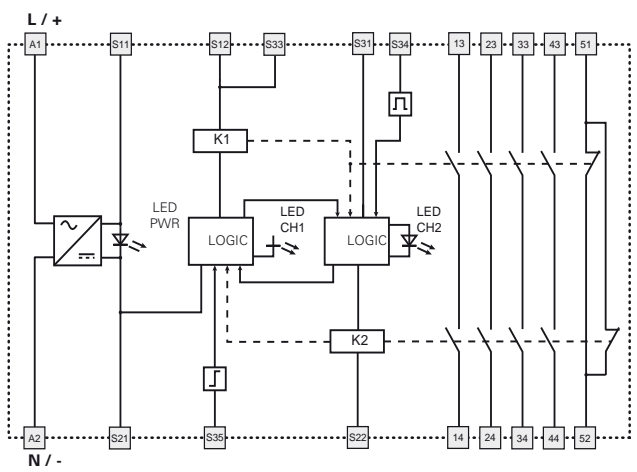


Safety module CS AR-07

Terminal layout

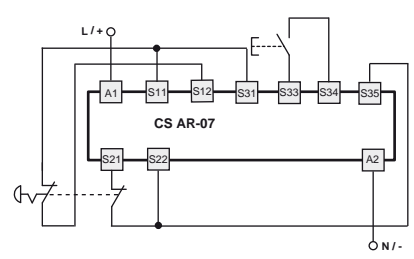
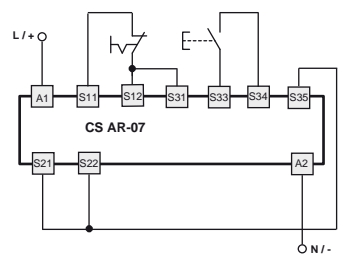


Internal diagram



Input configuration

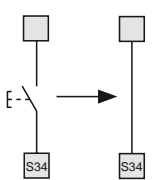
Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels



The diagram does not show the exact position of terminals in the product

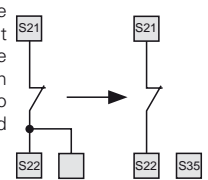
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



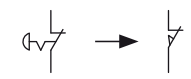
Monitored start

With regard to the indicated diagrams, it is necessary to remove the connection between S22 and S35 in order to activate the monitored start module.



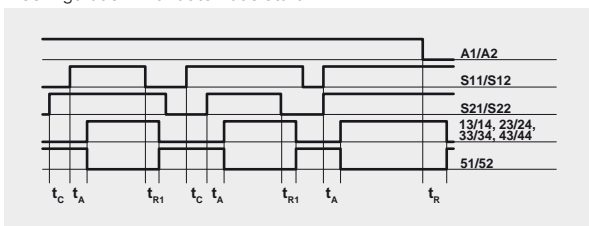
Movable guard monitoring

The safety module can control emergency stop circuits or movable guard monitoring circuits. Replace the emergency stop contacts with the switch contacts.

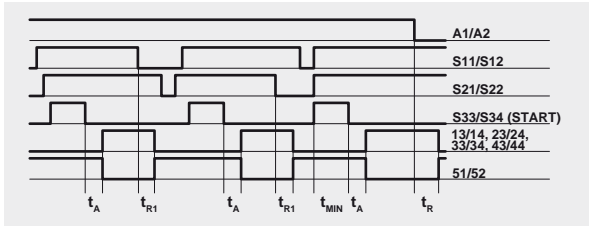


Operation diagrams

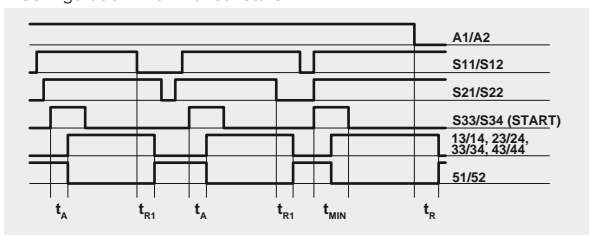
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



- Legend:
- t_{MIN} : min. duration of start impulse
 - t_C : simultaneity time
 - t_A : operating time
 - t_{R1} : releasing time
 - t_{R2} : releasing time in absence of power supply

Notes:
 The configurations with one channel are obtained taking into consideration only the S11/S12 input. 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.



Module for emergency stop, gate monitoring, solid-state output circuits (e.g. light curtains) and magnetic safety sensor

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 solid-state output circuits (e.g. light curtains), 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings and quality marks:



UL approval: E131787

EC type examination certificate: IMQ CP 432 DM

TÜV SÜD approval: Z10 10 09 75157 002

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Code structure

CS AR-08V024

Connection type		Supply voltage	
V	screw terminals	U12	12 Vdc -10% ... 15%
M	connector with screw terminals	024	24 Vac/dc ±15%
X	connector with spring terminals	120	120 Vac ±15%
		230	230 Vac ±15%

Stock items

CS AR-08V024

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree: IP40 (housing), IP20 (terminal strip)

Dimensions: see page 283, design A

General data

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 333

Ambient temperature: -25°C...+55°C

Mechanical endurance: >10 million operating cycles

Electrical endurance: >100,000 operating cycles

Pollution degree: external 3, internal 2

Impulse voltage (U_{imp}): 4 kV

Rated insulation voltage (U_i): 250 V

Overvoltage category: II

Weight: 0.3 kg

Supply

Rated supply voltage (U_n): 12 Vdc

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

10%

DC maximum residual ripple:

Supply voltage tolerance: ±15% of U_n

AC consumption: < 5 VA

DC consumption: < 2 W

Control circuit

Protection against short circuits: resistance PTC, I_h=0.5 A

PTC timing: intervention > 100 ms, reset > 3 s

Maximum input resistance: ≤ 50 Ω (15 Ω)*

Input current: < 30 mA (70 mA)*

Min. duration of start impulse t_{MIN}: > 200 ms (100 ms)*

Operating time t_A: < 150 ms (220 ms)*

Releasing time t_{RI}: < 20 ms (15 ms)*

Releasing time in absence of power supply t_R: < 150 ms (50 ms)*

Simultaneity time t_C: infinite

* version CS AR-08•U12

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts: 2 NO safety contacts,

contact type: forcibly guided

Contact material: 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 231-240.

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vac/dc, 50...60 Hz, 120 Vac; 50...60

Hz: 230 Vac; 50...60 Hz

AC consumption: < 5 VA

DC consumption: < 2 W

Maximum switching voltage: 230 Vac

Max. current per contact: 6 A

Utilization category: C300

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

Characteristics approved by TÜV SÜD

Rated supply voltage (U_n): 24 Vac/dc, ± 15%, 120 Vac ± 15%, 230

Vac ± 15%

Consumption: 5 VA max. AC, 2 W max. DC

Rated operating current (max.): 4 A

Max. 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 conformity with standards: 2006/42/EEC Machine Directive,

EN ISO 13849-1 (up to Cat. 4 PL e), EN 50178:1997, EN 60947-5-3/

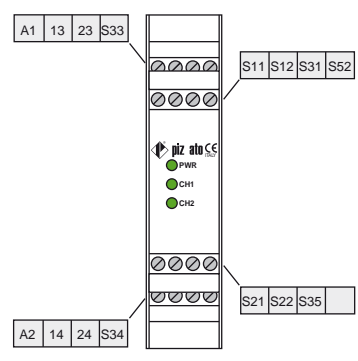
A1:2005, EN 61508-1:1998 (SIL CL 1-3), EN 61508-2:2000

(SIL CL 1-3), EN 61508-4:1998 (SIL CL 1-3), IEC 62061:2005 (SIL CL 3)



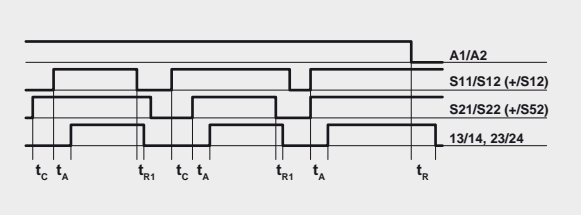
Safety module CS AR-08

Terminal layout

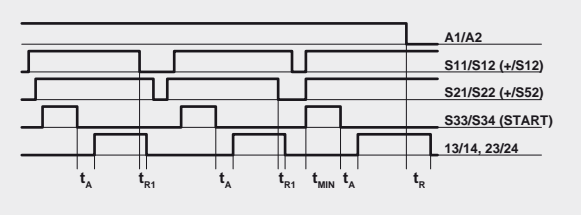


Operation diagrams

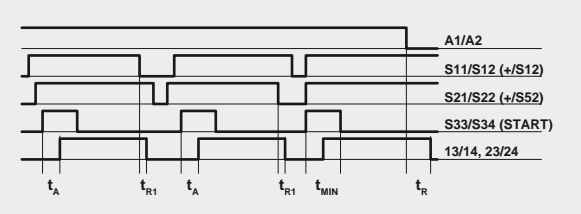
Configuration with automatic start



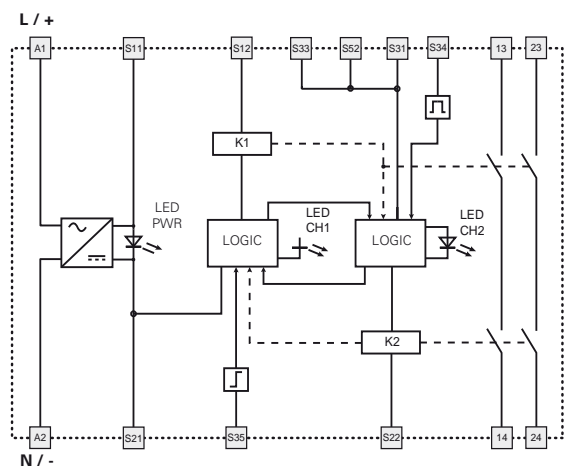
Configuration with monitored start



Configuration with manual start



Internal diagram



Legend:

- t_{MIN} : min. duration of start impulse
- t_c : simultaneity time
- t_A : operating time
- t_{R1} : releasing time
- t_R : releasing time in absence of power supply

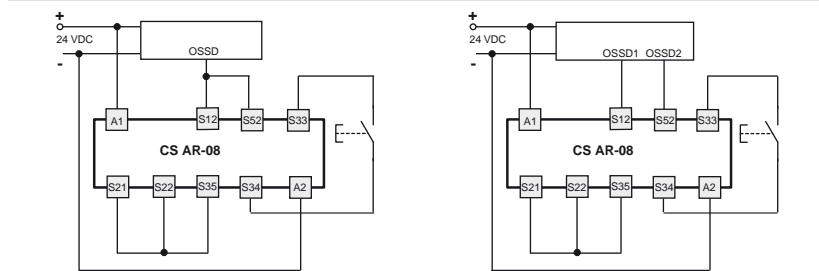
Notes:

The configurations with one channel are obtained taking into consideration only the CH1 input. In this case it is necessary to consider time t_{R1} referred to input CH1, time t_A referred to the supply, time t_c referred to input CH1 and to the start, and time t_{MIN} referred to the start.

Input configuration

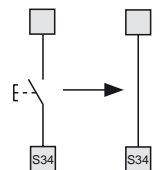
Solid state output circuits (e.g. light curtains)

Input configuration with manual start



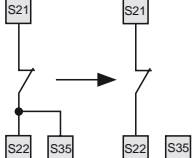
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



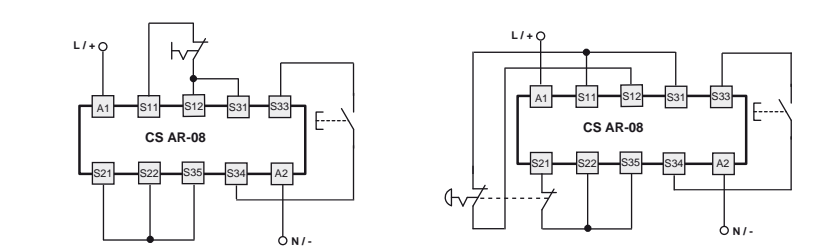
Monitored start

With regard to the indicated diagrams, it is necessary to remove the connection between S22 and S35 in order to activate the monitored start module.



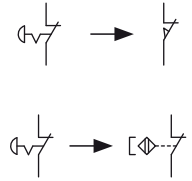
Emergency stop circuits

Input configuration with manual start



Movable guard monitoring and magnetic safety sensors

The safety module can control emergency stop circuits, movable guard monitoring circuits or magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. The sensors can only be used in 2-channel configuration.



The diagram does not show the exact position of terminals in the product



Module for emergency stop and gate monitoring

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)
- Small 22.5 mm housing
- 2 NO safety contacts
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree: IP40 (housing), IP20 (terminal strip)

Dimensions: see page 283, design A

General data

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 333

Ambient temperature: -25°C...+55°C

Mechanical endurance: >10 million operating cycles

Electrical endurance: >100,000 operating cycles

Pollution degree: external 3, internal 2

Impulse voltage (U_{imp}): 4 kV

Rated insulation voltage (U_i): 250 V

Overvoltage category: II

Weight: 0.2 kg

Supply

Rated supply voltage (U_n): 24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

DC maximum residual ripple: 10%

Supply voltage tolerance: ±15% of U_n

AC consumption: < 5 VA

DC consumption: < 2 W

Control circuit

Protection against short circuits: resistance PTC, I_h=0.5 A

PTC timing: intervention > 100 ms, reset > 3 s

Maximum input resistance: ≤ 50 Ω

Input current: < 70 mA

Min. duration of start impulse t_{MIN}: > 100 ms

Operating time t_A: < 50 ms

Releasing time in absence of power supply t_R: < 100 ms

Simultaneity time t_C: infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts: 2 NO safety contacts

Contact type: forcibly guided

Contact material: 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 231-240.

Code structure

CS AR-20V024

Start type

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 ±15%

120 120 Vac ±15%

230 230 Vac ±15%

Stock items

CS AR-20V024

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

AC consumption: < 5 VA

DC consumption: < 2 W

Maximum switching voltage: 30 Vac

Max. current per contact: 6 A

Utilization category: C300

Notes:

- Use 60° or 75° copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

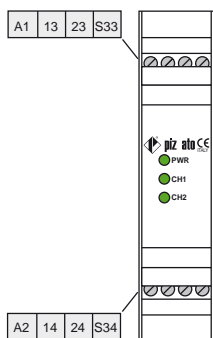
- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

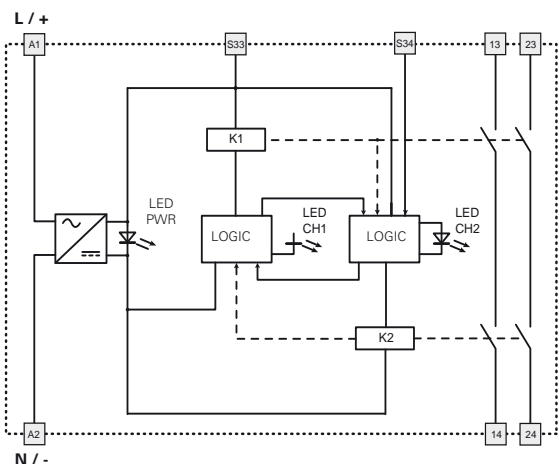


Safety module CS AR-20 / CS AR-21

Terminal layout

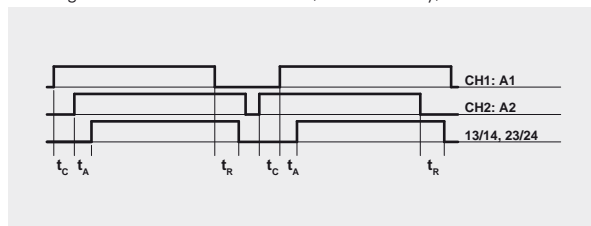


Internal diagram

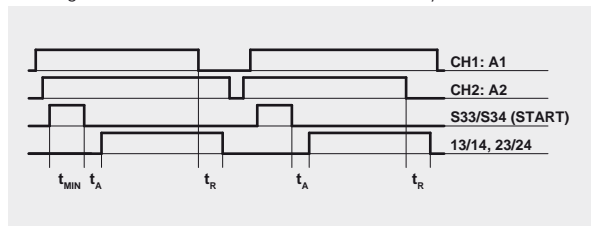


Operation diagrams

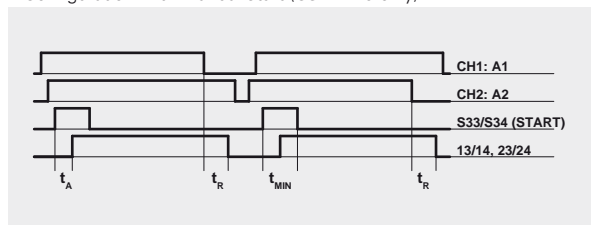
Configuration with automatic start (CS AR-20 only)



Configuration with monitored start (CS AR-21 only)



Configuration with manual start (CS AR-20 only)

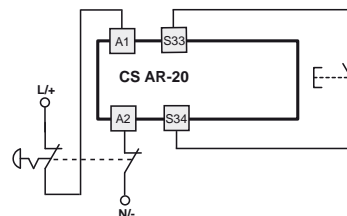
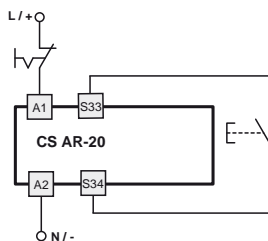


Legend:
t_MIN: min. duration of start impulse
t_c: simultaneity time
t_A: operating time
t_R: releasing time in absence of power supply

Notes:
The configurations with one channel are obtained taking into consideration only the CH1:A1 input. 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

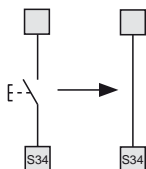
Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels



The diagram does not show the exact position of 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.

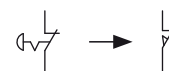


Monitored start

Use the CS AR-21 module following the diagram for the manual start.

Movable guard monitoring

The safety module can control emergency stop circuits or movable guard monitoring circuits. Replace the emergency stop contacts with the switch contacts.



Application examples See page 241



Module for emergency stop and gate monitoring

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)
- Small 22.5 mm housing
- 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

> 10 million operating cycles

Electrical endurance:

> 100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 70 mA

Min. duration of start impulse t_{MIN}:

> 100 ms

Operating time t_A:

< 50 ms

Releasing time in absence of power supply t_R:

< 75 ms

Simultaneity time t_C:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

3 NO safety contacts,

1 NC auxiliary contact

Contact type:

forcibly guided

Contact material:

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:

80 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 231-240.

Code structure

CS AR-22V024

Start type

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 ±15%

120 120 Vac ±15%

230 230 Vac ±15%

Stock items

CS AR-22V024

Characteristics approved by UL

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

AC consumption:

< 5 VA

DC consumption:

< 2 W

Maximum switching voltage:

230 Vac

Max. current per contact:

6 A

Utilization category

C300

Notes:

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

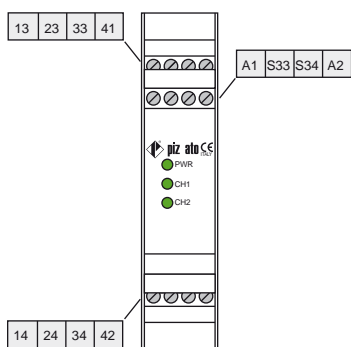
- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

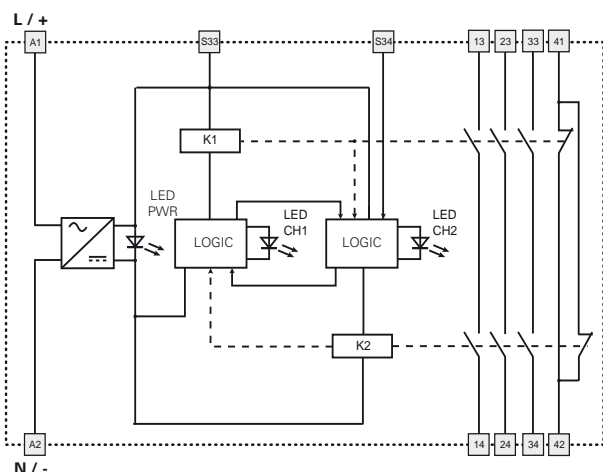


Safety module CS AR-22 / CS AR-23

Terminal layout

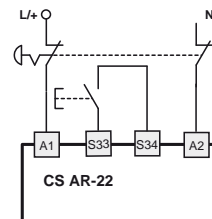
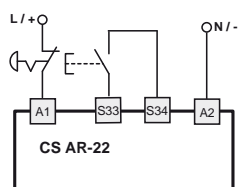


Internal diagram



Input configuration

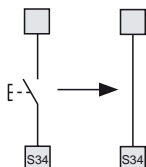
Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels



The diagram does not show the exact position of 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.

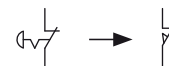


Monitored start

Use the CS AR-23 module following the diagram for the manual start.

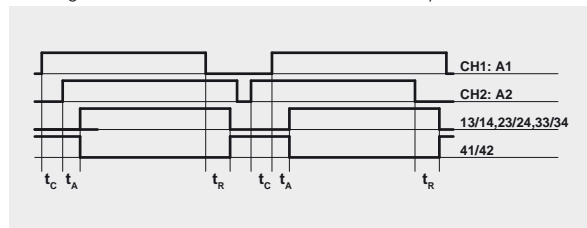
Movable guard monitoring

The safety module can control emergency stop circuits or movable guard monitoring circuits. Replace the emergency stop contacts with the switch contacts.

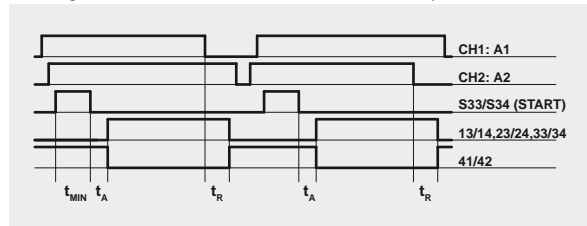


Operation diagrams

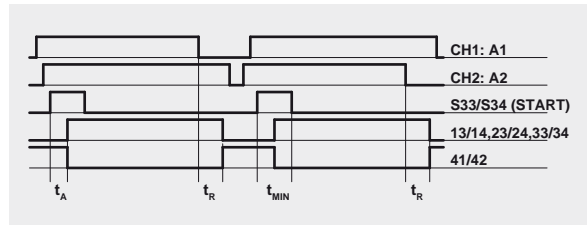
Configuration with automatic start (CS AR-22 only)



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 : operating time
- t_R : releasing time in absence of power supply

Notes:

The configurations with one channel are obtained taking into consideration only the CH1:A1 input. 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.



Module for emergency stop and gate monitoring

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)
- Small 22.5 mm housing
- 4 NO safety contacts
1 NC auxiliary contact
- Supply voltage:
24 Vac/dc

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Min. duration of start impulse t_{MIN}:

> 100 ms

Operating time t_A:

< 85 ms

Releasing time t_{RI}:

< 40 ms

Releasing time in absence of power supply t_R:

< 170 ms

Simultaneity time t_c:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

4 NO safety contacts,

1 NC auxiliary contact

Contact type:

forcibly guided

Contact material:

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:

72 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 231-240.

Code structure

CS AR-24V024

Start type

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 ±15%

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vac/dc; 50...60 Hz

AC consumption: < 5 VA

DC consumption: < 2 W

Maximum switching voltage: 230 Vac

Max. current per contact: 6 A

Utilization category C300

Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

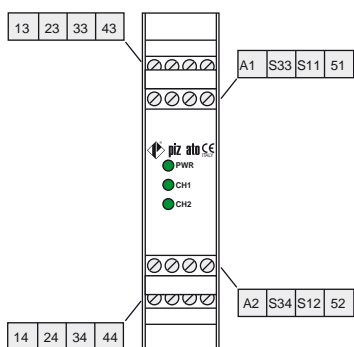
- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

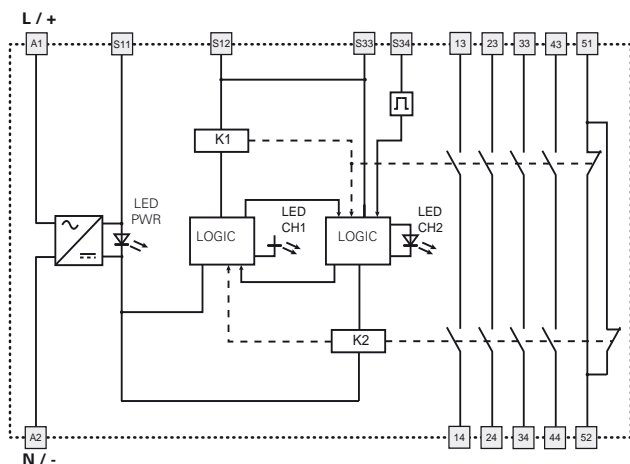


Safety module CS AR-24 / CS AR-25

Terminal layout

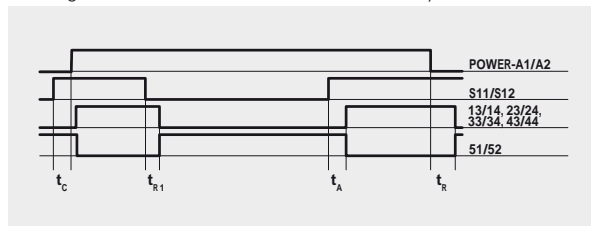


Internal diagram

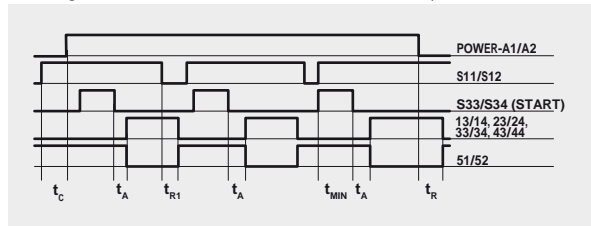


Operation diagrams

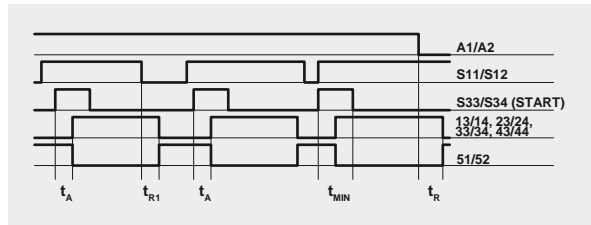
Configuration with automatic start (CS AR-24 only)



Configuration with monitored start (CS AR-25 only)



Configuration with manual start (CS AR-24 only)

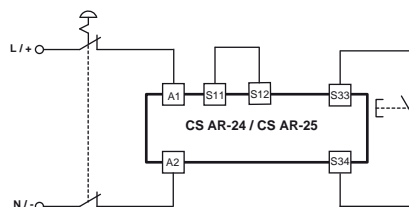
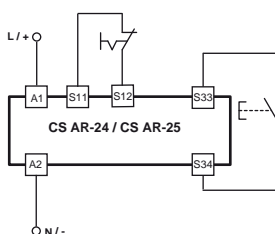


- Legend:
- t_{MIN} : min. duration of start impulse
 - t_c : simultaneity time
 - t_A : operating time
 - t_{r1} : releasing time
 - t_r : releasing time in absence of power supply

Notes:
The configurations with one channel are obtained taking into consideration only the S11/S12 input. 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

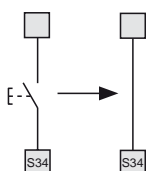
Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels



The diagram does not show the exact position of 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 the CS AR-25 module following the diagram for the manual start.

Movable guard monitoring

The safety module can control emergency stop circuits or movable guard monitoring circuits. Replace the emergency stop contacts with the switch contacts.





Module for emergency stop and gate monitoring

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)
- Small 22.5 mm housing
- 2 NO safety contacts
- Supply voltage: 24 Vac/dc

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design D

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 70 mA

Min. duration of start impulse t_{MIN}:

> 100 ms

Operating time t_A:

< 50 ms

Releasing time in absence of power supply t_R:

< 105 ms

Simultaneity time t_c:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

2 NO safety contacts

Contact type:

forcibly guided

Contact material:

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 231-240.

Code structure

CS AR-40V024

Start type

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 ±15%

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vac/dc; 50...60 Hz

AC consumption: < 5 VA

DC consumption: < 2 W

Maximum switching voltage: 230 Vac

Max. current per contact: 6 A

Utilization category: C300

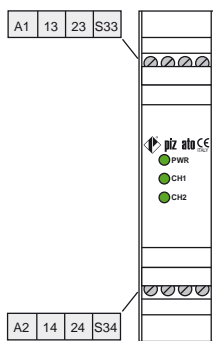
Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

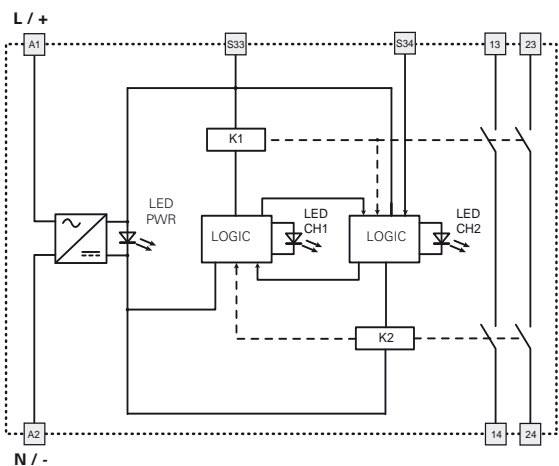


Safety module CS AR-40 / CS AR-41

Terminal layout

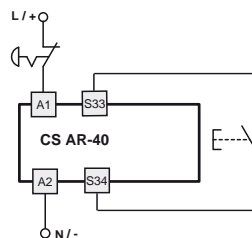


Internal diagram



Input configuration

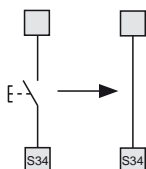
Emergency stop circuits
1-channel input configuration with manual start



The diagram does not show the exact position of 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.

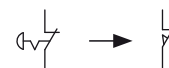


Monitored start

Use the CS AR-41 module following the diagram for the manual start.

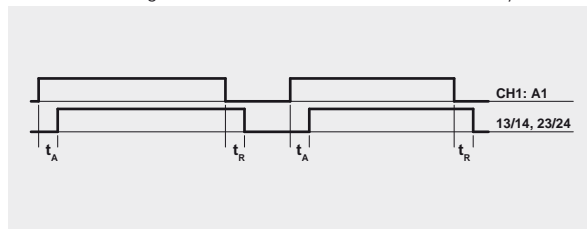
Movable guard monitoring

The safety module can control emergency stop circuits or movable guard monitoring circuits. Replace the emergency stop contacts with the switch contacts.

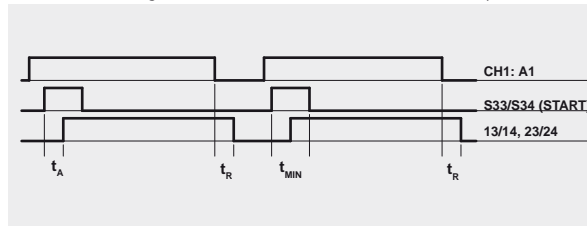


Operation diagrams

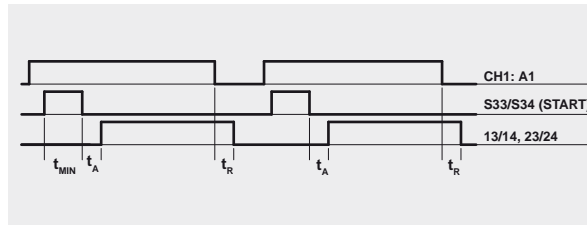
1-channel configuration with automatic start (CS AR-40 only)



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 : operating time
 - t_R : releasing time in absence of power supply



Module for emergency stop, gate monitoring, devices and magnetic safety sensors

Main features

- For safety applications up to SIL CL 1/PL c
- Small 22.5 mm housing
- 1 NO safety contacts
- Supply voltage: 24 Vac/dc

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design D

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 20 mA

Operating time t_A:

< 15 ms

Releasing time t_{R1}:

< 20 ms

Releasing time in absence of power supply t_R:

< 100 ms

Simultaneity time t_C:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

1 NO safety contacts

Contact material:

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 231-240.

Code structure

CS AR-46V024

Connection type	
V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Supply voltage		
024	24 Vac/dc	±15%

Characteristics approved by UL

Rated supply voltage (U _n):	24 Vac/dc; 50...60 Hz
AC consumption:	< 5 VA
DC consumption:	< 2 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

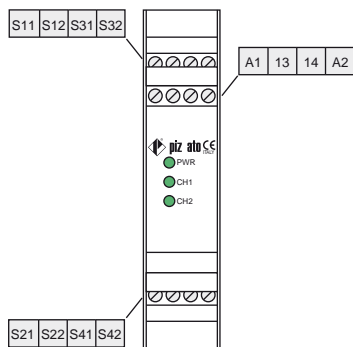
Notes:

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

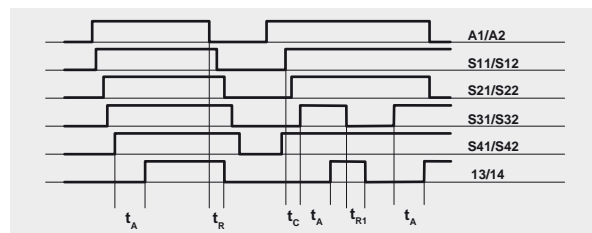


Safety module CS AR-46

Terminal layout

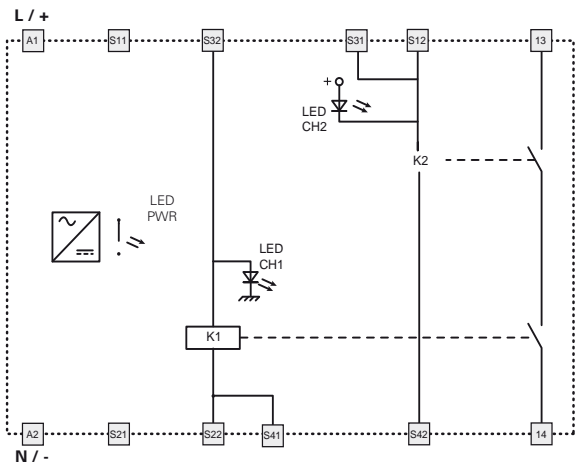


Operation diagrams



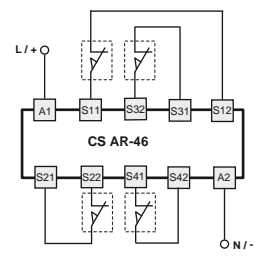
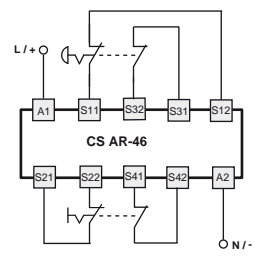
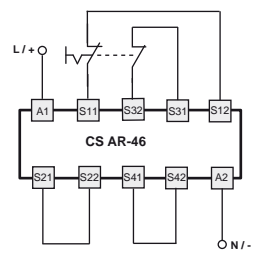
Legend:
 t_C : simultaneity time
 $t_{A'}$: operating time
 t_{R1} : releasing time
 $t_{A''}$: releasing time in absence of power supply

Internal diagram



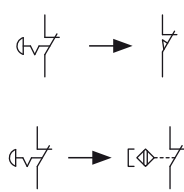
Input configuration

Emergency stop circuits		
Input configuration with automatic start		
2 channels and 1 emergency stop button	2 channels and 2 emergency stop buttons	2 channels and 4 switches



Movable guard monitoring and magnetic safety sensors

The safety module can control emergency stop circuits, movable guard monitoring circuits or magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. The sensors can only be used in 2-channel configuration.





Module for emergency stop, gate monitoring 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 the input channels to opposite potentials
- Small 22.5 mm housing
- Output contacts:
2 NO safety contacts, 1NO opto-decoupled, for signalling
- Supply voltage: 24 Vac/dc
- Insensitivity to voltage dips

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



IMQ certificate of conformity no. 340.

(Standard: EN 81-1:1998 + A3:2009, EN 81-2:1998 + A3:2009)

EC type examination certificate: IMQ CP 432 DM
(Machinery Directive)

IMQ type examination certificate no. 236
(Machinery Directive)

UL approval: E131787

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; ±15%; 50...60 Hz

DC maximum residual ripple:

10%

AC consumption:

< 5 VA

DC consumption:

< 2.5 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC intervention timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 40 mA

Min. duration of start impulse t_{MIN}:

> 50 ms

Operating time t_A:

< 120 ms

Releasing time t_{RI}:

< 15 ms

Releasing time in absence of power supply t_R:

< 65 ms

Simultaneity time t_C:

infinite

Operating time from power supply switch on: < 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

Releasing time t_{R2}:

< 1 ms

In conformity 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 62326-1, EN 60664-1, EN 60947-1,
EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

2 NO safety contacts,

Contact type:

forcibly guided

Contact material:

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 type F

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 231-240.

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 ±15%

Characteristics approved by UL

Rated supply voltage (U _n):	24 Vac/dc; 50...60 Hz
AC consumption:	< 5 VA
DC consumption:	< 2.5 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

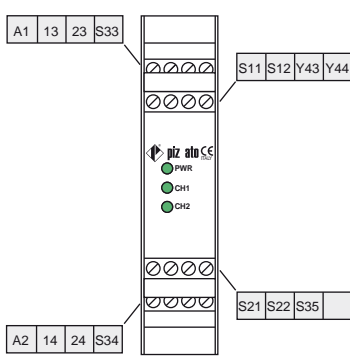
Notes:

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).



Safety module CS AR-91

Terminal layout

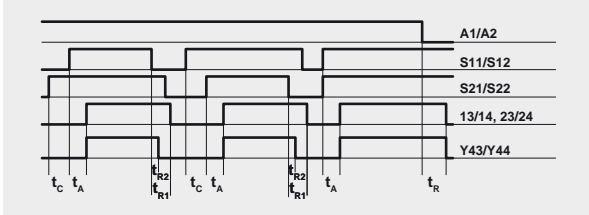


Voltage dips, short interruptions and voltage variations

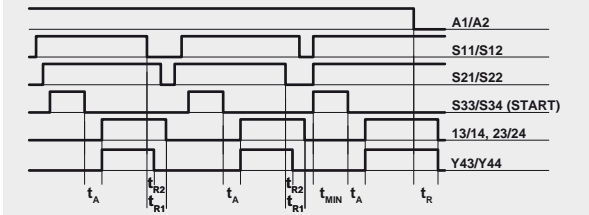
The CS AR-91 safety module has a built-in voltage drop sensor which serves to protect and safeguard the internal state of the safety relays, in the event of dips or short voltage interruptions. This is to prevent unwanted switching states in relation to the state of the inputs from occurring. When the input voltage is restored, the equipment always starts correctly and consistently with the inputs state. With brief voltage dips and interruptions, the safety module maintains its normal performance, while with longer voltage interruptions the safety outputs open which, along with the automatic start, are restored when the voltage is restored. With manual or monitored start, the operator will need to carry out a system reset.

Operation diagrams

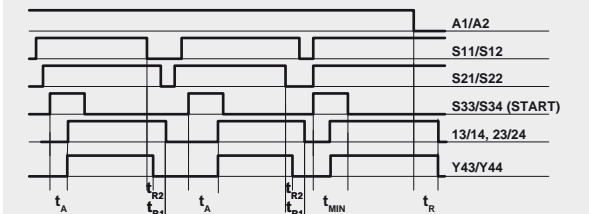
Configuration with automatic start



Configuration with monitored start



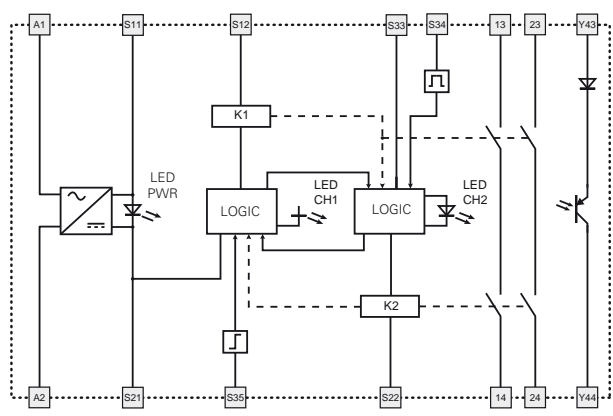
Configuration with manual start



Legend:
 t_{MIN} : min. duration of start impulse
 t_C : simultaneity time
 t_A : operating time
 t_{R1} : releasing time
 t_{R2} : releasing time in absence of power supply

Notes:
The configurations with one channel are obtained taking into consideration only the S11/S12 input. 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.

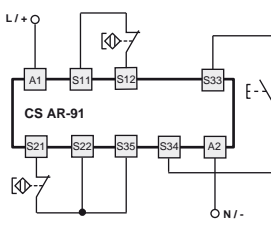
Internal diagram



Input configuration

Input configuration with magnetic sensors

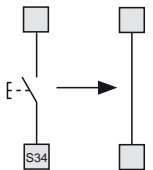
2 channels



The diagram does not show the exact position of terminals in the product

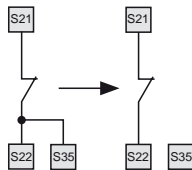
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



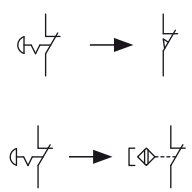
Monitored start

With regard to the indicated diagrams, it is necessary to remove the connection between S22 and S35 in order to activate the monitored start module.



Movable guard monitoring and magnetic safety sensors

The safety module can control emergency stop circuits, movable guard monitoring circuits or magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. The sensors can only be used in 2-channel configuration.





Module for emergency stop, gate monitoring, safety mats and safety bumpers with 4-wire technology

Main features

- For safety applications up to SIL CL 3/PL e
- Dual channel input circuit
- Choice between automatic start, manual start or monitored start
- Connection of the input channels to 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2.5 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 200 Ω

Input current:

< 10 mA

Min. duration of start impulse t_{MIN}:

> 150 ms

Operating time t_A:

< 120 ms

Releasing time t_{RI}:

< 15 ms

Releasing time in absence of power supply t_R:

< 100 ms

Simultaneity time t_c:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

2 NO safety contacts

Contact type:

forcibly guided

Contact material:

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 231-240.

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	±15%

Characteristics approved by UL

Rated supply voltage (U _n):	24 Vac/dc; 50...60 Hz
AC consumption:	< 5 VA
DC consumption:	< 2 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

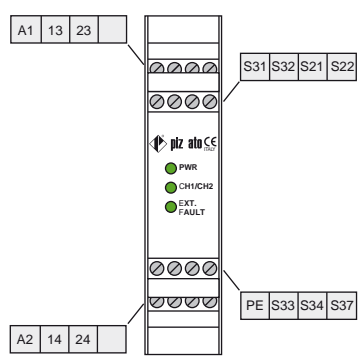
Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).



Safety module CS AR-51

Terminal layout

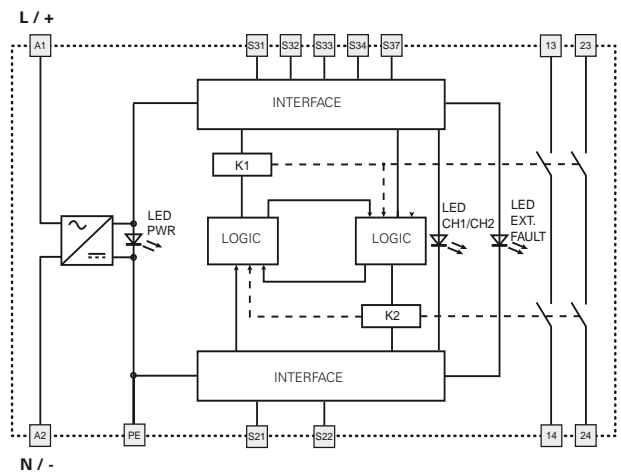


PE terminal connection
 The PE terminal has to be connected to the equipotential circuit of machine protection if it is necessary. This connection is made for functional reason, to reduce effects of an insulation fault on the machine operation. In particular, faults towards ground on control circuits must not cause an unwanted starting, either dangerous movements or obstruct the machine stop.

"EXT. FAULT" LED function
 When a pressure is exerted on surfaces of a bumper or a safety mat or a bumper, we obtain a short-circuit between the two conductive elements which form the device and are connected to the entry channels of the safety module.

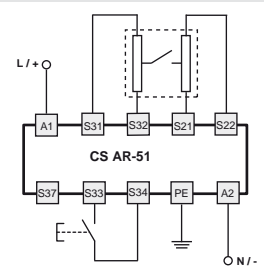
The produced signal cause the LED EXT.FAULT lighting to signal the short-circuit between channels and the output contacts opening, which produce the block of the control circuit and the safety setting of the machine. The EXT. FAULT LED does not activate in the case of wires or internal connection interruption of safety mat or bumper.

Internal diagram

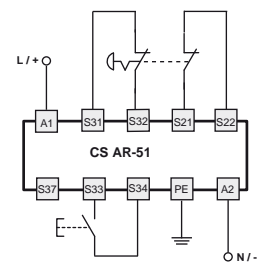


Input configuration

Safety mats and safety bumpers
 Input configuration with manual start
 2 channels

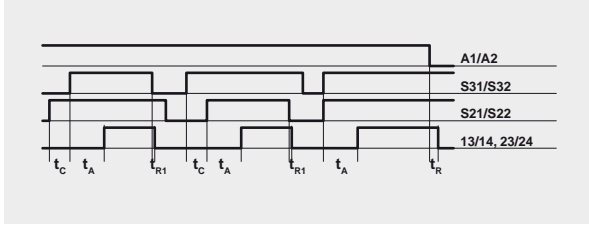


Emergency stop circuits
 Input configuration with manual start
 2 channels

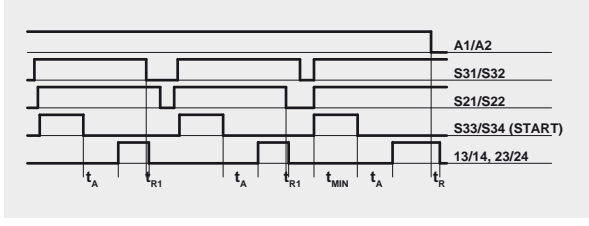


Operation diagrams

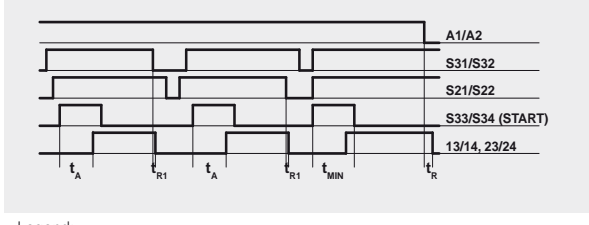
Configuration with automatic start



Configuration with monitored start



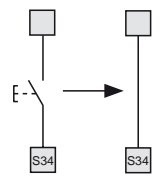
Configuration with manual start



Legend:
 t_{MIN} : min. duration of start impulse
 t_C : simultaneity time
 t_A : operating time
 t_{R1} : releasing time
 t_{Rr} : releasing time in absence of power supply

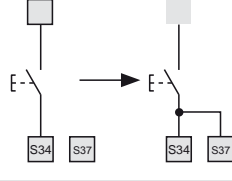
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



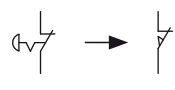
Monitored start

As regards the indicated diagrams, in order to activate the monitored start, it is necessary to add the connection between S34 and S37 terminals.



Movable guard monitoring

The safety module can control emergency stop circuits or movable guard monitoring circuits. Replace the emergency stop contacts with the switch contacts.



The diagram does not show the exact position of terminals in the product



Module, with delayed contacts at the opening of the input channels, for emergency stop, gate monitoring, solid-state output circuits (e.g. light curtains) 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 the input channels to opposite potentials
- Can be connected to solid-state output circuits (e.g. light curtains), to electromechanical contacts or to magnetic safety sensors
- 45 mm housing
- 2 NO instantaneous safety contacts, 1 NC auxiliary contact, instantaneous, 2 NO safety contacts, delayed.
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design C

General data

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

see page 333

Safety parameters:

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.5 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 10 VA

DC consumption:

< 5 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Min. duration of start impulse t_{MIN}:

> 200 ms

Operating time t_A:

< 150 ms

Releasing time t_{R1}:

< 20 ms

Releasing time in absence of power supply t_R:

< 150 ms

Releasing time, delayed contacts t_{R2}:

see "Code structure"

Simultaneity time t_C:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

2 NO instantaneous safety contacts,

1 NC auxiliary contact, instantaneous,

2 NO safety contacts, delayed.

Contact type:

forcibly guided

Contact material:

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:

72 (instantaneous), 36 (delayed) 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 231-240.

Code structure

CS AT-00V024-TF1

Releasing time, delayed contacts (t_{R2})

0	Fixed time (see TF)
1	from 0.3 to 3 s, step 0.3 s
2	from 1 to 10 s, step 1 s
3	from 3 to 30 s, step 3 s
4	from 30 to 300 s, step 30 s

Releasing time, delayed contacts (t_{R2})

TF0.5	0.5 s fixed time
TF1	1 s fixed time
TF3	3 s fixed time
...

Supply voltage

024	24 Vac/dc	±15%
120	120 Vac	±15%
230	230 Vac	±15%

Connection type

V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Characteristics approved by UL

Rated supply voltage (U _n):	24 Vac/dc; 50...60 Hz 120 Vac; 50...60 Hz 230 Vac; 50...60 Hz
AC consumption:	< 10 VA
DC consumption:	< 4 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

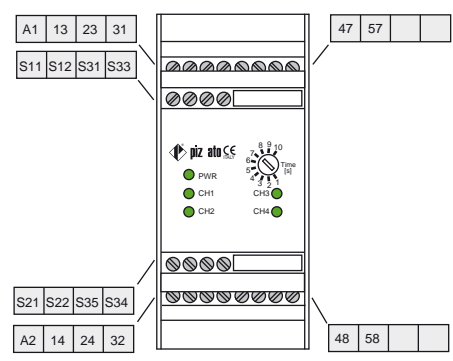
Notes:

- Use 60° or 75° C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

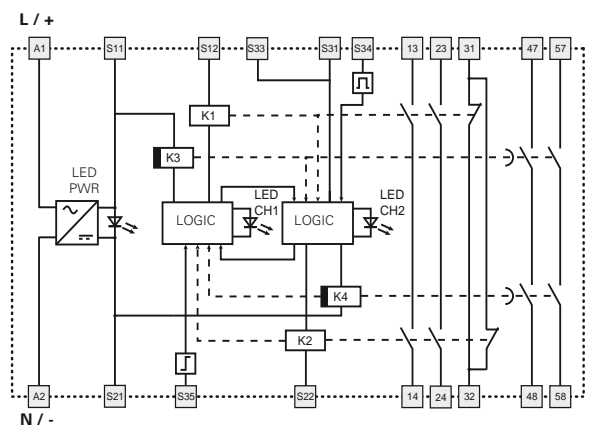


Safety module CS AT-0

Terminal layout

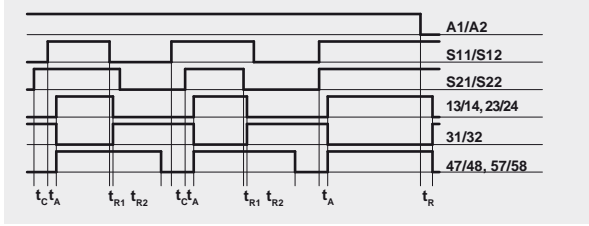


Internal diagram

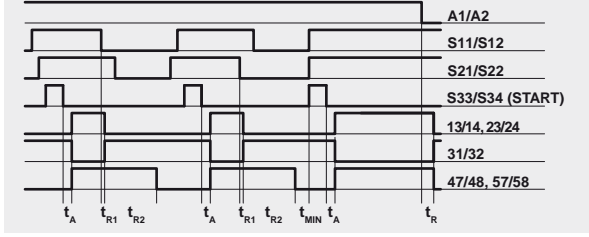


Operation diagrams

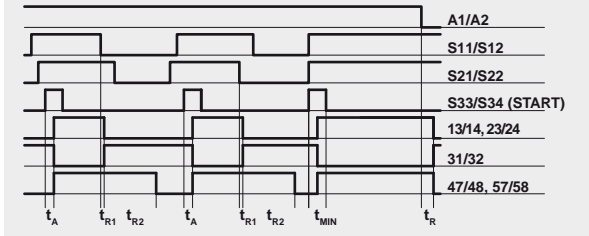
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



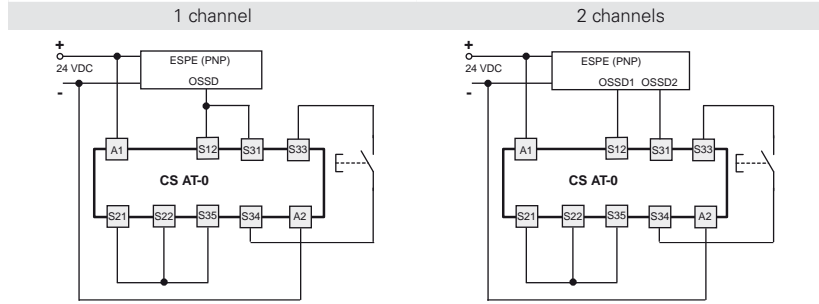
- Legend:
- t_{MIN} : min. duration of start impulse
 - t_c : simultaneity time
 - t_o : operating time
 - t_{R1} : releasing time
 - t_{R2} : releasing time in absence of power supply
 - t_{R2} : releasing time, delayed contacts adjustable (see "Code structure")

Notes:
The configurations with one channel are obtained taking into consideration only the S11/S12 input. In this case it is necessary to consider time t_{R1} and t_{R2} referred to input S11/S12, time t_A referred to the supply, time t_o referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

Input configuration

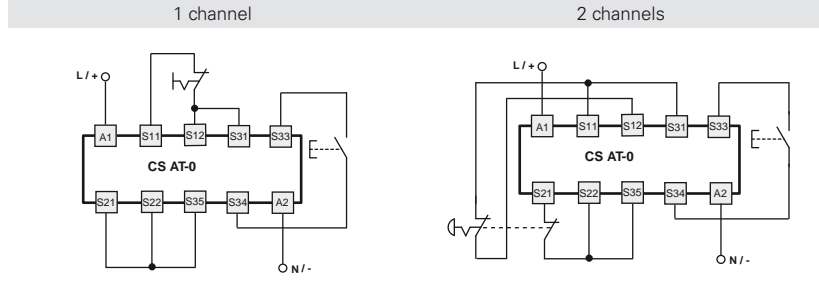
Solid state output circuits (e.g. light curtains)

Input configuration with manual start



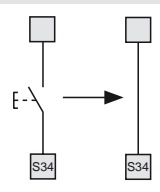
Emergency stop circuits

Input configuration with manual start



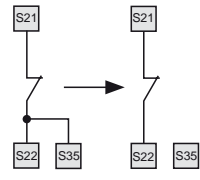
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



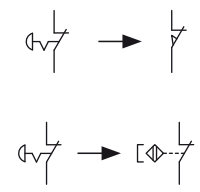
Monitored start

With regard to the indicated diagrams, it is necessary to remove the connection between S22 and S35 in order to activate the monitored start module.



Movable guard monitoring and magnetic safety sensors

The safety module can control emergency stop circuits, movable guard monitoring circuits or magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. The sensors can only be used in 2-channel configuration.





Module, with delayed contacts at the opening of the input channels, for emergency stop, gate monitoring, solid-state output circuits (e.g. light curtains) 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 the input channels to opposite potentials
- Can be connected to solid-state output circuits (e.g. light curtains), to electromechanical contacts or to magnetic safety sensors
- 45 mm housing
- 3 NO instantaneous safety contacts, 2 NO safety contacts, delayed.
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50...60 Hz)
 U_e (V) 230
 I_e (A) 3
 Direct current: DC13 (6 op. cycles/minute)
 U_e (V) 24
 I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787
 EAC approval: RU C-IT ДМ94.В.01024
 CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,
 Machinery Directive 2006/42/EC,
 EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94
 Protection degree: IP40 (housing), IP20 (terminal strip)
 Dimensions: see page 284, design C

General data

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
 see page 333
 Safety parameters:
 Ambient temperature: -25°C...+55°C
 Mechanical endurance: >10 million operating cycles
 Electrical endurance: >100,000 operating cycles
 Pollution degree: external 3, internal 2
 Impulse voltage (U_{imp}): 4 kV
 Rated insulation voltage (U_i): 250 V
 Overvoltage category: II
 Weight: 0.5 kg

Supply

Rated supply voltage (U_n): 24 Vac/dc; 50...60 Hz
 120 Vac; 50...60 Hz
 230 Vac; 50...60 Hz
 DC maximum residual ripple: 10%
 Supply voltage tolerance: $\pm 15\%$ of U_n
 AC consumption: < 10 VA
 DC consumption: < 5 W

Control circuit

Protection against short circuits: resistance PTC, $I_h=0.5$ A
 PTC timing: intervention > 100 ms, reset > 3 s
 Maximum input resistance: $\leq 50 \Omega$
 Input current: < 30 mA
 Min. duration of start impulse t_{MIN} : > 200 ms
 Operating time t_A : < 150 ms
 Releasing time t_{R1} : < 20 ms
 Releasing time in absence of power supply t_R : < 150 ms
 Releasing time, delayed contacts t_{R2} : see "Code structure"
 Simultaneity time t_C : infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1,
 EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts: 3 NO instantaneous safety contacts,
 2 NO safety contacts, delayed.
 Contact type: forcibly guided
 Contact material: 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 (instantaneous), 36 (delayed) A²
 Minimum current: 10 mA
 Contact resistance: ≤ 100 m Ω
 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 231-240.

Code structure

CS AT-10V024-TF1

Releasing time, delayed contacts (t_{R2})

0	Fixed time (see TF)
1	from 0.3 to 3 s, step 0.3 s
2	from 1 to 10 s, step 1 s
3	from 3 to 30 s, step 3 s
4	from 30 to 300 s, step 30 s

Releasing time, delayed contacts (t_{R2})

TF0.5	0.5 s fixed time
TF1	1 s fixed time
TF3	3 s fixed time
...

Supply voltage

024	24 Vac/dc	$\pm 15\%$
120	120 Vac	$\pm 15\%$
230	230 Vac	$\pm 15\%$

Connection type

V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vac/dc; 50...60 Hz
 120 Vac; 50...60 Hz
 230 Vac; 50...60 Hz
 AC consumption: < 10 VA
 DC consumption: < 4 W
 Maximum switching voltage: 230 Vac
 Max. current per contact: 6 A
 Utilization category: C300

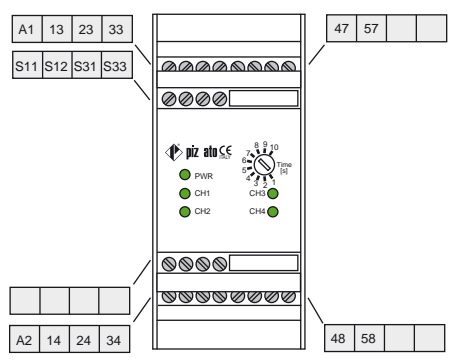
Notes:

- Use 60° or 75° C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

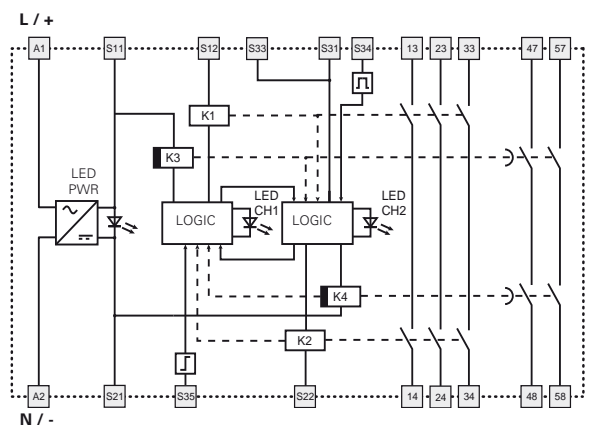


Safety module CS AT-1

Terminal layout

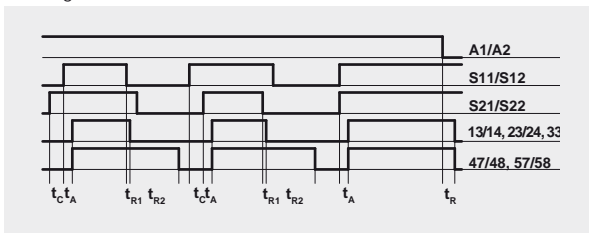


Internal diagram



Operation diagrams

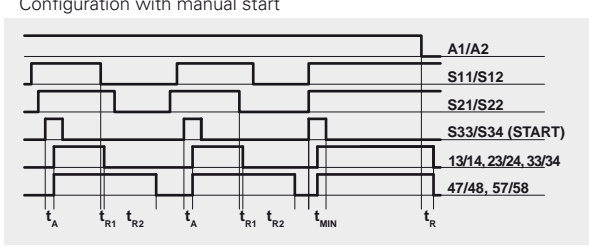
Configuration with automatic start



Configuration with monitored start



Configuration with manual start



Legend:
t_MIN: min. duration of start impulse
t_c: simultaneity time
t_A: operating time
t_R1: releasing time
t_R2: releasing time in absence of power supply
t_R: releasing time, delayed contacts adjustable (see "Code structure")

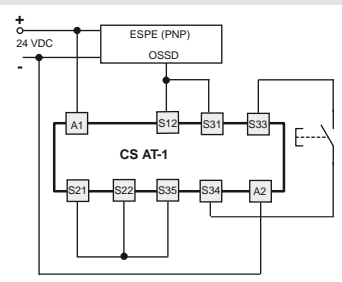
Notes:
The configurations with one channel are obtained taking into consideration only the S11/S12 input. In this case it is necessary to consider time t_R1 and t_R2 referred to input S11/S12, time t_A referred to the supply, time t_A referred to input S11/S12 and to the start, and time t_MIN referred to the start.

Input configuration

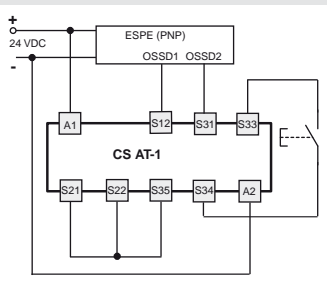
Solid state output circuits (e.g. light curtains)

Input configuration with manual start

1 channel



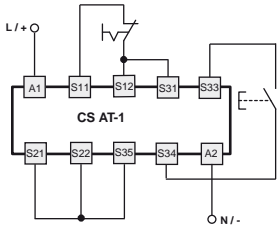
2 channels



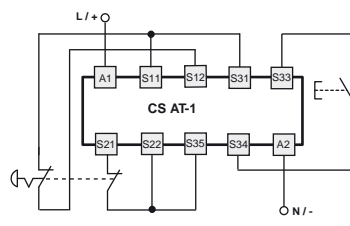
Emergency stop circuits

Input configuration with manual start

1 channel

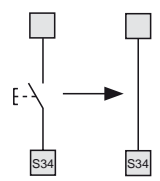


2 channels



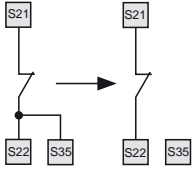
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



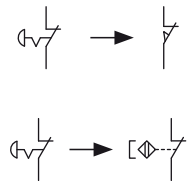
Monitored start

With regard to the indicated diagrams, it is necessary to remove the connection between S22 and S35 in order to activate the monitored start module.



Movable guard monitoring and magnetic safety sensors

The safety module can control emergency stop circuits, movable guard monitoring circuits or magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. The sensors can only be used in 2-channel configuration.





Module for emergency stop and gate 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
- Connectible to electromechanical contacts or to magnetic safety sensor
- 45 mm housing
- 2 NO instantaneous safety contacts, 1 NO safety contact, delayed.
- Supply voltage: 24 Vac/dc

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design C

General data

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

see page 333

Safety parameters:

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

> 10 million operating cycles

Electrical endurance:

> 100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

2.5 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 10 VA

DC consumption:

< 5 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Min. duration of start impulse t_{MIN}:

> 100 ms

Operating time t_A:

< 70 ms

Releasing time t_{R1}:

< 15 ms

Releasing time in absence of power supply t_R:

< 100 ms

Releasing time, delayed contacts t_{R2}:

see "Code structure"

Simultaneity time t_c:

infinite

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

2 NO instantaneous safety contacts,

1 NO safety contact, delayed.

Contact type:

forcibly guided

Contact material:

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 231-240.

Code structure

CS AT-30V024-TF1

Releasing time, delayed contacts (t_{R2})

0	Fixed time (see TF)
1	from 0.3 to 3 s, step 0.3 s
2	from 1 to 10 s, step 1 s
3	from 3 to 30 s, step 3 s
4	from 30 to 300 s, step 30 s

Releasing time, delayed contacts (t_{R2})

TF0.5	0.5 s fixed time
TF1	1 s fixed time
TF3	3 s fixed time
...

Supply voltage

024	24 Vac/dc	±15%
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Connection type

V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Characteristics approved by UL

Rated supply voltage (U _n):	24 Vac/dc; 50...60 Hz
AC consumption:	< 10 VA
DC consumption:	< 4 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

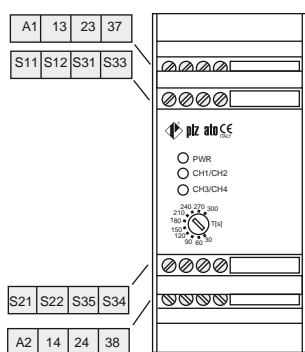
Notes:

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

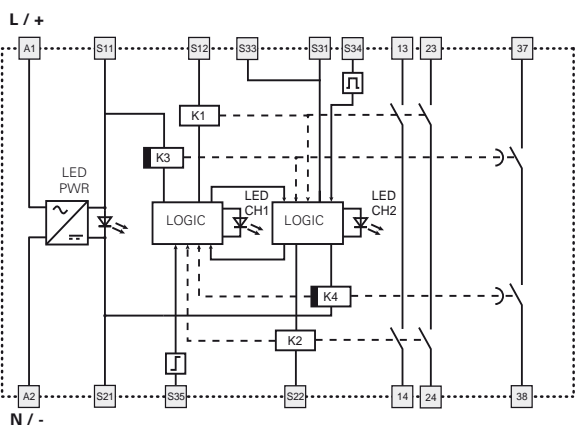


Safety module CS AT-3

Terminal layout

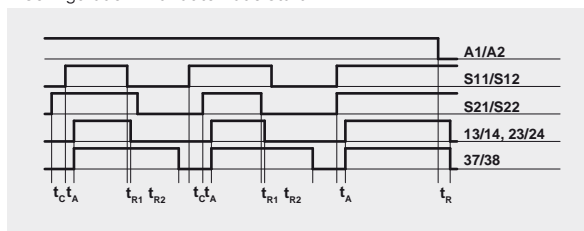


Internal diagram

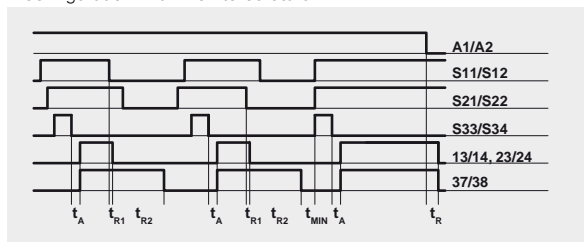


Operation diagrams

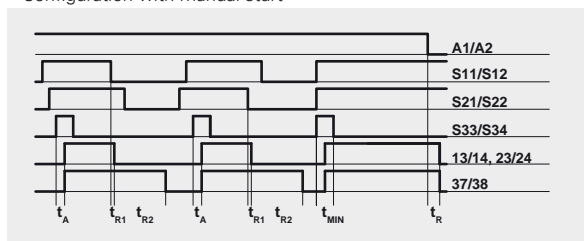
Configuration with automatic start



Configuration with monitored start



Configuration with manual start

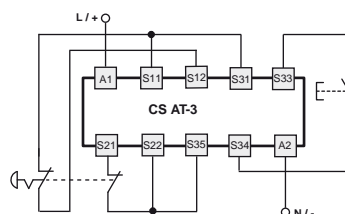
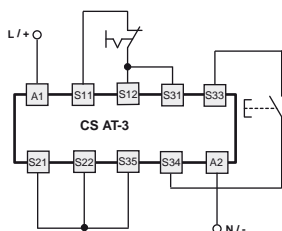


- Legend:
- t_{MIN} : min. duration of start impulse
 - t_c : simultaneity time
 - t_A : operating time
 - t_{R1} : releasing time
 - t_{R2} : releasing time in absence of power supply
 - t_{R1} : releasing time, delayed contacts adjustable (see "Code structure")

Notes:
The configurations with one channel are obtained taking into consideration only the S11/S12 input. In this case it is necessary to consider time t_{R1} and t_{R2} referred to input S11/S12, time t_A referred to the supply, time t_c referred to input S11/S12 and to the start, and time t_{MIN} referred to the start.

Input configuration

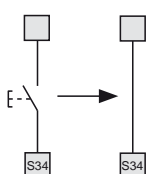
Emergency stop circuits	
Input configuration with manual start	
1 channel	2 channels



The diagram does not show the exact position of terminals in the product

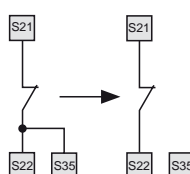
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



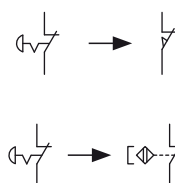
Monitored start

With regard to the indicated diagrams, it is necessary to remove the connection between S22 and S35 in order to activate the monitored start module.



Movable guard monitoring and magnetic safety sensors

The safety module can control emergency stop circuits, movable guard monitoring circuits or magnetic safety sensors. Replace the emergency stop contacts with switch contacts or sensor contacts. The sensors can only be used in 2-channel configuration.



The diagram does not show the exact position of terminals in the product

Application examples See page 241



Safety timer module with delayed contacts at energizing

Main features

- For safety applications up to SIL CL 3/PL e
- Timed circuits through safety system with self-monitoring and redundancy
- Suitable to control safety interlocked 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design C

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

> 10 million operating cycles

Electrical endurance:

> 100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

2.5 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Operating time t_A:

see "Code structure"

Releasing time in absence of power supply t_R:

< 40 ms

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

1 NO safety contact,
2 NC auxiliary contacts
forcibly guided

Contact type:

silver alloy

Contact material:

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 231-240.

Code structure

CS FS-11V024-TF1

Operating time (t _A)	
0	Fixed time (see TFx)
1	from 0.3 to 3 s, step 0.3 s
2	from 1 to 10 s, step 1 s
3	from 3 to 30 s, step 3 s
4	from 30 to 300 s, step 30 s

Operating 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

Supply voltage		
024	24 Vac/dc	±15%
120	120 Vac	±15%
230	230 Vac	±15%

Connection type	
V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Characteristics approved by UL

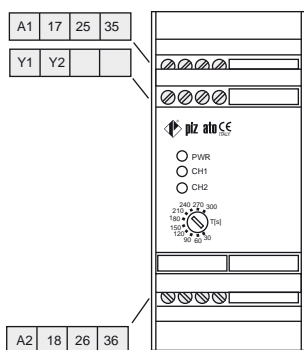
Rated supply voltage (U _n):	24 Vac/dc; 50...60 Hz 120 Vac; 50...60 Hz 230 Vac; 50...60 Hz
AC consumption:	< 5 VA
DC consumption:	< 2 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

Notes:
 - Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
 - Terminal tightening torque of 5-7 Lb In.
 - Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

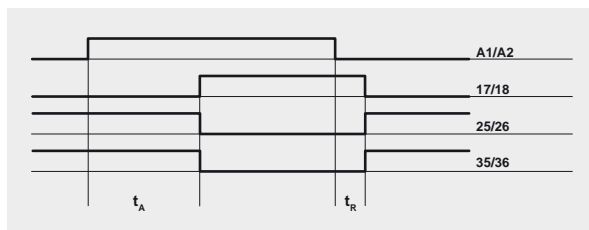


Safety module CS FS-1

Terminal layout

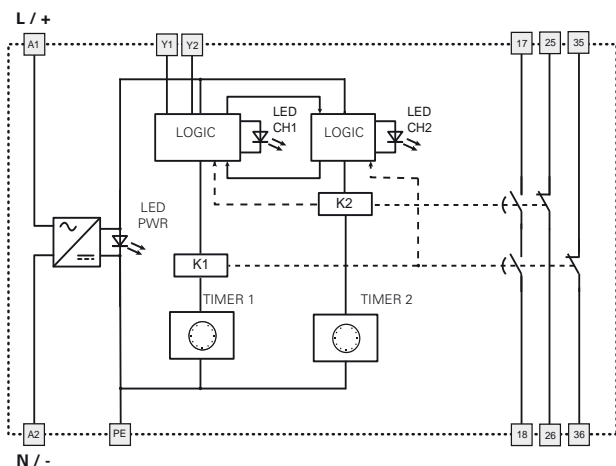


Operation diagram



Legend:
 t_A : adjustable operating time (see "Code structure")
 t_R : releasing time in absence of power supply

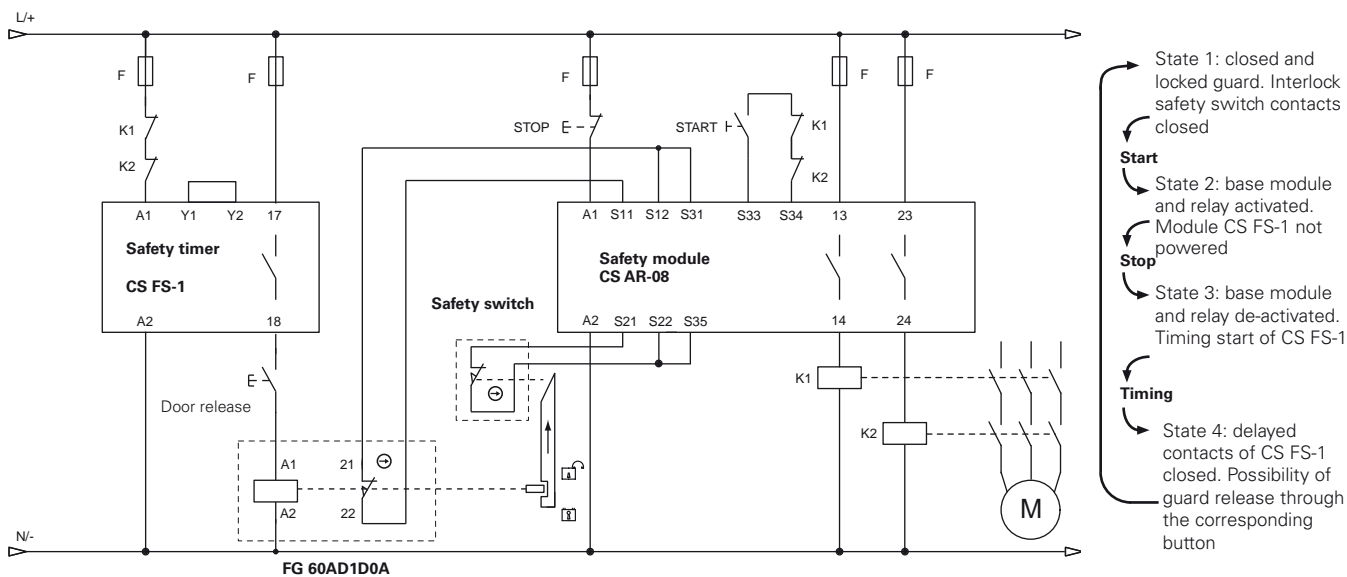
Internal diagram



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



The diagram shown displays the operation principle of a typical circuit for the control of a door-lock system with door blocking when interlock safety switch is not energised, and manual release of the single doors. In order to obtain the complete wiring diagram with different modalities of electrical blocking or with automatic door release, please contact our technical office.

The diagram does not show the exact position of terminals in the product



Safety timer module with delayed contacts at energizing

Main features

- For safety applications up to SIL CL 2/PL d
- Timed circuits through safety system with self-monitoring and redundancy
- Suitable to control safety interlocked 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings and quality marks:



UL approval: E131787

TÜV SÜD approval: Z10 12 04 75157 003

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design C

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vdc (A1-A2)

120 Vac; 50...60 Hz (B1-B2)

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Operating time t_A:

see "Code structure"

Releasing time in absence of power supply t_R:

< 40 ms

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

1 NO safety contact,

1 NC auxiliary contact,

1 CO auxiliary contact,

forcibly guided

Contact type:

Contact material:

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

Signalling output error (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 231-240.

Code structure

CS FS-20VU24-TFxx

Operating time (t_A)

0	Fixed time (see TFx)
1	from 0.3 to 3 s, step 0.3 s
2	from 1 to 10 s, step 1 s
3	from 3 to 30 s, step 3 s
4	from 30 to 300 s, step 30 s

Operating 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	±15%
120	24 Vdc (A1-A2)	±15%
	120 Vac (B1-B2)	±15%

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vdc; 120 Vac; 50...60 Hz;
 AC consumption: < 5 VA
 DC consumption: < 2 W
 Maximum switching voltage: 230 Vac
 Max. current per contact: 6 A
 Utilization category: C300
 - Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
 - Terminal tightening torque of 5-7 Lb In.
 - Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

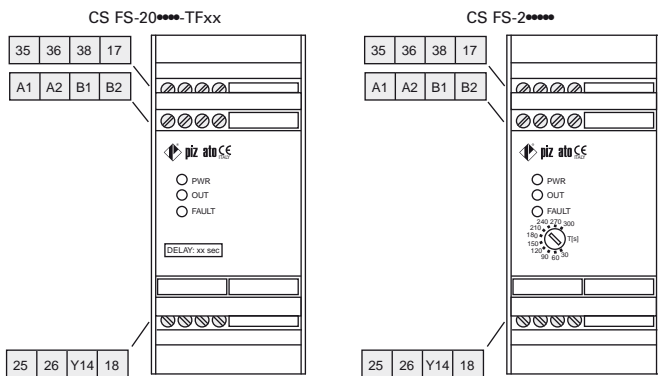
Characteristics approved by TÜV SÜD

Rated supply voltage (U_n): 24 Vdc; ± 15%, 120 Vac ± 15%
 Consumption: 5 VA max. AC, 2 W max. DC
 Rated operating current (max.): 4 A
 Max. 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 conformity with standards: 2006/42/EEC Machine Directive,
 EN ISO 13849-1 (up to Cat. 4 PL e), EN 50178:1997, EN 60947-5-3/
 A1:2005, EN 61508-1:1998 (SIL CL 1-3), EN 61508-2:2000
 (SIL CL 1-3), EN 61508-4:1998 (SIL CL 1-3), IEC 62061:2005 (SIL CL 3)



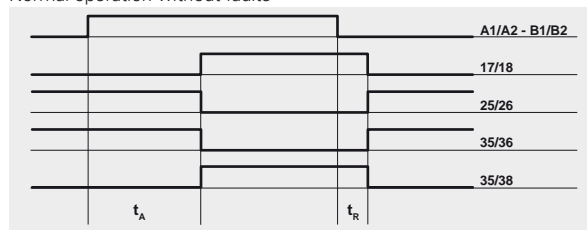
Safety module CS FS-2

Terminal layout



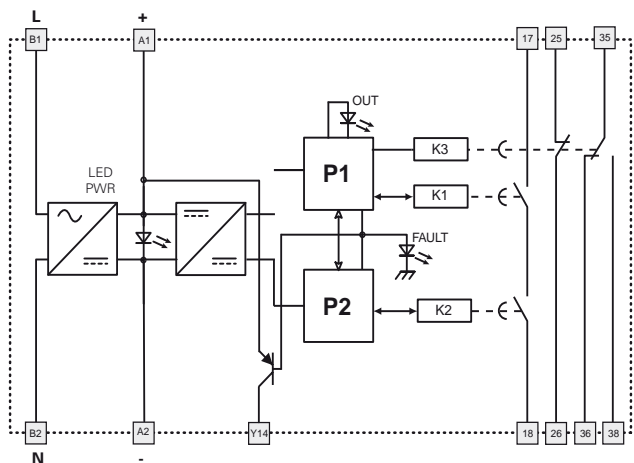
Operation diagram

CS FS-2**** Delay on
Normal operation without faults



Legend:
 t_A : adjustable operating time (see "Code structure")
 t_R : releasing time in absence of power supply

Internal diagram



A1-A2: 24 Vdc
 B1-B2: 120 Vac

Y14: auxiliary output activated when the module enters fault state.



Safety timer module with ON pulse function

Main features

- For safety applications up to SIL CL 2/PL d
- Timed circuits through safety system with self-monitoring and redundancy
- Suitable to control safety interlocked 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings and quality marks:



UL approval: E131787

TÜV SÜD approval: Z10 12 04 75157 003

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design C

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vdc (A1-A2)

120 Vac; 50...60 Hz (B1-B2)

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Releasing time t_A:

see "Code structure"

Releasing time in absence of power supply t_R:

< 40 ms

Start-up time t_S:

< 200 ms

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

1 NO safety contact,
1 NC auxiliary contact,
1 CO auxiliary contact,

forcibly guided

silver alloy

Contact type:

Contact material:

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

Signalling output error (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 231-240.

Code structure

CS FS-30VU24-TFxx

Releasing time (t_A)

0	Fixed time (see TFx)
1	from 0.3 to 3 s, step 0.3 s
2	from 1 to 10 s, step 1 s
3	from 3 to 30 s, step 3 s
4	from 30 to 300 s, step 30 s

Releasing 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	±15%
120	24 Vdc (A1-A2)	±15%
	120 Vac (B1-B2)	±15%

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vdc; 120 Vac; 50...60 Hz
AC consumption: < 5 VA
DC consumption: < 2 W
Maximum switching voltage: 230 Vac
Max. current per contact: 6 A
Utilization category: C300
- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

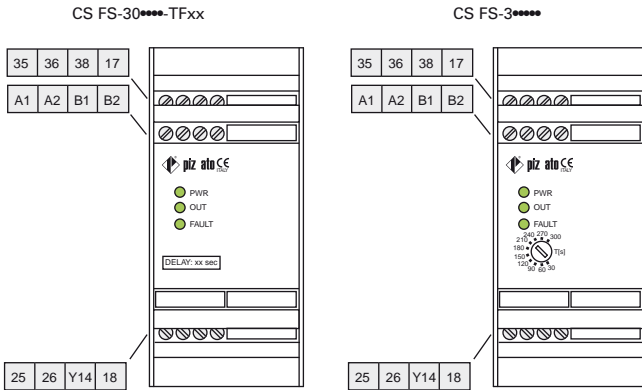
Characteristics approved by TÜV SÜD

Rated supply voltage (U_n): 24 Vdc; ± 15%, 120 Vac ± 15%
Consumption: 5 VA max. AC, 2 W max. DC
Rated operating current (max.): 4 A
Max. 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 conformity with standards: 2006/42/EEC Machine Directive, EN ISO 13849-1 (up to Cat. 4 PL e), EN 50178:1997, EN 60947-5-3/A1:2005, EN 61508-1:1998 (SIL CL 1-3), EN 61508-2:2000 (SIL CL 1-3), EN 61508-4:1998 (SIL CL 1-3), IEC 62061:2005 (SIL CL 3)

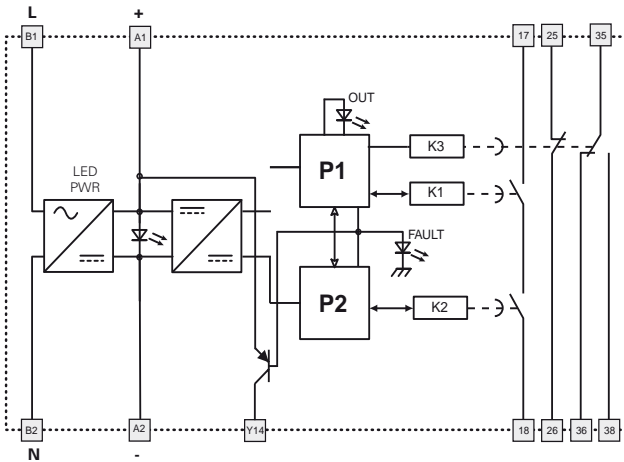


Safety module CS FS-3

Terminal layout



Internal diagram

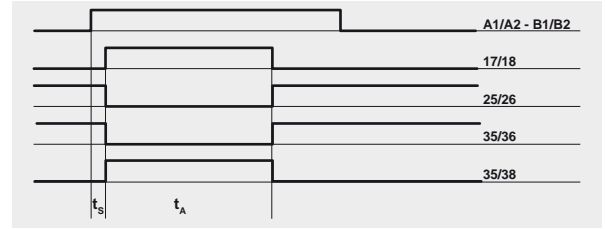


A1-A2: 24 Vdc
 B1-B2: 120 Vac

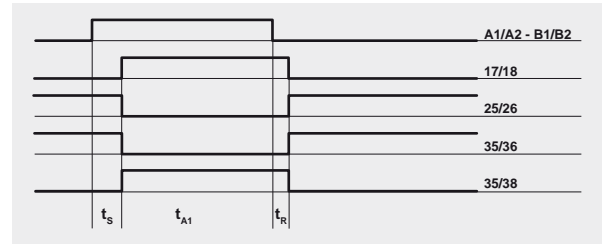
Y14: auxiliary output activated when the module enters fault state.

Operation diagram

CS FS-3**** Delay off
 Normal operation without faults



Operation without power supply



Legend:

- t_A : releasing time (see "Code structure")
- t_{A1} : releasing time if duration of power supply is minor to t_A
- t_R : releasing time in absence of power supply
- t_s : start-up time



Safety timer module with delayed contacts at opening of the input channels

Main features

- For safety applications up to SIL CL 2/PL d
- Timed circuits through safety system with self-monitoring and redundancy
- Suitable to control safety interlocked 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings and quality marks:



UL approval: E131787

TÜV SÜD approval: Z10 12 04 75157 003

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design C

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vdc (A1-A2)

120 Vac; 50...60 Hz (B1-B2)

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Releasing time t_A:

see "Code structure"

Releasing time in absence of power supply t_R:

40 ms

Input circuit

Maximum input resistance:

≤ 50 Ω

Input current:

< 8 mA

Activation time t_S:

< 110 ms

Minimum duration of input signal t_{MIN}:

> 50 ms

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

1 NO safety contact,
1 NC auxiliary contact,
1 CO auxiliary contact,
forcibly guided

Contact type:

silver alloy

Contact material:

230/240 Vac; 300 Vdc

Maximum switching voltage:

6 A

Max. current per contact:

36 A²

Conventional free air thermal current I_{th}:

10 mA

Max. total current Σ I_{th}²:

≤ 100 mΩ

Minimum current:

4 A

Contact resistance:

Type PNP

External protection fuse:

24 Vdc

Signalling output error (Y14):

10 mA

Rated operating voltage (U_e):

The number and the load capacity of output contacts can be increased by using expansion modules or contactors. See pages 231-240.

Rated operating current (I_e):

Code structure delayed contacts

CS FS-50VU24-TFxx

Releasing time (t_A)

0	Fixed time (see TFx)
1	from 0.3 to 3 s, step 0.3 s
2	from 1 to 10 s, step 1 s
3	from 3 to 30 s, step 3 s
4	from 30 to 300 s, step 30 s

Releasing time (t_A)

TFxx xx s (fixed time)

Supply voltage

U24	24 Vdc	±15%
120	24 Vdc (A1-A2)	±15%
	120 Vac (B1-B2)	±15%

Connection type

V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vdc; 120 Vac; 50...60 Hz;
AC consumption: < 5 VA
DC consumption: < 2 W
Maximum switching voltage: 230 Vac
Max. current per contact: 6 A
Utilization category: C300
- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

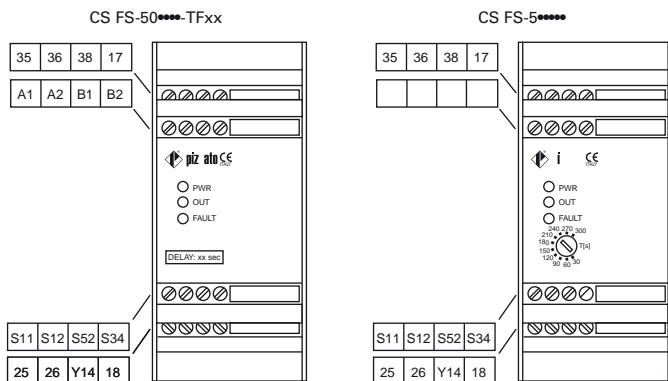
Characteristics approved by TÜV SÜD

Rated supply voltage (U_n): 24 Vdc; ± 15%, 120 Vac ± 15%
Consumption: 5 VA max. AC, 2 W max. DC
Rated operating current (max.): 4 A
Max. 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 conformity with standards: 2006/42/EEC Machine Directive, EN ISO 13849-1 (up to Cat. 4 PL e), EN 50178:1997, EN 60947-5-3/A1:2005, EN 61508-1:1998 (SIL CL 1-3), EN 61508-2:2000 (SIL CL 1-3), EN 61508-4:1998 (SIL CL 1-3), IEC 62061:2005 (SIL CL 3)



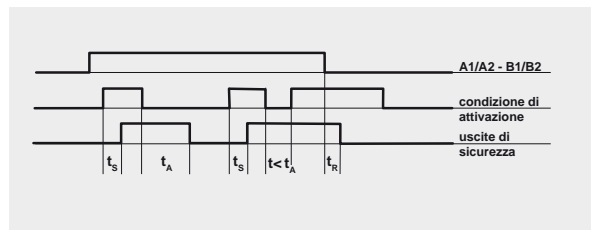
Safety module CS FS-5

Terminal layout

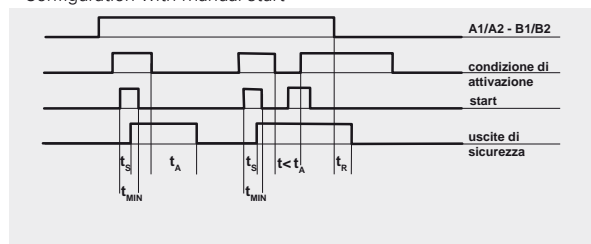


Operation diagram

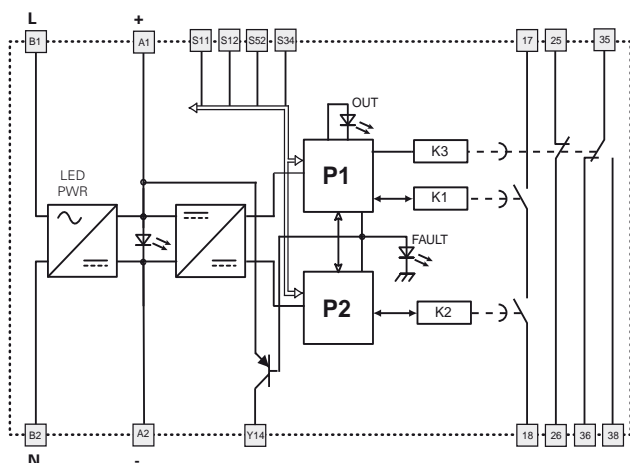
Configuration with automatic start



Configuration with manual start



Internal diagram



A1-A2: 24 Vdc
B1-B2: 120 Vac

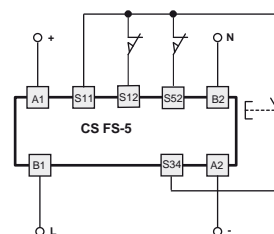
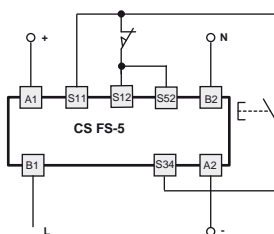
Y14: auxiliary output activated when the module enters fault state.

Legend:

- t_A: releasing time (see "Code structure")
- t_R: releasing time in absence of power supply
- t_S: activation time
- t_{MIN}: minimum duration of input signal

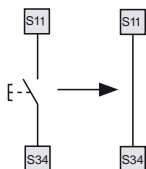
Input configuration

Movable guard monitoring	
Input configuration with manual start	
1 channel	2 channels



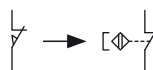
Automatic start

With regard to the indicated diagrams, bridge the start button between S33 and S34 in order to activate the automatic start module.



Movable guard monitoring and magnetic safety sensors

The safety module can control movable guard monitoring circuits or magnetic safety sensors. Replace the switch contacts with the sensors contacts. The sensors can only be used in 2-channel configuration.





Two-hand control 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 the input channels to opposite potentials
- Small 22.5 mm housing
- 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EC type examination certificate: IMQ BP 210 DM

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Operating time t_A:

< 50 ms

Releasing time t_{R1}:

< 20 ms

Releasing time in absence of power supply t_R:

< 70 ms

Time range for synchronized

actuation t_{SN}:

< 0.5 s

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

3 NO safety contacts,

1 NC auxiliary contact

forcibly guided

gold-plated silver alloy

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 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 231-240.

Code structure

CS DM-01V024

Connection type	
V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Supply voltage		
024	24 Vac/dc	±15%
120	120 Vac	±15%
230	230 Vac	±15%

Stock items

CS DM-01V024

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vac/dc; 50...60 Hz
120 Vac; 50...60 Hz
230 Vac; 50...60 Hz

AC consumption: < 5 VA

DC consumption: < 2 W

Maximum switching voltage: 230 Vac

Max. current per contact: 6 A

Utilization category: C300

Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

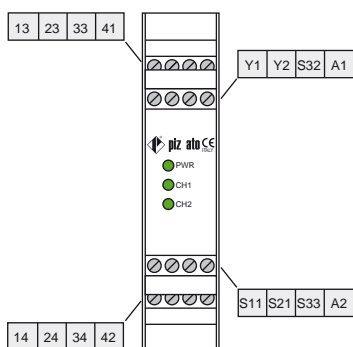
- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

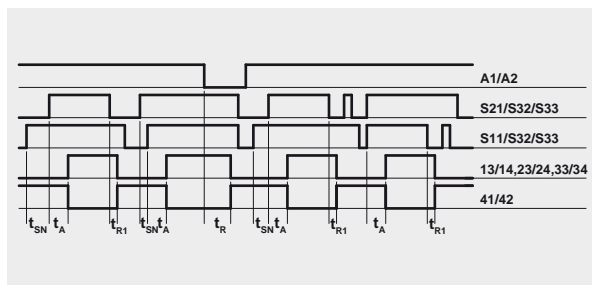


Safety module CS DM-01

Terminal layout

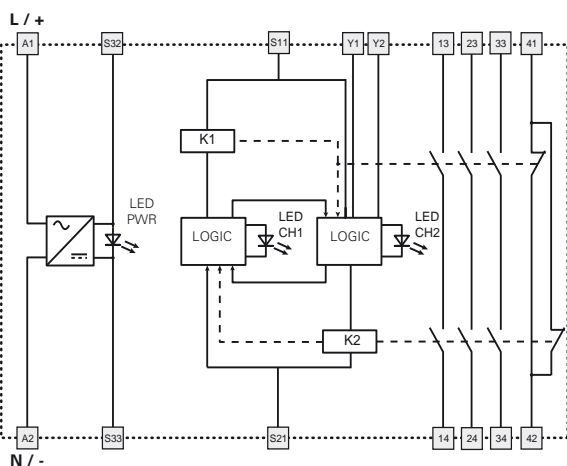


Operation diagram



Legend:
 t_{SN} : Time range for synchronized actuation
 t_A : operating time
 t_{R1} : releasing time
 t_R : releasing time in absence of power supply

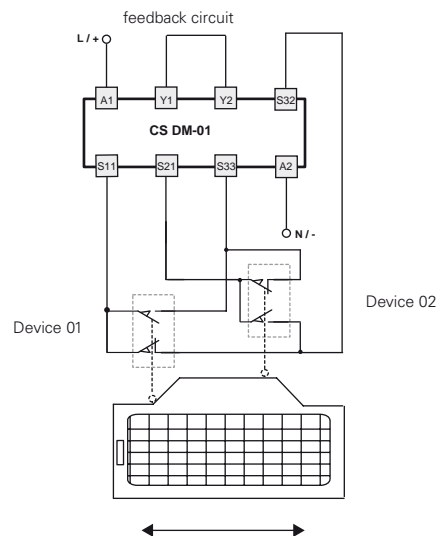
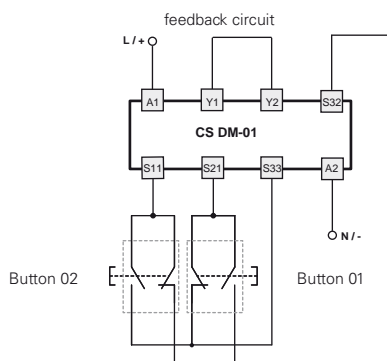
Internal diagram



Input configuration

Circuit with two-hand control device type III C according to EN 574

Movable guard monitoring with automatic start and simultaneity between channels < 0.5 s (safety category 4)



The diagram does not show the exact position of terminals in the product



Two-hand control 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 the input channels to opposite potentials
- Small 22.5 mm housing
- 2 NO safety contacts,
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EC type examination certificate: IMQ BP 210 DM

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Input current:

< 30 mA

Operating time t_A:

< 30 ms

Releasing time t_{R1}:

< 25 ms

Releasing time in absence of power supply t_R:

< 90 ms

Time range for synchronized

actuation t_{SN}:

< 0.5 s

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

2 NO safety contacts,

Contact type:

forcibly guided

Contact material:

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 231-240.

Code structure

CS DM-02V024

Connection type	
V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Supply voltage		
024	24 Vac/dc	±15%
120	120 Vac	±15%
230	230 Vac	±15%

Characteristics approved by UL

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

< 5 VA

AC consumption:

DC consumption:

Maximum switching voltage:

Max. current per contact:

Utilization category

230 Vac

6 A

C300

Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

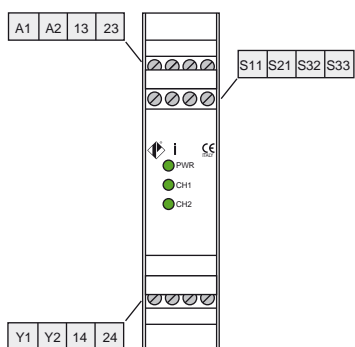
- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

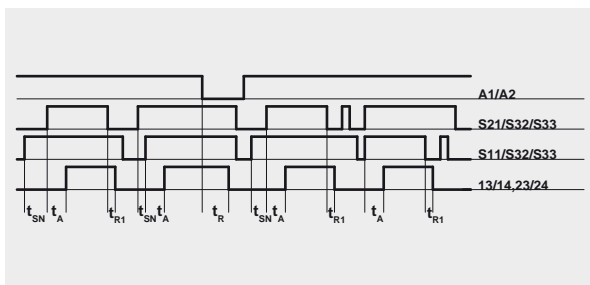


Safety module CS DM-02

Terminal layout

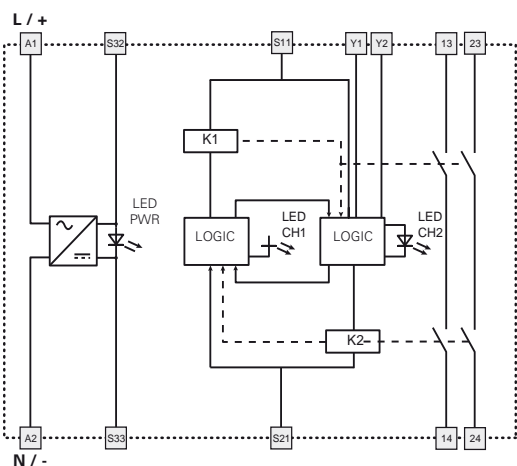


Operation diagram



Legend:
 t_{SN} : Time range for synchronized actuation
 t_A : operating time
 t_R : releasing time
 $t_{R'}$: releasing time in absence of power supply

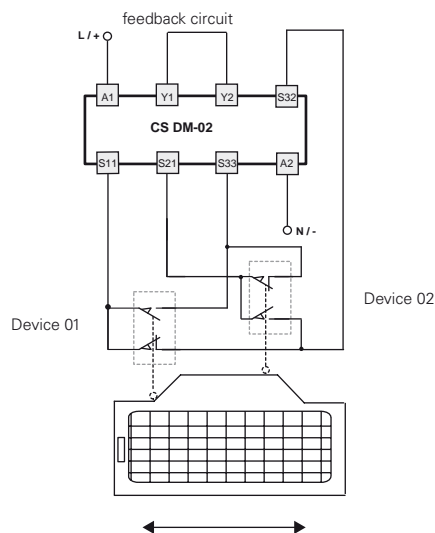
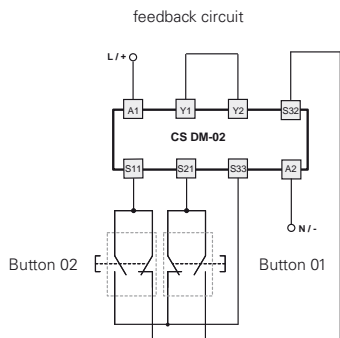
Internal diagram



Input configuration

Circuit with two-hand control device type III C according to EN 574

Movable guard monitoring with automatic start and simultaneity between channels < 0.5 s (safety category 4)



The diagram does not show the exact position of terminals in the product



Two-hand control 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 the input channels to opposite potentials
- Small 22.5 mm housing
- 2 NO safety contacts,
- Supply voltage: 24 Vac/dc, 120 Vac, 230 Vac

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EC type examination certificate: IMQ BP 210 DM

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

120 Vac; 50...60 Hz

230 Vac; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 100 Ω

Input current:

< 32 mA

Operating time t_A:

< 12 ms

Releasing time t_{R1}:

< 10 ms

Releasing time in absence of power supply t_R:

< 200 ms

Time range for synchronized

actuation t_{SN}:

< 0.5 s

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

2 NO safety contacts,

Contact type:

forcibly guided

Contact material:

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 231-240.

Code structure

CS DM-20V024

Connection type	
V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Supply voltage		
024	24 Vac/dc	±15%
120	120 Vac	±15%
230	230 Vac	±15%

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vac/dc; 50...60 Hz
120 Vac; 50...60 Hz
230 Vac; 50...60 Hz

AC consumption: < 5 VA

DC consumption: < 2 W

Maximum switching voltage: 230 Vac

Max. current per contact: 6 A

Utilization category: C300

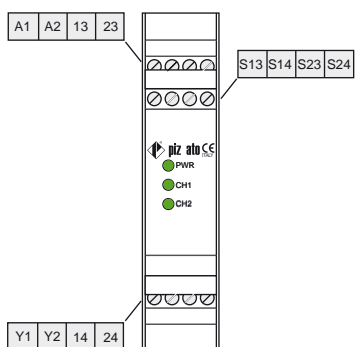
Notes:

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

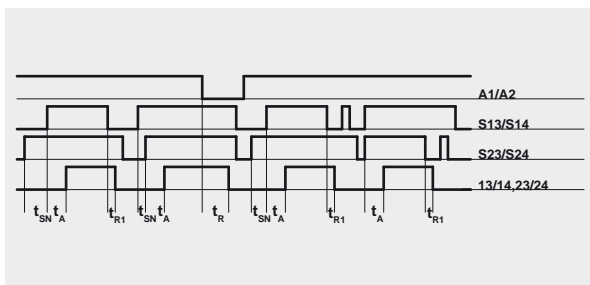


Safety module CS DM-20

Terminal layout

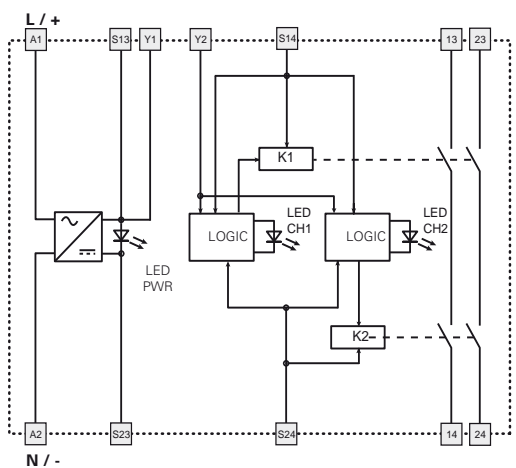


Operation diagram



Legend:
t_SN^A: Time range for synchronized actuation
t_A: operating time
t_RA: releasing time
t_R: releasing time in absence of power supply

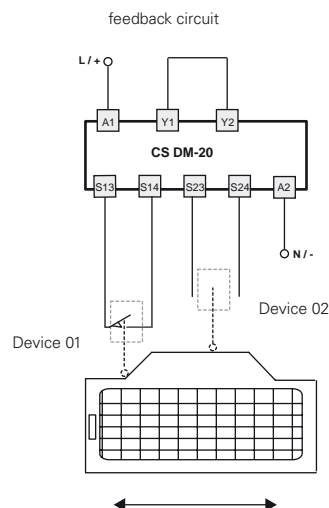
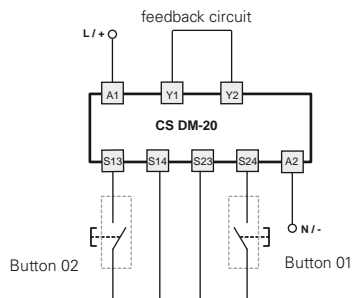
Internal diagram



Input configuration

Circuit with two-hand control device type III A according to EN 574

Safety gate monitoring with automatic start wiring and simultaneity between channels < 0,5 s



The diagram does not show the exact position of terminals in the product



Standstill monitor safety module

Main features

- For safety applications up to SIL CL 2/PL d
- Residual voltage at motor-stop selectable on 10 position.
- Galvanic separation between control circuit and measure circuit
- 45 mm housing
- 2 NO safety contacts
- 1 NC auxiliary contact
- 2 Semiconductor outputs:
 - 1 output for failure state signalling
 - 1 signalling output for commutation 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 op. cycles/minute)

Ue (V) 24

Ie (A) 4

Markings, quality marks and certificates:

UL approval: E131787

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data**Housing**

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree: IP40 (housing), IP20 (terminal strip)

Dimensions: see page 284, design C

General data

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 333

Ambient temperature: -25°C...+55°C

Mechanical endurance: >10 million operating cycles

Electrical endurance: >100,000 operating cycles

Pollution degree: external 3, internal 2

Impulse voltage (Uimp): 4 kV

Rated insulation voltage (Ui): 250 V

Overvoltage category: II

Weight: < 0.3 kg

Supply

Rated supply voltage (Un): 24 ... 230 Vac/dc; 50...60 Hz

DC maximum residual ripple: 10%

Supply voltage tolerance: ±15% of Un

AC consumption: < 6 VA

DC consumption: < 2 W

Input circuit

Voltage between terminals L1-L2-L3: 0 ... 690 Vac

Frequency: 0 ... 3 kHz

Input impedance: >1 MΩ

Stopped motor threshold voltage: from 20 mV to 500 mV adjustable over 10 positions

Started motor threshold voltage: double stopped motor threshold voltage

Maximum input impedance Y1-Y2: < 20 Ω

START Y1-Y2 circuit current: < 70 mA

RESET input voltage: 24 Vdc ± 20%

RESET input current: 10 mA

Control circuitOperating time t_A : < 2 sReleasing time t_{R1} : < 20 msReleasing time in absence of power supply t_R : < 3 sSimultaneity time t_C : 3 s

Test: Autotest on supply voltage activation and after activation of RESET input.

Test duration: 2,5 s (During the test in the measuring circuits the voltage must be lower than the stopped motor threshold voltage)

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts: 2 NO safety contacts,

1 NC auxiliary contact

forcibly guided

gold-plated silver alloy

Maximum switching voltage: 230/240 Vac; 300 Vdc

Max. current per contact: 6 A

Conventional free air thermal current Ith: 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 231-240.

Code structure**CS AM-01VE01-TC00**

Stopped motor voltage threshold adjustment range

01 from 20 to 500 mV, 53 mV stepSimultaneity time (t_C)**TC00** infinite**Connection type****V** screw terminals**M** connector with screw terminals**X** connector with spring terminals**Characteristics approved by UL**

Rated supply voltage (Un): 24 ... 230 Vac/dc;

50...60 Hz

AC consumption: < 9 VA

DC consumption: < 2 W

Motor input: up to 600 V

Output relay: C300 pilot duty

Notes:

- Suitable for use in environment with pollution degree 2

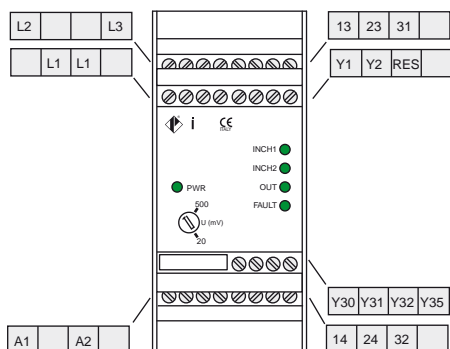
- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

- Terminal tightening torque of 5-7 Lb In.

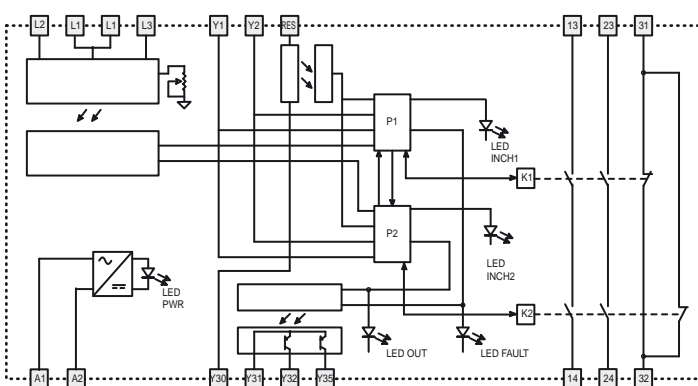


Safety module CS AM-0

Terminal layout

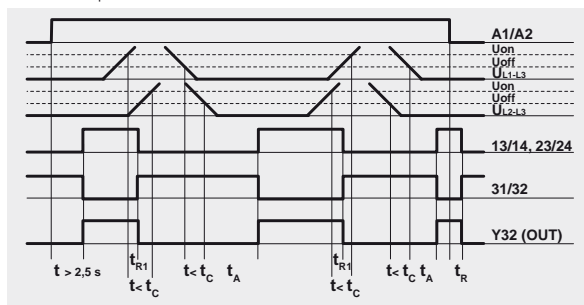


Internal diagram

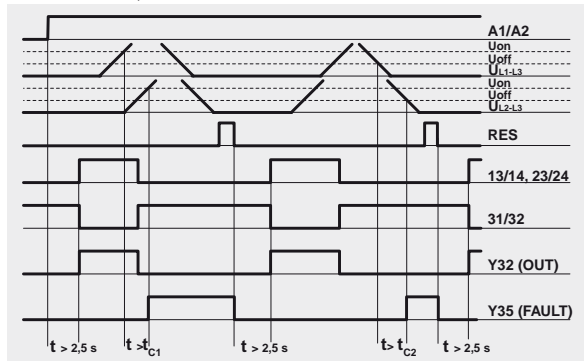


Operation diagrams

Normal operation



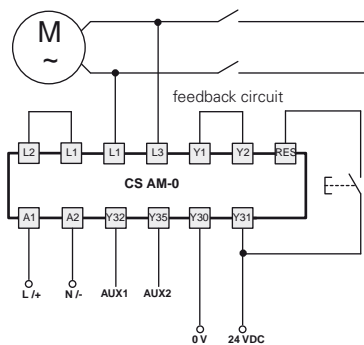
Reset (RES) operation



Legend:
 t_C : simultaneity time
 t_A : operating time
 t_{R1} : releasing time
 t_R : releasing time in absence of power supply

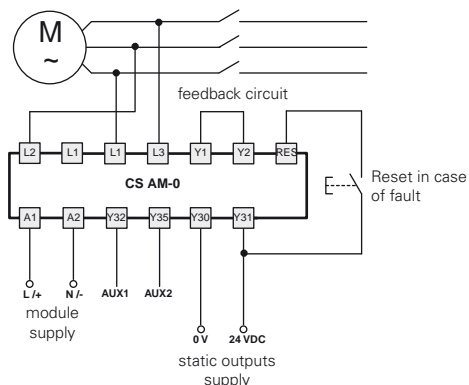
Input configuration

Single-phase motor



Δ 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.

Three-phase motor



The diagram does not show the exact position of terminals in the product



Expansion modules 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 the input channels to opposite potentials
- Small 22.5 mm housing
- 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vac/dc; 50...60 Hz

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

AC consumption:

< 5 VA

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Operating time t_A:

< 40 ms

Releasing time in absence of power supply t_R:

< 40 ms

In conformity 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 62326-1, EN 60664-1, EN 60947-1, 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

Contact material:

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:

72 A²

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	±15%

Characteristics approved by UL

Rated supply voltage (U _n):	24 Vac/dc; 50...60 Hz
AC consumption:	< 5 VA
DC consumption:	< 2 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

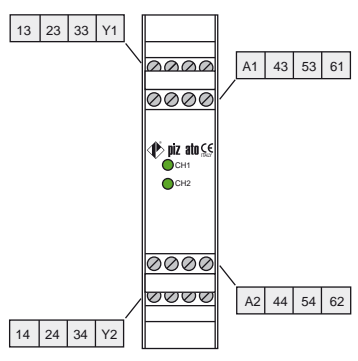
Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

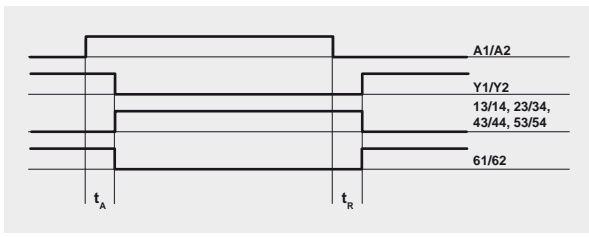


Expansion module CS ME-01

Terminal layout

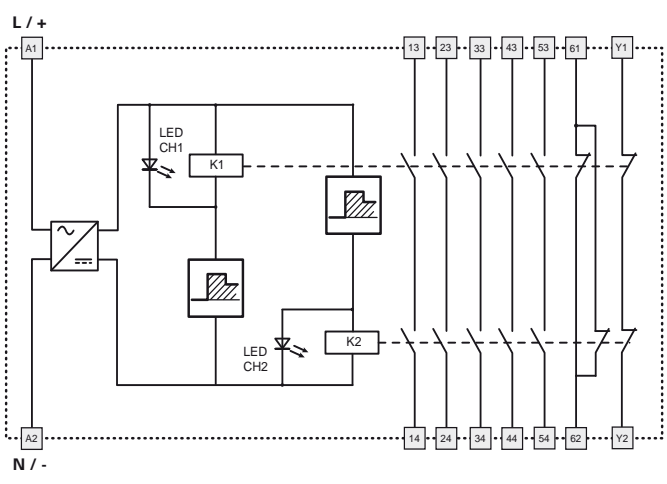


Operation diagram



Legend:
 t_A : operating time
 t_R : releasing time in absence of power supply

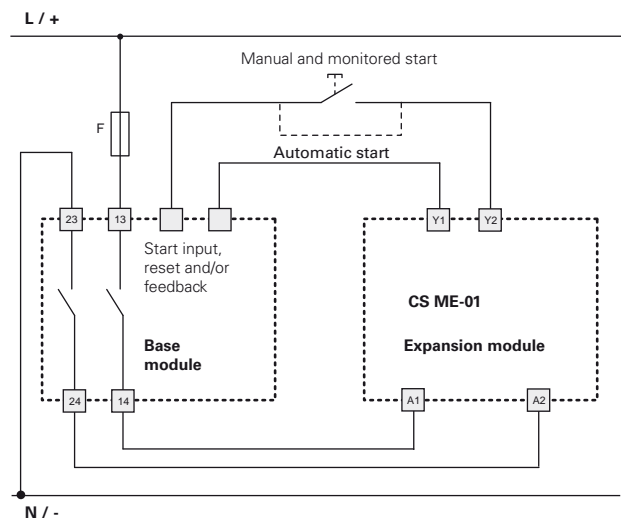
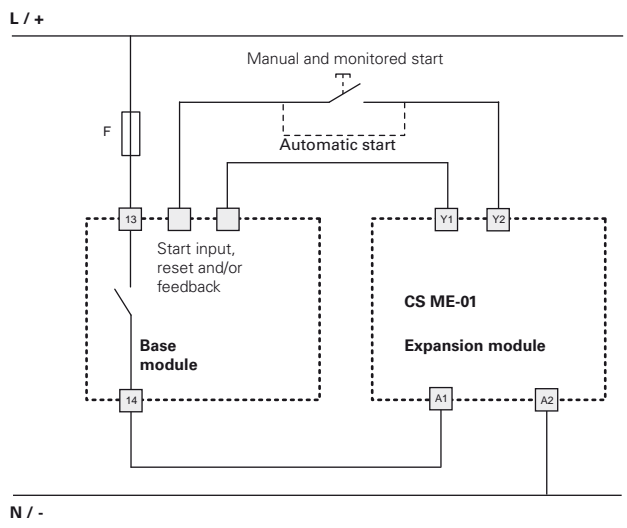
Internal diagram



Input configuration

Single channel control

Double channel control



The diagram does not show the exact position of terminals in the product



Expansion modules 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 the input channels to opposite potentials
- Small 22.5 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.3 kg

Supply

Rated supply voltage (U_n):

24 Vdc

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

DC consumption:

< 2 W

Control circuit

Protection against short circuits:

resistance PTC, I_h=0.5 A

PTC timing:

intervention > 100 ms, reset > 3 s

Maximum input resistance:

≤ 50 Ω

Operating time t_A:

< 100 ms

Releasing time in absence of power supply t_R:

< 60 ms

In conformity 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 62326-1, EN 60664-1, EN 60947-1,

EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

4 NO safety contacts,
2 NC auxiliary contacts,
1 NC feedback contact

Contact type:

forcibly guided

Contact material:

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 A²

Minimum current:

10 mA

Contact resistance:

≤ 100 mΩ

External protection fuse:

4 A

Code structure

CS ME-02VU24

Connection type	
V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Supply voltage		
U24	24 Vdc	±15%

Characteristics approved by UL

Rated supply voltage (U _n):	24 Vdc
DC consumption:	< 2 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

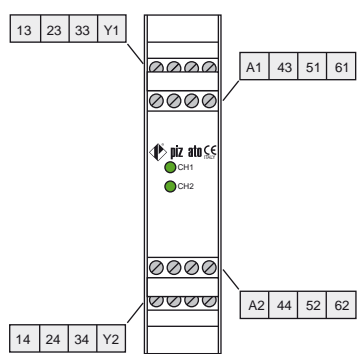
Notes:

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

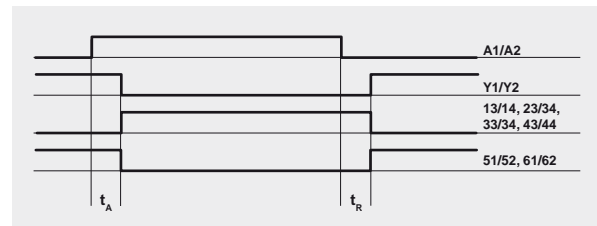


Expansion module CS ME-02

Terminal layout

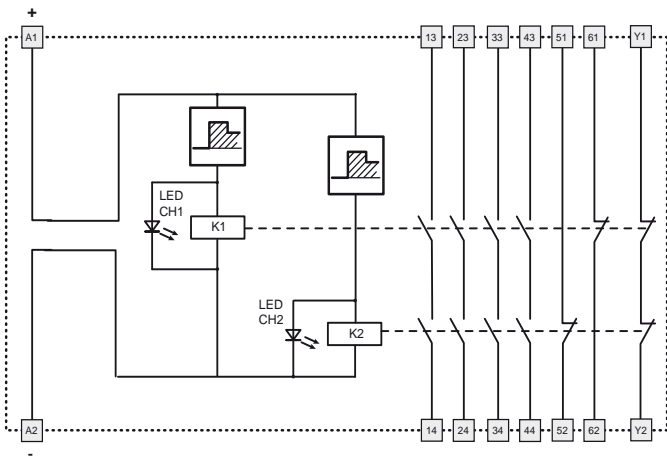


Operation diagram



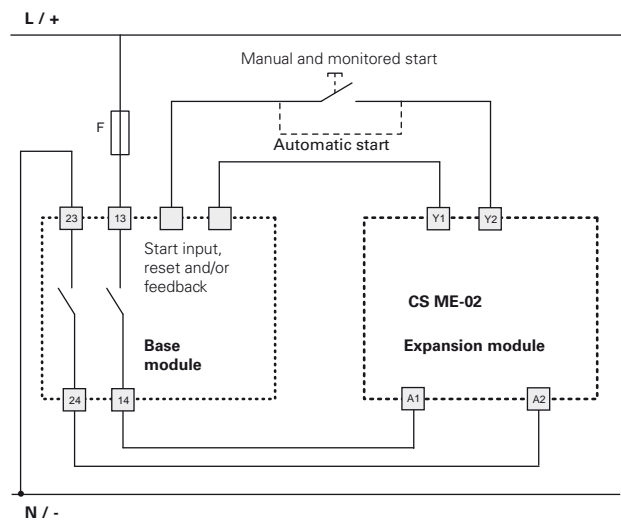
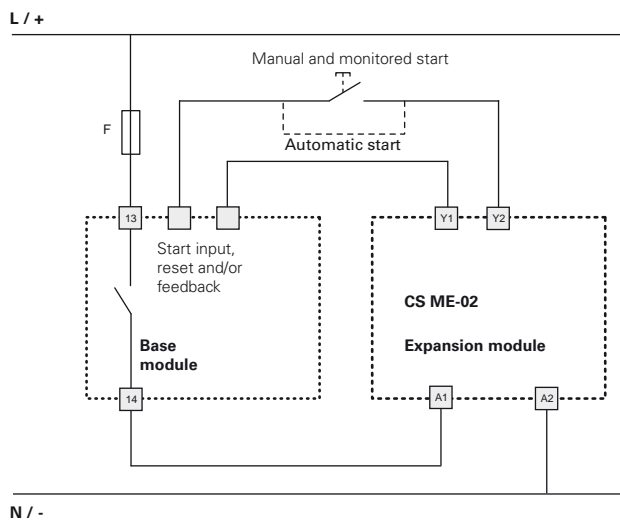
Legend:
 t_A : operating time
 t_R : releasing time in absence of power supply

Internal diagram



Input configuration

Single channel control	Double channel control
------------------------	------------------------



The diagram does not show the exact position of terminals in the product



Expansion modules with output contacts

Main features

- For safety applications up to SIL CL 3/PL e
- Module for solid-state output circuits (optical barriers type 2 and 4)
- 2 OSSD inputs
- Small 22.5 mm housing
- Output contacts:
 - 3 NO safety contacts,
 - 1 NC feedback contact/EDM
- Supply voltage: 24 Vdc

Utilization categories

Alternating current: AC15 (50...60 Hz)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design D

General data

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 solid state output circuits)

Safety parameters:

see page 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vdc

DC maximum residual ripple:

10%

Supply voltage tolerance:

±20% of U_n

DC consumption:

< 2 W

Consumption at start:

< 3 W

Control circuit

Operating time t_A:

< 40 ms

Releasing time t_{R1}:

< 15 ms

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

3 NO safety contacts,
1 NC feedback contact

Contact type:

forcibly guided

Contact material:

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

Code structure

CS ME-03VU24

Connection type	
V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Supply voltage		
U24	24 Vdc	±15%

Characteristics approved by UL

Rated supply voltage (U _n):	24 Vac/dc; 50...60 Hz
DC consumption:	< 2 W
Maximum switching voltage:	230 Vac
Max. current per contact:	6 A
Utilization category	C300

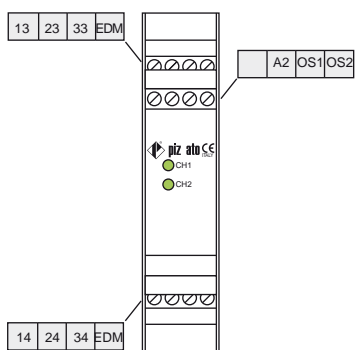
Notes:

- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

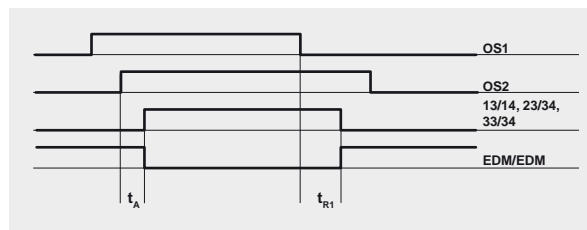


Expansion module CS ME-03

Terminal layout

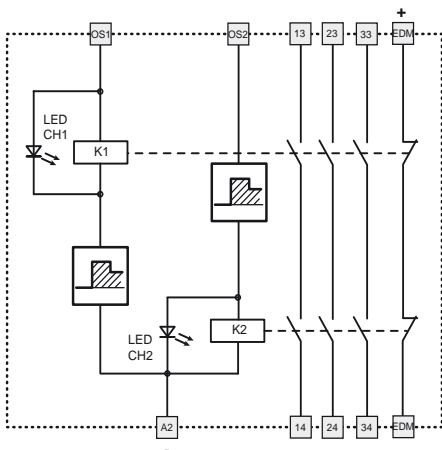


Operation diagram



Legend:
 t_A : operating time
 t_{R1} : releasing time

Internal diagram

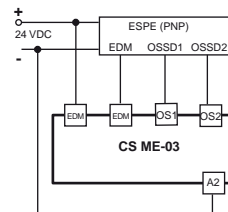
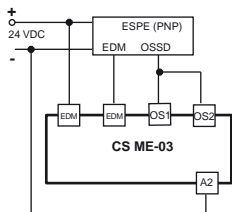


Input configuration

Solid state output circuits (e.g. light curtains)

1 channel

2 channels



The diagram does not show the exact position of terminals in the product



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 delayed time 0.5 - 1 - 2 and 3 s
- Small 22.5 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT DM94.B.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 283, design A

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.2 kg

Supply

Rated supply voltage (U_n):

24 Vdc

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

DC consumption:

< 2 W

Control circuit

Maximum input resistance:

≤ 50 Ω

Operating time t_A:

< 100 ms

Releasing time in absence of power supply t_R:

see Code structure

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

4 NO safety contacts,
2 NC auxiliary contacts,
1 NC feedback contact
forcibly guided

Contact type:

gold-plated silver alloy

Contact material:

230/240 Vac; 300 Vdc

Maximum switching voltage:

6 A

Max. current per contact:

6 A

Conventional free air thermal current I_{th}:

64 A²

Max. total current Σ I_{th}²:

10 mA

Minimum current:

≤ 100 mΩ

Contact resistance:

4 A

External protection fuse:

Code structure

CS ME-20VU24-TF1

Connection type	
V	screw terminals
M	connector with screw terminals
X	connector with spring terminals

Releasing 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

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vdc
DC consumption: < 2 W
Maximum switching voltage: 230 Vac
Max. current per contact: 6 A
Utilization category: C300

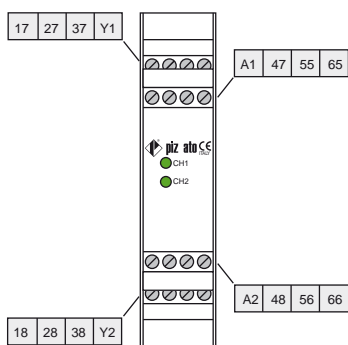
Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

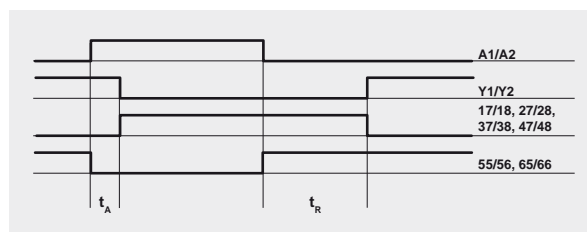


Expansion module CS ME-20

Terminal layout

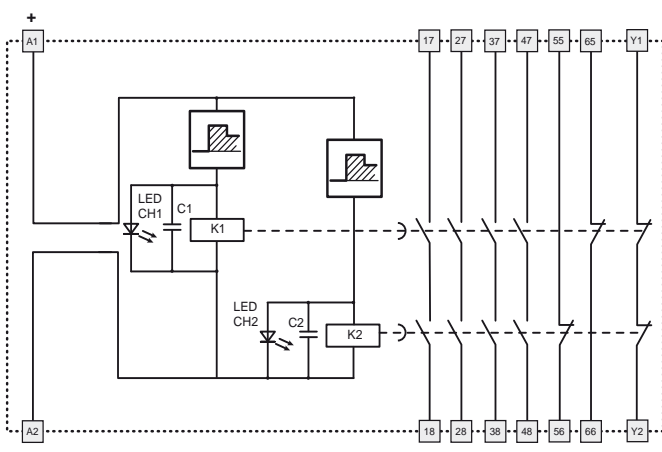


Operation diagram



Legend:
 t_A : operating time
 t_R : releasing time in absence of power supply (see "Code structure")

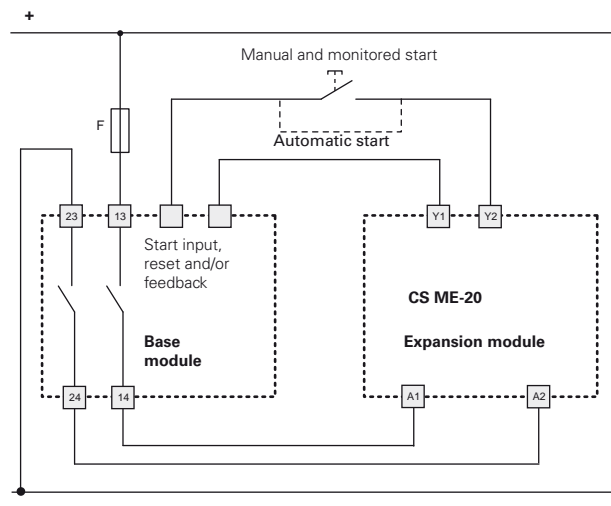
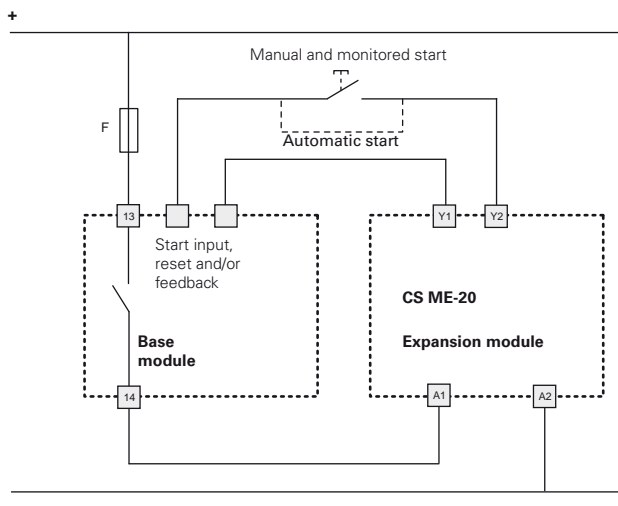
Internal diagram



Input configuration

Single channel control

Double channel control



The diagram does not show the exact position of terminals in the product



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 delayed time
- 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)

U_e (V) 230

I_e (A) 3

Direct current: DC13 (6 op. cycles/minute)

U_e (V) 24

I_e (A) 4

Markings, quality marks and certificates:



UL approval: E131787

EAC approval: RU C-IT ДМ94.В.01024

CCC approval: 2013010305640211

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,

Machinery Directive 2006/42/EC,

EMC Directive 2004/108/EC

Technical data

Housing

PA 6.6 polyamide housing, self-extinguishing, V0 acc. to UL 94

Protection degree:

IP40 (housing), IP20 (terminal strip)

Dimensions:

see page 284, design C

General data

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 333

Ambient temperature:

-25°C...+55°C

Mechanical endurance:

>10 million operating cycles

Electrical endurance:

>100,000 operating cycles

Pollution degree:

external 3, internal 2

Impulse voltage (U_{imp}):

4 kV

Rated insulation voltage (U_i):

250 V

Overvoltage category:

II

Weight:

0.4 kg

Supply

Rated supply voltage (U_n):

24 Vdc

DC maximum residual ripple:

10%

Supply voltage tolerance:

±15% of U_n

DC consumption:

< 2 W

Control circuit

Maximum input resistance:

≤ 50 Ω

Operating time t_A:

< 200 ms

Releasing time in absence of power supply t_R:

see Code structure

In conformity 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 62326-1, EN 60664-1, EN 60947-1, EN ISO 13849-1, EN ISO 13849-2, EN 62061, UL 508, CSA C22.2 n° 14-95

Output circuit

Output contacts:

4 NO safety contacts,
2 NC auxiliary contacts,
1 NC feedback contact

Contact type:

forcibly guided

Contact material:

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 A²

Minimum current:

10 mA

Contact resistance:

≤ 100 mΩ

External protection fuse:

4 A

Code structure

CS ME-30VU24-TF1

Fixed or selectable time

0 fixed time

1 selectable time

Connection type

V screw terminals

M connector with screw terminals

X connector with spring terminals

Releasing time in absence of power supply (t_R)

TF1 1 s fixed time (only CS ME-30)

...

TF12 12 s fixed time (only CS ME-30)

TS12 1 to 12 s, 1 s step (CS ME-31 only)

Characteristics approved by UL

Rated supply voltage (U_n): 24 Vdc

DC consumption: < 2 W

Maximum switching voltage: 230 Vac

Max. current per contact: 6 A

Utilization category C300

Notes:

- Use 60° or 75°C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.

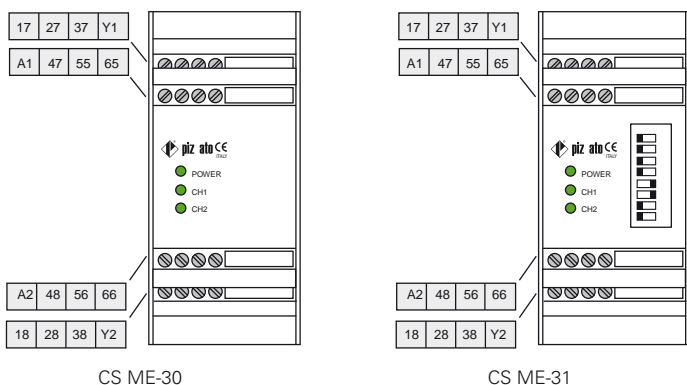
- Terminal tightening torque of 5-7 Lb In.

- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage and limited energy. (Supply from Remote Class 2 Source or limited voltage limited energy).

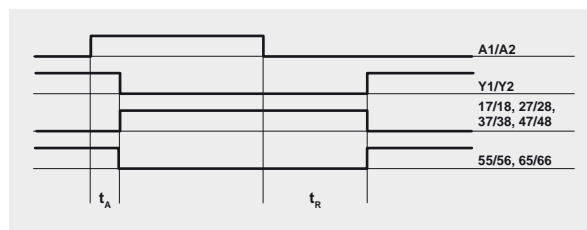


Expansion module CS ME-30 / CS ME-31

Terminal layout



Operation diagram

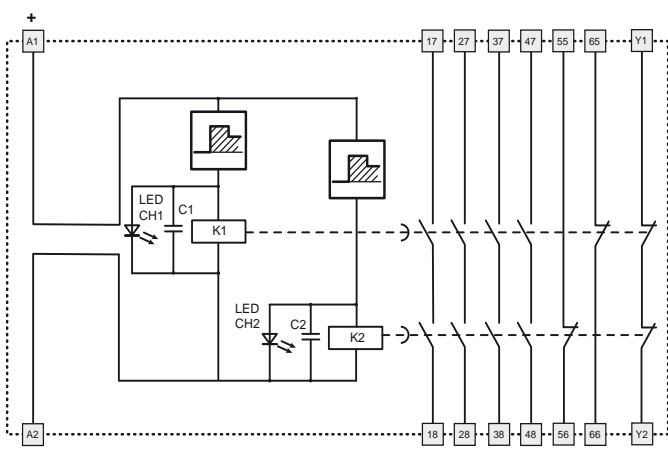


Legend:
 t_A : operating time
 t_R : releasing time in absence of power supply (see "Code structure")

Release time selection t_R (CS ME-31 only)

DIP SWITCH		t_R (s)
ON	<input checked="" type="checkbox"/>	1
OFF	<input type="checkbox"/>	
ON	<input checked="" type="checkbox"/>	2
OFF	<input type="checkbox"/>	
ON	<input type="checkbox"/>	3
OFF	<input checked="" type="checkbox"/>	
ON	<input checked="" type="checkbox"/>	4
OFF	<input type="checkbox"/>	
ON	<input type="checkbox"/>	5
OFF	<input checked="" type="checkbox"/>	
ON	<input checked="" type="checkbox"/>	6
OFF	<input type="checkbox"/>	
ON	<input checked="" type="checkbox"/>	7
OFF	<input type="checkbox"/>	
ON	<input type="checkbox"/>	8
OFF	<input checked="" type="checkbox"/>	
ON	<input checked="" type="checkbox"/>	9
OFF	<input type="checkbox"/>	
ON	<input checked="" type="checkbox"/>	10
OFF	<input type="checkbox"/>	
ON	<input type="checkbox"/>	11
OFF	<input checked="" type="checkbox"/>	
ON	<input checked="" type="checkbox"/>	12
OFF	<input type="checkbox"/>	

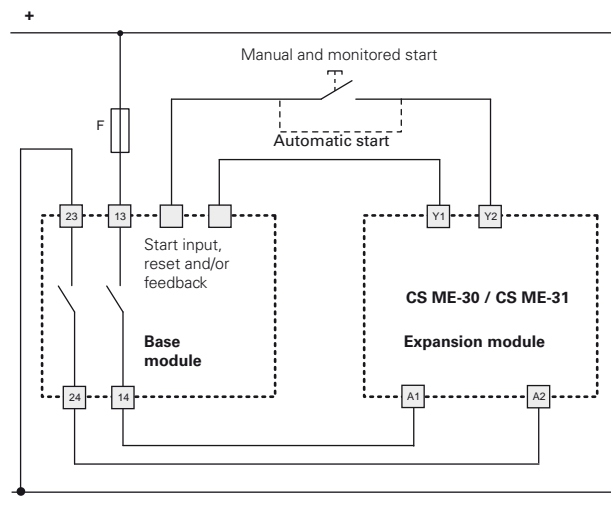
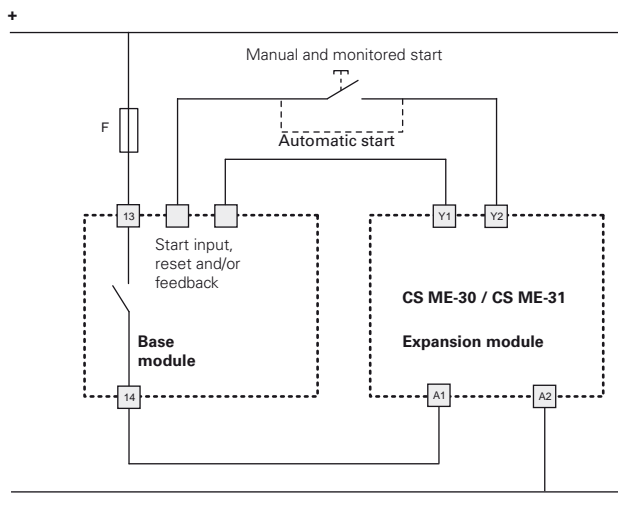
Internal diagram



Input configuration

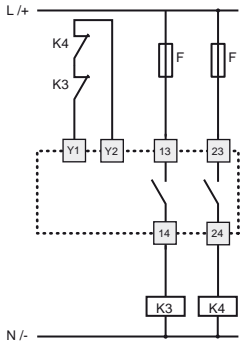
Single channel control

Double channel control



The diagram does not show the exact position of terminals in the product

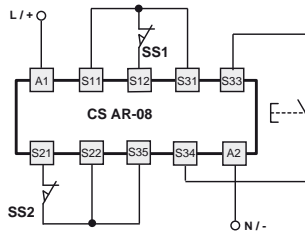
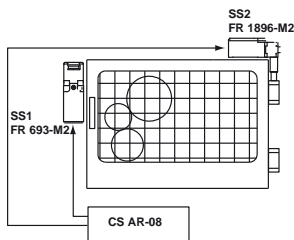
Increasing the number and the load capacity of the contacts with external contactors



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 contemplate the use of the CS AR-08 module. For the use of other modules, see characteristics, compatibility and internal diagram of each single module.

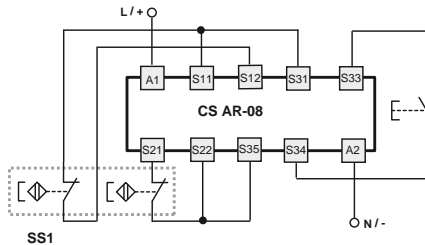
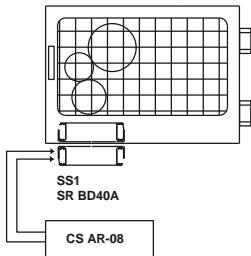
Application examples: safety gates monitoring, up to category 4 according to EN ISO 13849-1



- 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.

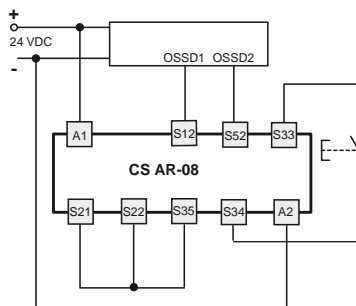
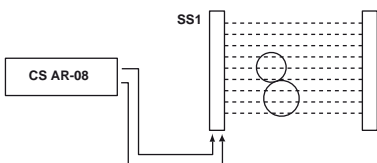
Application examples: safety magnetic sensors monitoring, up to category 4 according to EN ISO 13849-1



- 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

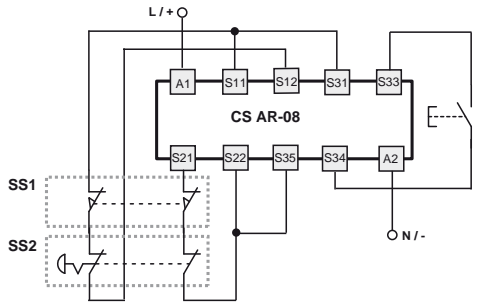
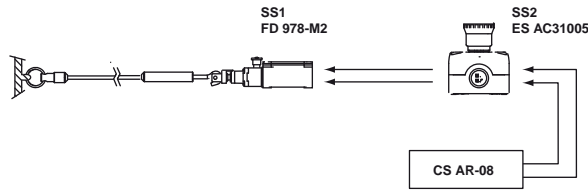


- Compatible modules**
- CS AR-05•••• CS AR-06••••
 - CS AR-08•••• CS AT-0••••
 - CS AT-1••••

Solid state output circuits (e.g. light curtains) with two OSSD outputs. System in safety category 2 or 4 according to the barrier.

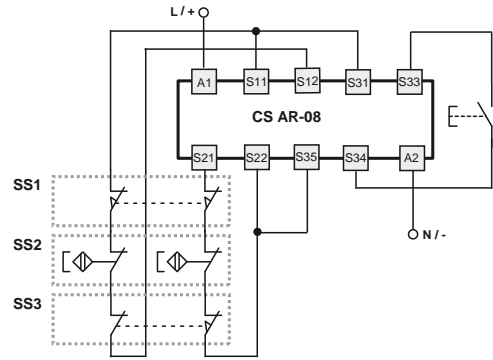
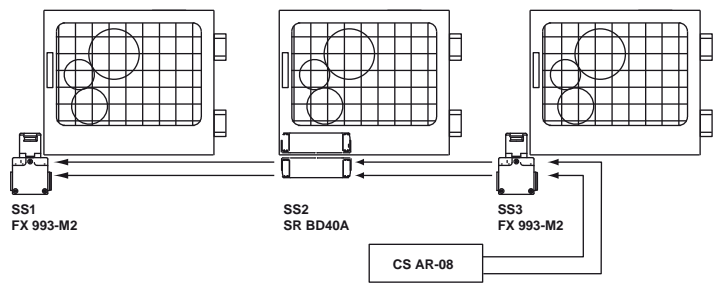


Application examples: monitoring of a switch and an emergency button for emergency stop, up to cat. 3 according to EN ISO 13849-1



- 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

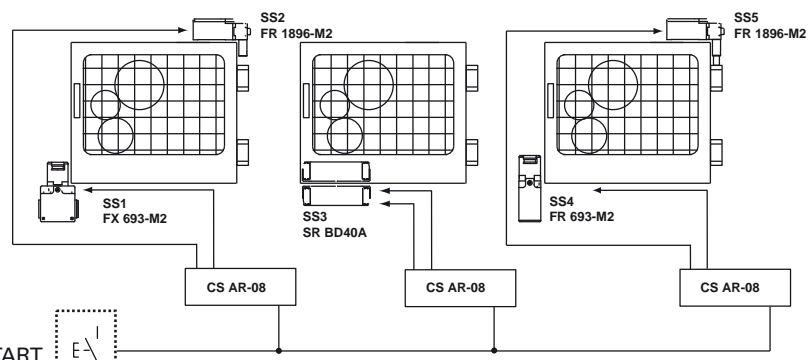


- Compatible modules**
- CS AR-01•E02 CS AR-02•E02 CS AR-04•024 CS AR-05••••
 - CS AR-06•••• CS AR-08•••• CS AT-0•••• CS AT-1••••
 - CS AT-3•••• CS AR-91•024

Monitoring of more guards through switches and magnetic sensors. System in category 3.

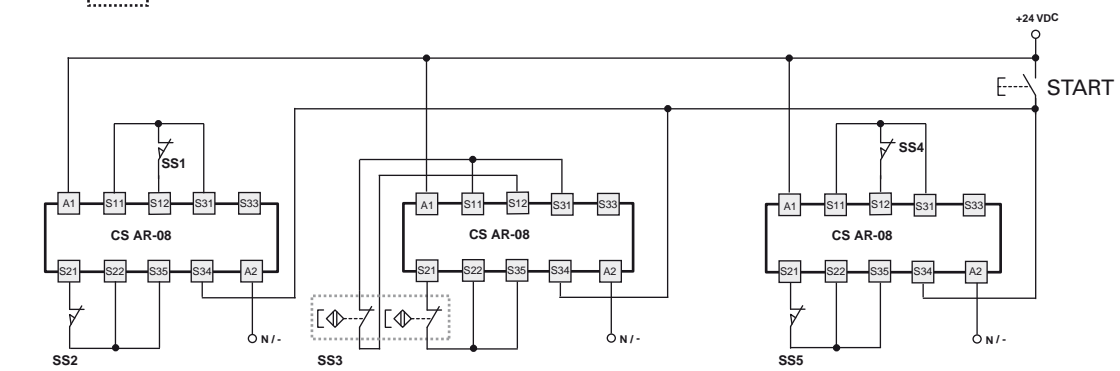
- The use of one single switch for guard requires that in the risk analysis stage it would be possible to exclude the mechanical breaking of the same.
- The sensor must have double coded channel.
- Verify possible requirements of the type C standard concerning own machinery.

Application examples: possibility of parallel module reset, up to category 4 according to EN ISO 13849-1



Monitoring of more 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



Introduction



A **Gemnis** series module is a programmable safety devices, which allows several safety functions to be carried out simultaneously. This product series has been developed specifically to meet the needs of machinery manufacturers 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** 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 designed for insertion in Gemnis line modules.

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**) from the site, which will allow you to program both current, **Gemnis K11**-designated modules, as well as previous ones.

General data of safety modules

Gemnis series modules can manage all of the following safety device types:

- Mechanic safety switches
- Switches with solenoid for guard locking
- Magnetic safety switches
- Optic safety barriers or optic safety sensors (in category 4)
- Safety sensors
- Emergency stop mushroom buttons
- Emergency stop rope switches
- Safety mats or safety bumpers with 4-wire technology
- Category IIIA or IIC two-hand controls
- Safety selectors
- Enabling devices
- NEW >** • 4-20 mA analogue sensors (Gemnis Studio 11)
- NEW >** • 0-4 kHz frequency signals (Gemnis Studio 11)
- NEW >** • Two beam muting systems (Gemnis Studio 11).

This modules are also equipped with functionality allowing you to also implement:

- Safety timing
- Detection of various types of faults in safety devices or their connections
- Temperature limit checking inside module
- State communications via USB port.

Finally, Gemnis series modules can:

- Manage up to eight different electronic safety outputs or four relay outputs
- Manage various (unsafe) signalling outputs
- State 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
- NEW >** • Watch videos illustrating Gemnis Studio 11 program operation.





Hardware structure of modules

Gemis 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 Gemis line 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 Gemis Studio program module. Once a module is programmed, you can also use the USB port for communicating with a PC installed beside the machine, and for the exchange of information relating to the module state.



The main developments introduced at the hardware level by the safety module update to version 11 are:

- NEW >** • Ability to manage programs up to four times larger
- NEW >** • The ability, with new dedicated modules, to manage analogue and/or speed inputs
- NEW >** • Models with 8 safe electronic outputs
- NEW >** • New module configurations available (following table).

Module	I type inputs	J type inputs	C type inputs	F type inputs	T test signals	OS safety outputs	O signalling outputs	Port	Width (mm)	Page
CS MP201M0	8	-	-	-	8	3NO	4	USB	45	249
CS MP202M0	16	-	-	-	4	4 PNP	4	USB	45	250
CS MP203M0	12	-	-	-	4	3NO + 1NO	4	USB	45	251
CS MP204M0	12	-	-	-	4	3NO	4	USB	45	252
CS MP205M0	4	4	-	4	4	4 PNP	4	USB	45	253
CS MP206M0	8	-	-	-	4	4 PNP	12	USB	45	254
CS MP207M0	4	-	2	-	4	4 PNP	4	USB	45	255
CS MP208M0	16	-	-	-	4	8 PNP	-	USB	45	256
CS MP301M0	24	-	-	-	8	3NO	4	USB	67.5	257
CS MP302M0	24	-	-	-	12	4 PNP	4	USB	67.5	258
CS MP303M0	32	-	-	-	4	4 PNP	4	USB	67.5	259
CS MP304M0	28	-	-	-	4	3NO + 1NO	4	USB	67.5	260
CS MP305M0	24	-	-	-	4	4 PNP	12	USB	67.5	261
CS MP306M0	20	-	-	-	4	3NO + 1NO	12	USB	67.5	262
CS MP307M0	8	4	2	4	4	4 PNP	4	USB	67.5	263
CS MP308M0	24	-	-	-	4	8 PNP	8	USB	67.5	264
CS MP309M0	32	-	-	-	4	8 PNP	-	USB	67.5	265
CS MP401M0	40	-	-	-	4	4 PNP	12	USB	90	266
CS MP402M0	32	-	-	-	12	8 PNP	8	USB	90	267
CS MP403M0	40	-	-	-	4	8 PNP	8	USB	90	268

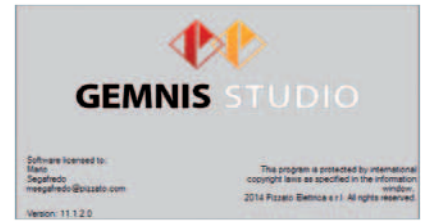
I = Digital inputs
 J = Decoupled digital inputs
 C = 4-20 mA type analogue signal inputs
 F = 0 to 4 kHz frequency signal inputs

T = Test signals
 OS = OSSD (PNP) safety outputs
 nn = Relay safety outputs
 O = PNP signalling outputs

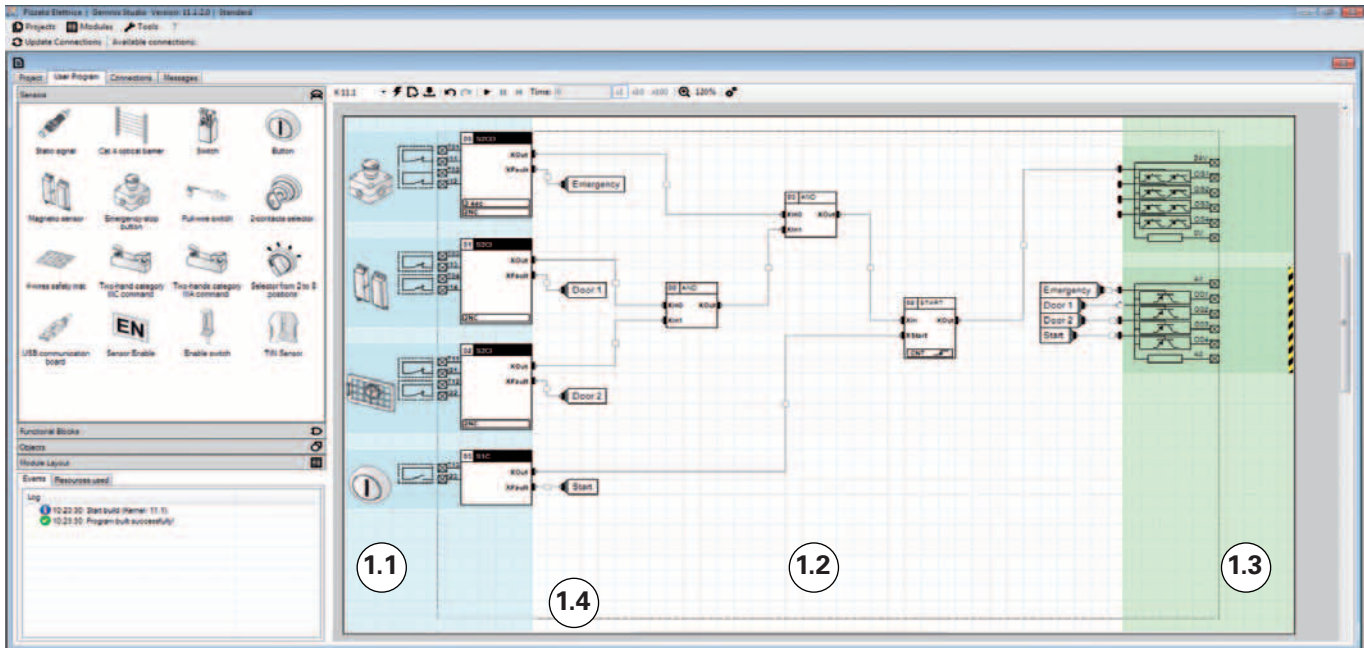
Gemis Studio software

Gemis Studio is software designed to allow the user to program a module belonging to the Gemis 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. Gemis Studio allows you to attach supporting information and useful notes to the configuration information, for overall understanding of the program. Gemis Studio also allows you to check correct application program operation prior to sending it to the module via the simulation.

Finally, Gemis Studio allows you to carry out monitoring and detection operations, and to graphically represent the state of an actively operational device in real time.



Desktop



The Gemis Studio software has been designed with the objective of making Gemis 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 sensors zone
- 1.2) the functional blocks zone
- 1.3) the outputs 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 Gemis 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 Gemis line module.

Printing

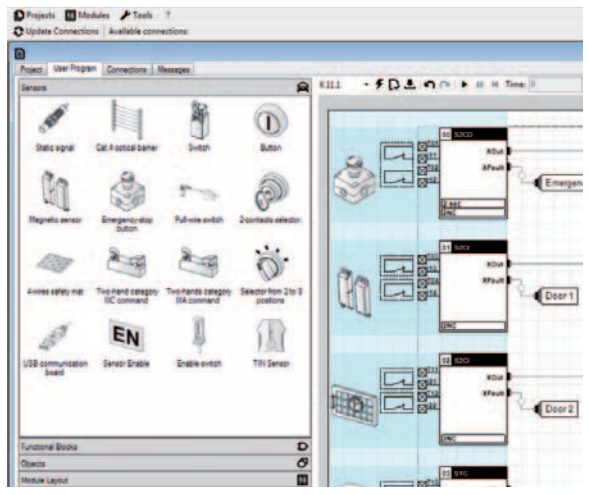
Gemis Studio can generate a Connection Report, which includes all module terminals connections, and a user Program Report, allowing you to print the Application Program.

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.

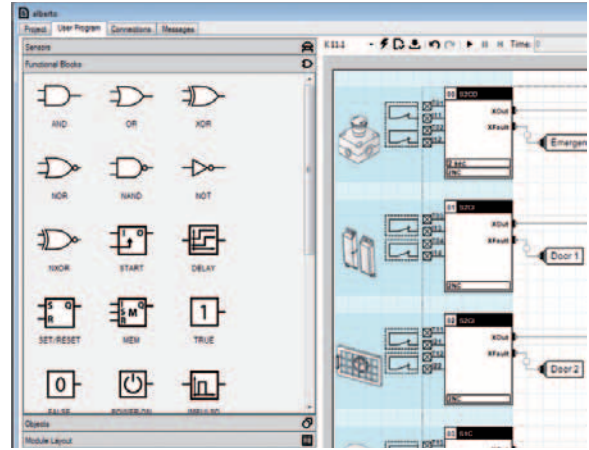
From the sensor panel, you can select a sensor using the mouse and drag it into the dedicated desktop area.

A full list of available sensors is shown to the side here.

Sensor list

Electrical type	Diagram	Examples
Sensor with 1 non-testable channel		
Sensor with 2 non-testable channels and 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 and 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		< NEW
Monitoring of a pair of analogue sensors with 4-20 mA output in both 2-wire and 3-wire versions		< NEW
Monitoring of a pair of signals in frequencies up to 4 KHz		< NEW

Function blocks



The function blocks represent all the logic functions required to process the data flow between sensors and outputs.

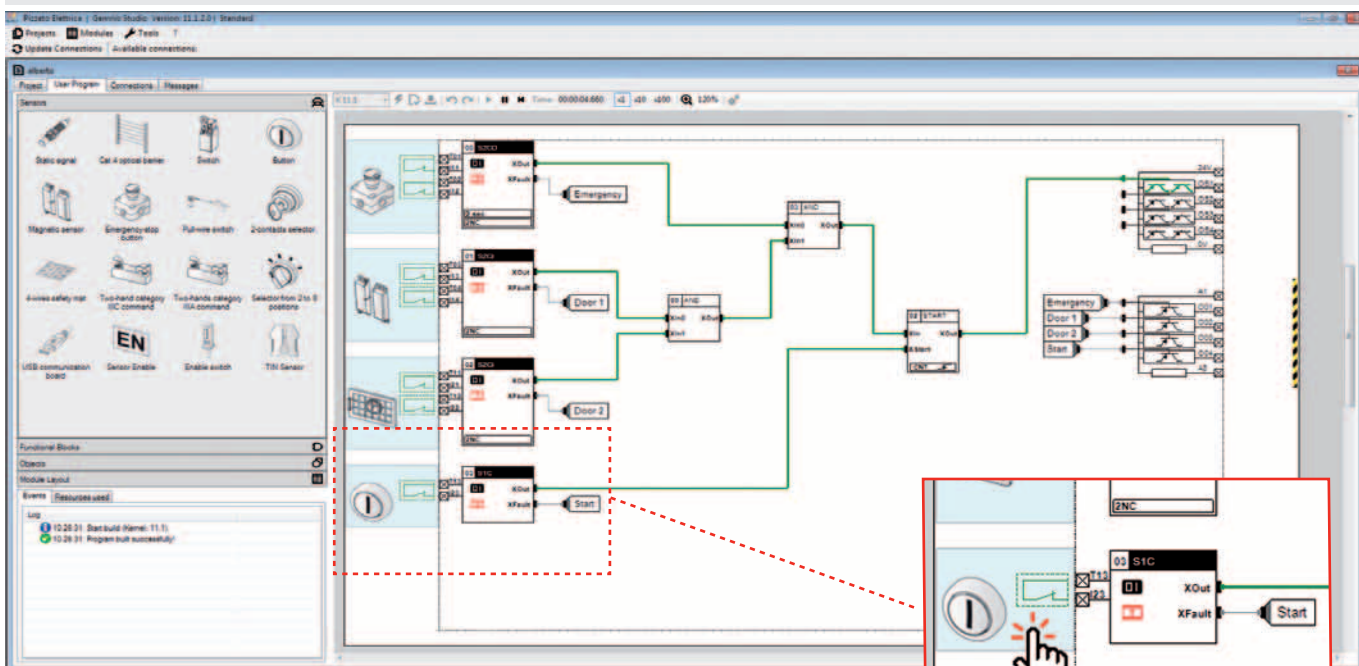
From the function block panel, a block can be selected using the mouse and dragged into the dedicated desktop area.

A full list of available function blocks is shown to the side here.

Block list

	AND Basic boolean function		TRUE / FALSE Basic boolean function		MESSAGE Transmits a message on the USB and COM ports
	OR Basic boolean function		POWER ON Active signal at first execution cycle		COUNTER Pulse counter
	XOR Basic boolean function		PULSE Returns a Delay Off-type signal on the preselected input edge		TRIGGER Detects the edge, either rising or falling, of an input signal
	NOR Basic boolean function		CLOCK Generates pulses at pre-established fixed intervals		FILTER Filters a signal from interference for a duration lower than set time
	NAND Basic boolean function		ERROR Puts the module into Error State		LDC Upstream function block for monitoring of a door-locking system
	NOT Basic boolean function		LKTBL Conversion table between same type data		WAVE Generates a waveform with variable period and ON time < NEW
	NXOR Basic boolean function		GEQ/EQU/LEQ Carries out a numerical comparison between two B or W-type values and displays the result in boolean format (X)		MUTE2 Upstream function block for monitoring of a 2-beam muting system < NEW
	START Control function				
	DELAY Returns a Delay Off or Delay On-type signal				
	SET/RESET Basic logical memory function				

Simulation



Gemis 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 to 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 compile, the simulation will not run.

The launch of the simulation phase transforms the desktop and how you interact with it. During this phase you can simulate module operation by interacting with the sensors and recreating 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. You can view real time implementation status of the module program, inputs and outputs. In Gemnis Studio 11 the video data update has been made faster and for the analysis of large projects, graphical pan & zoom functions are also available in the Monitor.

Technical support

A technical support service is currently provided free of charge to users who have registered on the site and have activated Gemnis Studio using the activation process. Gemnis Studio can operate in two modes: Demo mode and Standard mode.

The version downloaded from the site operates initially in demo mode, which does not allow saving of projects or sending of a new project to a Gemnis series module. Demo mode still allows creation and simulation of a project or sending of an existing project to a Gemnis series module. The demo version is almost a fully functional product but the only support provided is via the online help, and any other information which is freely available on the www.gemnis.com site.

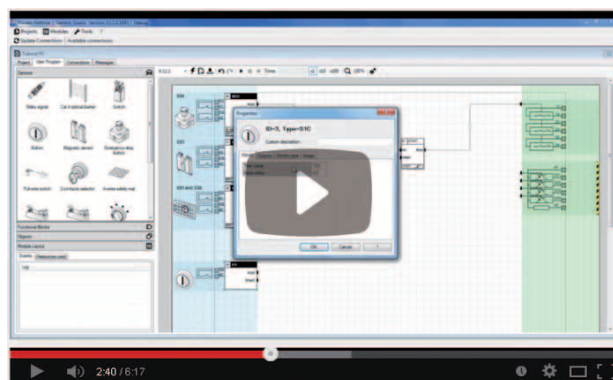
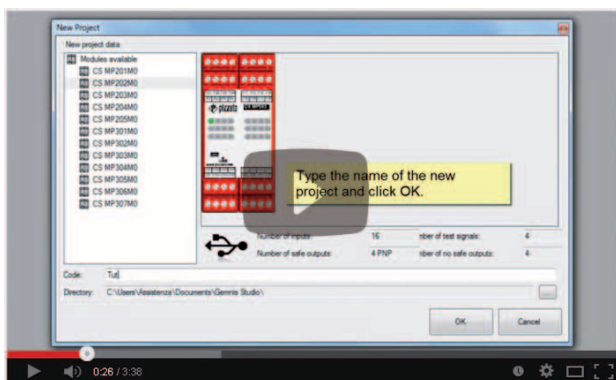
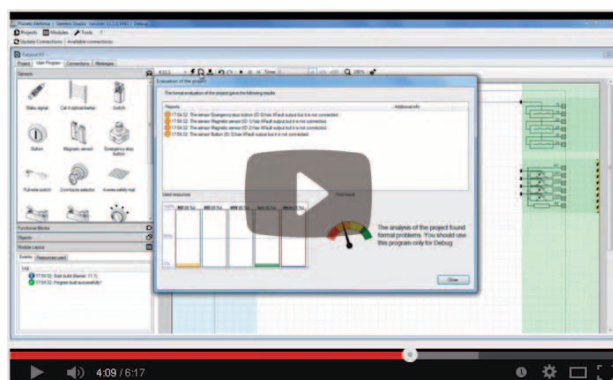
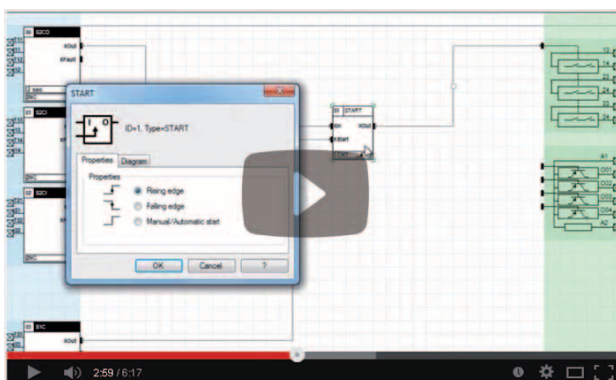
The Gemnis Studio demo version program is enabled in standard mode, i.e. becomes fully operational, via an activation process that requires direct connection (via USB) with any Gemnis series module. This procedure generates a code that must be provided when requesting technical assistance.

In practice, the purchase of a module allows full operation of the Gemnis Studio program (including saving the project) and enables the user to request additional information from the Pizzato Elettrica Help Desk. 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 11 program operation (for example how to activate the program and then go from the DEMO version to STANDARD Gemnis Studio or how to create a new project).





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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General technical data

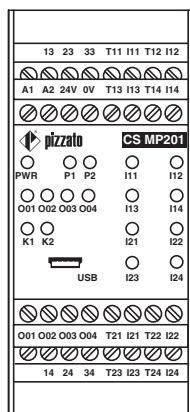
Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
MTTFd	133	
PFHd	4.54E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	8	269 s. 6
Test outputs (Tx)	8	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Relay safety output circuits	3NO	270 s. 14
Weight	300 g	

Markings and quality marks:

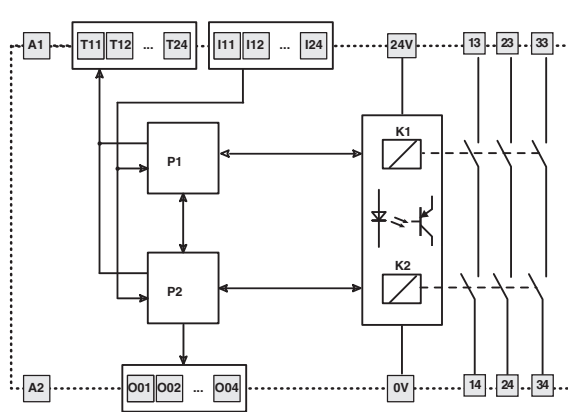


UL approval: E131787
 EAC approval: RUC-ITDM94.B.01024
 TÜV SÜD approval: requested

Terminal layout



Internal diagram



Code structure

CS MP201M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

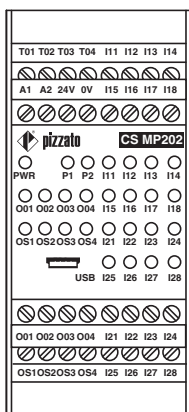


UL approval: E131787
 EAC approval: RUC-IT DM94.B.01024
 TÜV SÜD approval: requested

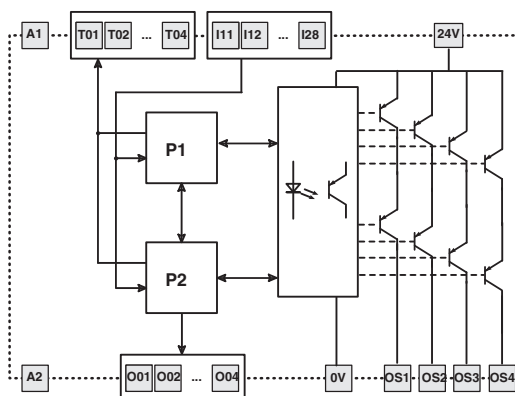
General technical data

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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	
MTTFd	573	
PFHd	4.73E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	16	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Semiconductor safety output circuits (OSx)	4 PNP	270 s. 12
Weight	250 g	

Terminal layout



Internal diagram



Code structure

CS MP202M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals

Stock items

CS MP202M0



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General technical data

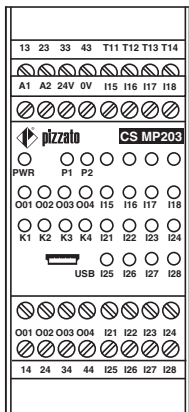
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Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
MTTFd	101	
PFHd	5.74E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	12	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Relay safety output circuits	3NO+1NO	270 s. 14
Weight	300 g	

Markings and quality marks:

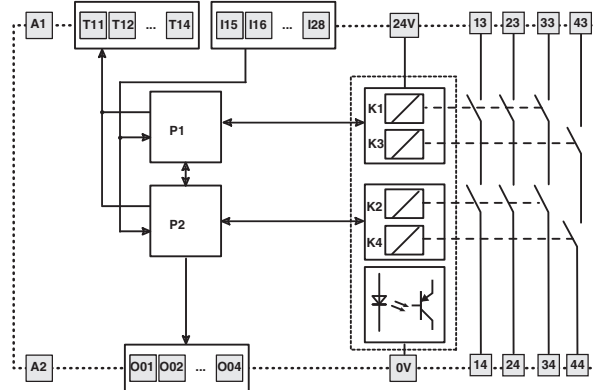


UL approval: E131787
 EAC approval: RUC-ITDM94.B.01024
 TÜV SÜD approval: requested

Terminal layout



Internal diagram



Code structure

CS MP203M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



General technical 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	
MTTFd	132	
PFHd	5.32E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	12	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Relay safety output circuits	3NO	270 s. 14
Weight	300 g	

Main features

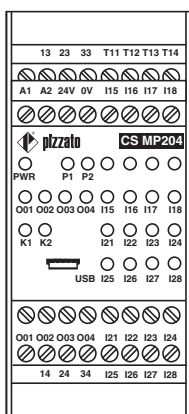
- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemis Studio for easy and intuitive programming and program simulation
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

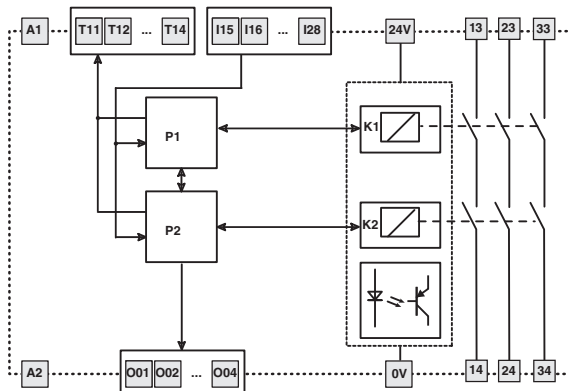


UL approval: E131787
 EAC approval: RUC-IT ДМ94.В.01024
 TÜV SÜD approval: requested

Terminal layout



Internal diagram



Code structure

CS MP204M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

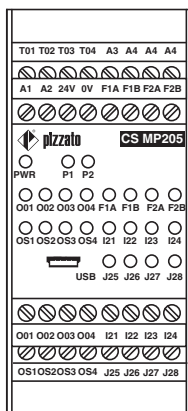


EAC approval: RU C-ITDM94.B.01024
TÜV SÜD approval: requested

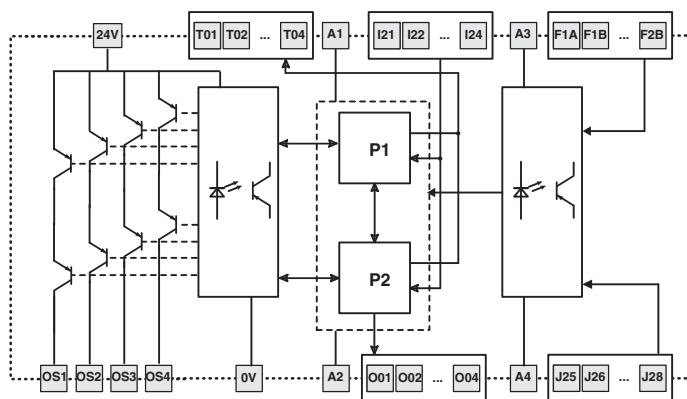
General technical data

Parameter:	Value:	Page:
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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	
MTTFd	406	
PFHd	4.83E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	4	269 s. 6
Decoupled digital inputs (Jx)	4	269 sez. 7
Inputs for frequency signals from 0 to 4 kHz (Fx)	4	269 sez. 9
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Semiconductor safety output circuits (OSx)	4 PNP	270 s. 12
Weight	250 g	

Terminal layout



Internal diagram



Code structure

CS MP205M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



General technical 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	
MTTFd	643	
PFHd	2.85E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemnis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	8	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	12	270 s. 11
Semiconductor safety output circuits (OSx)	4 PNP	270 s. 12
Weight	250 g	

Main features

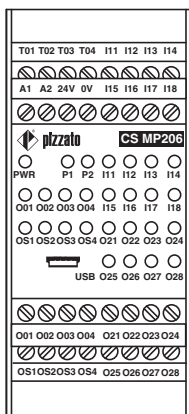
- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemnis Studio for easy and intuitive programming and program simulation
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

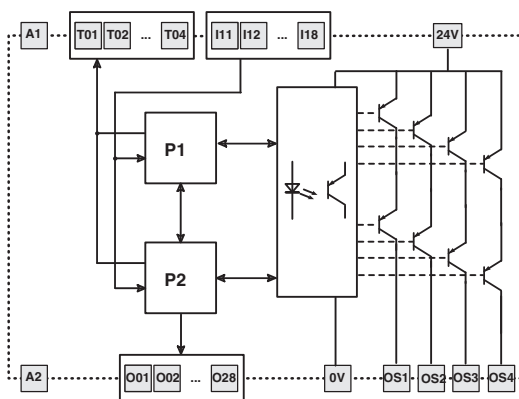


UL approval: E131787
 EAC approval: RUC-IT DM94.B.01024
 TÜV SÜD approval: requested

Terminal layout



Internal diagram



Code structure

CS MP206M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

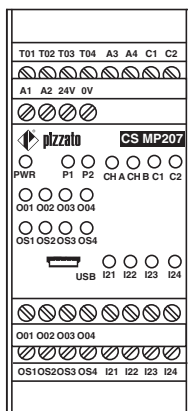


EAC approval: RUC-ITDM94.B.01024
TÜV SÜD approval: requested

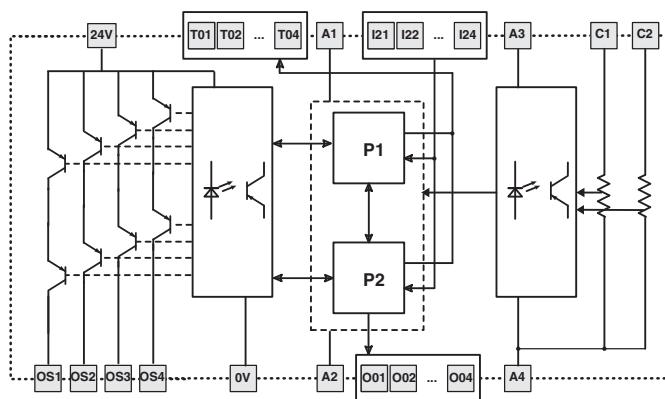
General technical data

Parameter:	Value:	Page:
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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	
MTTFd	407	
PFHd	5.39E-09	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	4	269 s. 6
4-20 mA type analogue signal inputs (Cx)	2	269 sez. 8
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Semiconductor safety output circuits (OSx)	4 PNP	270 s. 12
Weight	250 g	

Terminal layout



Internal diagram



Code structure

CS MP207M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

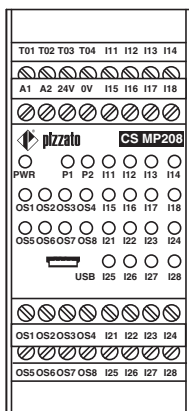


EAC approval: RUC-ITDM94.B.01024
TÜV SÜD approval: requested

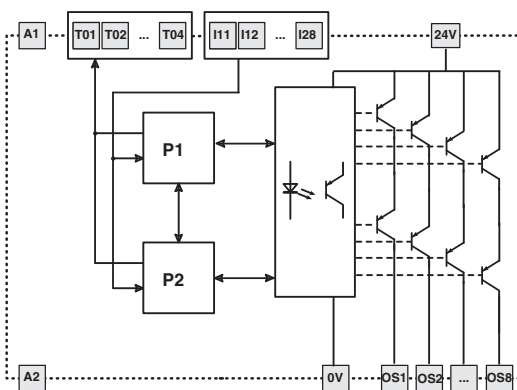
General technical data

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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	
MTTFd	588	
PFHd	6.17E-09	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x45x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	16	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor safety output circuits (OSx)	8 PNP	270 s. 13
Weight	250 g	

Terminal layout



Internal diagram



Code structure

CS MP208M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General technical data

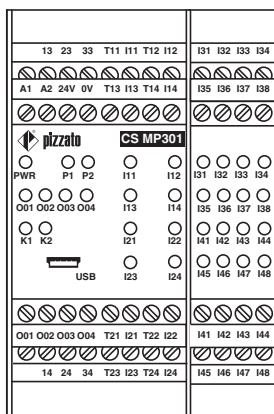
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Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
MTTFd	126	
PFHd	8.92E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	24	269 s. 6
Test outputs (Tx)	8	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Relay safety output circuits	3NO	270 s. 14
Weight	400 gr	

Markings and quality marks:

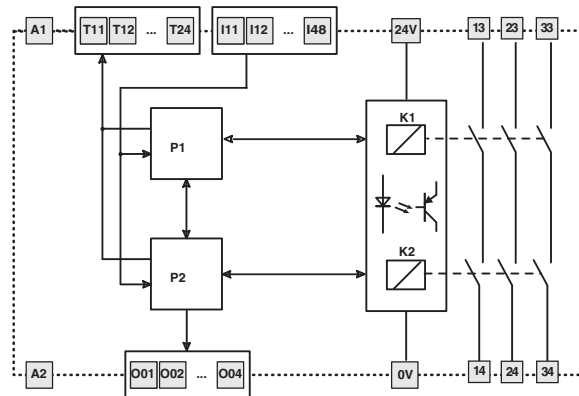


UL approval: E131787
 EAC approval: RUC-ITDM94.B.01024
 TÜV SÜD approval: requested

Terminal layout



Internal diagram



Code structure

CS MP301M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



General technical 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	
MTTFd	604	
PFHd	3.45E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	24	269 s. 6
Test outputs (Tx)	12	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Semiconductor safety output circuits (OSx)	4 PNP	270 s. 12
Weight	350 gr	

Main features

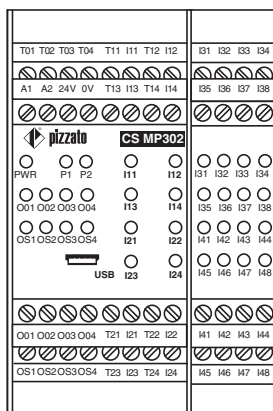
- For safety applications up to SIL CL 3/PL e
- Supply voltage: 24 Vdc
- Gemis Studio for easy and intuitive programming and program simulation
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

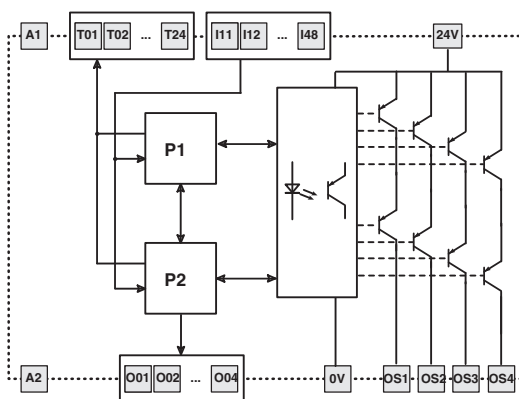


UL approval: E131787
 EAC approval: RUC-IT DM94.B.01024
 TÜV SÜD approval: requested

Terminal layout



Internal diagram



Code structure

CS MP302M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General technical data

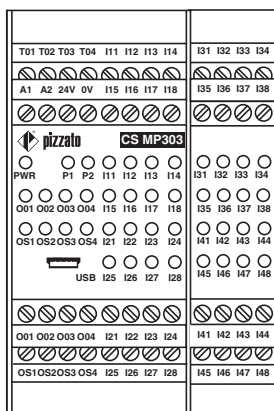
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Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
MTTFd	459	
PFHd	9.11E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	32	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Semiconductor safety output circuits (OSx)	4 PNP	270 s. 12
Weight	350 gr	

Markings and quality marks:

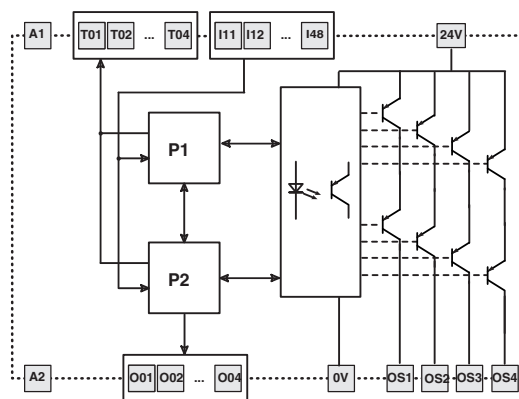


UL approval: E131787
 EAC approval: RUC-ITDM94.B.01024
 TÜV SÜD approval: requested

Terminal layout



Internal diagram



Code structure

CS MP303M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

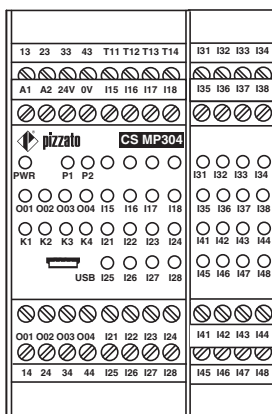


UL approval: E131787
 EAC approval: RUC-IT DM94.B.01024
 TÜV SÜD approval: requested

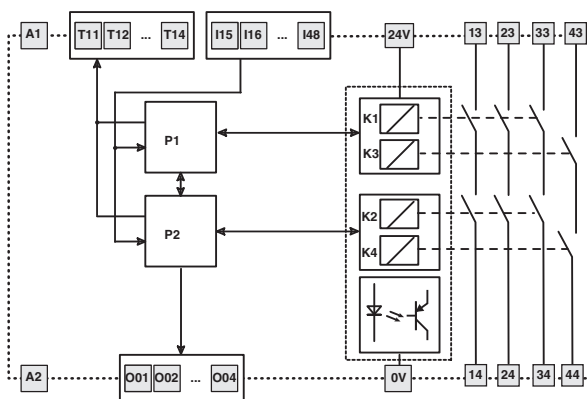
General technical data

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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	
MTTFd	97	
PFHd	1.01E-09	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	28	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Relay safety output circuits	3NO+1NO	270 s. 14
Weight	400 gr	

Terminal layout



Internal diagram



Code structure

CS MP304M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General technical 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	
MTTFd	503	
PFHd	7.24E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	24	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	12	270 s. 11
Semiconductor safety output circuits (OSx)	4 PNP	270 s. 12
Weight	350 gr	

Markings and quality marks:

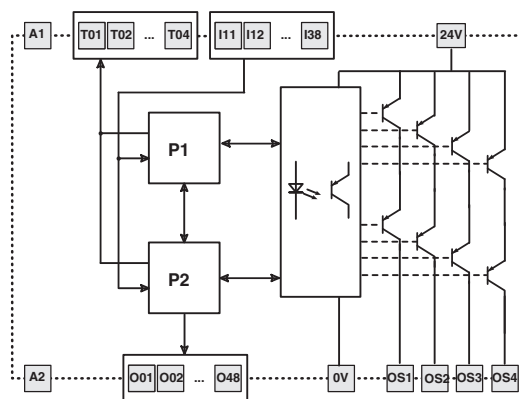


UL approval: E131787
 EAC approval: RUC-ITDM94.B.01024
 TÜV SÜD approval: requested

Terminal layout

T01 T02 T03 T04	I11 I12 I13 I14	I31 I32 I33 I34
A1 A2 24V 0V	I15 I16 I17 I18	I35 I36 I37 I38
CS MP305		
PWR P1 P2	I11 I12 I13 I14	I31 I32 I33 I34
O01 O02 O03 O04	I15 I16 I17 I18	I35 I36 I37 I38
OS1 OS2 OS3 OS4	I21 I22 I23 I24	O41 O42 O43 O44
USB	I25 I26 I27 I28	O45 O46 O47 O48
O01 O02 O03 O04	I21 I22 I23 I24	O41 O42 O43 O44
OS1 OS2 OS3 OS4	I25 I26 I27 I28	O45 O46 O47 O48

Internal diagram



Code structure

CS MP305M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

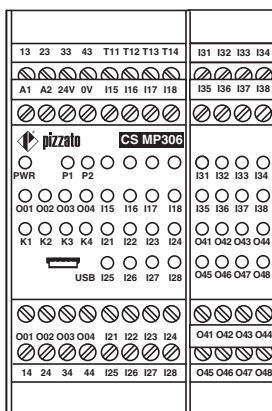


UL approval: E131787
 EAC approval: RUC-IT ДМ94.В.01024
 TÜV SÜD approval: requested

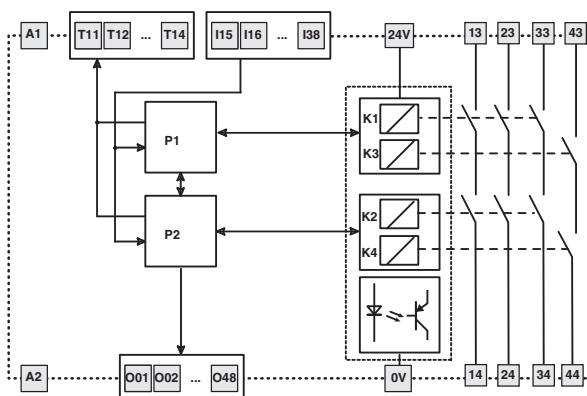
General technical data

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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	
MTTFd	99	
PFHd	8.25E-10	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	20	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	12	270 s. 11
Relay safety output circuits	3NO+1NO	270 s. 14
Weight	400 gr	

Terminal layout



Internal diagram



Code structure

CS MP306M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

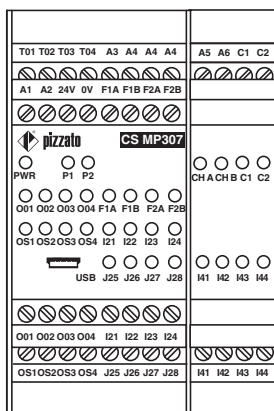


EAC approval: RUC-ITDM94.B.01024
TÜV SÜD approval: requested

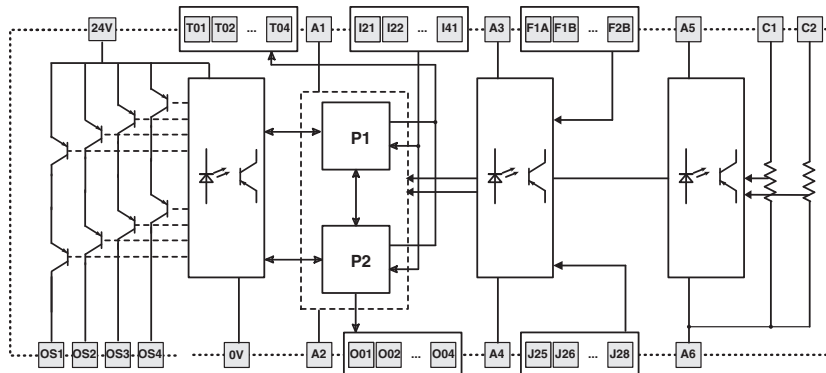
General technical data

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	
MTTFd	276	
PFHd	5.84E-09	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	8	269 s. 6
Decoupled digital inputs (Jx)	4	269 sez. 7
4-20 mA type analogue signal inputs (Cx)	2	269 sez. 8
Inputs for frequency signals from 0 to 4 kHz (Fx)	4	269 sez. 9
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	4	270 s. 11
Semiconductor safety output circuits (OSx)	4 PNP	270 s. 12
Weight	350 gr	

Terminal layout



Internal diagram

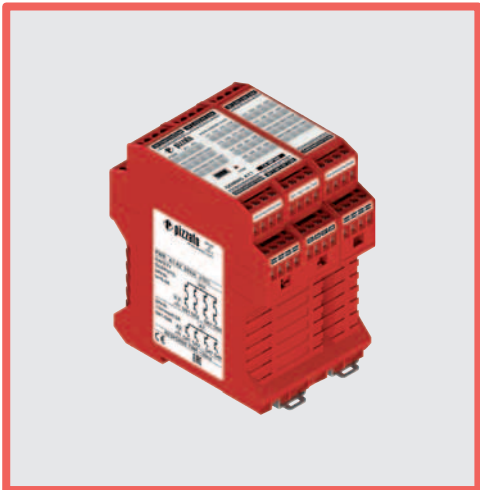


Code structure

CS MP307M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

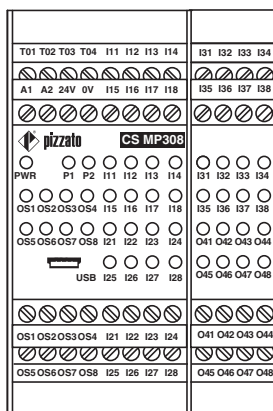


EAC approval: RUC-ITDM94.B.01024
TÜV SÜD approval: requested

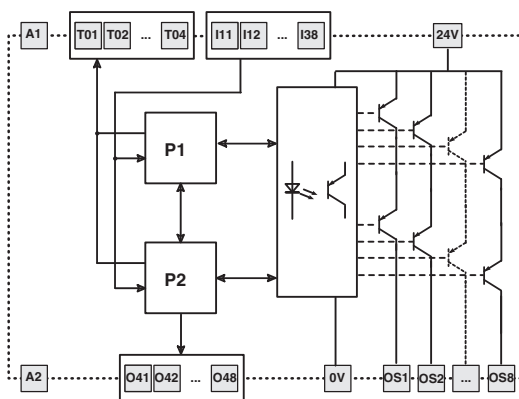
General technical data

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	
MTTFd	514	
PFHd	6.42E-09	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	24	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	8	270 s. 11
Semiconductor safety output circuits (OSx)	8 PNP	270 s. 13
Weight	350 gr	

Terminal layout



Internal diagram



Code structure

CS MP308M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General technical data

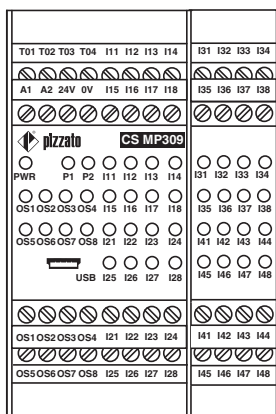
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Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
MTTFd	469	
PFHd	6.61E-09	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x67.5x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	32	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor safety output circuits (OSx)	8 PNP	270 s. 13
Weight	350 gr	

Markings and quality marks:

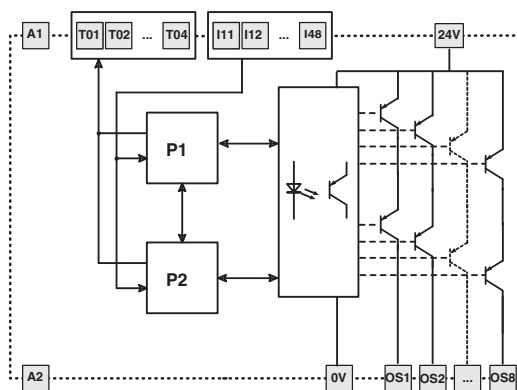


EAC approval: RU C-ITDM94.B.01024
 TÜV SÜD approval: requested

Terminal layout



Internal diagram

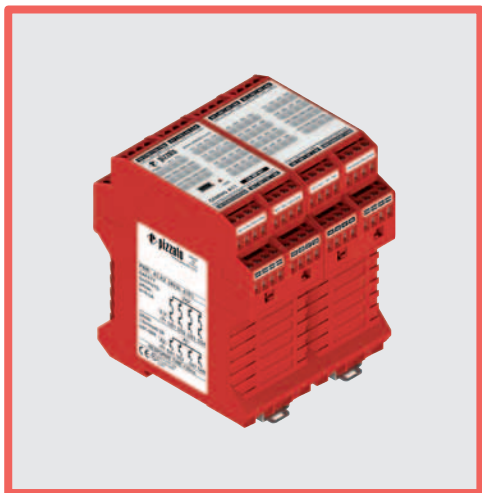


Code structure

CS MP309M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

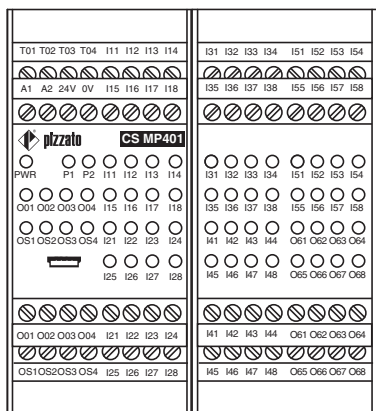


UL approval: E131787
 EAC approval: RUC-IT DM94.B.01024
 TÜV SÜD approval: requested

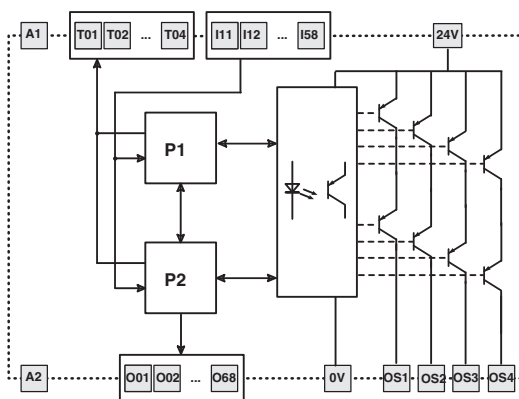
General technical data

Parameter:	Value:	Page:
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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	
MTTFd	413	
PFHd	1.16E-09	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x90x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	40	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	12	270 s. 11
Semiconductor safety output circuits (OSx)	4 PNP	270 s. 12
Weight	500 gr	

Terminal layout



Internal diagram

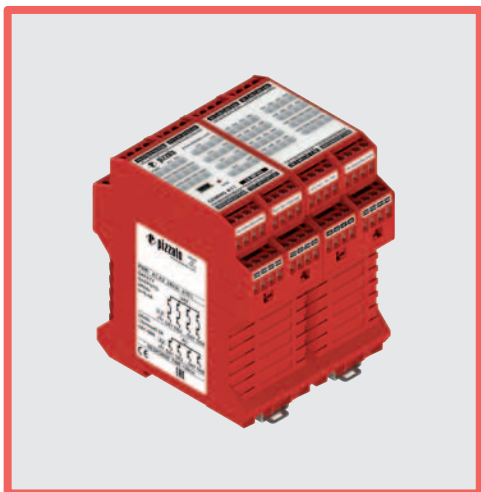


Code structure

CS MP401M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

General technical data

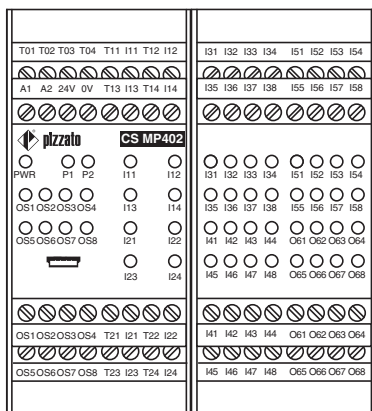
Parameter:	Value:	Page:
SIL CL acc. to EN IEC 62061	up to SIL CL 3	
Performance Level (PL) acc. to EN ISO 13849-1	up to PL e	
Safety category acc. to EN ISO 13849-1	up to cat. 4	
MTTFd	452	
PFHd	6.67E-09	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x90x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	32	269 s. 6
Test outputs (Tx)	12	269 s. 10
Semiconductor signalling output circuits (Ox)	8	270 s. 11
Semiconductor safety output circuits (OSx)	8 PNP	270 s. 13
Weight	500 gr	

Markings and quality marks:

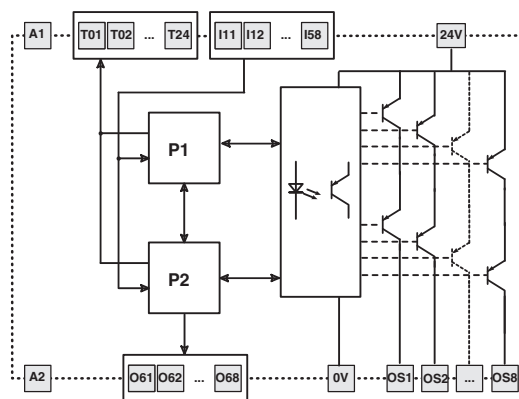


EAC approval: RUC-ITDM94.B.01024
TÜV SÜD approval: requested

Terminal layout



Internal diagram

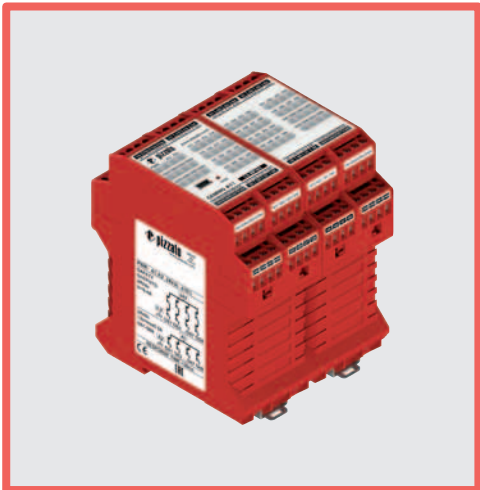


Code structure

CS MP402M0

Connection type

- M** connector with screw terminals
- X** connector with spring terminals



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
- Wide availability of logical blocks for the management of external devices and programs
- Custom configured versions available on request

Markings and quality marks:

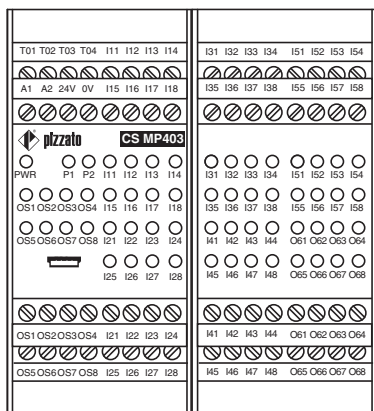


EAC approval: RUC-ITDM94.B.01024
 TÜV SÜD approval: requested

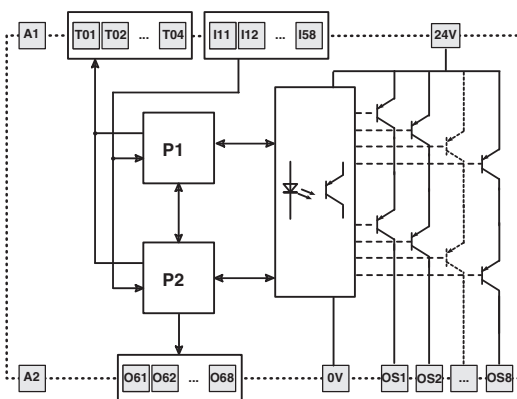
General technical data

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	
MTTFd	416	
PFHd	6.86E-09	
Response time of the system	< 30 ms	
Dimensions (HxLxW)	111.5x90x99 mm	
Housing data		269 s. 1
Environmental data		269 s. 2
Supply		269 s. 3
In conformity with standards		269 s. 4
Programming software	Gemis Studio	269 s. 5
USB port	Yes	
Safety inputs (Ix)	40	269 s. 6
Test outputs (Tx)	4	269 s. 10
Semiconductor signalling output circuits (Ox)	8	270 s. 11
Semiconductor safety output circuits (OSx)	8 PNP	270 s. 13
Weight	500 gr	

Terminal layout



Internal 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 according to UL 94
Protection degree:	IP40 (housing) IP20 (terminal strip)
Dimensions, cable cross sections, terminal tightening torque:	pages 284-285 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 (Un):	24 Vdc
DC maximum residual ripple:	10%
Supply voltage tolerance:	±15% of Un
Rated consumption (w/o load):	< 3 W
Protection against short circuits:	resistance PTC, I _h =0.5 A
PTC triggering time:	Intervention > 100 ms, reset > 3 s

Internal protection against short circuits
on outputs (Tx, Ox): Electronic

Maximum current generation ability of module
as a sum of the Tx and Ox type outputs: 0.5 A

Self-test time on startup: < 2 s

4) In conformity 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 62326-1, EN 61326-1, EN 61326-3-1,
EN 60664-1, EN 62061, EN 61131-6, UL 508, CSA C22.2 n°14-95.

In conformity with the requirements of:

Low Voltage Directive 2006/95/EC,
Machinery Directive 2006/42/EC,
EMC Directive 2004/108/EC

Characteristics approved by UL

Rated supply voltage: 24 Vdc
DC consumption: < 3 W

Relay output:
- maximum switching voltage: 230/240 Vac,
- maximum current: 4 A
- utilization category: C300 pilot duty

Semiconductor output:
- maximum switching voltage: 24 V dc
- maximum current: 500 mA

Notes:
- Use 60° or 75 °C copper (Cu) conductor, rigid or flexible, wire size AWG 30-12.
- Terminal tightening torque of 5-7 Lb In.
- Only for 24 Vac/dc version, supply from remote class 2 source or limited voltage
and limited energy. (Supply from Remote Class 2 Source or limited
voltage limited energy).

5) Gemnis Studio

The **Gemis Studio** software is the graphic development environment
for the creation, simulation and debugging of programs suitable to be
included in the modules belonging to the Gemnis line.
This software is licensed to users wishing to program these modules,
subject to prior registration at www.gemis.com.
You can download the latest **Gemis Studio** software version from
the site, which will allow you to program Gemnis line safety modules.

Gemis Studio software minimum download requirements

Computer and processor:	x86 with clock frequency of 1 GHz
Memory:	512 MB
Hard disk:	200 MB
Screen:	Monitor with resolution of 1024 × 768 or higher.

Operating system:	Microsoft Windows XP+SP3, Microsoft Seven or Microsoft Windows 8.1 Microsoft Framework .NET 3.5 or higher Microsoft Report Viewer
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6) Input circuits (Ix)

Input circuits voltage and current:	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: period 0.4 ms	Yes, maximum interference
Maximum input resistance:	100 Ohm
Maximum input capacitance:	470 nF to ground 470 nF between the two conductors

7) Decoupled input circuits (Jx)

Input circuits voltage and current:	24 V, 5 mA
Input signals:	0-8 V (Off), 12-24 V (On)
Galvanic separation:	Yes
Insulation voltage (Ui):	500 V
Minimum duration of input signal:	10 ms
Input signal filtering: period 0.4 ms	Yes, maximum interference
Maximum input resistance:	100 Ohm
Maximum input capacitance:	470 nF to ground 470 nF between the two

conductors

NB: Voltage and current values indicated refer to the power supply terminals
(Ax, see each module individually) of the board housing the Jx type terminals

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 (Ui):	500 V

NB: Voltage and current values indicated refer to the power supply terminals
(Ax, see each module individually) of the board housing the Cx type terminals

9) Frequency input circuits (Fx)

Rated supply voltage:	24 Vdc ± 15 %
Input circuit voltage and current:	24 Vdc, 7 mA
Supply voltage check of proximity sensors on power supply:	24 Vdc ± 20 %
Maximum detectable frequency:	4 kHz
Minimum detectable frequency:	1 Hz
Frequency detection accuracy:	1 % ± 1 digit
Resolution:	0.1 Hz
Minimum detection time closed tree:	1 s
Galvanic separation:	Yes
Insulation voltage (Ui):	500 V

NB: Voltage and current values indicated refer to the power supply terminals
(Ax, see each module individually) of the board housing the Fx type terminals

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 voltage (Uimp):	0.8 kV
Rated insulation voltage (Ui):	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 voltage (Uimp):	0.8 kV
Rated insulation voltage (Ui):	32 V
Short circuit detection between outputs:	Yes
Deactivation pulse duration on 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 voltage (Uimp):	0.8 kV
Rated insulation voltage (Ui):	32 V
Short circuit detection between outputs:	Yes
Deactivation pulse duration on safety outputs:	< 300 µs

14) Relay safety output circuits

Rated voltage 24V-0V:	24 Vdc
Contact type:	Guided contacts according to EN 50205
Contact material:	gold-plated silver alloy
Maximum switching voltage:	230 Vac; 300 Vdc
Maximum current per contact:	6 A
Max. total current ΣI_{th}^2 :	36 A ²
Minimum current:	10 mA
Protection fuse:	4 A type gG
Max. load:	1380 VA/W
Impulse voltage (Uimp):	4 kV
Rated insulation voltage (Ui):	500 V
Utilization category (EN 60947-5-1):	AC15 (Ue=230V, Ie=3A); DC13 (Ue=24V, Ie=4A (6 op. cycles/minute)
Utilization category (UL 508):	C300
Contact resistance:	< 100 mOhm
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 pages 231 - 240.

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 the 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.

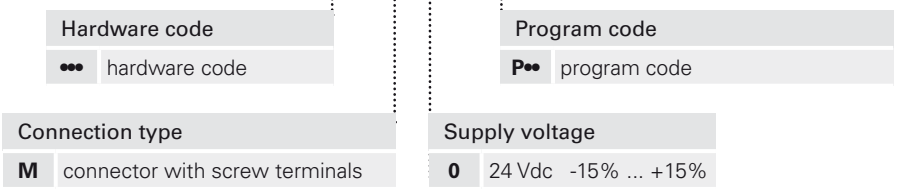
Markings and quality marks:



UL approval: E131787
EAC approval: RU C-IT ДМ94.В.01024

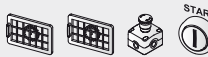
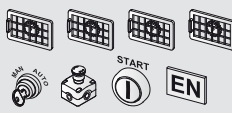
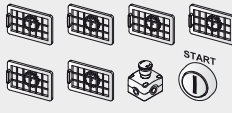
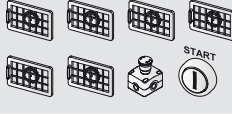
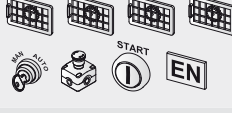

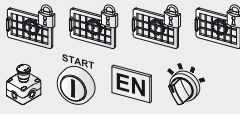
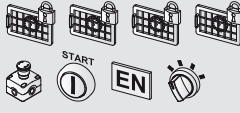
Code structure

CS MF201M0-P●●





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	273
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	274
CS MF202M0-P3	Monitoring of 6 guards in AND (2NC contacts), 1 emergency stop with automatic start or manual monitored start. 	4 PNP	4 PNP	275
CS MF202M0-P4	Monitoring of 6 guards in AND (1NC+1NO contacts), 1 emergency stop with automatic start or manual monitored start. 	4 PNP	4 PNP	276
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	277
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 timed output with a 4 way time selector. Selectable On/Off delay. 	4 PNP	4 PNP	278
CS MF202M0-P7	Monitoring of 4 guards in AND with door lock equipped switches, "D" principle, 1 emergency stop, monitored start. Two instantaneous outputs and two timed outputs via 4 way time selector. 	4 PNP	4 PNP	279
CS MF202M0-P8	Monitoring of 4 guards in AND with door lock equipped switches, "E" principle, 1 emergency stop, monitored start. Two instantaneous outputs and two timed outputs via 4 way time selector. 	4 PNP	4 PNP	280

Legend



Movable guard monitoring



Start function



Time selector



Movable guard with lock monitoring



Bypass selector



Enabling input



Emergency stop



Product code
CS MF201M0-P1



Main functions

- Monitoring of 2 guards
- 1 emergency stop monitoring
- Automatic start or monitored manual start

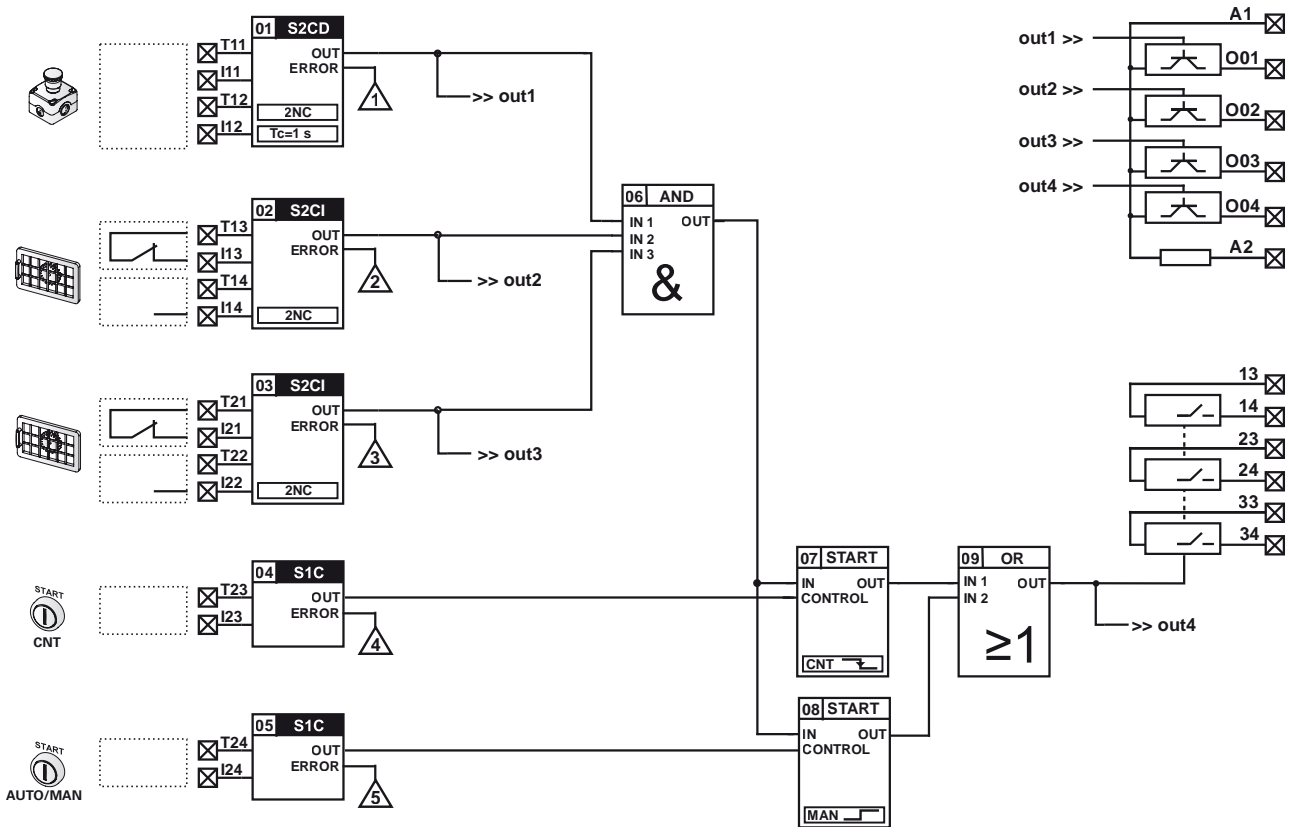
Outputs

- 3 NO safety outputs
- 4 PNP signalling outputs

Technical data: see CS MP201M0
 Dimensions, cable cross sections, terminal tightening torque: page 284, design C
 Internal wiring diagram: page 286
 Terminal layout: page 286

Application program: P1

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:





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

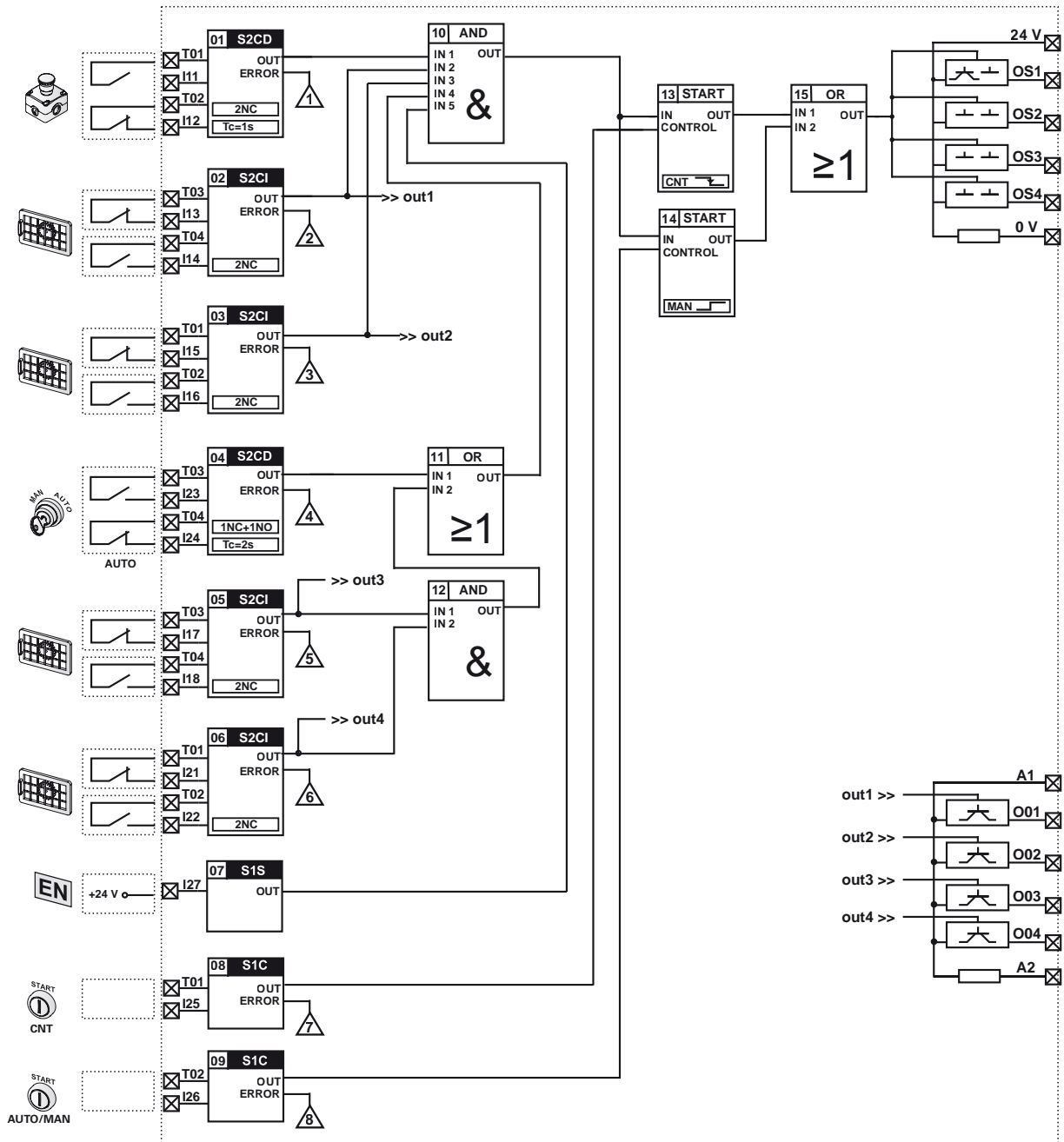
Outputs

- 4 PNP safety outputs
- 4 PNP signalling outputs

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 284, design C
Internal wiring diagram: page 286
Terminal layout: page 286

Application program: P2

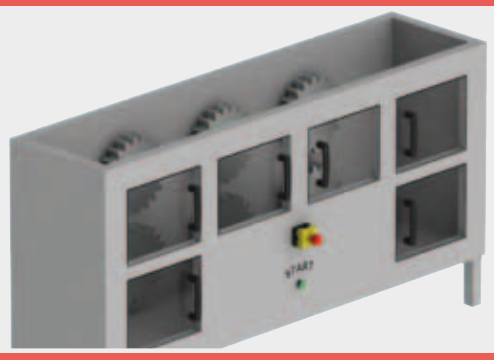
The application program stored in the module executes one or more safety functions, as shown in the following block diagram:



Pre-programmed module CS MF202M0-P3



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

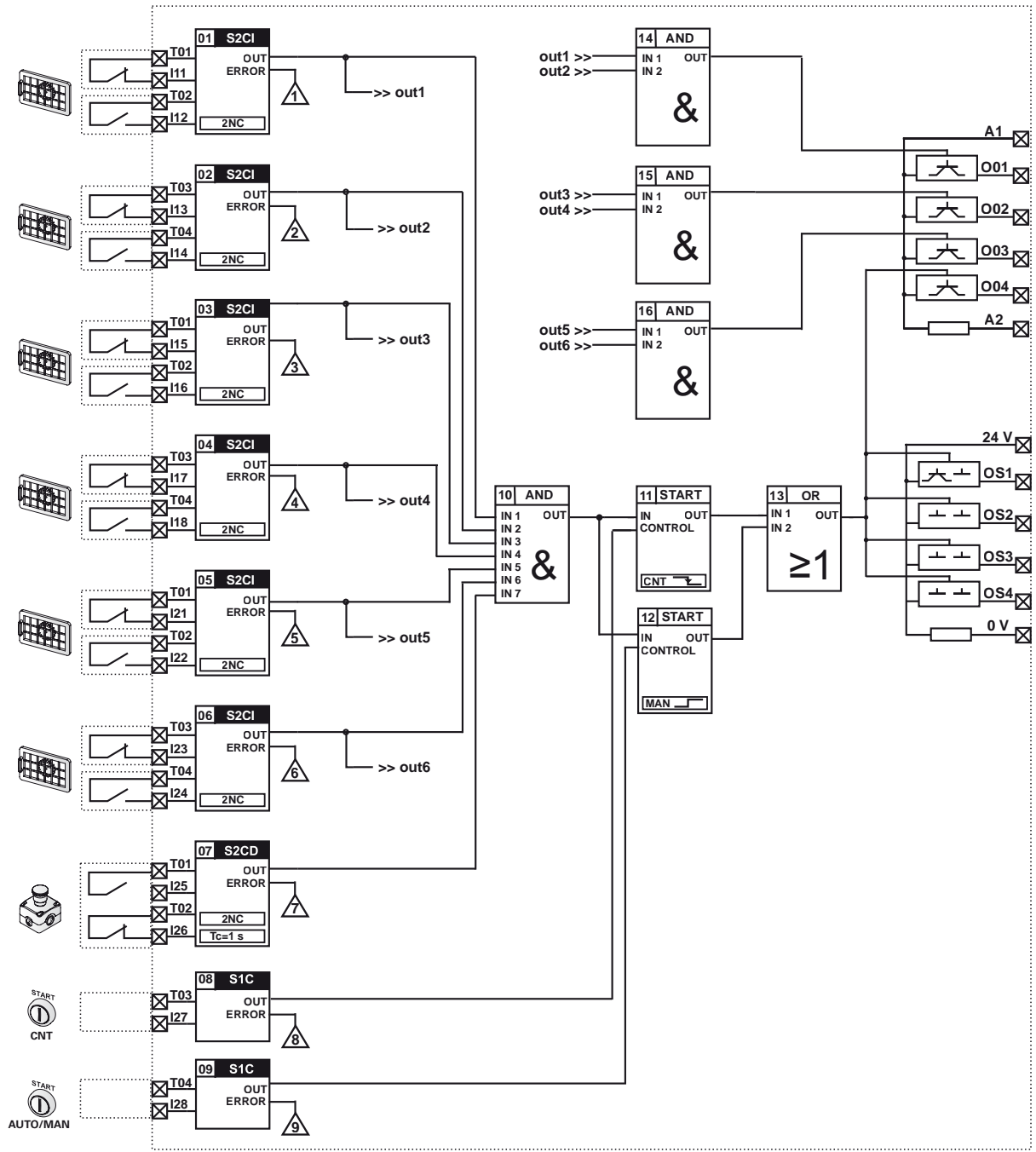
Dimensions, cable cross sections, terminal tightening torque: page 284, design C

Internal wiring diagram: page 286

Terminal layout: page 286

Application program: P3

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:





Product code
CS MF202M0-P4



Main functions

- Monitoring of 6 guards (1NC+1NO contacts)
- 1 emergency stop
- Automatic start or monitored manual start

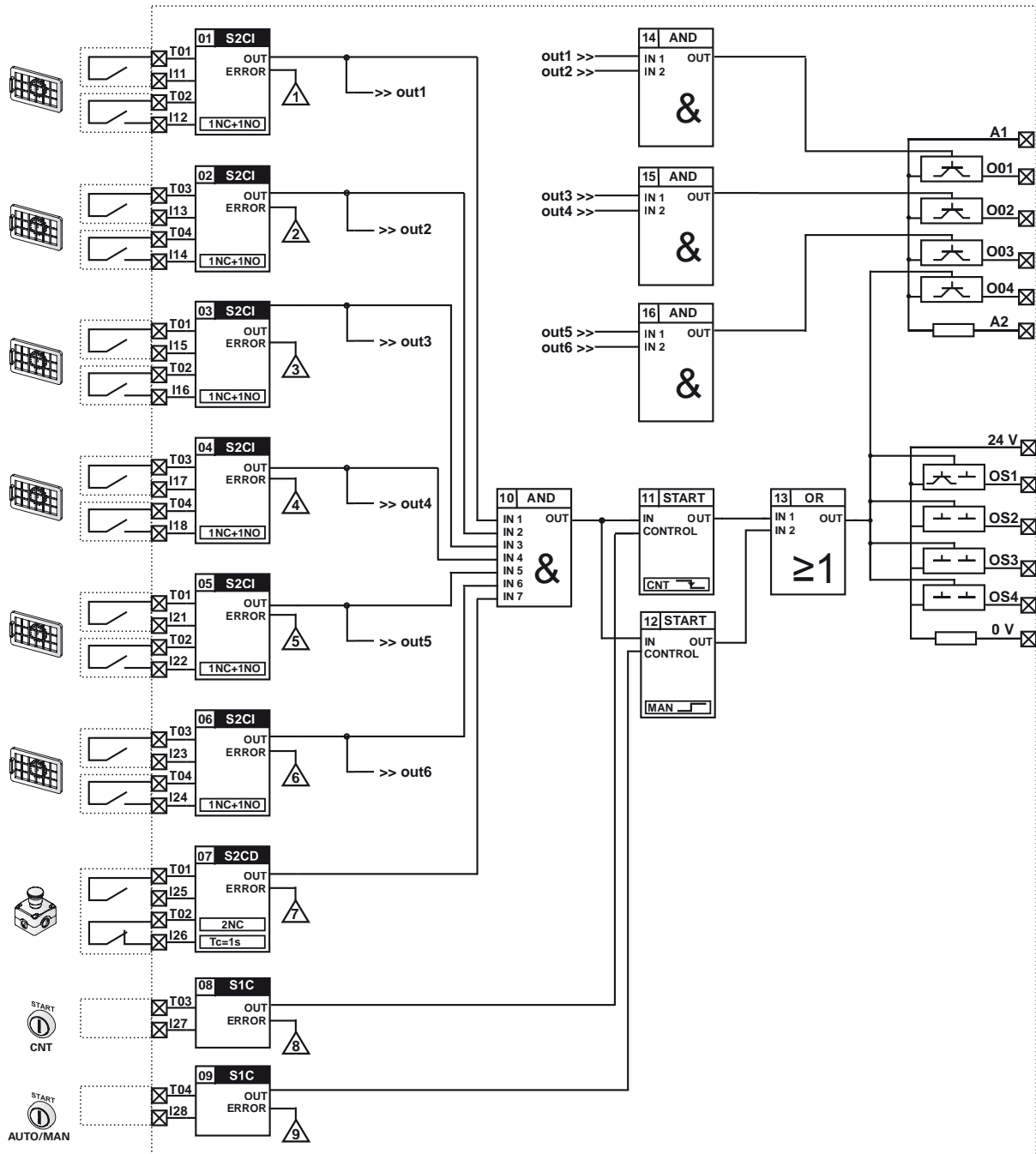
Outputs

- 4 PNP safety outputs
- 4 PNP signalling outputs

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 284, design C
Internal wiring diagram: page 286
Terminal layout: page 286

Application program: P4

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:



Pre-programmed module CS MF202M0-P5



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

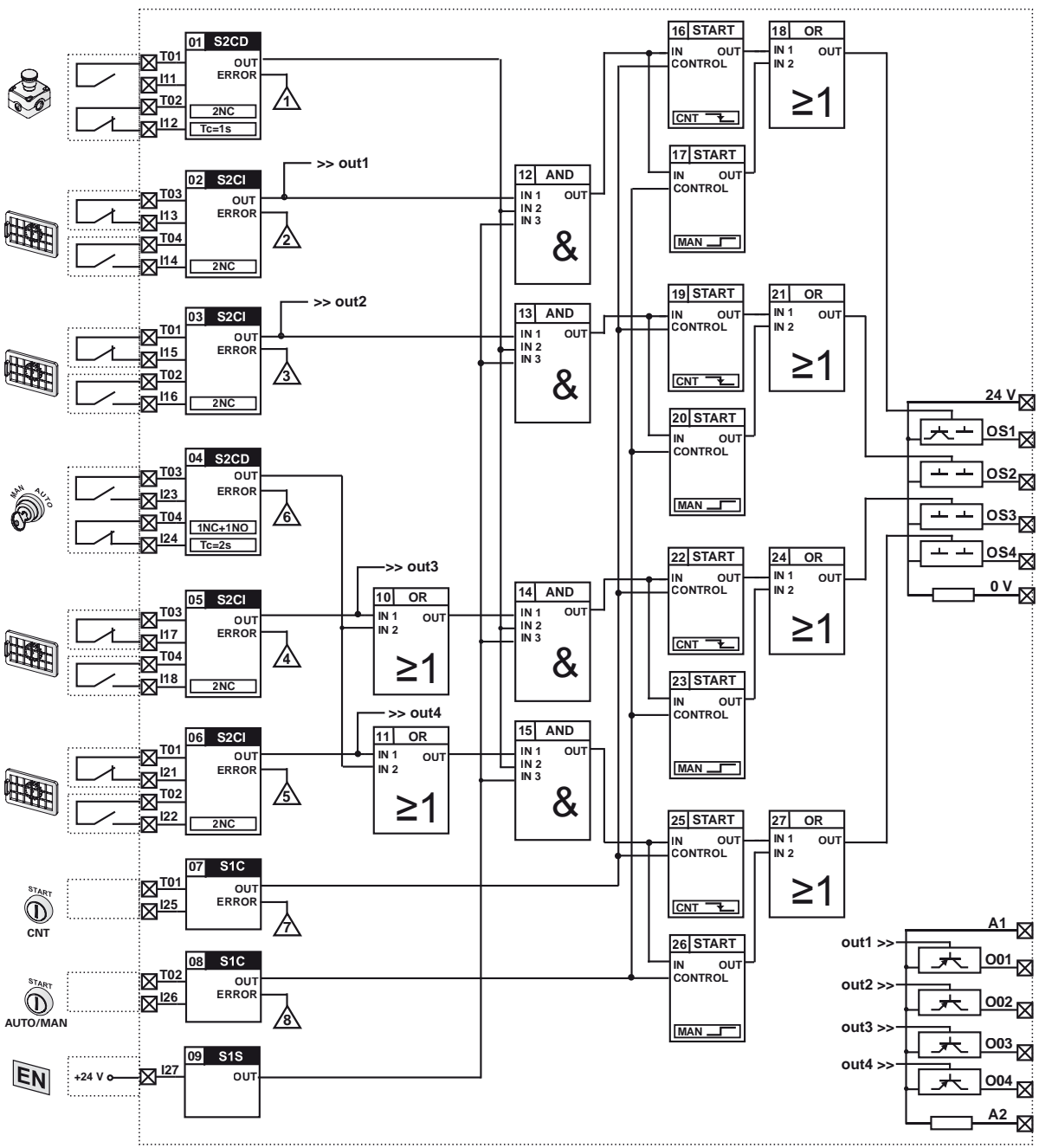
Outputs

- 4 PNP safety outputs
- 4 PNP signalling outputs

Technical data: see CS MP202M0
 Dimensions, cable cross sections, terminal tightening torque: page 284, design C
 Internal wiring diagram: page 286
 Terminal layout: page 286

Application program: P5

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:





Pre-programmed module CS MF202M0-P6



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
- 4 way time selector

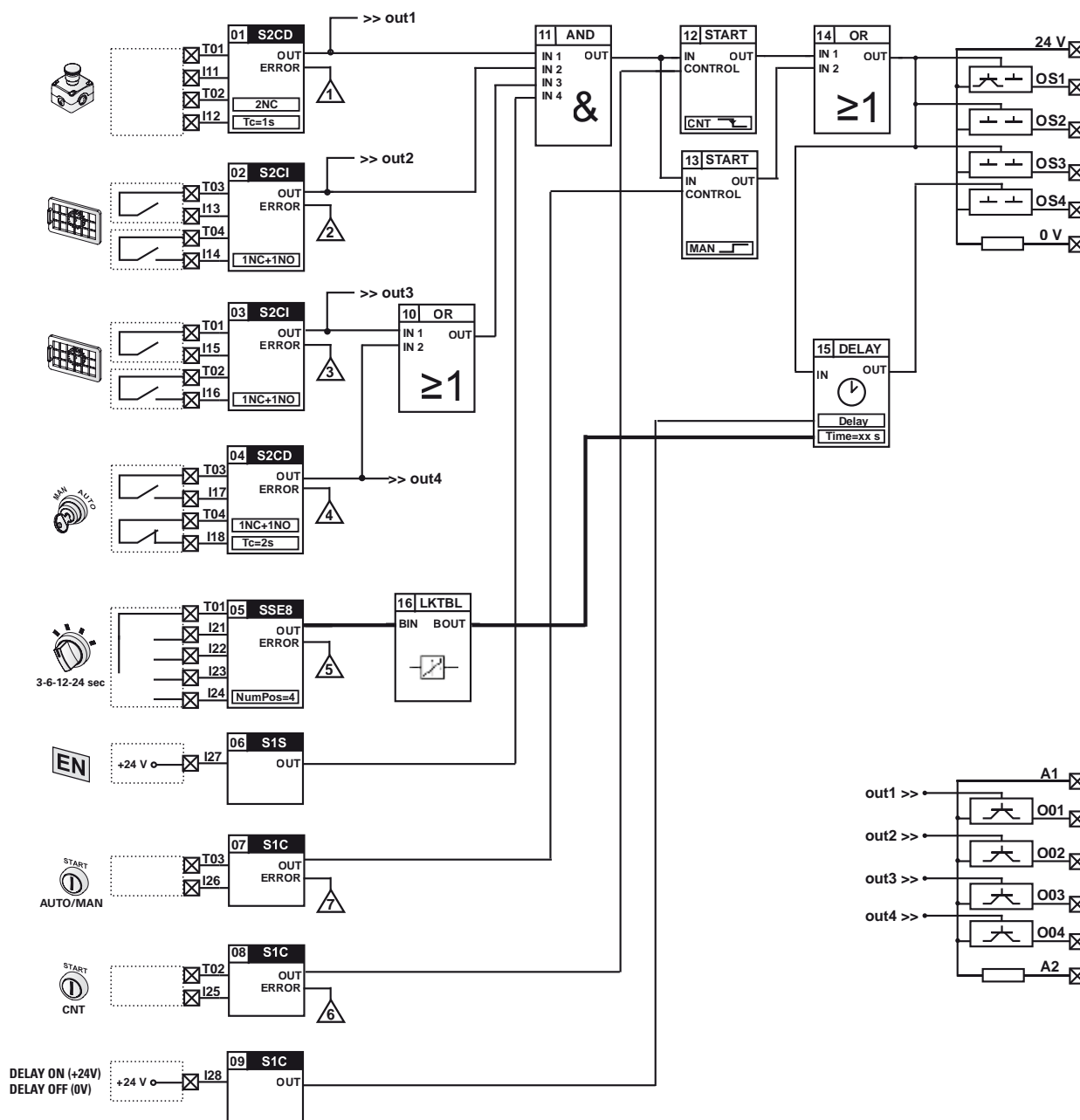
Outputs

- Three instantaneous outputs and one timed PNP safety output
- 4 PNP signalling outputs

Technical data: see CS MP202M0
 Dimensions, cable cross sections, terminal tightening torque: page 284, design C
 Internal wiring diagram: page 286
 Terminal layout: page 286

Application program: P6

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:





Product code
CS MF202M0-P7



Main functions

- Monitoring of 4 guards with door lock equipped switches, "D" principle (door locked with de-energised solenoid)
- 1 emergency stop
- Monitored start

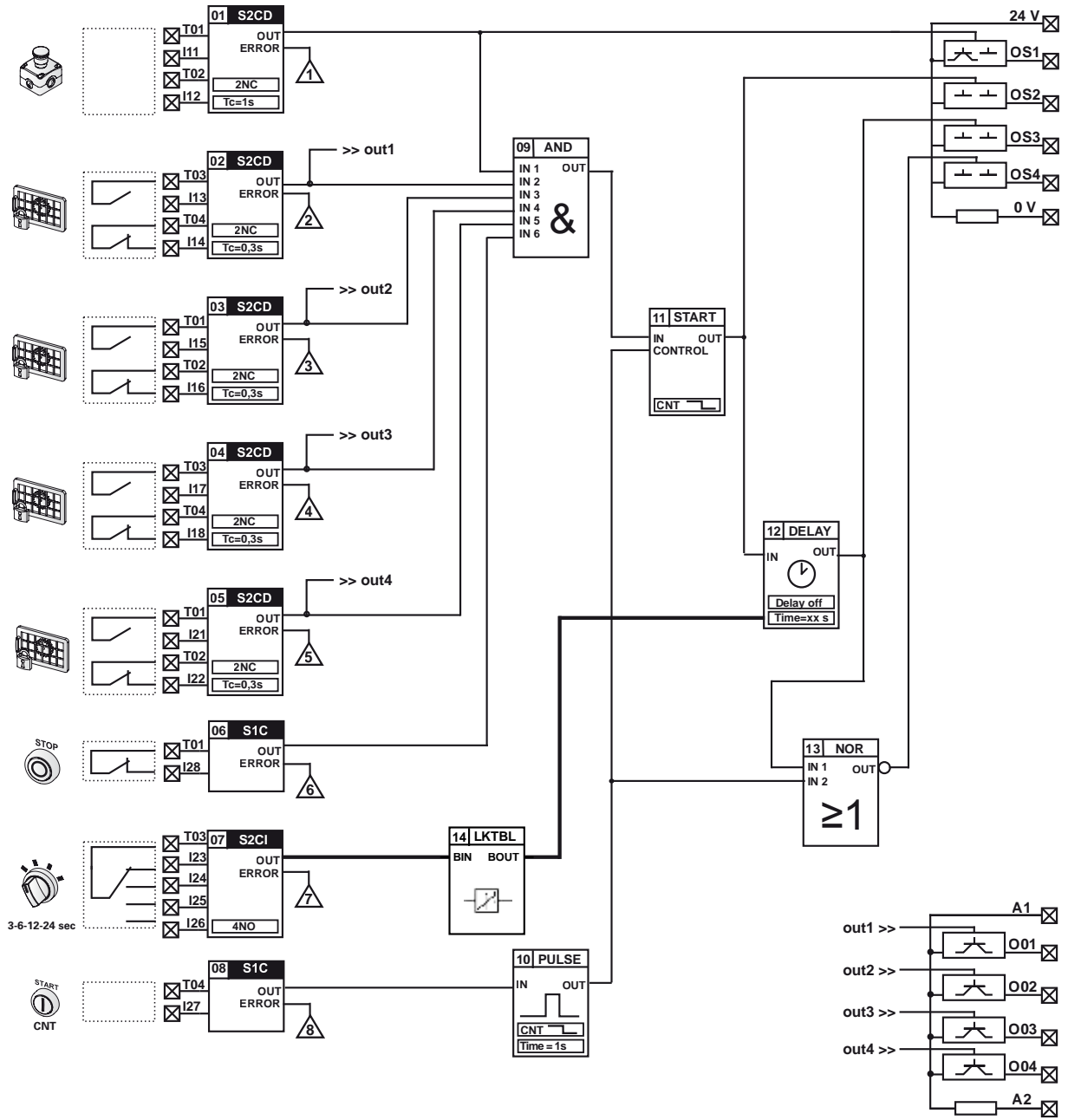
Outputs

- 2 instantaneous outputs and 2 timed PNP safety outputs with a 4 way time selector
- 4 PNP signalling outputs
- OS4 output for door locking control

Technical data: see CS MP202M0
 Dimensions, cable cross sections, terminal tightening torque: page 284, design C
 Internal wiring diagram: page 286
 Terminal layout: page 286

Application program: P7

The application program stored in the module executes one or more safety functions, as shown in the following block diagram:





Product code
CS MF202M0-P8

Main functions

- Monitoring of 4 guards with door lock equipped switches, "E" principle (door locked with energised solenoid)
- 1 emergency stop
- Monitored start

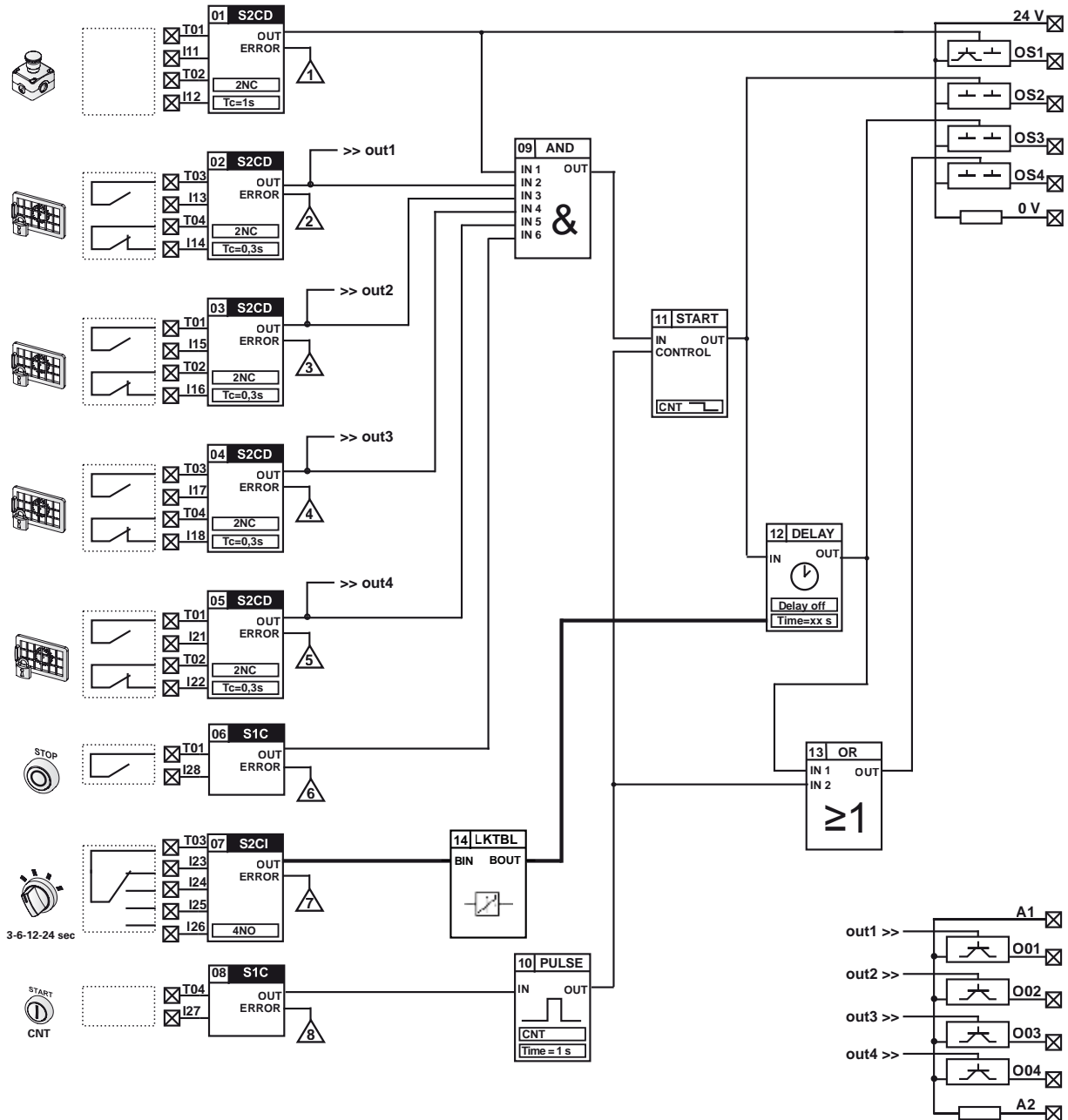
Outputs

- 2 instantaneous outputs and 2 timed PNP safety outputs with a 4 way time selector
- 4 PNP signalling outputs
- OS4 output for door locking control

Technical data: see CS MP202M0
Dimensions, cable cross sections, terminal tightening torque: page 284, design C
Internal wiring diagram: page 286
Terminal layout: page 286

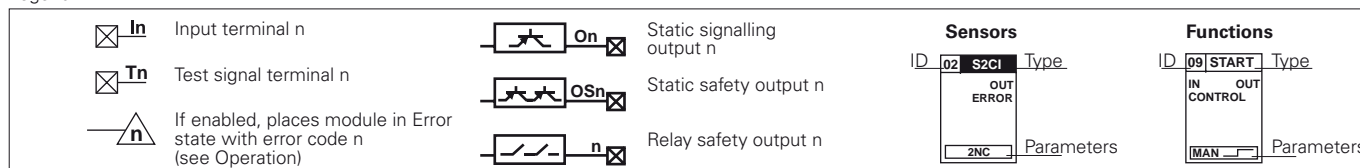
Application program: P8

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 280).

Legend



Disclaimer:

Subject to modifications without prior notice and errors excepted. The data given in this sheet are accurately checked and refer to typical mass production values. The device descriptions and its applications, the fields of application, the external control details, as well as information on installation and operation, are provided to the best of our knowledge. This does not in any way mean that the characteristics described may entail legal liabilities extending beyond the "General Terms of Sale," as stated in the Pizzato Elettrica general catalogue. Customers/users are not absolved from the obligation to read and understand our information and recommendations and pertinent technical standards, before using the products for their own purposes.

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 is placed in a safe condition, that is, with all safety outputs 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 highlight the malfunction. In this case, the application program can communicate an error code by making the LEDs (P1, P2) blink 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 static 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	Restorable fault: Overcurrent on Tx or Ox outputs. Recommended action: Disconnect the static signalling outputs (Ox) and the test outputs (Tx) to check whether an external short circuit is present.
Green	Red x 1 Blue x 2	Restorable fault. Problem detected on OSx (short circuit towards earth or positive, 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	Restorable fault. Module temperature outside the limits. Recommended action: Restore module temperature to within permissible limits.
Green	Blue x N	Error status entered by module at the request of the application program. Error code N. Typically due to incorrect input conditions (external short circuits, status not permitted). Recommended action: Suggested 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 when a 24Vdc signal is present on 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	Maximum simultaneity time in seconds
Examples		Emergency stop button; Rope switch; Switch with two connected contacts; Modal selectors with two changeover positions; Two distinct switches with time interdependence

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	2 to 8 position modal selector
Outputs	OUT	The output gives a numerical value of 1 to 8 corresponding to the same active input, 0 in case of error
	ERROR	The ERROR output is active in the case where several inputs or no input are active, or in the case where an electric malfunction is detected in the input signals
Parameters	NumPos	Number of input contacts (from 2 to 8)
Examples		Modal selectors with a common contact and a number of outputs ranging from 2 to 8

FUNCTIONS

Function	AND	AND logical function
Outputs	OUT	The OUT output is only activated where all IN input signals are present

Function	DELAY	Delayed process activation/deactivation
Outputs	OUT	The OUT output is activated in the presence of the IN input signal with a Td delay (Don type parameter) The OUT output is deactivated in the absence of the IN input signal with a Td delay (Doff type parameter)
	Don / Doff	Delay type, at Don (delay-on) activation or at Doff (delay-off) deactivation
Parameters	Td	Activation or deactivation delay period

Function	NOR	NOR logical function
Outputs	OUT	The OUT output is only activated in the absence of all the IN input signals

Function	OR	OR logical function
Outputs	OUT	The OUT output is only activated in the presence of at least one IN input signal

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, if the signal at the IN input is present, on the edge (see parameter) of the CONTROL signal. It therefore remains active as long as IN is present
Parameters	MAN / CNT	MAN = activation on the rising edge, CNT = activation on the falling edge

Function	LKTBL	Lookup table: Conversion table between same type data
Outputs	BOUT	Output converted data. 0 at start.
Parameters	Number of data	Number of data present in the table

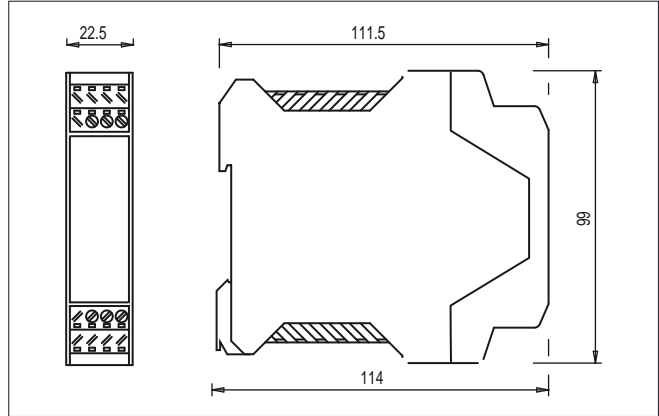
Design A, housing thickness 22.5 mm

Connection data

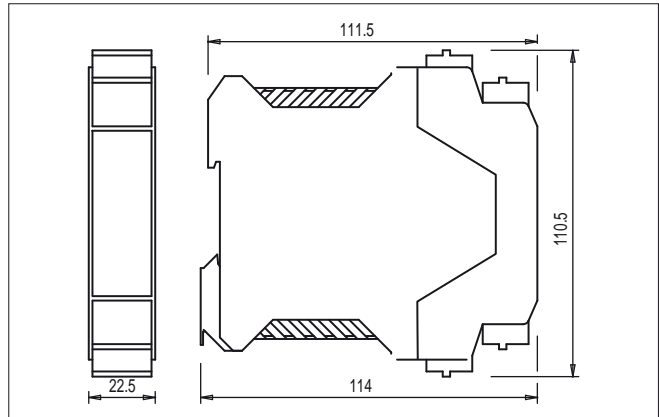
Terminals tightening torque:	0.5 ... 0.6 Nm
Cable cross section:	0.2...2.5 mm ²
	24 ... 12 AWG

Installation

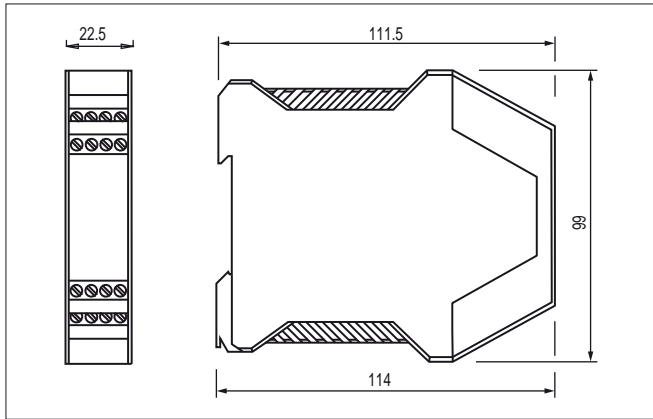
Snap mounting to DIN rail



Connector with screw terminals



Connector with spring terminals



Screw terminals

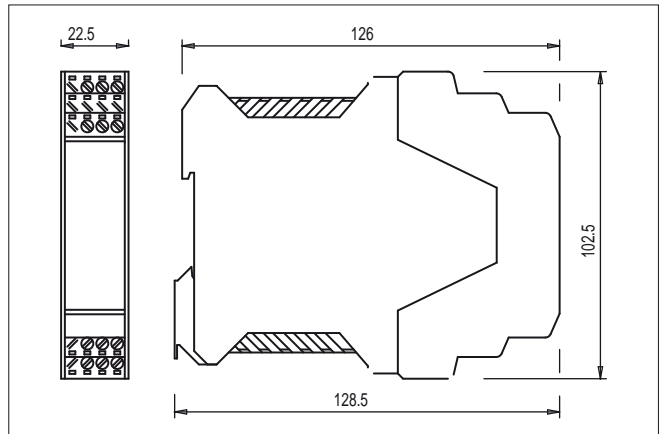
Design B, housing thickness 22.5 mm

Connection data

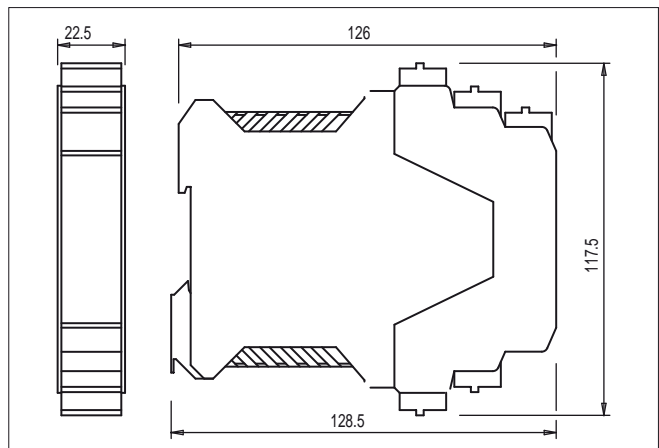
Terminals tightening torque:	0.5 ... 0.6 Nm
Cable cross section:	0.2...2.5 mm ²
	24 ... 12 AWG

Installation

Snap mounting to DIN rail



Connector with screw terminals



Connector with spring terminals



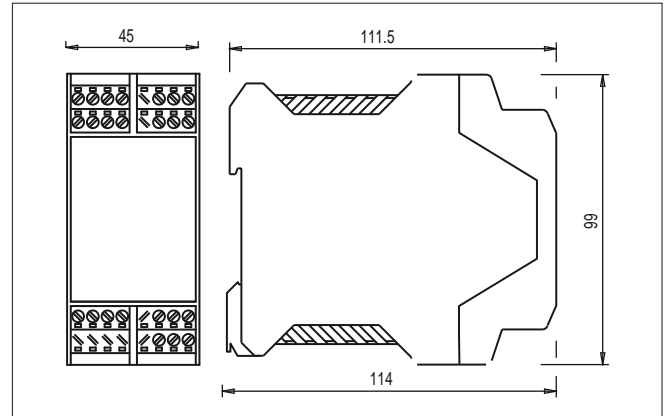
Design C, housing thickness 45 mm

Connection data

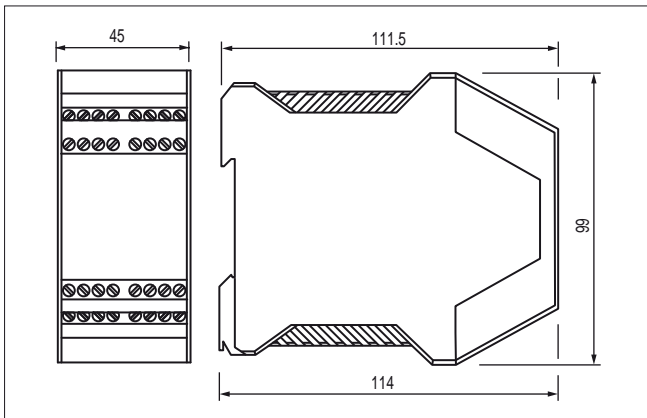
Terminals tightening torque: 0.5 ... 0.6 Nm
 Cable cross section: 0.2...2.5 mm²
 24 ... 12 AWG

Installation

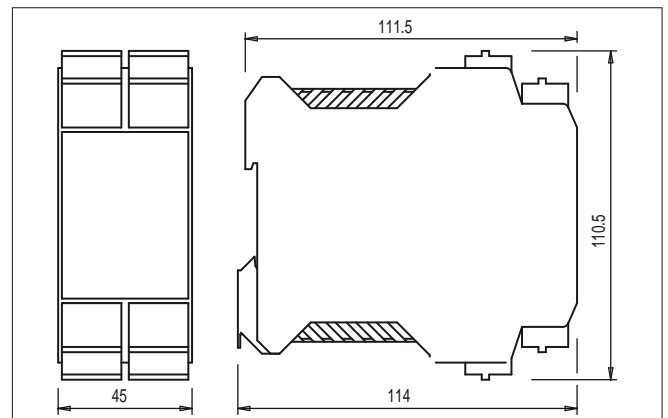
Snap mounting to DIN rail



Connector with screw terminals



Screw terminals



Connector with spring terminals

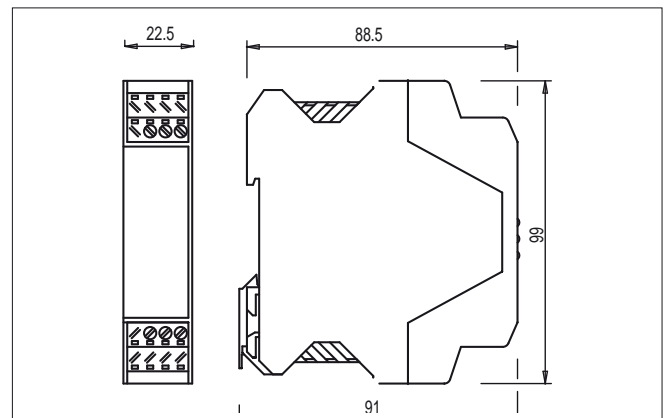
Design D, housing thickness 22.5 mm

Connection data

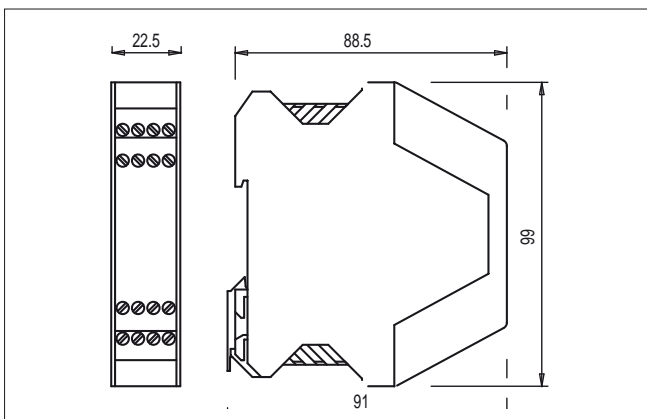
Terminals tightening torque: 0.5 ... 0.6 Nm
 Cable cross section: 0.2...2.5 mm²
 24 ... 12 AWG

Installation

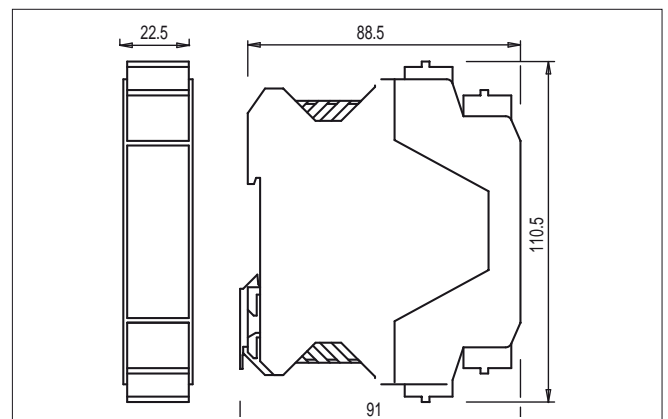
Snap mounting to DIN rail



Connector with screw terminals



Screw terminals



Connector with spring terminals

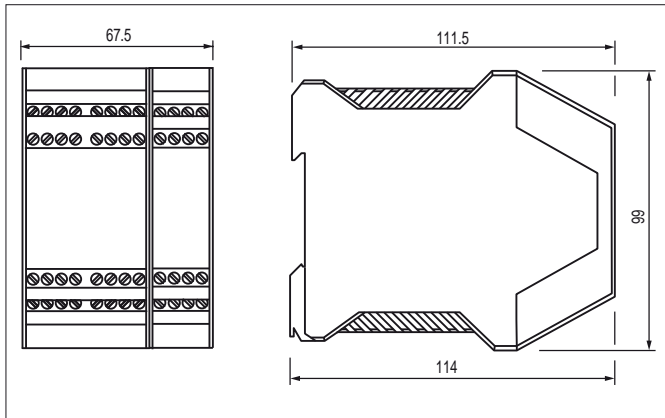
Design E, housing thickness 67.5 mm

Connection data

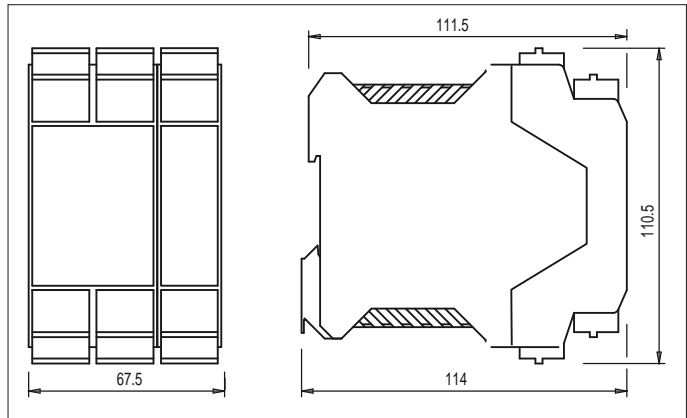
Terminals tightening torque:	0.5 ... 0.6 Nm
Cable cross section:	0.2...2.5 mm ²
	24 ... 12 AWG

Installation

Snap mounting to DIN rail



Screw terminals



Connector with spring terminals

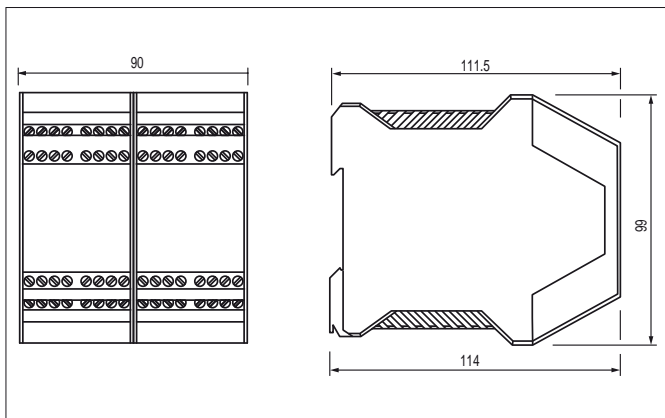
Design F, housing thickness 90 mm

Connection data

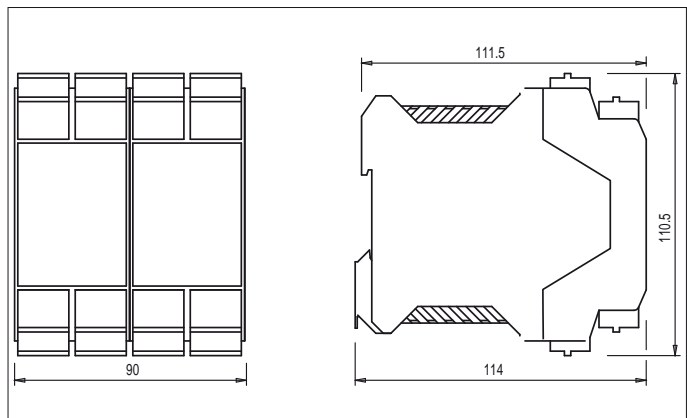
Terminals tightening torque:	0.5 ... 0.6 Nm
Cable cross section:	0.2...2.5 mm ²
	24 ... 12 AWG

Installation

Snap mounting to DIN rail



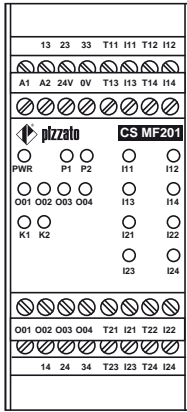
Screw terminals



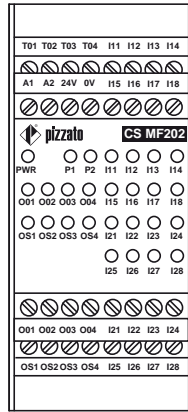
Connector with spring terminals



CS MF series terminal layout

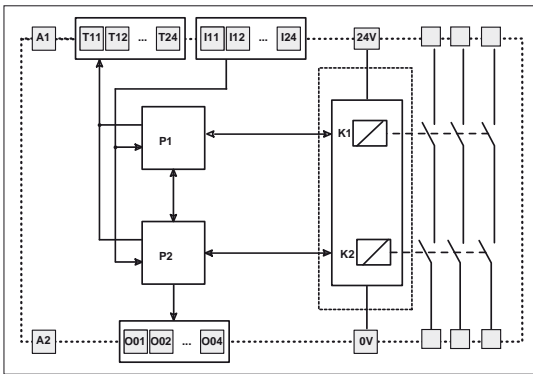


CS MF201

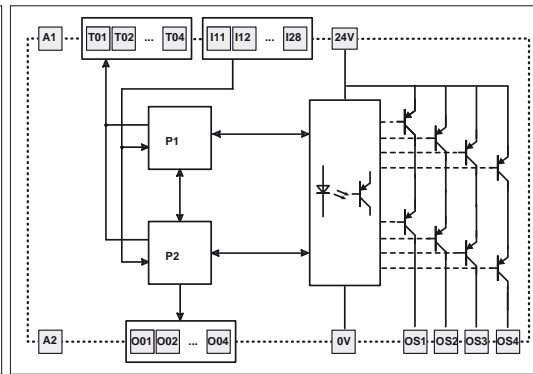


CS MF202

CS MF series internal wiring diagram



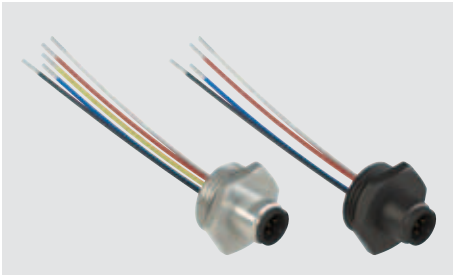
CS MF201



CS MF202

M12 plugs

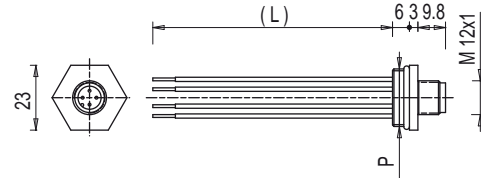
All measures in the drawings are in mm



These standard M12 plugs 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 switch with connector can be replaced with an identical one very quickly, avoiding the possibility of incorrect wiring.

Technical data:

Max. operating voltage:	250 Vac / 300 Vdc (4/5 poles) 30 Vac / 36 Vdc (8/12 poles)
Max. operating current:	4 A (4/5 poles) 2 A (8 poles) 1.5 A (12 poles)
Protection degree:	IP67 acc. to EN 60529
Ambient temperature:	-25°C ... +80°C
Tightening torque:	1 ... 1.5 Nm
Wire cross-section:	0.5 mm ² (20 AWG) for 4/5 poles 0.25 mm ² (24 AWG) for 8 poles 0.14 mm ² (26 AWG) for 12 poles gold-plated



Contact type: Conductor configuration

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.

article		options	
VF CNM5MM-L100			
Body material		Cable length (L)	
M metal		8.5 cm (standard)	
P plastic		L16 16 cm	
		L100 100 cm	
		L200 200 cm	
No. of poles		Connection type	
4 4 poles		M M12x1	
5 5 poles		Connector thread (P)	
8 8 poles		M M20 x 1.5 (standard)	
12 12 poles		P PG 13.5	

Stock items

- VF CNP4MM
- VF CNP4PM
- VF CNM5MM
- VF CNM5PM

ATTENTION: always cut off the power supply before disconnecting the connector. The connector is not suitable for separation of electrical loads.
Note: the 12-pin connector is only available in metal with M20x1.5 thread and 16 cm cables.

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

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

M12 sockets with cable

All measures in the drawings are in mm

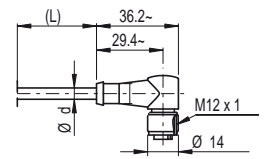
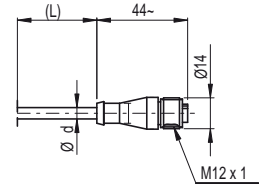


Technical data:

- Polyurethane connector body (4/5/8 poles)
- Polypropylene connector body (12 poles)
- Class 6 rated copper of the wires acc. to IEC 60228 for mobile installation (4/5/8 poles)
- Class 5 rated copper of the wires acc. to IEC 60228 for fixed installation (12 poles)
- Gold-plated contacts (resistance < 5 mΩ)
- Self locking ring nut
- High flexibility wire suitable to be used in movable chains, with PVC sheath conforming to IEC 60332-3 and CEI 20-22II standards. With polyurethane sheath on request (4/5/8 poles)
- PVC cable, fixed installation (12 poles)

Technical data:

Max. operating voltage: 250 Vac / 300 Vdc (4/5 poles)
 30 Vac / 36 Vdc (8/12 poles)
 Max. operating current: 4 A (4-5 poles) 2 A (8 poles) 1.5 A (12 poles)
 Protection degree: IP67 acc. to EN 60529
 IP69K acc. to ISO 20653
 Ambient temperature: (Protect the cables from direct high-pressure and high-temperature jets)
 -25°C ... +90°C for fixed installation (4/5/8 poles)
 -15°C ... +90°C for mobile installation (4/5/8 poles)
 -25°C ... +70°C for fixed installation (12 poles)
 Wire cross-section: 0.34 mm² (22 AWG) for 4 poles
 0.25 mm² (24 AWG) for 5/8 poles
 0.14 mm² (26 AWG) for 12 poles
 Minimum bending radius: > cable diameter x 10



Ø d: 5 mm for 4 and 5 poles
 6 mm for 8 poles
 6.5 mm for 12 poles

Conductor configuration

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	Connection type
4 4 poles	M M12x1
5 5 poles	
8 8 poles	
12 12 poles	
Sheath coating	
P PVC (standard)	
U PUR	
Connector type	
D straight (standard)	
G angled	
Cable length (L)	No. of poles
1 1 metre	4 5 8 12
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

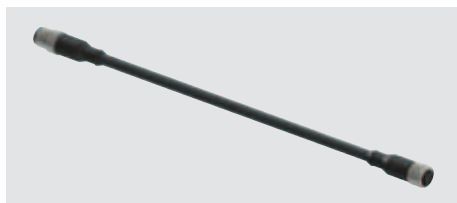
Attention! No stock item, minimum order quantity 100 pcs.

ATTENTION: always cut off the power supply before disconnecting the connector. The connector is not suitable for separation of electrical loads.

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

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

Extension cable with M12 connectors

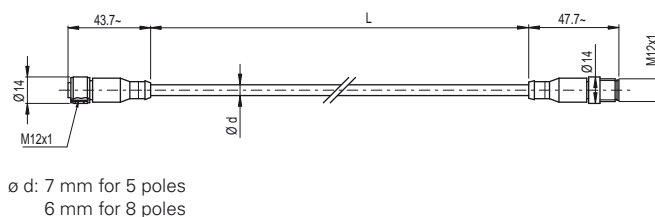


Technical data:

Polyurethane connector body
 Class 6 rated copper of the wires acc. to IEC 60228
 Gold-plated contacts (resistance < 5 mΩ)
 Self locking ring nut
 High flexibility cable suitable to be used in drag chains, with PVC sheath conforming to IEC 60332-3 and CEI 20-22II standards.

Technical data:

Max. operating voltage: 250 Vac / 300 Vdc (5 poles)
 30 Vac / 36 Vdc (8 poles)
 Max. operating current: 4 A (5 poles) 2 A (8 poles)
 Protection degree: IP67 acc. to EN 60529
 Ambient temperature: -25°C ... +90°C for fixed installation
 -15°C ... +90°C for mobile installation
 Wire cross-section: 0.5 mm² (20 AWG) (5 poles)
 0.25 mm² (24 AWG) (8 poles)
 Minimum bending radius: > cable diameter x 10



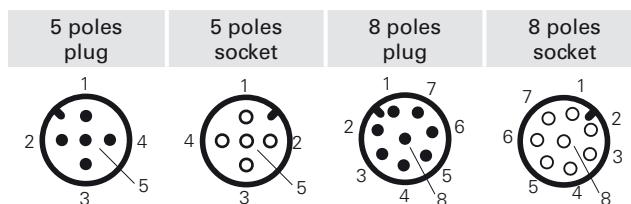
Ø d: 7 mm for 5 poles
 6 mm for 8 poles

Code structure

VF CA5PD3M-MD

No. of poles		Connection type	
5	5 poles	M	M12x1
8	8 poles		
Sheath coating		Cable length (L)	
P	PVC	3	3 metres (standard) • •
		5	5 metres (standard) • •
		0	10 metres (standard) •
			Other lengths on request
Connector type		No. of poles	
D	straight	5	• •
		8	• •

Conductor configuration



Articles

VF CA5PD3M-MD
 VF CA5PD5M-MD
 VF CA5PD0M-MD
 VF CA8PD3M-MD
 VF CA8PD5M-MD

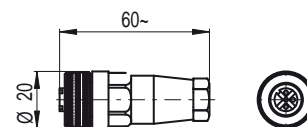
M12 sockets, field wireable

All measures in the drawings are in mm



General data

Technopolymer connector body
 Gold-plated contacts
 Screw terminals for wiring
 Max. operating voltages: 250 Vac/dc (4 and 5 poles)
 30 Vac/dc (8 poles)
 Maximum current: 4 A
 Protection degree: IP67 acc. to EN 60529
 Ambient temperature: -25°C ... +85°C
 Wire cross-section: from 0.25 mm² (24 AWG) to 0.5 mm² (20 AWG)



Article	Description	no. of poles
VF CBMP4DM04	Field wireable M12 socket, straight, for multipolar cables from Ø 4 to Ø 6.5 mm	4
VF CBMP5DM04	Field wireable M12 socket, straight, for multipolar cables from Ø 4 to Ø 6.5 mm	5
VF CBMP8DM04	Field wireable M12 socket, straight, for multipolar cables from Ø 4 to Ø 7 mm	8

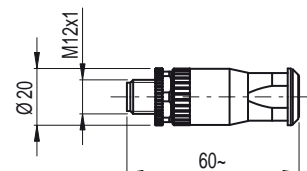
M12 plugs, field wireable

All measures in the drawings are in mm



General data

Technopolymer connector body
 Gold-plated contacts
 Screw terminals for wiring
 Max. operating voltages: 250 Vac/dc (5 poles)
 30 Vac/dc (8 poles)
 Maximum current: 4 A
 Protection degree: IP67 acc. to EN 60529
 Ambient temperature: -25°C ... +85°C
 Wire cross-section: from 0.25 mm² (24 AWG) to 0.5 mm² (20 AWG)

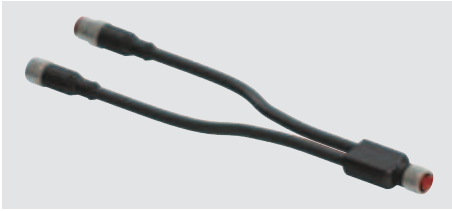


Article	Description	no. of poles
VF CCMP5DM04	Field wireable M12 plug, straight, for multipolar cables from Ø 4 to Ø 6.5 mm	5
VF CCMP8DM04	Field wireable M12 plug, straight, for multipolar cables from Ø 4 to Ø 7 mm	8

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

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

M12 connectors, Y-shaped, for series connections

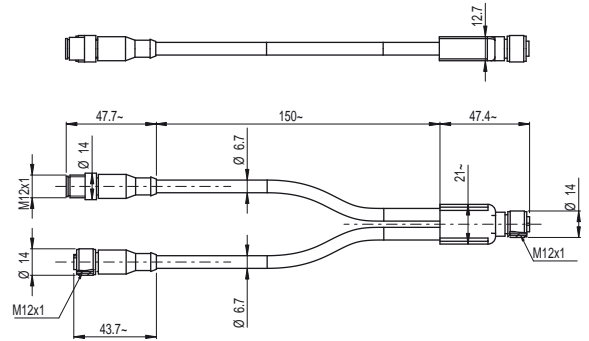


Technical data:

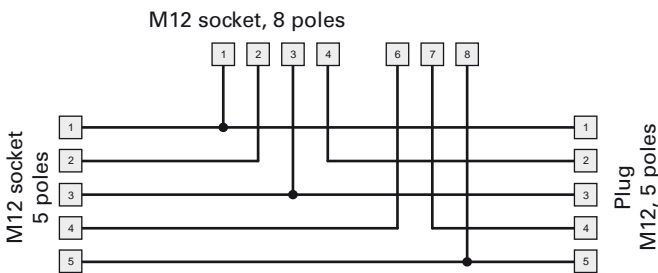
Polyurethane connector body
 Class 6 rated copper of the wires acc. to IEC 60228
 Gold-plated contacts (resistance < 5 mΩ)
 Self locking ring nut
 High flexibility cable suitable to be used in drag chains, with PVC sheath conforming to IEC 60332-3 and CEI 20-22II standards.

Technical data:

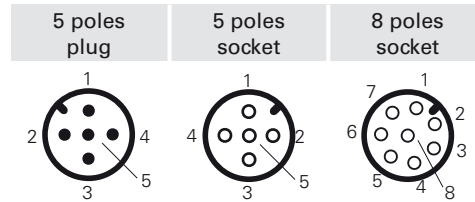
Max. operating voltage: 30 Vac / 36 Vdc
 Max. operating current: 4 A (4-5 poles) 2 A (8 poles)
 Protection degree: IP67 acc. to EN 60529
 Ambient temperature: -25°C ... +90°C for fixed installation
 -15°C ... +90°C for mobile installation
 Wire cross-section: 0.5 mm² (22 AWG)
 Minimum bending radius: > cable diameter x 10



Internal wiring diagram, Y-shaped connector



Conductor configuration



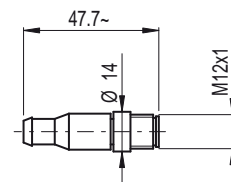
Article	Description
VF CY201P0	M12 connectors, Y-shaped, for series connections

M12 terminating plugs for series connections

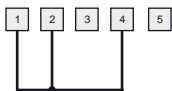


Technical data:

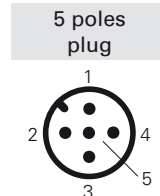
Polyurethane connector body
 Gold-plated contacts (resistance < 5 mΩ)
 Self locking ring nut
 Protection degree: IP67 acc. to EN 60529
 Max. operating voltage: 250 Vac / 300 Vdc
 Max. operating current: 4 A



Internal wiring diagram of the terminating plug



Conductor configuration



Article	Description
VF CY100P0	M12 terminating plugs for series connections, 5 poles

Series connection with Y-shaped M12 connectors

To facilitate and simplify the series wiring of the safety devices, a variety of accessories are available, designed specifically for this purpose. Based on the proven design of the M12 connector, which simply combines standard elements, category 4, PLE and SIL3 safety device chains are available, which can connect up to 32 devices in series. All of which is without the risk of connection errors and with a high IP67 protection degree. The safety chains are composed of a 24Vdc power supply unit, a series of extension cables to reach the various devices in the field, Y connectors to branch away from the chain towards each individual device, and a terminator to close the end of the line. A suitable safety module is used alongside the power supply unit to assess the state of the safety chain safe outputs.

Items connected in series

The series may consist of both devices that are identical to one another (homogeneous series) or belong to different series (mixed series).

Only 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•

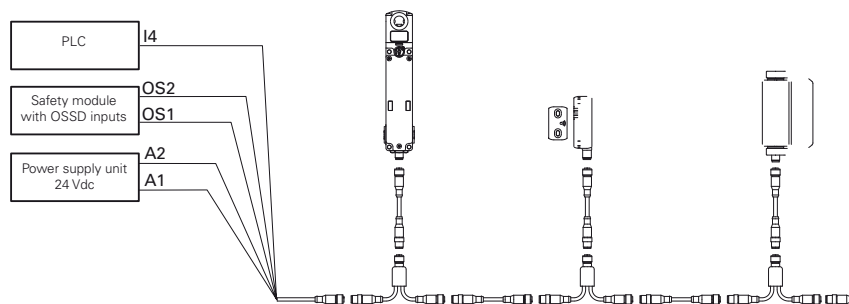
NG series safety switches with solenoid and RFID technology: Any item with an M12 connector for series connection with a "Y" connector or with option: K950, K951, K952

HX series safety hinge switches: HX BEE1••M

Electrical connection of the chain

Pin	Colour	Connection
1	Brown	A1 +24 Vdc supply input
2	White	OS1 Safety output
3	Blue	A2 0 V supply input
4	Black	OS2 Safety output
5	Grey	I4 Solenoid activation input

Note: By activating or deactivating the I4 input, all NG series switches in the chain will lock or unlock all the protections. Activation and deactivation of the I4 input has no effect on the ST sensors and HX hinges in the chain.

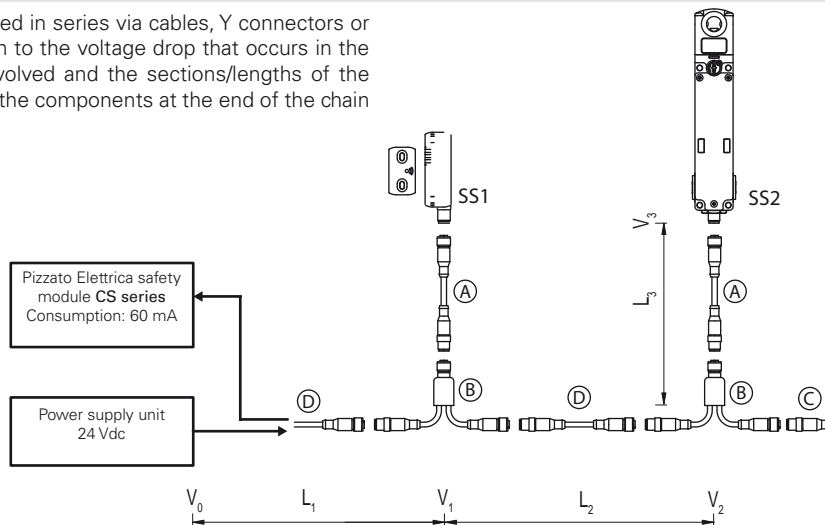


Connection example and voltage drop verification

Attention! For proper operation of the devices connected in series via cables, Y connectors or junction boxes, it is necessary to pay particular attention to the voltage drop that occurs in the circuit. In particular, we must evaluate the currents involved and the sections/lengths of the cables used, to ensure that under real usage conditions the components at the end of the chain are supplied within permissible limits.

Legend:

- L_1 length 1st section (m)
- L_2 length 2nd section (m)
- L_3 length 3rd section (m)
- V_0 Supply voltage (V)
- V_1 voltage at point 1 (V)
- V_2 voltage at point 2 (V)
- V_3 voltage at point 3 (V)
- I_1 transfer current 1st section (A)
- I_2 transfer current 2nd section (A)
- I_3 transfer current 3rd section (A)
- ρ copper resistance = $0.018 (\Omega \times \text{mm}^2/\text{m})$
- S wire cross-section (mm^2)
- SS1 safety sensor, 45 mA consumption (ST series)
- SS2 safety switch with lock, 505 mA consumption (NG series)
- (A): Extension cable with M12 connectors, $0,25 \text{ mm}^2$ (VF CA8PD5M-MD)
- (B): M12 connectors, Y-shaped (VF CY201P0)
- (C): Terminating plugs for series connections (VF CY100P0)
- (D): Extension cable with M12 connectors, $0,5 \text{ mm}^2$ (VF CA5PD0M-MD)



Data:

$$I_1 = I_{CS} + I_{SS1} + I_{SS2} = 60 + 45 + 505 = 610 \text{ mA}$$

$$I_2 = I_{SS2} = 505 \text{ mA}$$

$$I_3 = I_{SS2} = 505 \text{ mA}$$

$$V_0 = 24 \text{ V}$$

$$L_1 = 10 \text{ m}$$

$$L_2 = 10 \text{ m}$$

$$L_3 = 5 \text{ m}$$

$$S_1 = 0,5 \text{ mm}^2$$

$$S_2 = 0,5 \text{ mm}^2$$

$$S_3 = 0,25 \text{ mm}^2$$

Calculations:

$$V_1 = V_0 - \rho \times \frac{L_1}{S_1} \times I_1 = 24 - 0,018 \times \frac{10}{0,5} \times 0,61 = 23,7 \text{ V}$$

$$V_2 = V_1 - \rho \times \frac{L_2}{S_2} \times I_2 = 23,7 - 0,018 \times \frac{10}{0,5} \times 0,505 = 23,5 \text{ V}$$

$$V_3 = V_2 - \rho \times \frac{L_3}{S_3} \times I_3 = 23,5 - 0,018 \times \frac{5}{0,25} \times 0,505 = 23,3 \text{ V}$$

Conclusions:

Given the minimum SS2 supply voltage which is equal to $24 \text{ V} - 10\% = 21,6 \text{ V}$, which is $23,3 \text{ V} > 21,6 \text{ V}$, the device chain described above can be classed as properly dimensioned.

Junction box for series connection of up to 4 devices



Technical data:

Material: Self-extinguishing shock-proof polycarbonate with double insulation, UV resistant fibreglass reinforced, with increased shock resistance.

Screw material: stainless steel

Protection degree: IP67 acc. to IEC 60529
IP69K acc. to ISO 20653

Conduit entries: with cable gland having equal or higher protection degree

- 2 upper and lower inputs with knock out M20 - 1/2 NPT
- 2 side inputs with knock out M20 - 1/2 NPT - M25
- 2 base inputs with knock out M16

Ambient temperature: -40°C ... +80°C

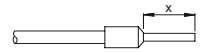
Tightening torque of the cover screws: 1 ... 1.4 Nm

Connection system: PUSH-IN spring type

Cross-section of rigid wires and flexible wires with wire-end sleeve: min. 1 x 0.34 mm² (1 x AWG 24)
max. 1 x 1.5 mm² (1 x AWG 16)

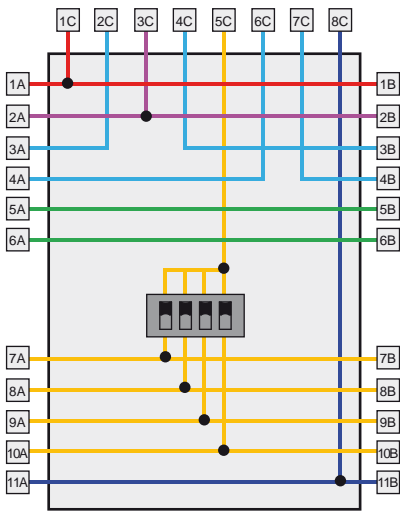
Wire cross-section with pre-insulated wire-end sleeve: min. 1 x 0.34 mm² (1 x AWG 24)
max. 1 x 0.75 mm² (1 x AWG 18)

Cable stripping length (x): min.: 8 mm
max.: 12 mm



Article	Description
VF CY302P0	Junction box for series connection of up to 4 devices

Conductor configuration



Example of series connection of 4 NG series switches

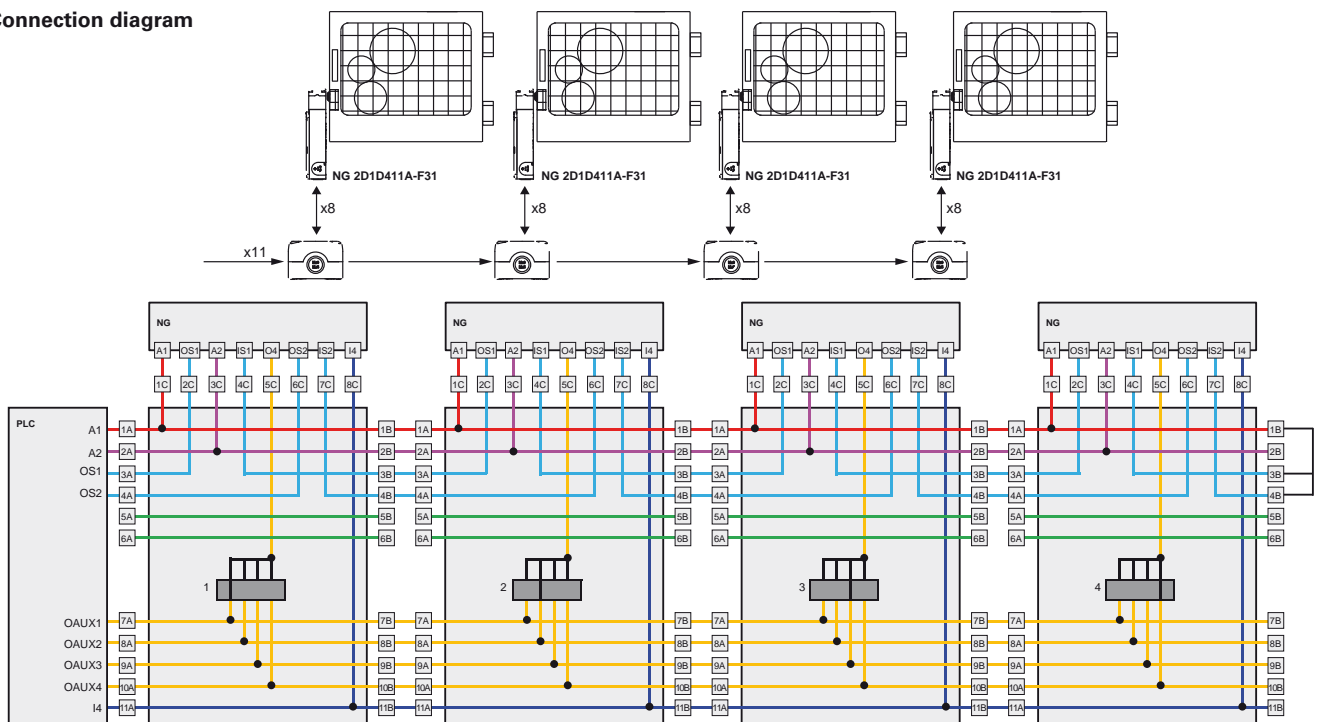
Terminal box	Connection
1A	A1 +24 Vdc supply input
2A	A2 0 V supply input
3A	OS1 Safety output
4A	OS2 Safety output
5A	Auxiliary connection
6A	Auxiliary connection
7A	O AUX1 Auxiliary output Oaux1
8A	O AUX2 Auxiliary output Oaux2
9A	O AUX3 Auxiliary output Oaux3
10A	O AUX4 Auxiliary output Oaux4
11A	I4 Solenoid activation input

Terminal box	Connection
1B	A1 +24 Vdc supply input
2B	A2 0 V supply input
3B	IS1 Safety input
4B	IS2 Safety input
5B	Auxiliary connection
6B	Auxiliary connection
7B	O AUX1 Auxiliary output Oaux1
8B	O AUX2 Auxiliary output Oaux2
9B	O AUX3 Auxiliary output Oaux3
10B	O AUX4 Auxiliary output Oaux4
11B	I4 Solenoid activation input

Terminal box	Connection
1C	A1 +24 Vdc supply input
2C	OS1 Safety output
3C	A2 0 V supply input
4C	IS1 Safety input
	O3 Signalling output, actuator inserted
5C	O4 Signalling output, actuator inserted and locked
6C	OS2 Safety output
7C	IS2 Safety input
8C	I4 Solenoid activation input



Connection diagram



M8 sockets with cable

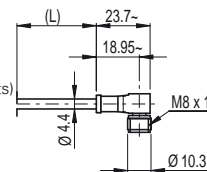
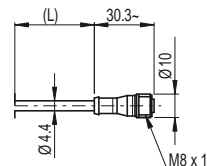


Technical data:

Polyurethane connector body
Class 6 rated copper of the wires acc. to IEC 60228
Gold-plated contacts (resistance < 5 mΩ)
Self locking ring nut
High flexibility cable suitable to be used in drag chains, with PVC sheath conforming to IEC 60332-3 and CEI 20-22II standards.
With polyurethane sheath on request.

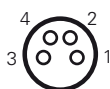
Max. operating voltage: 60 Vac / 75 Vdc
Max. operating current: 4 A
Protection degree: IP67 acc. to EN 60529
IP69K acc. to ISO 20653
(Protect the cables from direct high-pressure and high-temperature jets)
Ambient temperature: -25°C ... +90°C for fixed installation
-15°C ... +90°C for mobile installation
Wire cross-section: 0.25 mm² (24 AWG)
Minimum bending radius: > cable diameter x 10

All measures in the drawings are in mm



Conductor configuration

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 (standard)
3	3 poles

Sheath coating

P	PVC (standard)
U	PUR

Connector type

D	straight (standard)
G	angled

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! No stock item,
minimum order quantity 100 pcs.

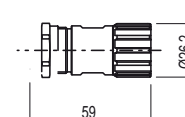
M23 sockets, 12 poles, without cable

All measures in the drawings are in mm



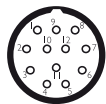
Technical data:

Body: metal, nickel-plated
Max. operating voltage: 300 Vac
Dielectric strength: 2500 Vac for 1 minute
Max. operating current: 8 A
Protection degree: IP67 / IP69K
Ambient temperature: -40°C ... +125°C
Tightening torque: 1 ... 1.5 Nm
Contact type: gold-plated (resistance < 3 mΩ)
Pollution degree: 3
Mating cycles: > 1000

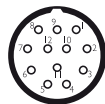


Pin configuration

12 poles



clockwise numbering



counterclockwise numbering

Article	Description
---------	-------------

VF AC2205

Nut fastener



M23 connector nut fastener,
article:
VF CBSM12DS07.
Required for opening and
wiring the connector.

Code structure

VF CBSM12TS07

Connection type

S	M23x1
----------	-------

Body material

M	metal
----------	-------

No. of poles

12	12 poles
-----------	----------

Cable diameter

07	from Ø 7 to Ø 12 mm
-----------	------------------------

Pin connection type

S	solder 0.34 ... 1 mm ²
----------	--------------------------------------

Connector type

T	clockwise numbering (standard)
D	counterclockwise numbering

Stock items

VF CBSM12TS07

Items with code on green background are stock items

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

Wiretrap cable glands

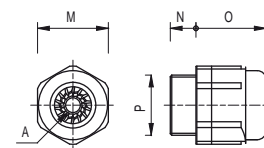
10 pcs. packs



The design of this cable gland improves the retention forces of the wires. Each type of cable gland accepts a wide range of cable diameters.
Only fit for circular cables.

Technical data:

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 from Ø 10 ... 17 mm	⊙	30	10	28	M25x1.5
	VF PAM20C6N	M20x1.5 cable gland for one cable from 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 from Ø 3 ... 7 mm	⊙	24	9	24	M20x1.5
	VF PAM16C5N	M16x1.5 cable gland for one cable from Ø 5 ... 10 mm	⊙	22	7.5	23	M16x1.5
	VF PAM16C4N	M16x1.5 cable gland for one cable from Ø 4 ... 8 mm	⊙	22	7.5	23	M16x1.5
	VF PAM16C3N	M16x1.5 cable gland for one cable from Ø 3 ... 7 mm	⊙	22	7.5	23	M16x1.5
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
Metric threads	VF PAM20CBN	M20x1.5 multi hole cable gland for 2 cables from Ø 3 ... 5 mm	⊙	24	9	23	M20x1.5
	VF PAM20CDN	M20x1.5 multi hole cable gland for 3 cables from Ø 1 ... 4 mm	⊙	24	9	23	M20x1.5
	VF PAM20CEN	M20x1.5 multi hole cable gland for 3 cables from Ø 3 ... 5 mm	⊙	24	9	23	M20x1.5
	VF PAM20CFN	M20x1.5 multi hole cable gland for 4 cables from Ø 1 ... 4 mm	⊙	24	9	23	M20x1.5

Thread adapters

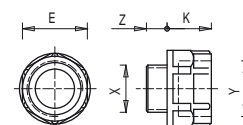
100 pcs. packs



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.

Technical data:

Body material: reinforced technopolymer with glass fibre
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

100 pcs. packs

**Technical data:**

Body material: technopolymer
Protection degree: IP67 acc. to EN 60529
Tightening torque: from 1.2 to 1.6 Nm (PG13.5 / M20)
1 ... 1.4 Nm (PG11 / M16)



Article	Description	A	B
VF PTM20	Protection cap M20x1,5	25	M20x1.5
VF PTM16	Protection cap M16x1,5	23	M16x1.5
VF PTG13,5	Protection cap PG13,5	25	PG 13.5
VF PTG11	Protection cap PG11	23	PG 11

All measures in the drawings are in mm

Items with code on green background are stock items

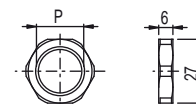
→ The 2D and 3D files are available at www.pizzato.com

Plastic nuts, threaded

100 pcs. packs

**Technical data:**

Body material: technopolymer
Tightening torque: 1.2 ... 2 Nm



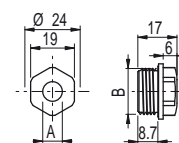
Article	Description	S	CH	P
VF DFPM25	Plastic nut, threaded, M25x1.5	6	32	M25x1.5
VF DFPM20	Plastic nut, threaded, M20x1.5	6	27	M20x1.5
VF DFPM16	Plastic nut, threaded, M16x1.5	5	22	M16x1.5
VF DFPP13	Plastic nut, threaded, PG13.5	6	27	PG 13.5

Chock plugs

100 pcs. packs

**Technical data:**

Body material: technopolymer
Protection degree: IP54 acc. to EN 60529
Tightening torque: 0.8 ... 1 Nm

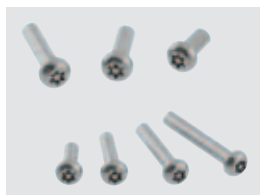


Notes: Use a socket wrench for tightening.

Article	Description	A	B
VF PFM20C8N	Cable gland cap for Ø 8 ... Ø 12 mm cable, threaded M20x1.5	7.5	M20x1.5
VF PFM20C4N	Cable gland cap for Ø 4 ... Ø 8 mm cable, threaded M20x1.5	3.5	M20x1.5

Safety screws Torx

10 pcs. packs



Pan head screws with Torx fitting and pin, stainless steel.
Where required for applications conforming to EN ISO 14119 use a thread locker.

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 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

Safety screws One-Way

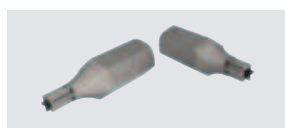
10 pcs. packs



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

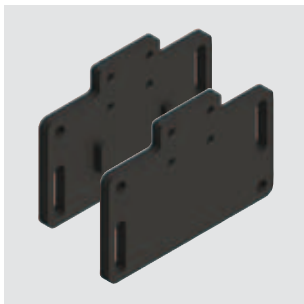
Fixing plates



Metal fixing plate, designed to fix rope switches on the ceiling.
The plate is provided with many fixing holes suitable for all series of switches. 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 the adjustment of the operating point.

Every plate has a double couple of fixing holes, one for standard switches and the other one for switches with reset device. In this way the actuator will always have the same actuating point.

Article	Description
VF SFP1	Fixing plate (FR series)
VF SFP3	Fixing plate (FX series)

Indicator lights

5 pcs. packs

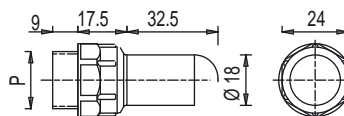


These indicator lights are used for visualizing a change of the state of an electric contact inside the switch. They can be installed only on series FL, FX, FZ, FW, FG or FS switches by screwing them on one of the conduit entries not used for electric cables, and they can have many different functions: for example, combined with a rope switch (e.g. FL 1878-M2) they can indicate (also in the distance) if the switch has been actuated.

Otherwise, combined with safety switches with separate actuator (e.g. FL 693-M2), they can indicate if the protection is closed correctly or not. Combined with a safety switch with solenoid (FS or FG series), they can indicate if the protection is locked or unlocked. Combined with any switch of FL, FX,, FW or FZ series they can be used to calibrate the actuator. The light indicators are decomposable in two parts for bulb replacement without removing the lamp holder from the switch, and their inner part can rotate in such a way that it can be wired and screwed on the switch without any risk of kinking the wires.

Technical data:

Max. operating voltage U_i :	250 Vac/dc
Rated impulse withstand voltage (U_{imp}):	4 kV
Bulb max. power:	3 W
Protection degree:	IP67 acc. to EN 60529
Bulb connection:	BA9
Cable cross-section:	min. 0.5 mm ² max. 1.5 mm ²
Ambient temperature:	-25°C ... +40°C
Tightening torque:	3 ... 4 Nm



Code structure

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

VF ILI024GM

Bulb type	
I	incandescence
X	without bulb

Thread (P)	
M	M20 x 1.5 (standard)
P	PG 13.5

Stock items

VF ILI024GM
VF ILI024RM
VF ILI024VM
VF ILX000GM
VF ILX000RM
VF ILX000VM



Bulb voltage	
024	24 Vac/dc ±10%
110	110 Vac/dc ±10%
220	220 Vac/dc ±10%
000	without bulb

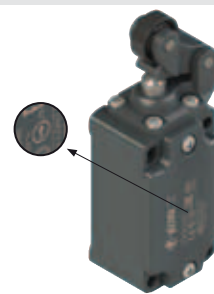
Cover colour	
G	yellow
R	red
V	green
W	white

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

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

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 in the same protection two or more switches are used, it is possible to connect the contact NO to the safety circuit. In this case at least one of the two switches must have a 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 .
- Operate the switch **at least with the positive opening force**, indicated between brackets below each article, aside the minimum force value.
- The fixing of the device must occur in compliance with the standard 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 NC normally closed contacts (11-12, 21-22, 31-32) is guaranteed.

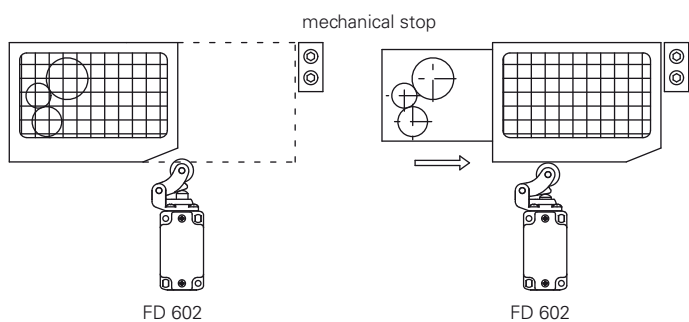


Fig.1

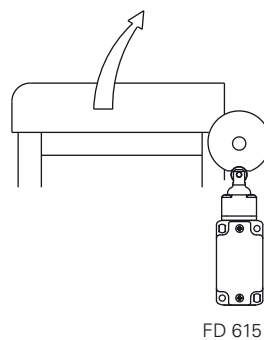


Fig.2

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).

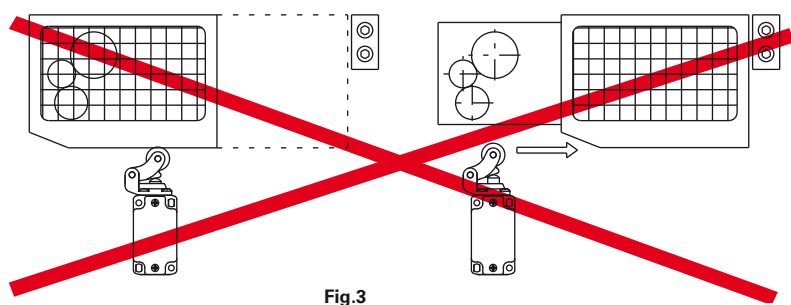


Fig.3

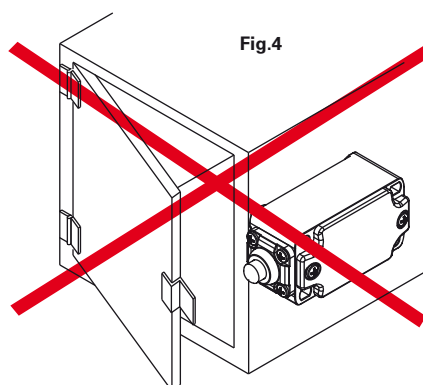
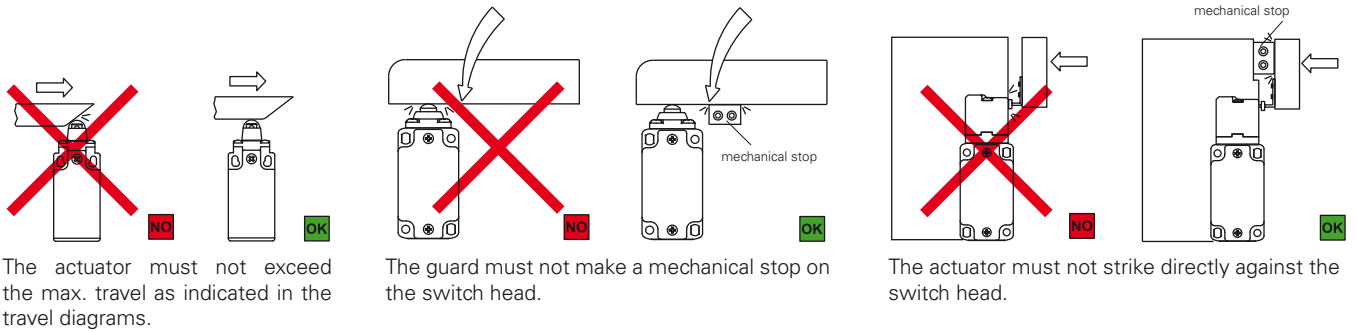


Fig.4

Mechanical stop

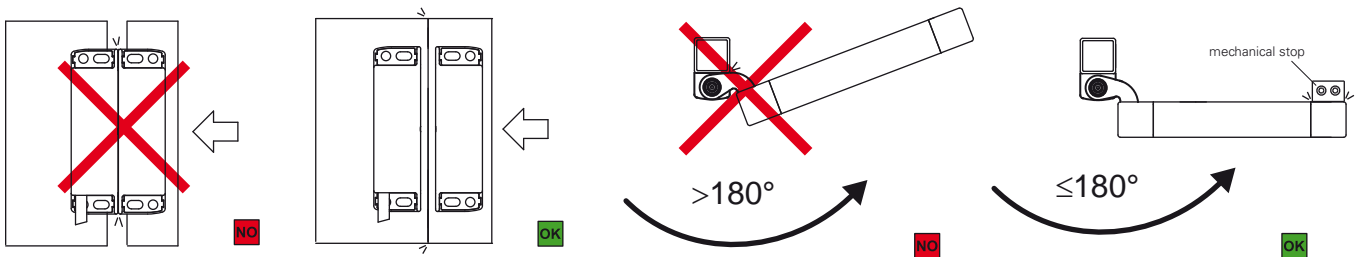
Acc. to EN ISO 14119 paragraph 5.2 letter h) "the position sensors must not be used as mechanical stop"



The actuator must not exceed the max. travel as indicated in the travel diagrams.

The guard must not make a mechanical stop on the switch head.

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 and HC series must not exceed 180°.

Actuation modes

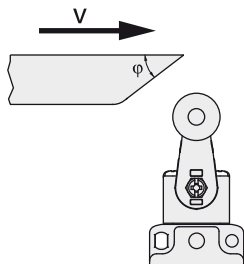
Recommended application	Application to avoid <small>Possible application but with mechanical stress for the switch higher than expected, mechanical endurance is not guaranteed</small>	Forbidden application

Switches for heavy duty applications

Maximum and minimum actuation speed (FD-FL-FP-FC series)

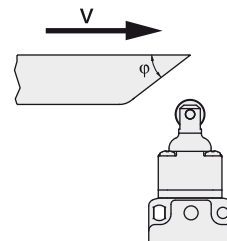
Roller lever - Type 11

φ	Vmax (m/s)	Vmin (mm/s)	
		L	R
15°	2,5	9	0,07
30°	1,5	8	
45°	1	7	
60°	0,75	7	



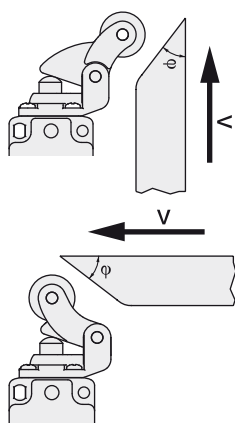
Roller plunger - Type 22

φ	Vmax (m/s)	Vmin (mm/s)	
		L	R
15°	1	4	0,04
30°	0,5	2	0,02
45°	0,3	1	0,01



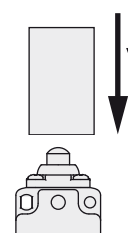
Roller lever - Type 33

φ	Vmax (m/s)	Vmin (mm/s)	
		L	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	R
0,5	1	0,01

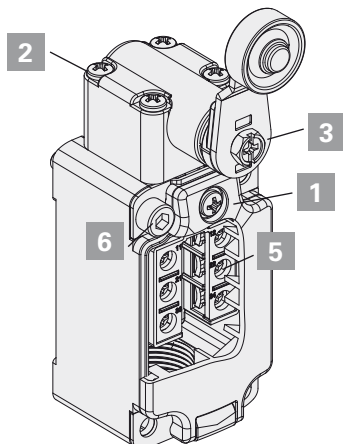


Contact type:

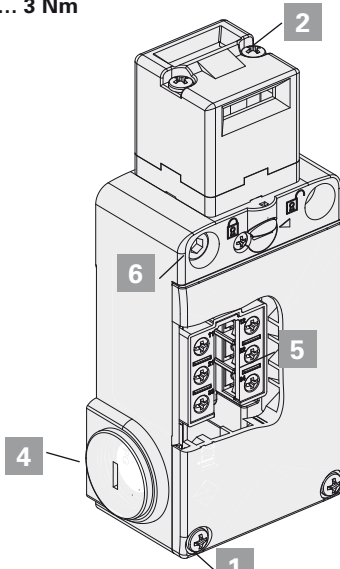
- R** = snap action
- L** = slow action

Tightening torques FD-FL-FP-FC-FG-FS-NG series

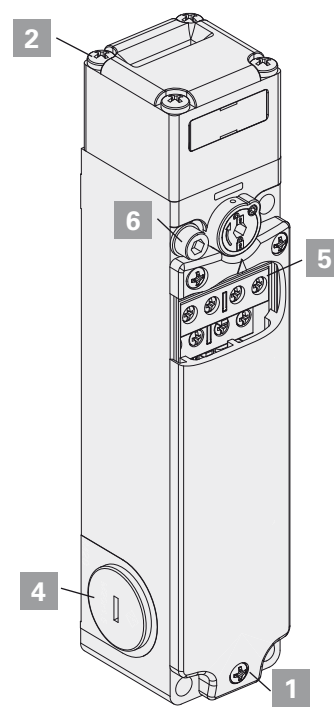
- Cover screws **1** 0.8 ... 1.2 Nm
- Head screws **2** 0.8 ... 1.2 Nm
- Lever screw **3** 0.8 ... 1.2 Nm
- Protection caps **4** (conduit entry M20/PG13.5) 1.2 ... 1.6 Nm
- (conduit entry M16/PG11) 1 ... 1.4 Nm
- Contact block screws **5** 0.6 ... 0.8 Nm
- M5 body fixing screws (with washer for FS series) **6** 2 ... 3 Nm



FD-FL-FC-FP



FS



FG-NG

Switches for heavy duty applications FD-FL-FP-FC series

Travel diagrams

Contact blocks	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6 inverted contacts
2 2x(1NO-1NC) 						
3 1NO-1NC 						
5 1NO+1NC 						
6 1NO+1NC 			/			
7 1NO+1NC 			/			
9 2NC 			/			
10 2NO 						
11 2NC 			/		/	
12 2NO 			/			
13 2NC 			/			
14 2NC 			/			
15 2NO 			/			
16 2NC 	/	/	/		/	/
18 1NO+1NC 						
20 1NO+2NC 						
21 3NC 						
22 2NO+1NC 						
28 1NO+2NC 			/			/
29 3NC 			/			/
30 3NC 			/			/
33 1NO+1NC 						
34 2NC 						
37 1NO+1NC 			/			
66 1NC 			/			
67 1NO 						

Legend

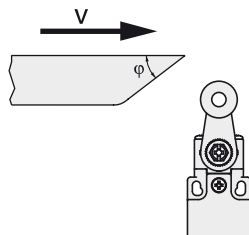
Closed contact |
 Open contact |
 Positive opening travel acc. to EN 60947-5-1 |
 Pushing the switch /
 Releasing the switch

Switches for normal duty applications

Maximum and minimum actuation speed (FR-FM-FX-FZ-FK series)

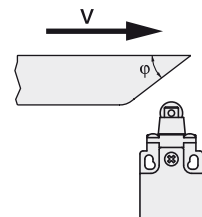
Roller lever - Type 1

φ	Vmax (m/s)	Vmin (mm/s)	
		L	R
15°	2,5	9	0,07
30°	1,5	8	
45°	1	7	
60°	0,75	7	



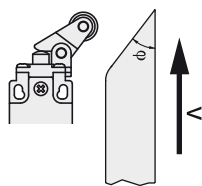
Roller plunger - Type 2

φ	Vmax (m/s)	Vmin (mm/s)	
		L	R
15°	1	4	0,04
30°	0,5	2	0,02
45°	0,3	1	0,01



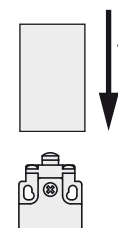
Roller lever - Type 3

φ	Vmax (m/s)	Vmin (mm/s)	
		L	R
15°	1	5	0,05
30°	0,5	2,5	0,025
45°	0,3	1,5	0,015



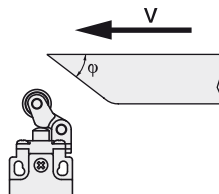
Plunger - Type 4

Vmax (m/s)	Vmin (mm/s)	Vmin (mm/s)
	L	R
0,5	1	0,01



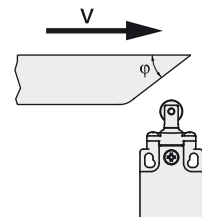
Contact type:

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



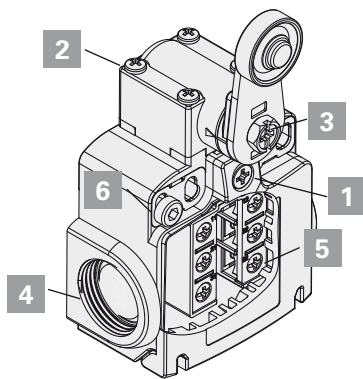
Roller plunger - Type 5

φ	Vmax (m/s)	Vmin (mm/s)	
		L	R
15°	0,3	4	0,04
30°	0,2	2	0,02



Tightening torques (FR, FX, FK and FW series)

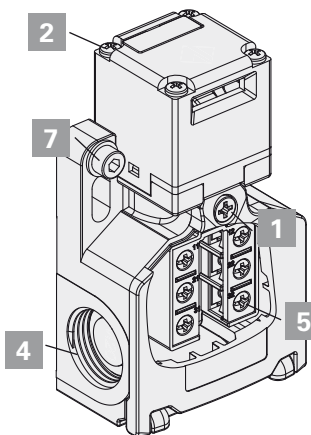
- Cover screws **1** 0.7 ... 0.9 Nm
- Head screws **2** 0.5 ... 0.7 Nm
- Lever screw **3** 0.7 ... 0.9 Nm
- Protection caps **4** (conduit entry M20/PG13.5) 1.2 ... 1.6 Nm
- (conduit entry M16/PG11) 1 ... 1.4 Nm
- Contact block screws **5** 0.6 ... 0.8 Nm
- M4 body fixing screws (with washer for FR-FK series) **6** 2 ... 3 Nm
- M5 body fixing screws (with washer for FW series) **7** 2 ... 3 Nm



FR-FX-FK-FM-FZ

Tightening torques (FM and FZ series)

- Cover screws **1** 0.8 ... 1.2 Nm
- Head screws **2** 0.8 ... 1.2 Nm
- Lever screw **3** 0.8 ... 1.2 Nm
- Protection caps **4** (conduit entry M20/PG13.5) 1.2 ... 1.6 Nm
- (conduit entry M16/PG11) 1 ... 1.4 Nm
- Contact block screws **5** 0.6 ... 0.8 Nm
- M4 body fixing screws **6** 2 ... 3 Nm



FM

Switches for normal duty applications (FR-FM-FX-FZ-FK series)

Travel diagrams

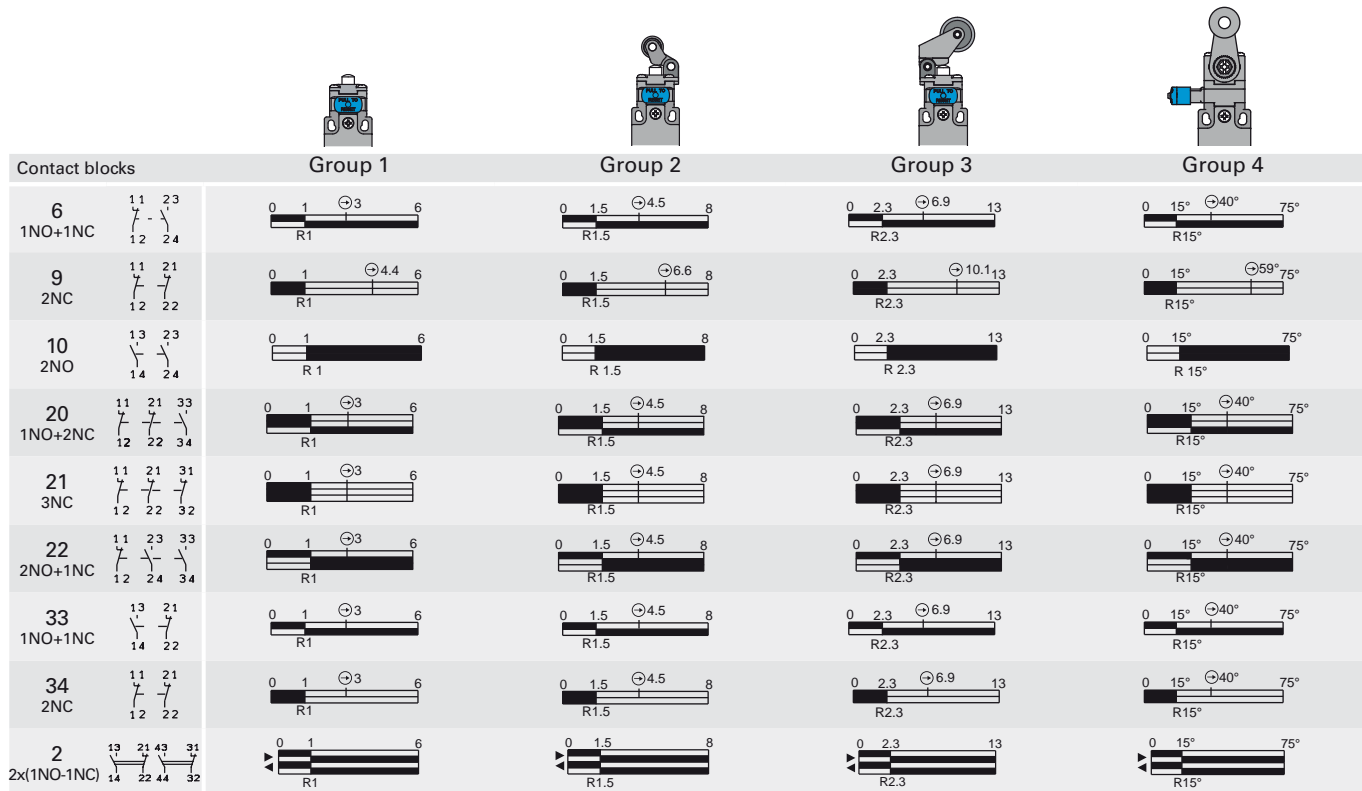
Contact blocks	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7 inverted contacts
2 2x(1NO-1NC) 							
3 1NO-1NC 							
5 1NO+1NC 							
6 1NO+1NC 				/			
7 1NO+1NC 				/			
9 2NC 				/			
10 2NO 							
11 2NC 				/		/	
12 2NO 							
13 2NC 				/			
14 2NC 				/			
15 2NO 				/			
16 2NC 	/	/	/	/		/	/
18 1NO+1NC 							
20 1NO+2NC 							
21 3NC 							
22 2NO+1NC 							
28 1NO+2NC 				/			
29 3NC 				/			
30 3NC 				/			
33 1NO+1NC 							
34 2NC 							
37 1NO+1NC 				/			
66 1NC 							
67 1NO 							

Legend

Closed contact |
 Open contact |
 Positive opening travel acc. to EN 60947-5-1 |
 Pushing the switch /
 Releasing the switch

Switches with reset W3 for normal duty applications, FR-FM-FX-FZ-FK series

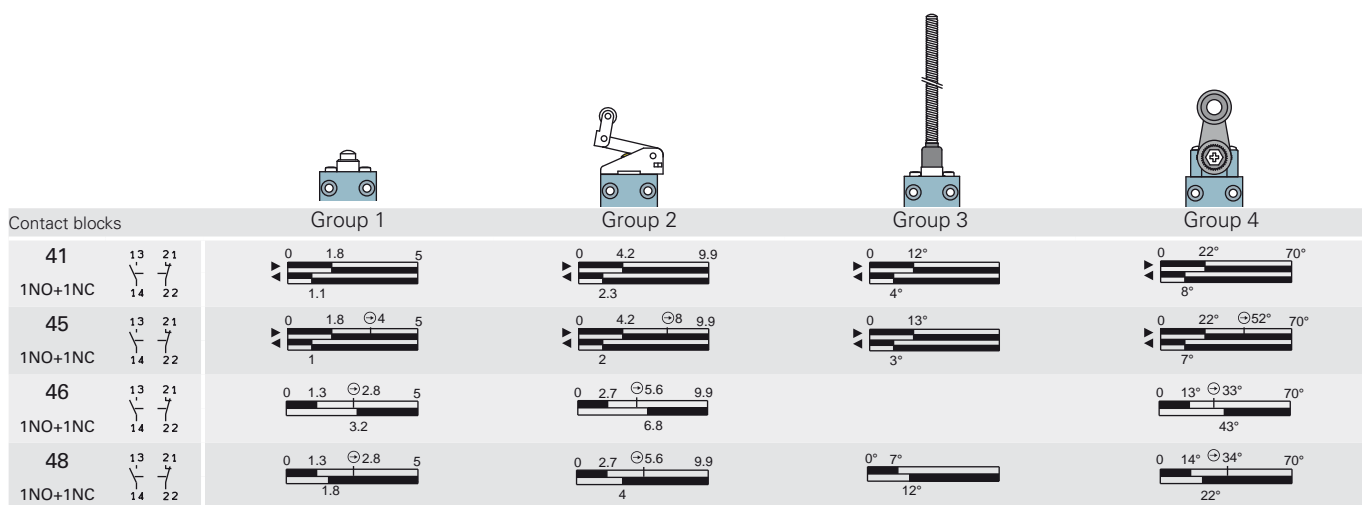
Travel diagrams



Legend
 Closed contact | Open contact | Positive opening travel acc. to EN 60947-5-1 | Pushing the switch / Releasing the switch | R travel for reset attachment

Prewired switches FA series

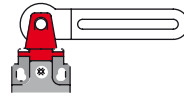
Travel diagrams



Legend
 Closed contact | Open contact | Positive opening travel acc. to EN 60947-5-1 | Pushing the switch / Releasing the switch

Switches for safety applications, FR-FM-FX-FZ-FK-FW series

Travel diagrams



Contact blocks		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

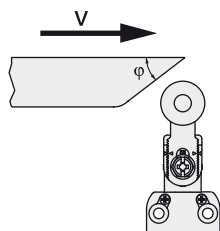
Closed contact |
 Open contact |
 Positive opening travel acc. to EN 60947-5-1 |
 Pushing the switch /
 Releasing the switch

Modular prewired switches (NA-NB-NF series)

Maximum and minimum actuation speed

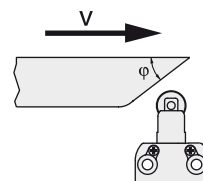
Roller lever - Type 1

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	



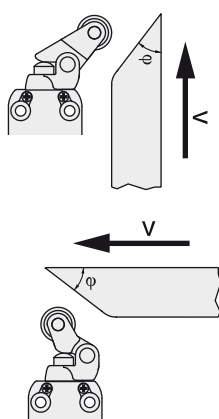
Roller plunger - Type 2

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



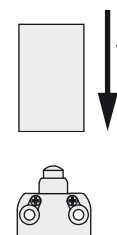
Roller lever - Type 3

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



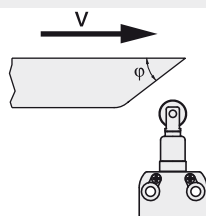
Plunger - Type 4

Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
0,5	1	0,01



Roller plunger - Type 5

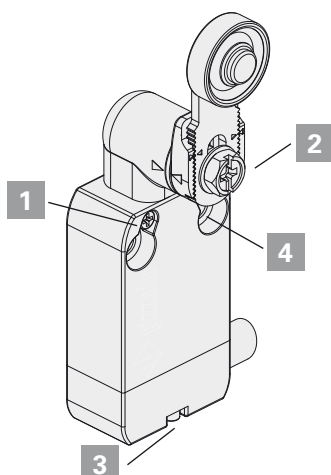
φ	Vmax (m/s)	Vmin (mm/s) L	Vmin (mm/s) R
15°	0,3	4	0,04



Contact type:

R = snap action
L = slow action

Screw tightening torques



For NA and NB series:


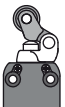


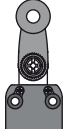

Head screws **1** **0.5 ... 0.7 Nm**
 Lever screws **2** **0.8 ... 1.2 Nm**
 Connector screw **3** **0.3 ... 0.6 Nm**
 M4 body fixing screws **4** **2 ... 3 Nm**

For NF series:






Head screws **1** **0.3 ... 0.4 Nm**
 Lever screws **2** **0.8 ... 1.2 Nm**
 Connector screw **3** **0.2 ... 0.3 Nm**
 M4 body fixing screws **4** **2 ... 3 Nm**

Modular prewired switches (NA-NB-NF series)

Travel diagrams

						
Contact blocks	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
B11 1NO+1NC						
B02 2NC						
B12 1NO+2NC						
B22 2NO+2NC						
G11 1NO+1NC				/		
G02 2NC						
G12 1NO+2NC				/		
G22 2NO+2NC				/		
H11 1NO+1NC						
H12 1NO+2NC						
H22 2NO+2NC						
L11 1NO+1NC						
L12 1NO+2NC						
L22 2NO+2NC						
BA1 1NO+1NC in deviation						

Legend

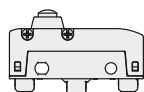
 Closed contact |
  Open contact |
  Positive opening travel acc. to EN 60947-5-1 |
  Pushing the switch /
  Releasing the switch

Microswitches MK series

Maximum and minimum actuation speed

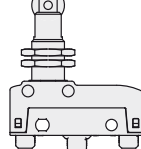
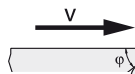
Plunger - Type 1

Vmax (m/s)	Vmin (mm/s)
0,5	0,05



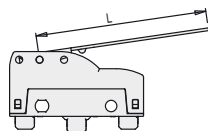
Roller plunger - Type 2

φ	Vmax (m/s)	Vmin (mm/s)
15°	0,6	0,2
30°	0,3	0,1
45°	0,1	0,05



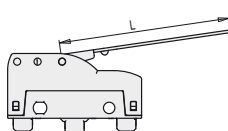
Lever with direct action (D) - Type 3

Vmax (m/s)	Vmin (mm/s)
0,03 x L	0,0166 x L



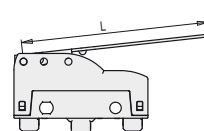
Lever with inverted action (R) - Type 4

Vmax (m/s)	Vmin (mm/s)
0,015 x L	0,0083 x L



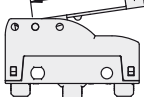
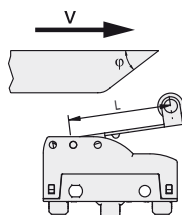
Lever with back direct action (F) - Type 5

Vmax (m/s)	Vmin (mm/s)
0,01 x L	0,0047 x L



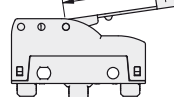
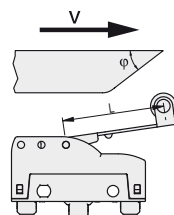
Roller lever with direct action (D) - Type 6

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



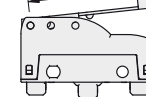
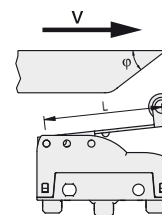
Roller lever with inverted action (R) - Type 7

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

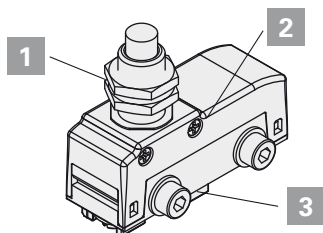


Roller lever with back direct action (F) - Type 8

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



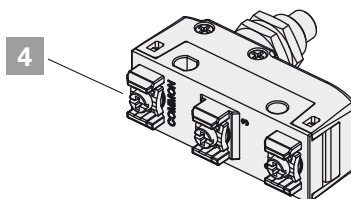
Tightening torques



Tighten the nuts **1** with a torque of **2 ... 3 Nm**.
Tighten the head screws **2** with a torque of **0.3 ... 0.4 Nm**.

Tighten the M4 screws **3** with a torque of **0.8 ... 1.2 Nm**, insert washer.

Attention: A tightening torque higher than 1.2 Nm can cause the breaking of the microswitch.



Tighten the terminal screws **4** with a torque of **0.6 ... 0.8 Nm**.

General prescriptions

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 perforated housing for inserting the wires. In order to guarantee an adequate protection degree of the device, the wiring through the hole must be done with an appropriate sealing that prevents polluting agents from entering. For a correct wiring then the cable glands, fittings, connectors and other means must have the IP protection degree according to EN 60529 equal to or higher than the one 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 entails the cessation of the warranty on the item and relieves the manufacturer of any liability.

Device utilization

- 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 to be operated 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 actuating travel.
- Do not exceed the maximum actuation travel.
- Avoid contact 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 whole device.
- In case the device is deformed or damaged replace it completely. There is no guarantee of working for a deformed or damaged device.
- Always attach the following instructions in the manual of the machine where the device is installed
- The preservation of the following instructions for use has to allow their consultation for the whole utilization period of the device.

Wiring and installation

- The installation has to be made by qualified staff.
- Limit the use of these devices to control functions.
- 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.
- Turn off the power before access to the contacts, also during the wiring.
- Do not paint or varnish the devices.
- It is possible to install the product only on flat and clean surfaces.
- Do not bend or deform the device during installation.
- Do not use the device as a support for other parts of the machine (e.g. wireways, conduits, etc.)
- The device must be fixed to the machine through the holes provided on the housing. The device must be fixed with screws of adequate length and resistance to the expected stress. At least two screws must be used to fix the housing to the machine.
- After and during the installation do not pull the electrical cables connected to the device. If high traction is applied to the cables (not supported by an appropriate cable gland) the device contact block may be damaged.
- During wiring comply with the following requirements:
 - Comply with the minimum and maximum sections of electrical conductors admitted by terminals (if present).
 - Tighten the electrical terminals with the torque indicated in this catalog (if present).
- 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, terminals, cable numbering systems and any other part do not obstruct the cover from closing correctly or if pressed between them do not damage or compress the internal contact block.
- For the device 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 the 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 is shorter than the maximum travel allowed by the device.
- After installation, periodically check for correct device operation.

Do not use in the following environments:

- Environment where dust and dirt can cover the device and by sedimenting stop its correct working.
- Environment where sudden changes of temperature cause condensation.
- Environment where ice formation on the device is possible.
- Environment where the application causes knocks or vibrations which can damage the device.
- Environment with presence of explosive and inflammable gas or dust.

Utilization limits

- Use the devices following the instructions, complying with their working limits and the standards in force.
- The devices have specific application limits (min. and max. ambient temperature, mechanical endurance, protection degree, utilization categories, etc.). These limits are satisfied by the different devices only if singularly taken and not in combination among them. For further information contact our technical department.
- The utilization implies compliance and acknowledgement of the following standards: EN 60204-1, EN 60947-5-1, ISO 12100, EN ISO 14119.
- Contact our Technical dept. 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 on the following instructions.
 - In nuclear power stations, trains, airplanes, cars, buses, incinerators, medical devices or any application where the safety of two or more persons depend on the correct operation of the device.

Additional prescription for safety applications

Provided that all previous requirements for the devices installed for safety application are fulfilled, further additional prescriptions have to be observed:

- The utilization in any case implies compliance and acknowledgement of the following standards: IEC 60204-1, IEC 60947-5-1, ISO 12100, EN ISO 14119, EN 62061, EN ISO 13849-1, EN ISO 13850.
- Always connect the protection fuse (or equivalent device) 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 doesn't have to be less than one a year.
- After the 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 is shorter than the maximum travel allowed by the device.
- When the device is installed with safety functions, the duration of its use is limited. After 20 years from the date of manufacture, the device must be replaced completely, although still functioning. The production date can be derived from the production lot on the item. Example: A10 FD7-411. The first letter refers to the month of manufacture (A=January, B=February, etc.). The second and third letters refer to the year (10=2010, 11=2011, etc.)

Features

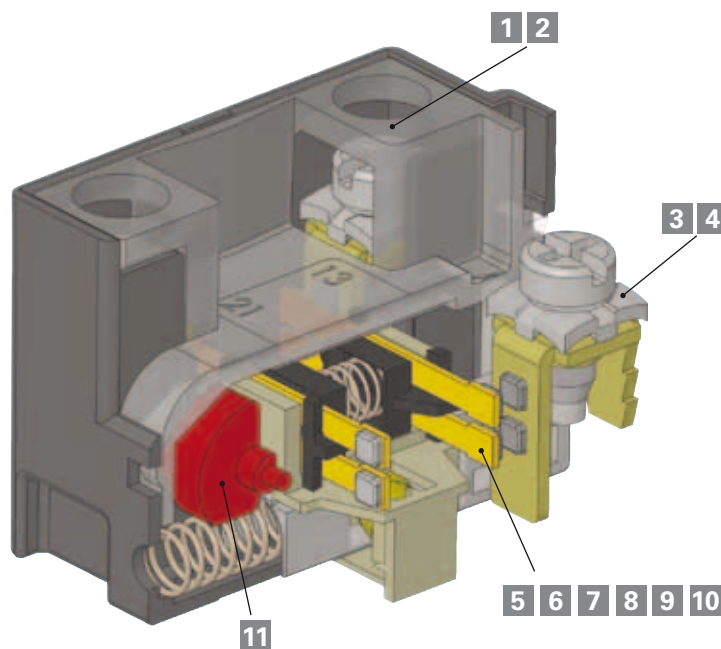
The contact blocks developed by the company Pizzato Elettrica contain the experience gained in 30 years of technological development and in millions of pieces sold. The contact blocks range available shown in this chapter is one of the widest in the world in the sector of position switches.

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 intend to be a selection of all contact blocks, but cannot be used to determine complete characteristics of the switch equipped with that contact block. For example, when a contact block with positive opening is used in a switch with a not rigid actuator, the result is a switch that on the whole is not one with positive opening.

The complete list of contact blocks currently in production is visible on page 315.

On page 253, the features of the electronic contact block E1, which can be used on position switches for a series of surveys, otherwise complex even with electronic sensors, are explained in detail. On the market doesn't exist an electronic sensor that at the same time has the characteristics of operation precision and repeatability, ability of the switching point adjustment, working temperature and price of this unit.



Description	Page	Description	Page
1 Captive screws	310	8 Contact design classification acc. to EN 60947-5-1 X, Y, C, Za, Zb	313
2 Finger protection terminals	310	9 Contact type: Slow action / snap action / snap action with constant pressure	314
3 Clamping screw plates for different diameter cables	310	10 Force on contacts	314
4 Self-lifting clamping screw plates	310	11 Positive opening of contacts	343
5 Contact material: Silver alloy or gold-plated silver alloy	310		
6 Contact technology and reliability: Single bridge, double bridge	311		
7 Operating voltages and currents for reliable switching	312		

1 Captive screws

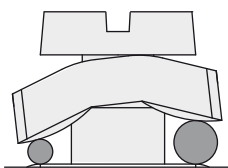
Switches with this characteristic have clamping screws that remain in seat even if completely unscrewed. This feature reduces wiring time, since the operator does not have to be careful not to unscrew the screws completely and does not risk to lose them by mistake, which is very useful in case of wirings in uncomfortable position.

2 Finger protection

All terminals in the contact blocks have a protection degree IP20, in accordance with the standard EN 60529, therefore they are protected against access to dangerous parts with diameter over 12 mm.



3 Clamping screw plates for different diameter cables



These clamping screw plates have a particular "roofing tile" structure and are connected loosely to the clamping screw. In this way, during the wires fixing, the clamping screw plate is able to suit to cables of different diameter (see picture) and tends to tighten the wires toward the screw instead of permitting them to escape towards the outside.

4 Self-lifting clamping screw plates

Switches with this feature have clamping screw plates that go up or down turning the clamping screw, permitting an easy and quick wiring.

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 charges, usually with low voltages and supply currents. The gold thickness used has been studied for resistance to millions of mechanical cycles.

6 Contact technology and reliability

Sometimes, hardly ever, an electric contact may not work. A commutation failure is a typical consequence of an occasional presence of a high resistance on the contacts due to dust, a slight layer of oxidation, or impurity of any kind that remains inside the switch during its wiring. The repeatability of this type of phenomena depends not only on the switch, but also on the environmental working conditions and the type of load the switch drives. These effects are more evident with low electrical loads, when the electric voltage does not succeed in perforating thin layers of oxide or small dust grains.

This type of malfunction may be accepted in the hand-operated devices, because it is enough to repeat the operation in order to make everything work again. This is not the case with position switches, where a failure in a switch could cause considerable damage to the machinery.

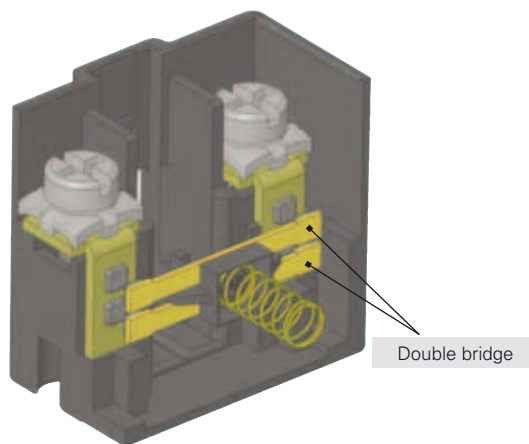
In the following table we refer to two typical contact structures (type A and B) normally used in the industry and the ones which have been used by Pizzato Elettrica for several years in most of the switches: movable contacts with double interruption and twin bridge (type C).

As you can see from the table below, this last structure (type C) features the same contact resistance (R) of the simple mobile contact (type A), but with a much lower probability of failure (fe).

In fact, defined x the probability of a single interruption failure, it results that in the contact type A the commutation failure probability $fe=x$, in the type B $fe \cong 2x^2$, whereas in the type C it is $fe = 4x^2$.

This means that if in a certain situation the probability of a single interruption failure x is equal, for instance, to 1×10^{-4} (1 failed interruption every 10.000) we will have:

- 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	Failure probability fe
A		simple mobile contact	$R=R_c$	$fe=x$
B		mobile contact, double interruption	$R=2 \cdot R_c$	$fe=2x^2$
C		mobile contact, double interruption, twin bridge	$R= \frac{2 \cdot R_c}{2} = R_c$	$fe=4x^2-4x^3+x^4$

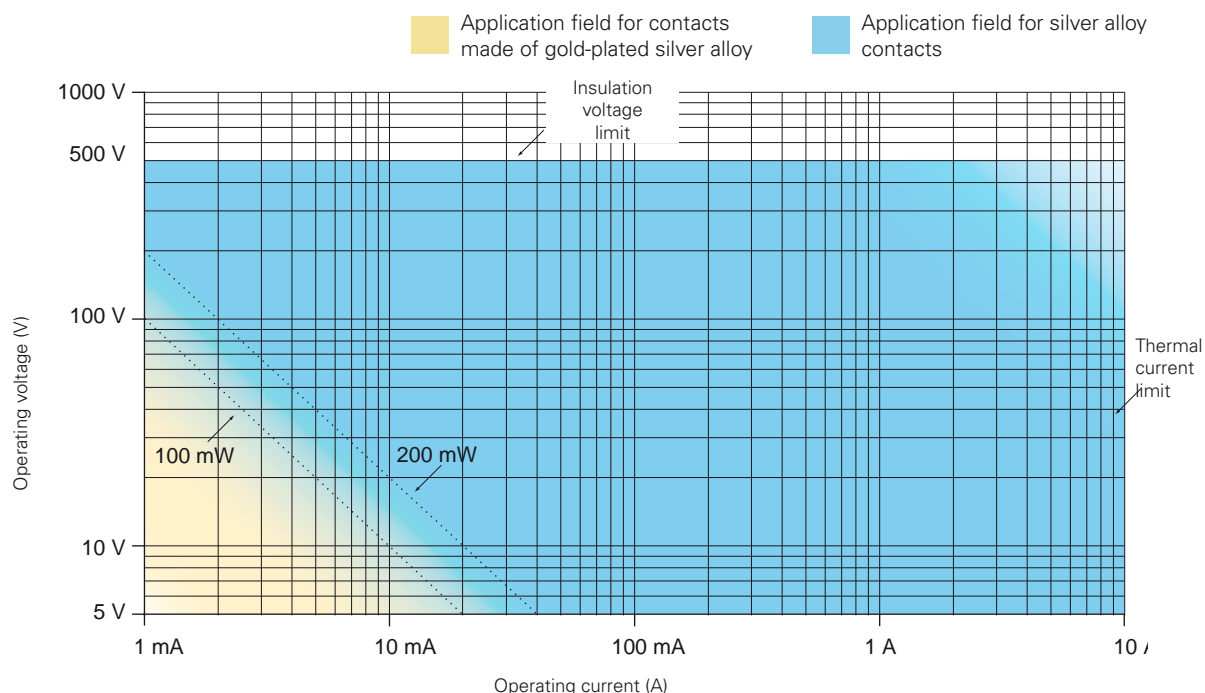
7 Minimum operating voltages and currents for reliable switching

The electric contact reliability depends on a lot of elements that change their effect in accordance with the load type. For high power loads it is essential that the contact should be able to eliminate the heat created during switching. For low power loads, instead, it is important that oxides or other impurities do not obstruct the passing of the electric signal. The choice of the electric contacts material is a compromise between different and sometimes opposing requirements. For position switches contacts a silver alloy is usually used that has proved suited to switching of loads in the range of approximately 1 kW to 0.1 W. Moving below this power range, effects may occur due to the oxide which is created naturally when silver makes contact with the air; just as 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 not possible to define a fix threshold beyond which the "missing switching phenomenon" does not appear, because there are a lot of mechanical and electric parameters that influence this value. For example, a good twin bridge electric contact in laboratory is able to switch without signal loss loads in the μW range for dozens of millions of handling operations. However, this does not mean that the same contact is able to provide the same services when the switch operates in an area with sudden changes of temperature (condensate formation) or with few switchings (oxides formation).

To avoid part of this type of problems, for very low loads are used gold plated contacts, profiting from the non-oxidability of this material. The thickness of the gold-plating should be adequate to be mechanically resistant to switching and to be electrically resistant to possible sparks that may vaporize it. It is for this reason that Pizzato Elettrica uses micron thickness gold plating suitable for millions of working cycles. Gold platings with lower thickness have simply an aesthetic function, suitable only for protection of the product against oxidation when kept in stock for long time.

The minimum current and voltage values suggested by Pizzato Elettrica are readable on the diagram below, divided in 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 in industrial application that may also be reduced in not general conditions. It is recommended, however, to always evaluate that the power signal to commutate should be 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, especially with signal powers lower than 10 mW.



100 mW Suggested limit for general applications with snap action contact blocks with silver alloy contacts.

200 mW Suggested limit for general applications with snap 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			Double interruption contact element with two terminals
Y			
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

Symbol "+" between contact designs (e.g. X+X, Za+Za, X+X+Y, etc.) indicates the combinations of simple contact blocks **electrically separated** between each other.

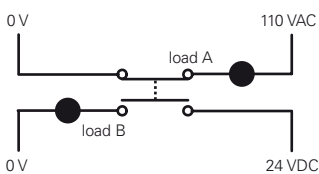
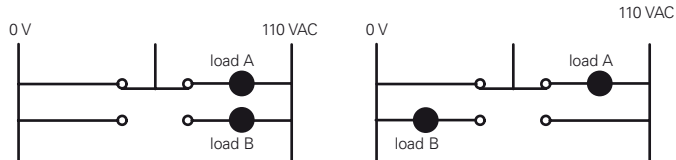
The **electrically separated contacts allow** the application of different voltages on the contacts and the connection of loads on different polarities (figure 1).

Prescriptions and restrictions for Za contacts

Electrical loads must be connected to the same phase or polarity. The contacts **are not** electrically separated, connection of different voltages between the NC contact and the NO contact is not allowed (fig. 2 and 3).

Also, as prescribed by the standard EN 60947-5-1 paragraph K.7.1.4.6.1, if Za contacts with positive opening for safety applications are used, the following restrictions have to be adopted:

" If the control accessory has shifting contacts components with design C or Za, **you have to use only one contact component** (closure or cutoff). In case of shifting contact with design Zb, both contacts may be used..."

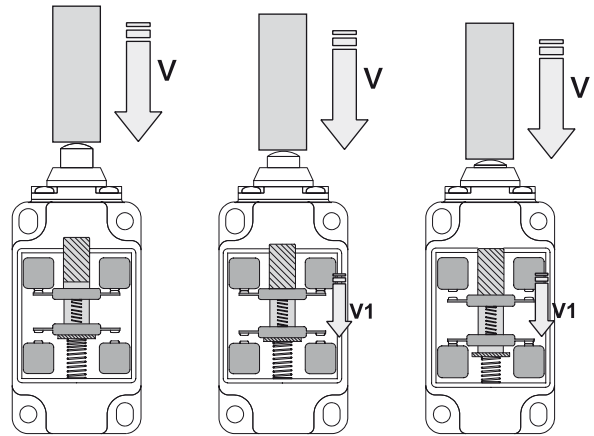
Zb design contactfigure 1: **correct****Za design contact**figure 2: **correct**figure 3: **incorrect**

9 Contact block with dependent action: 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 armature advances 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.

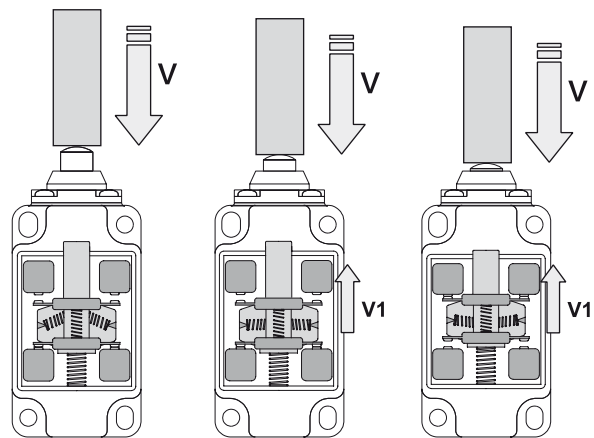
$$V = V1$$



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). After reaching a predetermined point in travel, the contact armature snaps causing the contacts switching.

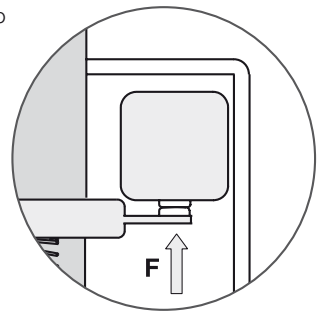
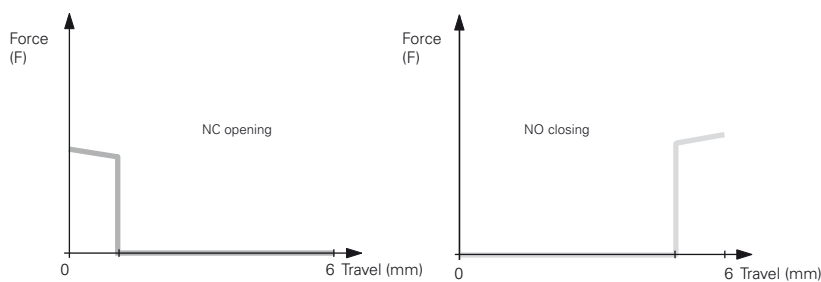
The snap action contact block is suitable for applications having high currents and/or slow actuation movements. This kind of contact block has a differential travel.

$$V \neq V1$$

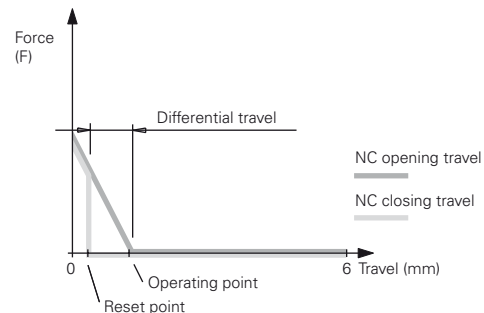
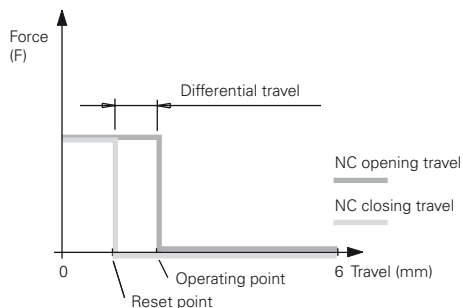


10 Contact block: diagrams of the force on the contacts

The following diagrams show the relationship between of the force exerted on the contacts (F) compared to the switch armature travel.



Contact blocks with slow action



Contact blocks with snap action and constant pressure 5, 11, 12. The pressure on the contact remains constant while approaching to the snap point.

Contact blocks with snap action 2, 3, 17. The pressure on the contact decreases while approaching to the snap point.

Contact blocks FD-FP-FL-FC-FR-FM-FX-FZ-FK-FW-FS series

Contact blocks	Contact diagram	Linear travel diagram	Contact design	Operation type	Positive opening \ominus	Contact type	Captive screws	Terminals with finger protection	Gold-plated contacts	
2	2x(1NO-1NC)			Za+Za	snap action	no	Double interruption	no	no	Not Available
3	1NO-1NC			Za	snap action	no	Double interruption	no	no	Not Available
5	1NO+1NC			Zb	snap action	yes	Double interruption, twin bridge	yes	yes	Available
6	1NO+1NC			Zb	slow action	yes	Double interruption, twin bridge	yes	yes	Available
7	1NO+1NC			Zb	slow action	yes	Double interruption, twin bridge	yes	yes	Available
8	1NC			Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
9	2NC			Y+Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
10	2NO			X+X	slow action	no	Double interruption, twin bridge	yes	yes	Available
11	2NC			Y+Y	snap action	yes	Double interruption, twin bridge	yes	yes	Available
12	2NO			X+X	snap action	no	Double interruption, twin bridge	yes	yes	Available
13	2NC			Y+Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
14	2NC			Y+Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
15	2NO			X+X	slow action	no	Double interruption, twin bridge	yes	yes	Available
16	2NC			Y+Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
18	1NO+1NC			Zb	slow action	yes	Double interruption, twin bridge	yes	yes	Available
20	1NO+2NC			Y+Y+X	slow action	yes	Double interruption, twin bridge	yes	yes	Available
21	3NC			Y+Y+Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
22	2NO+1NC			Y+X+X	slow action	yes	Double interruption, twin bridge	yes	yes	Available
28	1NO+2NC			Y+Y+X	slow action	yes	Double interruption, twin bridge	yes	yes	Available
29	3NC			Y+Y+Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
30	3NC			Y+Y+Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
33	1NO+1NC			Zb	slow action	yes	Double interruption, twin bridge	yes	yes	Available
34	2NC			Y+Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
37	1NO+1NC			Zb	slow action	yes	Double interruption, twin bridge	yes	yes	Available
66	1NC			Y	slow action	yes	Double interruption, twin bridge	yes	yes	Available
67	1NO			X	slow action	no	Double interruption, twin bridge	yes	yes	Available
E1	1NO-1NC			PNP	electronic	no	electronic	no	no	/

Contact blocks FG series

Contact blocks	Contact diagram	Linear travel diagram	Contact design	Operation type	Positive opening \ominus	Contact type	Captive screws	Terminals with finger protection	Gold-plated contacts
60•	Contact block with 4 poles and multiple contact designs. See page 93			slow action	yes	With double interruption and twin bridge and double support	yes	yes	Available

Contact blocks NA-NB-NF series

Contact blocks	Contact diagram	Linear travel diagram	Contact design	Operation type	Positive opening \ominus	Contact type	Captive screws	Terminals with finger protection	Gold-plated contacts
B11	1NO+1NC		Zb	snap action	yes	Double interruption	/	/	Available
B02	2NC		Y+Y	snap action	yes	Double interruption	/	/	Available
B12	1NO+2NC		X+Y+Y	snap action	yes	Double interruption	/	/	Available
B22	2NO+2NC		X+X+Y+Y	snap action	yes	Double interruption	/	/	Available
G11	1NO+1NC		Zb	slow action	yes	Double interruption	/	/	Available
G02	2NC		Y+Y	slow action	yes	Double interruption	/	/	Available
G12	1NO+2NC		X+Y+Y	slow action	yes	Double interruption	/	/	Available
G22	2NO+2NC		X+X+Y+Y	slow action	yes	Double interruption	/	/	Available
H11	1NO+1NC		Zb	slow action	yes	Double interruption	/	/	Available
H12	1NO+2NC		X+Y+Y	slow action	yes	Double interruption	/	/	Available
H22	2NO+2NC		X+X+Y+Y	slow action	yes	Double interruption	/	/	Available
L11	1NO+1NC		Zb	slow action	yes	Double interruption	/	/	Available
L12	1NO+2NC		X+Y+Y	slow action	yes	Double interruption	/	/	Available
L22	2NO+2NC		X+X+Y+Y	slow action	yes	Double interruption	/	/	Available
BA1	1NO+1NC in deviation		C	snap action	yes	Double interruption	/	/	Available

Contact blocks HP series

Contact blocks	Contact diagram	Linear travel diagram	Contact design	Operation type	Positive opening \ominus	Contact type	Captive screws	Terminals with finger protection	Gold-plated contacts
50C	1NO+1NC		Zb	snap action	yes	Double interruption	/	/	Available
50D	2NC		Y+Y	snap action	yes	Double interruption	/	/	Available
50 F	1NO+2NC		X+Y+Y	snap action	yes	Double interruption	/	/	Available
50M	2NO+2NC		X+X+Y+Y	snap action	yes	Double interruption	/	/	Available
52C	1NO+1NC		Zb	slow action	yes	Double interruption	/	/	Available
52D	2NC		Y+Y	slow action	yes	Double interruption	/	/	Available
52 F	1NO+2NC		X+Y+Y	slow action	yes	Double interruption	/	/	Available
52M	2NO+2NC		X+X+Y+Y	slow action	yes	Double interruption	/	/	Available
53C	1NO+1NC		Zb	slow action	yes	Double interruption	/	/	Available
53 F	1NO+2NC		X+Y+Y	slow action	yes	Double interruption	/	/	Available
53M	2NO+2NC		X+X+Y+Y	slow action	yes	Double interruption	/	/	Available

Connection diagram for assembled connectors

For FD - FL - FM - FZ - FC series with metal housing

Contact block 2 1NO-1NC+1NO-1NC	Contact block 5 1NO+1NC	Contact block 6 1NO+1NC	Contact block 7 1NO+1NC	Contact block 9 2NC	Contact block 10 2NO	Contact block 11 2NC	Contact block 12 2NO	Contact block 13 2NC	
M12 connector, 8 poles	M12 connector, 5 poles	M12 connector, 5 poles	M12 connector, 5 poles	M12 connector, 5 poles	M12 connector, 5 poles	M12 connector, 5 poles	M12 connector, 5 poles	M12 connector, 5 poles	
Contacts	Pin no.	Contacts	Pin no.	Contacts	Pin no.	Contacts	Pin no.	Contacts	Pin no.
NO	3-4	NC	1-2	NC	1-2	NC	1-2	NO	1-2
NC	5-6	NO	3-4	NO	3-4	NO	3-4	NC	3-4
NC	7-8	ground	5	ground	5	ground	5	ground	5
NO	1-2								

Contact block 14 2NC	Contact block 15 2NO	Contact block 16 2NC	Contact block 18 1NO+1NC	Contact block 20 2NC+1NO	Contact block 21 3NC	Contact block 22 1NC+2NO	Contact block 33 1NC+1NO	Contact block 34 2NC	
M12 connector, 5 poles	M12 connector, 5 poles	M12 connector, 5 poles	M12 connector, 5 poles	M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 5 poles	M12 connector, 5 poles	
Contacts	Pin no.	Contacts	Pin no.	Contacts	Pin no.	Contacts	Pin no.	Contacts	Pin no.
NC (1°)	1-2	NO (1°)	1-2	NC, lever at the right	1-2	NC	3-4	NC	1-2
NC (2°)	3-4	NO (2°)	3-4	NC	3-4	NC	5-6	NO	3-4
ground	5	ground	5	NC, lever to the left	3-4	NO	5-6	NO	3-4
				NO	3-4	NC	7-8	ground	5
				ground	5	NO	7-8	ground	5
				ground	1	ground	1	ground	5

Contact block 28 2NC+1NO	Contact block 29 3NC	Contact block 30 3NC	Contact block E1 PNP				
M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 5 poles				
Contacts	Pin no.	Contacts	Pin no.	Contacts	Pin no.	Contacts	Pin no.
NC	3-4	NC	3-4	NC	3-4	+	1
NC	5-6	NC	5-6	NC	5-6	-	3
NO	7-8	NC	7-8	NC	7-8	NC	2
ground	1	ground	1	ground	1	NO	4
						ground	5

For FS series with technopolymer housing

Contact block 18 1NO+1NC	Contact block 20 2NC+1NO	Contact block 21 3NC	Contact block 28 2NC+1NO	Contact block 29 3NC	Contact block 30 3NC		
M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 8 poles		
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
NC	3-4	NC	3-4	NC	3-4	NC	3-4
NO	5-6	NC	5-6	NC	5-6	NC	5-6
		NO	7-8	NC	7-8	NC	7-8

Connection diagram for assembled connectors

For FP - FR - FX - FW series with technopolymer housing

Contact block 2 1NO-1NC+1NO-1NC	Contact block 5 1NO+1NC	Contact block 6 1NO+1NC	Contact block 7 1NO+1NC	Contact block 9 2NC	Contact block 10 2NO	Contact block 11 2NC	Contact block 12 2NO	Contact block 13 2NC
M12 connector, 8 poles	M12 connector, 4 poles	M12 connector, 4 poles	M12 connector, 4 poles	M12 connector, 4 poles	M12 connector, 4 poles	M12 connector, 4 poles	M12 connector, 4 poles	M12 connector, 4 poles
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.
NO 3-4	NC 1-2	NC 1-2	NC 1-2	NC 1-2	NO 1-2	NC 1-2	NO 1-2	NC (1°) 1-2
NC 5-6	NO 3-4	NO 3-4	NO 3-4	NC 3-4	NO 3-4	NC 3-4	NC 3-4	NO 3-4
NC 7-8								
NO 1-2								

Contact block 14 2NC	Contact block 15 2NO	Contact block 16 2NC	Contact block 18 1NO+1NC	Contact block 20 2NC+1NO	Contact block 21 3NC	Contact block 22 1NC+2NO	Contact block 33 1NC+1NO	Contact block 34 2NC
M12 connector, 4 poles	M12 connector, 4 poles	M12 connector, 4 poles	M12 connector, 4 poles	M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 4 poles	M12 connector, 4 poles
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.
NC (1°) 1-2	NO (1°) 1-2	NC, lever at the right 1-2	NC 1-2	NC 3-4	NC 3-4	NC 3-4	NC 1-2	NC 1-2
NC (2°) 3-4	NO (2°) 3-4	NC, lever to the left 3-4	NO 3-4	NC 5-6	NC 5-6	NO 5-6	NO 3-4	NC 3-4
				NO 7-8	NC 7-8	NO 7-8		

Contact block 28 2NC+1NO	Contact block 29 3NC	Contact block 30 3NC
M12 connector, 8 poles	M12 connector, 8 poles	M12 connector, 8 poles
Contacts Pin no.	Contacts Pin no.	Contacts Pin no.
NC 3-4	NC 3-4	NC 3-4
NC 5-6	NC 5-6	NC 5-6
NO 7-8	NC 7-8	NC 7-8

Contact block E1 PNP
M12 connector, 4 poles
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 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles
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 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles
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 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles	M23 connector 12 poles
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	NC 3-4	NO 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 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles
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	NC	NC	NO	NC	NC	NC	NC	NC	NC
NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
NO	NC	NC	NC	NC	NO	NC	NC	NC	NO
NO	NO	NC	NC	NO	NO	NC	NC	NO	NO

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 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles
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	NO	NC	NC	NC	NC	NC	NC	NO	NC
NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
NO	NO	NC	NO	NO	NC	NC	NO	NC	NO
NO	NO	NC	NO	NO	NO	NC	NO	NC	NO

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 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles	M12 connector 12 poles
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	NC	NO	NO	NO	NO	NC	NO	NC	NO
NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
NC	NO	NO	NO	NO	NO	NO	NO	NC	NO
NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

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.

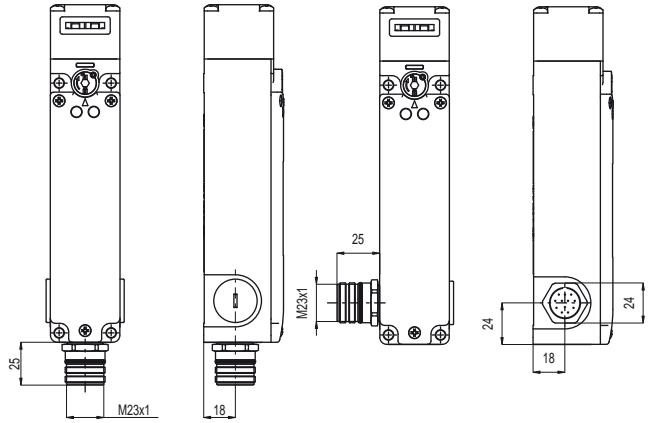
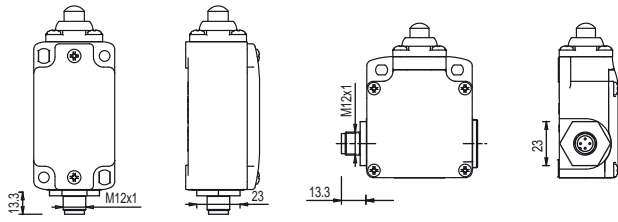
Outline dimension with assembled connectors

Switch with M12 connector mounted below

Switch with M12 connector, mounted at the right, at the left, or below

Switch with M23 connector mounted below

Switch with M23 connector, mounted at the right or left



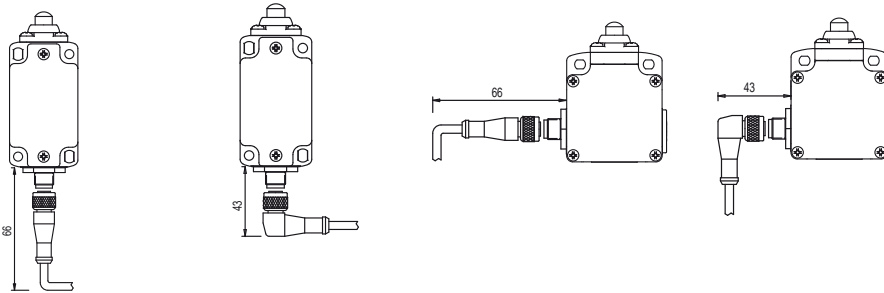
FD - FP - FL - FC - FR - FM - FX - FZ - FW - FS - FG - NG series

FG - NG series

Minimum distances required for insertion of the connectors

Switch with M12 connector mounted below

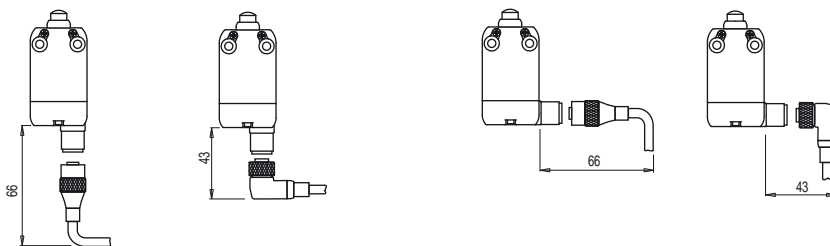
Switch with M12 connector, mounted at the right or left



FD - FP - FL - FC - FR - FM - FX - FZ - FW - FS - FG - NG series

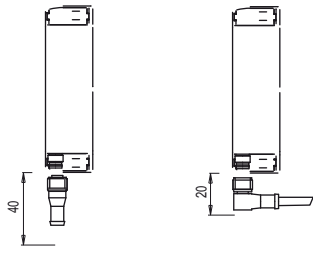
Switch with M12 connector, at bottom

Switch with M12 connector, at the right

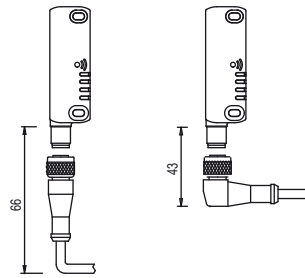


NA - NB - NF series

Sensor with M8 connector



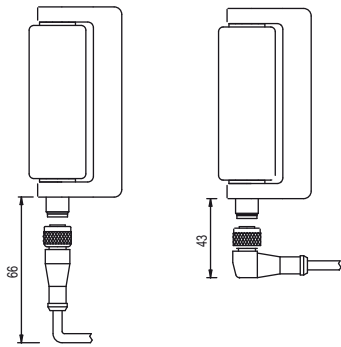
Sensor with M12 connector



SR series

ST series

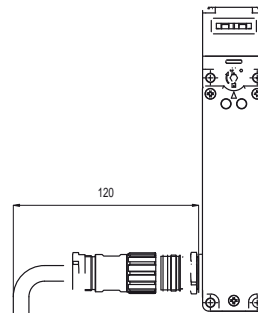
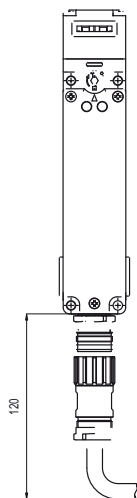
Hinge with M12 connector



HP - HX series

Switch with M23 connector mounted below

Switch with M23 connector, mounted at the right or left



FG - NG series

1- Foreword

Purpose of this section is to provide the machine manufacturer with a quick introduction on some standards related to machine safety, to clarify some basic principles and to provide some application examples. This brief guide refers only to the aspects related to the Functional Safety of the machine, that is all the measures aimed at protecting the machinery operator from the risks arising by their operation, and at aspects relating to the design and selection of interlock devices for guards.

It does not mention risks due to other hazards as for example electric energy presence, pressure containers, explosive atmospheres etc. which anyhow shall be evaluated by the machine manufacturer.

This document has been prepared by Pizzato Elettrica best knowledge, considering the standards and interpretations and the existent technologies in year 2015. Since some of the directives are being applied for the first time in these months it cyeart be excluded that in the meantime further directives or interpretations by the official bodies will modify the evaluations provided in this document. Therefore the examples here reported must be always evaluated by the final user according to the technology/directive progress report and they do not relieve users of their own responsibilities. Pizzato Elettrica does not take any responsibility on the reported examples and does not exclude the possibility of involuntary data errors nor inaccuracy.

2 -Design in safety. The European standards structure.

In order to be freely marketed in the countries of the European Community every device or machinery must comply with Community Directives. They establish the general principles in order for the manufacturer not to place on the market hazardous products for operators. The products and different possible hazards as a whole are very wide, that's why throughout the time many different directives have been issued. As an example we quote the low voltage directive 2006/95/EC, the explosive atmosphere directive 2014/34/UE, the electromagnetic compatibility directive 2004/108/EC, etc. Any hazard due to machinery functioning is governed by Machinery Directive 2006/42/EC.

The conformity to directives is certified by the manufacturer's issue of the Conformity Declaration and by the application of the CE marking on the machine itself.

For the risks assessment of the machine and realization of safety systems to protect the operator from those risks, the European Committees for Standardization CEN and CENELEC have issued a series of standards which translate into technical requirements the contents of directives. The standards published on the Official Journal of the European Union are to be intended as harmonized. The manufacturer who applies those standards to certify his own machineries has a presumption of conformity to the directives.

The machine safety standards are divided into three types: A, B and C.

Type A standards: give basic concepts, principles for design and general aspects that can be applied to machinery.

Type B standards: deal particularly with one or more aspects concerning the safety and they are also divided into:

- B1: standards concerning some safety aspects (e.g. safety distances, temperatures, noise, etc.)
- B2: standards concerning safety devices (e.g. two-hand controls, interlocking devices, etc.)

Type C standards: deal with detailed safety requirements for particular groups of machines (e.g. hydraulic presses, injection machineries,...).

The manufacturer of devices or machineries must first verify if the product is covered by a type C standard. If so, the standard gives the safety requirements, otherwise type B standards for any specific aspect or device of the product shall apply. Failing further requirements, the manufacturer shall follow general guidelines stated in type A standards.

TYPE A STANDARDS

for example:

EN ISO 12100. Safety of machinery - General design principles - Risk assessment and risk reduction.

TYPE B1 STANDARDS

for example:

EN 62061. Functional safety of safety-related electrical, electronic and programmable electronic control systems.
EN ISO 13849-1 and -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 for guards
EN 60204-1. Electrical equipment of machines
EN 60947-5-1. Electromechanical control devices.

TYPE C STANDARDS

for example:

EN 201. Machinery for rubber and plastic material - Injection machines
EN 415-1. Safety of wrapping machines
EN 692. Mechanical presses
EN 693. Hydraulic presses
EN 848-1. Safety of wood-working machines – Miller on one single side with rotating tool – Part 1: Single-shaft vertical miller (router)

3 - Designing safe machines. Risks analysis.

The first step to build a safe machine is to identify all possible hazards to which the machine operators are exposed. The hazards identification and classification allow to define the risks for the operator, that is the combination of the possibility that the hazard occurs and the type of possible injury for the operator.

The methodology of risk analysis and assessment, of procedures for their reduction, is defined by standard EN ISO 12100. This contains a cyclic analysis model such that, once the initial objectives are agreed, the analysis of risks and possible solutions to reduce these risks are repeatedly evaluated until the objectives are met.

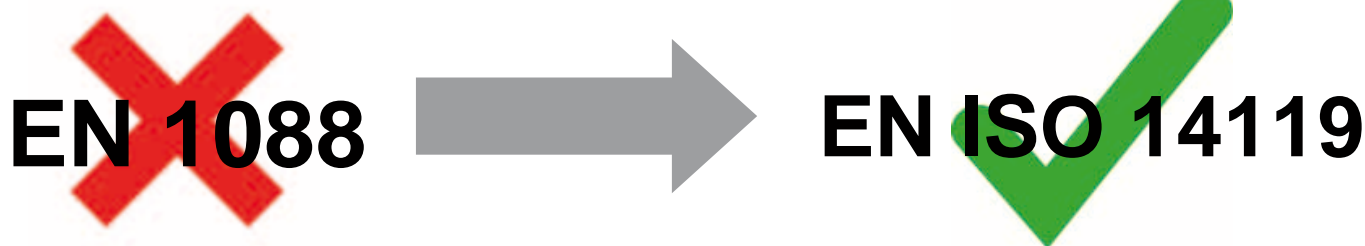
The model introduced by this standards provides for proceeding with the risks reduction/elimination after an analysis through a process as follows:

- 1) risks elimination at the origin, through the system structure and the use of inherently safe design principles
- 2) risks reduction by safeguarding and control systems
- 3) manifestation of residual risks by informing the users

Since each machinery presents hazards and it's not possible to completely eliminate all possible risks, the objective is to reduce the machinery risks to residual acceptable levels.

4- Design and selection of interlocking devices associated with guards (EN ISO 14119)

New European standard EN ISO 14119 "Interlocking devices associated with guards – Principles for design and selection" came into force on October 2nd, 2013 and superseded EN 1088/ISO 14119:1998 as of May, 2015.



The standard involves machine designers as well as the interlock device manufacturers (and system integrators), providing requirements for the creation of the device and its correct installation.

The standard highlights some little clear aspects and considers additional technologies used for interlocking devices; defines some parameters (**actuator type and level of coding**) and regulates the specifications for correct installation, so as to increase the protection against guard manipulation.

The standard also considers other aspects related to interlocking device (e.g. guard locking principle, electromagnetic lock, auxiliary release, escape and emergency release, etc.) which are not detailed here.

Coding level of the actuators

An important change introduced by the standard is the definition of a coded actuator and the classification of the level of coding:

- **coded actuator** – actuator especially designed to actuate a specific interlocking device;
- **low level coded actuator** – actuator for which 1 to 9 variations in code are available (e.g. the magnetic sensors SR series or the safety switches with separate actuator FS, FG, FR, FD...);
- **medium level coded actuator** - actuator for which 10 to 1000 variations in code are available;
- **high level coded actuator** - actuator for which more than 1000 variations in code are available (e.g. the sensors of the SX series with RFID technology or the interlocking devices NG series with RFID technology and guard locking)

Types of interlocking devices

Standard EN ISO 14119 defines different types of interlocking devices:

- **Interlocking device type 1** - mechanical actuation by uncoded actuator (e.g. hinge interlocking devices HP series)
- **Interlocking device type 2** - mechanical actuation by coded actuator (e.g. safety switches with separate actuator of the FR, FS, FG, ... series)
- **Interlocking device type 3** - non-contact actuation by uncoded actuator
- **Interlocking device type 4** - non-contact actuation by coded actuator (e.g. RFID safety sensors ST and NG series)

Examples of actuation principle		Actuator examples		Type
Mechanical	Direct contact/force	Not encoded	Rotating cam Linear cam Hinge	Type 1
		Encoded	Key actuated Trapped key	Type 2
Without contact	Inductive	Not encoded	Ferromagnetic material	Type 3
	Magnetic		Magnet, solenoid	
	Capacitive		Any suitable object	
	Ultrasounds	Any suitable object		
Optical	Encoded	Any suitable object	Type 4	
Magnetic		Magnetically coded		
RIFD		RFID, encoded		
Optical		Optical, encoded		

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 device		Type 2 and type 4 devices (low level coded actuators)	Type 2 and type 4 devices (high level coded actuators)
	Rotary or linear cam safety switches	Hinge safety switches		
Installation out of reach (1)				
Shielding, physical obstruction (2)			X	
Installation in hidden position (3)	X			
Status monitoring or cyclic testing (4)				
Non-detachable fixing of device and actuator				
Non-detachable fixing of device		M		
Non-detachable fixing of actuator		M	M	M
Additional interlocking device and plausibility check	R		R	

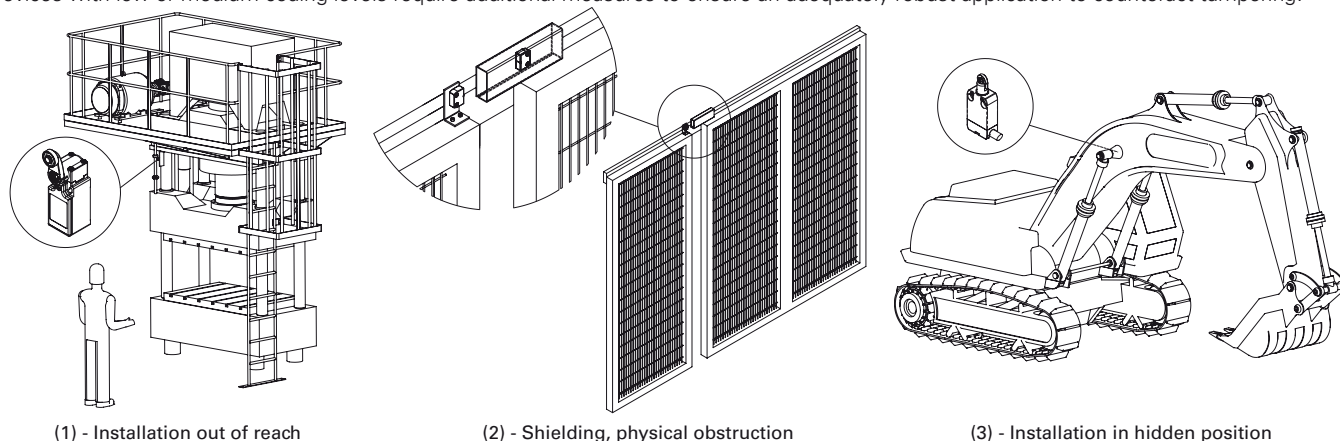
Excerpt from EN ISO 14119 - Table 3

X: obligation to apply at least one of the measures listed in the "Principles and measures to prevent circumvention" column

M: obligatory measure

R: recommended measure

It is obvious that in order to meet all the requirements of EN ISO 14119, it is easier to use devices with RFID technology with a high level of coding and hinge switches, as it is necessary to fulfil only a few requirements in order to prevent circumvention of the devices themselves. Devices with low or medium coding levels require additional measures to ensure an adequately robust application to counteract tampering.



(4) – A status monitoring can be made for example in a machine where the working cycle is easily predictable, so as to verify that at the end or during specific phases of the working cycle the guards are actually open (e.g. to remove the processed material or to make quality controls); in case the system control does not detect the guard opening actions, an alarm is generated and the machine stopped.

Guard locking devices and holding force

The manufacturer of the guard locking device shall ensure that in the engage position, the guard locking device withstands at least the specified holding force F_{zh} . This force shall be at the most equal to the maximum holding force divided by a safety coefficient equal to 1.3.

For example, a device with maximum specified force $F_{zh} = 2000$ N must pass a test with a maximum holding force equal to $F_{1max} = 2600$ N.

An interlocking device with guard locking shall provide both the interlocking function (guard open/closed) and the guard locking function (locked/unlocked). Each of these functions may require a different PL safety level (ref. EN ISO 13849-1). In most cases the PL of the guard locking function is lower than the PL of the interlocking function. (See paragraph 8.4, note 2 of EN ISO 14119).

To highlight that an interlocking device provides also the locking monitoring, the new standard requires that the product shall have the symbol represented aside.



$$F_{zh} = \frac{F_{1max}}{1,3}$$

5 - Normative present situation. Reason of changes, new standards and some overlapping

“Traditional” standards for Functional Safety as EN 954-1 had the great merit of formalizing some of the basic principles in the safety circuits analysis in accordance to deterministic principles. On the other hand they don't deal with programmable electronic devices at all, and generally they suffer the passed time. To include the programmable electronic devices in the control system analysis, the new standards approach is basically probabilistic therefore new statistical variables have been introduced.

This approach original standard is the IEC 61508 which deals the safety of complex programmable electronic systems. It's an impressive standard (divided in 8 sections for a total amount of almost 500 pages) suitable for different application fields (process industry, industrial machineries, nuclear plants), so that it has achieved the status of type A standard (not harmonized). The standard introduces the SIL concept (Safety Integrity Level) that is a probabilistic indication of a system residual risk.

From IEC 61508 comes EN 62061, which in particular concerns safety in industrial machineries complex and programmable electronic systems. The concepts introduced by this standard allow the application generally to any control system with electric, electronic and programmable electronic technology (excluding non-electric technology systems).

EN ISO 13849, developed by CEN under ISO aegis, also comes from this probabilistic approach but it tries to make the manufacturer used to the EN 954-1 concepts pass to the new concepts in a less traumatic way. The standard is applied to electromechanical, hydraulic, not complex electronic systems and to some programmable electronic systems with predefined structures. EN ISO 13849 is a type B1 standard, it introduces the PL concept (Performance Level) that is, as for SIL, a probabilistic indication of machinery residual risk. In this standard it is indicated a correlation between SIL and PL; there are concepts borrowed by EN 61508 (as DC and CCF) and it is established a reference with safety categories of EN 954-1.

In the functional safety field for control circuits safety, there are presently two standards in force (year 2013):

- EN ISO 13849-1. Type B1 standard which uses the PL concept.
- EN 62061. Type B1 standard which uses the SIL. concept.

The two standards EN 62061 and EN ISO 13849-1 show a discrete overlapping concerning the application field. For several aspects they are alike and there's a precise link between the two different symbols (SIL and PL) which indicates the two standards analysis result.

The recommendation on the two standards application ambit is stated in EN ISO 13849-1, table 1 and, as you can see, both standards can be applied for wide products typologies.

PL EN ISO 13849-1	a	b	c	d	e	
SIL EN 62061 - IEC 61508	-	1	2	3	(4)	
PFH _d	10 ⁻⁴	10 ⁻⁵	3x10 ⁻⁶	10 ⁻⁶	10 ⁻⁷	10 ⁻⁸
A hazardous failure every n years	~1	~10	~40	~100	~1000	~10000

Important note.

EN 13849-1 is a type B1 standard, therefore if a machinery is already classified by a type C standard is this last one to prevail. All type C standards previously developed are based on concepts of EN 954-1. For manufacturers of machineries covered by a type C standard, the introduction time of new standards could be different according to the updating speed of the various technical committees.

Table 1 - Recommended application of EN 62061 and EN ISO 13849-1

	Technology used by the part of the control system that is linked to safety	EN ISO 13849-1	EN 62061
A	Not electrical, hydraulic for example	X	Not handled
B	Electromechanical, for example relays and/ or non-complex electronics	Limited to designated architectures ^a and up to PL=e	All architectures up to SIL 3
C	Complex electronics, for example programmable	Limited to designated architectures ^a and up to PL=d	All architectures up to SIL 3
D	A combined with B	Limited to designated architectures ^a and up to PL=e	X ^c
E	C combined with B	Limited to designated architectures (see note 1) and up to PL=d	All architectures up to SIL 3
F	C combined with A or C combined with A and B	X ^b	X ^c

X indicates that the line is covered by the international standard shown in the head of the column

a. Designated architectures are defined in clause 6.2 (EN ISO 13849-1) to provide a simplified approach to quantification of the performance level

b. For complex electronics: the designated architectures are used according to this part of EN ISO 13849-1 and up to PL=d, or any architecture which is compliant with EN 62061

c. For non-electrical technologies, the parts are used as subsystems in accordance with this part of EN ISO 13849-1

Note. Taken from table 1 of EN ISO 13849-1:2006

The choice of the standard to be used is up to the manufacturer according to the adopted technology. We believe that EN ISO 13849-1 is a standard easier to apply thanks to its mediate approach and reutilization of the concepts already known to the market.

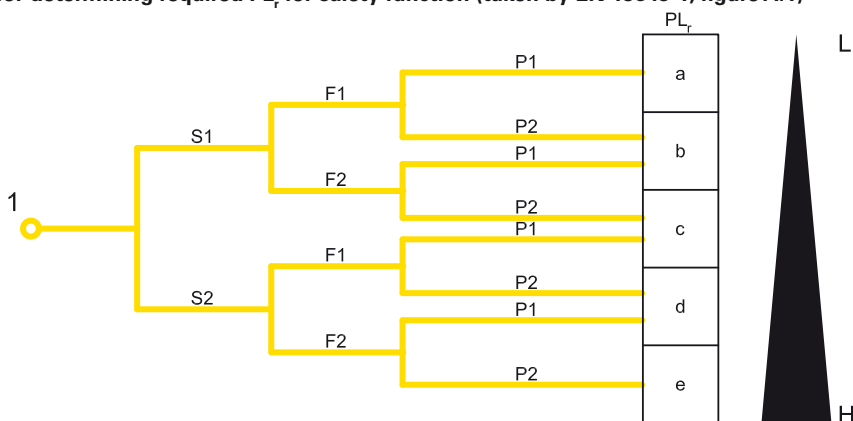
Note: In 2008 the Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) has introduced a report (BGIA Report 2/2008) on the EN ISO 13849-1 application where it is stated that the recommendations and restrictions for EN ISO 13849-1 applications must be considered obsolete, therefore even in case of programmable electronics (case C and E in the above table) the limit can be considered PL e.

6- EN ISO 13849-1 and new parameters: PL, MTTF_d, DC, CCF

EN ISO 13849-1 provides the manufacturer with an iterative method to assess if a machine risk can be limited to an acceptable residual risk through adequate safety functions. The adopted method provides for each risk an hypothesis-analysis-validation cycle at the end of which it must be demonstrated that every intended safety function is adequate to the related risk being considered.

The first step consists in the evaluation of the Performance Level required by each safety function. The first step consists in the evaluation of the Performance Level required by each safety function. As for EN 954-1, also EN 13849 uses a graph for a machine function risk analysis (figure A.1) determining, instead of a required safety category, a Required Performance level or PL_r for the safety function which protects that machine part. The machinery manufacturer, starting from the graph point 1 and answering to S, F and P questions, will identify the PL_r for the intended safety function. The manufacturer then shall make a system to protect the machinery operator with a PL performance level equal or greater than the required.

Risk graph for determining required PL_r for safety function (taken by EN 13849-1, figure A.1)



Key

- 1** Starting point for evaluation of safety function's contribution to risk reduction
- L** Low contribution to risk reduction
- H** High contribution to risk reduction
- PL_r** Required performance level

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 specific conditions
 - P2** scarcely possible

Note: It would be easier for a manufacturer not having to repeat the machine risk analysis and try to use the data already derived from an EN 954-1 risk analysis.

Generally this is not possible since with the new standard the risk graph changed (see figure above) therefore, with identical risks, the required safety function levels can have changed. The German Institute BGIA in its report 2008/2 on EN ISO 13849-1 suggests that a conversion could be adopted through a worst-case approach as in the following table. For further information refer to the mentioned report.

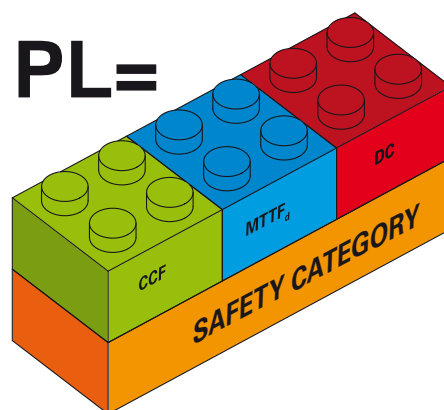
Category requested by EN 954-1	Performance requested (PL _r) and Category requested acc. to EN ISO 13849-1
B	→ b
1	→ c
2	→ d, Category 2
3	→ d, Category 3
4	→ e, Category 4

Five performance levels are set out, from PL_a to PL_e on risk increasing and each one of them identifies a numerical range of average probability of dangerous failure per hour. For example PL_d defines that the average probability of a dangerous failure per hour is included between 1x10⁻⁶ and 1x10⁻⁷, that is about 1 dangerous failure every 100-1000 years.

PL	Average probability of dangerous failure per hour PFHd (1/h)	
a	≥ 10 ⁻⁵	e < 10 ⁻⁴
b	≥ 3 x 10 ⁻⁶	e < 10 ⁻⁵
c	≥ 10 ⁻⁶	e < 3 x 10 ⁻⁶
d	≥ 10 ⁻⁷	e < 10 ⁻⁶
e	≥ 10 ⁻⁸	e < 10 ⁻⁷

Other measures are also necessary to achieve the PL of a control system, which are:

1. The system Safety Category which derives from the architecture (structure) of the control system and its behaviour under fault conditions
2. MTTF_d of components
3. DC or system Diagnostic Coverage.
4. CCF or system Common Cause Failure.



Safety Categories.

The majority of control circuits normally used are represented by a logic block structure:

- Input or signals input
- Logic or processing signals logic
- Output or control signals output

differently combined according to the control circuit structure.

EN ISO 13849-1 allows for five different basic circuit structures termed Designated Architectures. These architectures, combined with the fault-mode behaviour and some minimum values of $MTTF_d$, DC and CCF, indicate the system control Safety Category as shown in the following table. EN ISO 13849-1 Safety Categories therefore are not the same but they extend the Safety Category concept introduced by the previous EN 954-1.

Category	Summary of requirements	System behaviour	Principles used to achieve safety	$MTTF_d$ of each channel	DC_{avg}	CCF
B	Safety-related parts of control systems and/or their protective equipment, as well as their components, shall be designed, constructed, selected, assembled and combined in accordance with relevant standards so that they can withstand the expected influences. Basic safety principles shall be used. Architecture:	The occurrence of a fault can lead to the loss of the safety function.	Mainly characterized by selection of components	Low or Medium	None	Not relevant
1	Requirements of category B shall apply. Well-tried components and well-tried safety principles shall be used. Architecture:	The occurrence of a fault can lead to the loss of the safety function but the probability of occurrence is lower than for Category B.	Mainly characterized by selection of components	High	None	Not relevant
2	Requirements of category B and the use of well-tried safety principles shall apply. Safety function shall be checked at suitable intervals by the machine control system. Architecture:	The occurrence of a fault can lead to the loss of the safety function between the checks. The loss of the safety function is detected by the check.	Mainly characterized by structure	Low to High	Low to Medium	See Annex F
3	Requirements of category B and the use of well-tried safety principles shall apply. Safety-related parts shall be designed so that: – a single fault in any of these parts does not lead to the loss of the safety function, and – whenever reasonably practicable, the single fault is detected. Architecture:	When a single fault occurs the safety function is always performed. Some, but not all faults will be detected. Accumulation of undetected faults can lead to the loss of the safety function.	Mainly characterized by structure	Low to High	Low to Medium	See Annex F
4	Requirements of category B and the use of well-tried safety principles shall apply. Safety-related parts shall be designed, so that: – a single fault in any of these parts does not lead to a loss of the safety function, and – a single fault is detected at or before the next demand upon the safety function. If this is not possible, then the accumulation of undetected faults must not lead to the loss of the safety function. Architecture:	When a single fault occurs the safety function is always performed. Detection of accumulated faults reduces the probability of the loss of the safety function (high DC). The faults will be detected in time to prevent the loss of the safety function.	Mainly characterized by structure	High	High (including accumulation of faults)	See Annex F

MTTF_d ("Mean Time To Dangerous Failure";).

This parameter tries to determine the system component "safety quality" by defining its mean lifetime before a dangerous failure (note that it is not a generic failure) stated in years. Practically, the calculation of the MTTF_d is based on numerical values supplied by the components manufacturers. Where there's a lack of data the standard itself lists some typical values in specific reference tables (EN ISO 13849-1 Annex C). The calculation leads to a numerical value included in 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

In case of wearable components (typically mechanic and hydraulic devices), instead of the component MTTF_d, the manufacturer shall provide the component B_{10d} data that is the average number of the component operations until 10% of the units studied have failed dangerously. The component B_{10d} has to be converted to MTTF_d by the machine manufacturer with the formula:

$$MTTF_d = \frac{B_{10d}}{0,1 \cdot n_{op}}$$

Where n_{op} = component mean number of annual operations.

Assuming the machine daily operating frequency and the daily operating hours, n_{op} can be determined from:

$$n_{op} = \frac{d_{op} \cdot h_{op} \cdot 3600s/h}{t_{ciclo}}$$

where

d_{op} = operating time in days per year

h_{op} = operating time in hours (h) per day

t_{ciclo} = cycle time (s)

Note that the MTTF_d parameter, when it derives from a wearable component, does not depend only from the component itself but also from the application. A electromechanical device with low operating frequency, e.g. a contactor only used for emergency stop, generally has a high MTTF_d but if the same device is used for normal cycle operation here the contactor MTTF_d, with low cycle time, can drop dramatically.

All the control circuit single components are used to calculate the circuit MTTF_d according to its structure. In one channel architecture circuits (as in category B, 1 and 2) every single components contribution is linear and the channel MTTF_d calculation is determined from:

$$\frac{1}{MTTF_d} = \sum_{i=1}^N \frac{1}{MTTF_{di}}$$

In order to avoid too optimistic interpretation the maximum MTTF_d value of each channel is restrained to 100 years. No channel with MTTF_d inferior to 3 years is allowed.

In case of two channel systems (categories 3 and 4) the circuit MTTF_d calculation is determined from symmetrically arranging the two channels MTTF_d 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 tries to indicate the effectiveness of a system' self-test monitoring its possible failures. According to the percentage of dangerous failures detectable by the system the diagnostic coverage shall be different. The DC parameter is a percentage value which is estimated by some values stated in a table (EN ISO 13849-1 annex E) according to the measures adopted by the manufacturer to detect any anomaly in its circuit. Since, in general, there are different measures to detect different anomalies in the same circuit, the average value or DC_{avg} calculation results in four levels, which are:

High DC_{avg} ≥ 99%

Medium 90% ≤ DC_{avg} < 99%

Low 60% ≤ DC_{avg} < 90%

None DC_{avg} < 60%

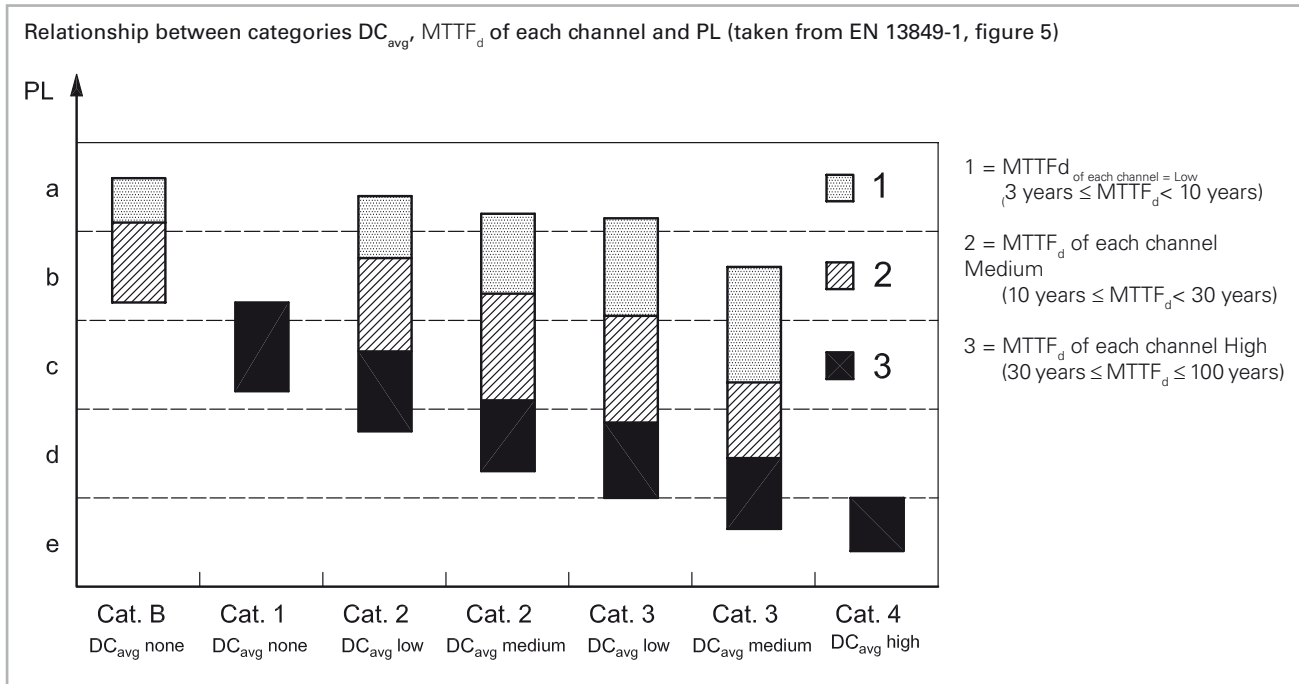
The None diagnostic coverage is admitted only for systems with architecture B or 1.

CCF ("Common Cause Failures")

Only in case of category 2, 3 or 4 systems for the calculation of PL it is necessary also the evaluation of possible common cause failure or CCF that can invalidate the systems redundancy. The evaluation is made by a check-list (EN ISO 13849-1 Annex F) which determines points from 0 to 100 according to the adopted solutions against common cause failures. The minimum value admitted for categories 2,3 and 4 is 65 points.

PL ("Performance Level")

Knowing all this data, EN ISO 13849-1 determines the system PL by a correlation table (EN ISO 13849-1 Annex K) or by a simplified graphic figure (EN ISO 13849-1 paragraph 4.5) as follows.



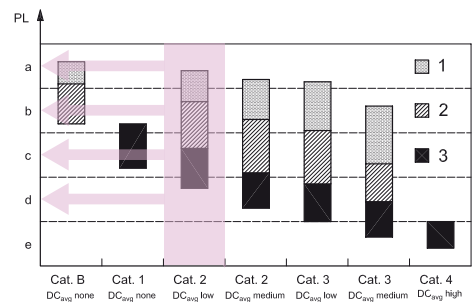
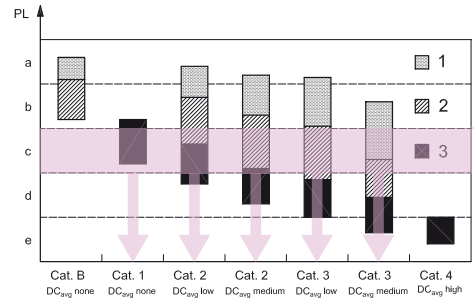
This image is very useful since it can be read from different point of view. Given a certain PL_r , the graph shows all the different solutions which determine that PL, that is the possible circuit structures which provide the same PL.

For instance, observing the figure, to obtain a system having a PL equal to "c" level all the following solutions are possible:

1. Category 3 system with little affordable components ($MTTF_d$ =low) and medium DC.
2. Category 3 system with affordable components ($MTTF_d$ =medium) and low DC.
3. Category 2 system with affordable components ($MTTF_d$ =medium) and medium DC.
4. Category 2 system with affordable components ($MTTF_d$ =medium) and low DC.
5. Category 1 system with highly affordable components ($MTTF_d$ =high).

At the same time the figure, chosen a circuit structure, allows to immediately see the max. PL reachable according to the average diagnostic coverage and the components $MTTF_d$. Therefore the manufacturer can exclude at once some circuit structures because not adequate to the required PL_r .

In general though, to identify the system PL do not refer to this figure since in many cases the graphic areas superimpose on the different PL margin lines. Instead, the table in EN ISO 13849-1 Annex K can be used for a precise determination of the circuit PL.



Safety parameters table

The B10d data shown in the table refer to the mechanical life of the device contacts, under normal ambient conditions. NO contacts may be used within the safety circuit only if combined with an NC contact, and must be monitored (for example, by a PLC or safety module). The value in B10d for NC and NO contacts refers to a maximum electrical load equal to 10% of the current value shown in the application category. Mission time (for all items indicated below): 20 years.

Electromechanical 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 and solenoid	1,000,000	5,000,000	20%
FS	Safety switches with separate actuator with lock and solenoid	1,000,000	4,000,000	20%
F•••96 F•••95	Safety switch with pin for hinge	1,000,000	5,000,000	20%
F•••C•	Switches with slotted hole lever for swing 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 (used 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	Prewired modular 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} (NC)	B ₁₀ /B _{10d}
E2 1PU1•••••••	Single maintained buttons	2,000,000	50%
E2 1PU2•••••••	Single spring-return buttons	30,000,000	50%
E2 1PD•••••••, E2 1PT•••••••	Double and triple buttons	2,000,000	50%
E2 1PE•••••••	Emergency buttons	600,000	50%
E2 1SE•••••••, E2 1SL•••••••	Selector switches and illuminated selector switches	2,000,000	50%
E2 1SC•••••••	Selector switches with key	600,000	50%
E2 1PQ•••••••	Quadruple buttons	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 switch with pin for hinge	500,000	2,500,000	20%
F•••C•-EX•	Switches with slotted hole lever for swing guards	500,000	1,000,000	50%
F•••••-EX•	Rope switches for emergency stop	500,000	1,000,000	50%

Electronic devices

Code	Article description	MTTF _d	DC	PFH _d	SIL CL	PL	Cat
HX BEE1-•••	Safety hinge with electronic unit	4018	H	2.29E-11	3	e	4
ST	Safety sensors with RFID technology	4077	H	1.46E-09	3	e	4
NG	RFID safety switches with lock	1883	H	8.07 E-10	3	e	4
CS AM-01	Standstill monitor safety module	145	M	1.94E-09	2	d	3
CS AR-01, CS AR-02	Safety module for monitoring of guards and emergency stops	227	H	1.18E-10	3	e	4
CS AR-04	Safety module for monitoring of guards, emergency stops	152	H	1.84E-10	3	e	4
CS AR-05, CS AR-06	Safety module for monitoring of guards, emergency stops and light barriers	152	H	1.84E-10	3	e	4
CS AR-07	Safety module for monitoring of guards and emergency stops	111	H	7.56E-10	3	e	4
CS AR-08	Safety module for monitoring of guards, emergency stops and light barriers	218	H	4.58E-10	3	e	4
CS AR-20, CS AR-21	Safety module for monitoring of guards and emergency stops	225	H	4.18E-10	3	e	3
CS AR-22, CS AR-23	Safety module for monitoring of guards and emergency stops	151	H	5.28E-10	3	e	3
CS AR-24, CS AR-25	Safety module for monitoring of guards and emergency stops	113	H	6.62E-10	3	e	3
CS AR-40, CS AR-41	Safety module for monitoring of guards and emergency stops	225	H	4.18E-10	2	d	2
CS AR-46	Safety module for monitoring of guards and emergency stops	435	-	3.32E-08	1	c	1
CS AR-51	Safety module for monitoring of safety mats and bumpers	209	H	9.43E-09	3	e	4
CS AR-90	Safety module for monitoring of lift floor leveling	382	H	5.03E-10	3	e	4
CS AR-91	Safety module for monitoring of lift floor leveling	227	H	1.18E-10	3	e	4

B_{10d}: Number of operations before 10% of the components have failed dangerously

B₁₀: Number of operations before 10% of the components have failed

B₁₀/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	Article description	MTTF _d	DC	PFH _d	SIL CL	PL	Cat
CS AR-93	Safety module for monitoring of lift floor leveling	227	H	1.34E-10	3	e	4
CS AR-94	Safety module for monitoring of lift floor leveling	213	H	5.62E-09	3	e	4
CS AR-94•U12	Safety module for monitoring of lift floor leveling	227	H	1.13E-10	3	e	4
CS AR-95	Safety module for monitoring of lift floor leveling	213	H	5.42E-09	3	e	4
CS AT-0•, CS AT-1•	Safety module with timer for monitoring of guards and emergency stops	84	H	9.01E-09	3	e	4
CS AT-3•	Safety module with timer for monitoring of guards and emergency stops	74	H	4.05E-09	3	e	4
CS DM-01	Safety module for monitoring of two-hand controls	142	H	2.99E-08	3	e	4
CS DM-02	Safety module for monitoring of two-hand controls	206	H	2.98E-08	3	e	4
CS DM-20	Safety module for monitoring of two-hand controls	42	-	1.32E-06	1	c	1
CS FS-1•	Safety timer module	146	H	1.62E-09	3	e	4
CS FS-2•, CS FS-3•	Safety timer module	205	M	1.10E-08	2	d	3
CS FS-5•	Safety timer module	349	M	1.17E-08	2	d	3
CS ME-01	Contact expansion module	76	H	6.38E-10	①	①	①
CS ME-02	Contact expansion module	113	H	2.84E-09	①	①	①
CS ME-03	Contact expansion module	208	M	2.45 E-08	①	①	①
CS ME-20	Contact expansion module	113	H	3.07E-09	①	①	①
CS ME-3•	Contact expansion module	112	H	2.77E-09	①	①	①
CS M•201	Multifunctional safety module	133	H	4.54E-10	3	e	4
CS M•202	Multifunctional safety module	573	H	4.73E-10	3	e	4
CS M•203	Multifunctional safety module	101	H	5.74E-10	3	e	4
CS M•204	Multifunctional safety module	132	H	5.32E-10	3	e	4
CS M•205	Multifunctional safety module	406	H	4.83E-10	3	e	4
CS M•206	Multifunctional safety module	643	H	2.85E-10	3	e	4
CS M•207	Multifunctional safety module	407	H	5.39E-09	3	e	4
CS M•208	Multifunctional safety module	588	H	6.17E-09	3	e	4
CS M•301	Multifunctional safety module	126	H	8.92E-10	3	e	4
CS M•302	Multifunctional safety module	604	H	3.45E-10	3	e	4
CS M•303	Multifunctional safety module	459	H	9.11E-10	3	e	4
CS M•304	Multifunctional safety module	97	H	1.01E-09	3	e	4
CS M•305	Multifunctional safety module	503	H	7.24E-10	3	e	4
CS M•306	Multifunctional safety module	99	H	8.25E-10	3	e	4
CS M•307	Multifunctional safety module	276	H	5.84E-09	3	e	4
CS M•308	Multifunctional safety module	514	H	6.42E-09	3	e	4
CS M•309	Multifunctional safety module	469	H	6.61E-09	3	e	4
CS M•401	Multifunctional safety module	413	H	1.16E-09	3	e	4
CS M•402	Multifunctional safety module	452	H	6.67E-09	3	e	4
CS M•403	Multifunctional safety module	416	H	6.86E-09	3	e	4

B_{10d}: Number of operations before 10% of the components have failed dangerously

B₁₀: Number of operations before 10% of the components have failed

B₁₀/B_{10d}: ratio of total failures to dangerous failures.

MTTF_d: Mean Time To Dangerous Failure

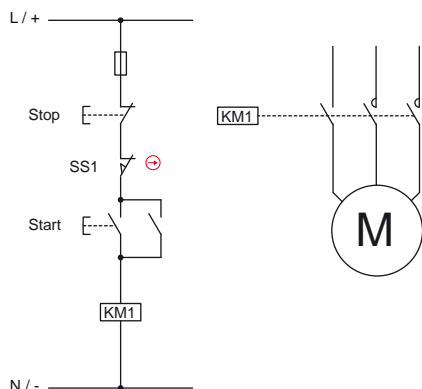
DC: Diagnostic Coverage

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 Dependent from the base module

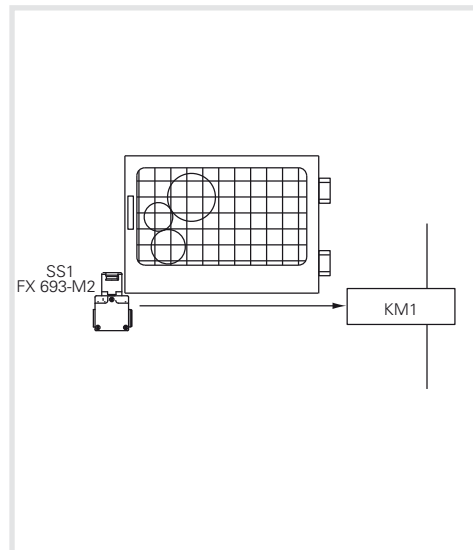
EXAMPLE 1**Application: Guard monitoring**

Reference standard EN ISO 13849-1

Safety category

1

Performance Level

PL c

The control circuit in the figure has a guard monitoring function. If the guard is open the engine must not start. The hazards analysis points out how the system does not have inertia, that is the engine, once de-energizing the power, stops faster than opening the guard. The risk analysis shows the required PL_r target is PL c. It is necessary to verify if the assumed control system, which has a one channel structure, has a PL_r higher or equal to PL_r .

Description of the safety function

The guard position is detected by the switch with separate actuator SS1 which operates directly on the contactor KM1. The contactor KM1 that controls the moving parts is usually activated by the buttons Start and Stop but the working cycle analysis shows that also the guard is open at every operation cycle. Consequently, the contactor and the switch number of operation can be considered equal.

The circuit structure is one channel type without supervision (category B or 1) where there are only Input (switch) and Output (contactor) components.

The safety function is not performed when a device failure occurs.

No measures for fault detection are implemented.

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 tested device according to EN ISO 13849-2 table D.4. The device B_{10d} value is supplied by the manufacturer (see page 333) equal to 2,000,000 operations.
- KM1 is a contactor used at nominal value. It's a well tested device in accordance with EN ISO 13849-2 table D.4. Its B_{10d} value is equal to 2,000,000 operations. This value is determined from the standard tables (see EN ISO 13849-1 table C.1).

Assumption of the frequency of use

- It is assumed that the machinery is used for 365 days per year, for three shifts of 8 hours and 600 s cycle time. Therefore the operations per year both for the contactor and the switch is equal to maximum $N_{op} = (365 \times 24 \times 3,600) / 600 = 52,560$.
- An operation of the start button every 300 seconds is assumed. The annual operations are at maximum equal to $n_{op}/year = 105,120$
- KM1 contactor shall be actuated both for the machine normal start-stop and the restart after the guard opening. $n_{op}/year = 52,560 + 105,120 = 157,680$

MTTF_d Calculation

The $MTTF_d$ of the SS1 switch is equal to: $MTTF_d = B_{10d} / (0,1 \times n_{op}) = 2000000 / (0,1 \times 52560) = 381$ years

The $MTTF_d$ of the KM1 contactor is equal to: $MTTF_d = B_{10d} / (0,1 \times n_{op}) = 2000000 / (0,1 \times 157680) = 127$ years

In consequence the one channel circuit $MTTF_d$ is equal to: $1 / (1/381 + 1/127) = 95$ years

Diagnostic Coverage DC_{avg}

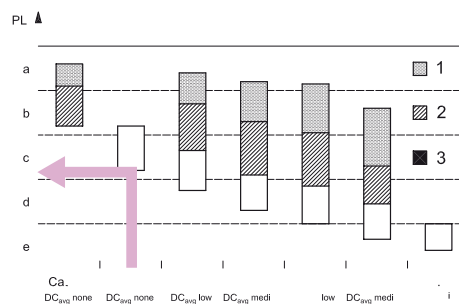
No measures for fault detection are implemented therefore the diagnostic coverage is None, admitted condition for the considered circuit which is in category 1.

CCF Common Cause Failure

No CCF calculation is necessary for a category 1 circuit.

PL verification

From the standard table or figure 5 we can verify that for a Category 1 circuit with $MTTF_d = 95$ years the resulting PL of the control circuit is PL c. Therefore the PL_r target is reached.



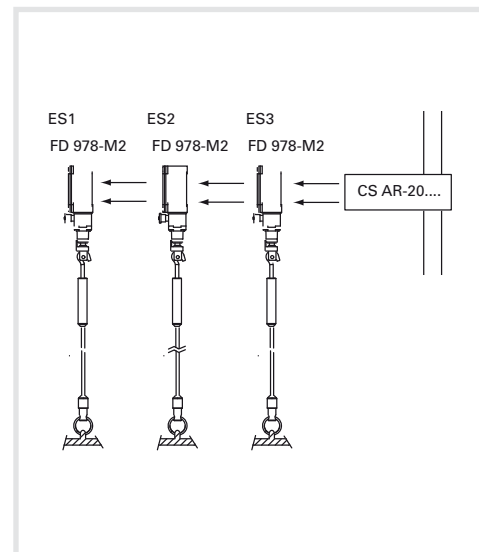
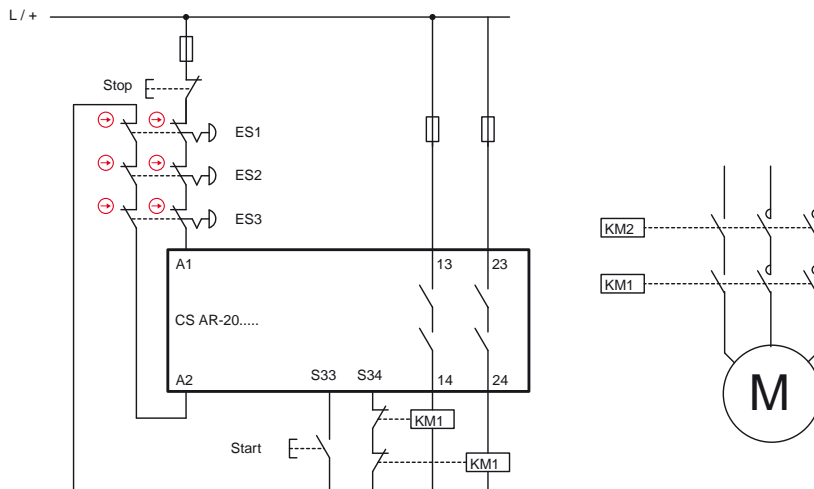
EXAMPLE 2**Application: Emergency stop control**

Reference standard EN ISO 13849-1

Safety category

3

Performance Level

PL e**Description of the safety function**

The operation of one emergency device causes the safety module and the two contactors KM1 and KM2 to intervene.

The ES1, ES2, ES3 device signal is redundantly read by the CS safety module. Also the KM1 and KM2 contactors (with forcibly guided contacts) are monitored by CS via the feedback circuit.

Device data:

- ES1, ES2, ES3 (FD 978-M2) are rope switches for emergency stop with positive opening. The B_{10d} value is equal to 2,000,000 (see page 333)
- KM1, KM2 are contactors used at nominal load. The device B_{10d} value is equal to 2,000,000 (see EN ISO 13849-1 Table C.1)
- CS is a safety module (CS AR-20) with $MTTF_d=225$ years (see page 333) and DC= High
- The circuit architecture is two channels type in category 3

Assumption of the frequency of use

- Twice a month $n_{op}/year = 24$
- Start button operation: 4 times a day
- Assuming 365 working day, contactors shall intervene $4 \times 365 + 24 = 1,484$ times/year
- Switches are operated with the same frequency.
- The case of more buttons pushed together is not considered.

MTTF_d Calculation

- $MTTF_{d,ES1,ES2,ES3} = 833.333$ years
- $MTTF_{d,KM1,KM2} = 13.477$ years
- $MTTF_{d,CS} = 225$ years
- $MTTF_{d,CH1} = 221$ years. Value restricted to 100 years. The channels are symmetric thus $MTTF_d=100$ years (High)

Diagnostic Coverage DC_{avg}

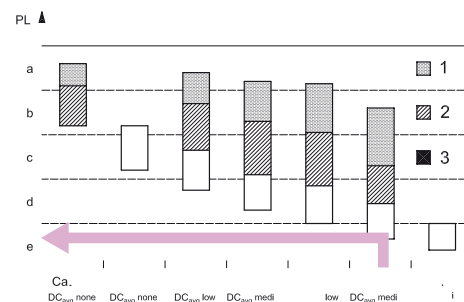
- KM1 and KM2 contactors are monitored by CS via the feedback circuit. DC=99% (High)
- The CS AR-20 safety module has a High diagnostic coverage.
- Not all faults in the emergency device series can be detected. The diagnostic coverage is 90% (Medium)

CCF Common Cause Failure

We assume a score > 65 (based on EN ISO 13849-1 - annex F).

PL verification

- A category 3 circuit with $MTTF_d=High$ and $DC_{avg} = High$ can reach a PL e.



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EXAMPLE 3

Application: Guard monitoring

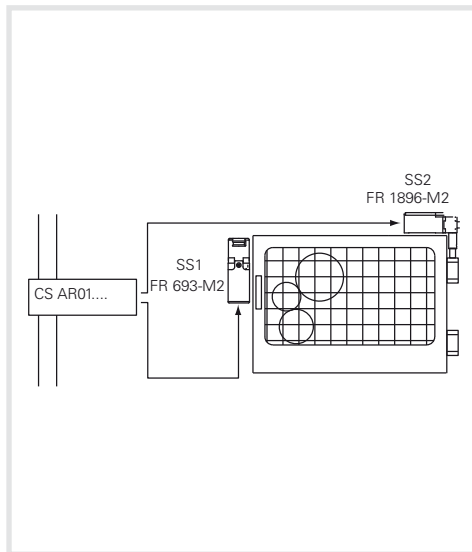
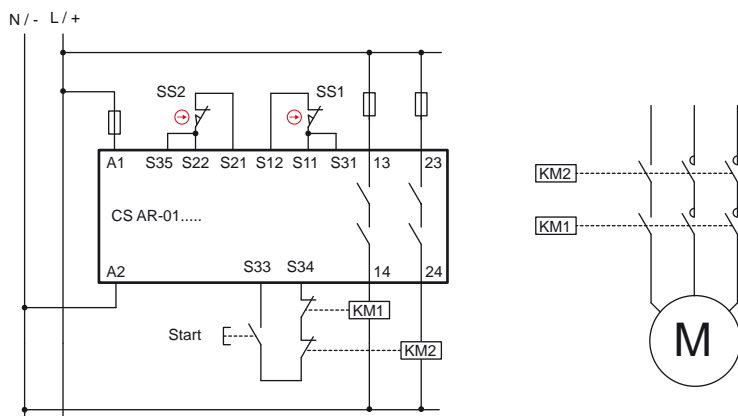
Reference standard EN ISO 13849-1

Safety category

4

Performance Level

PL e



Description of the safety function

The guard opening causes the SS1 and SS2 switches to intervene; consequently the safety module and the KM1 and KM2 contactors do the same.

The SS1, SS2 device signal is redundantly monitored by the CS safety module.

The switches have a different operating principle.

Also the KM1 and KM2 contactors (with forcibly guided contacts) are monitored by CS via the feedback circuit.

Device data:

- SS1 (FR 693-M2) is a switch with positive opening. The B_{10d} value is equal to 2,000,000 (see page 333)
- SS2 (FR 1896-M2) is a hinge operating switch with positive opening. $B_{10d} = 5,000,000$ (see page 333)
- KM1, KM2 are contactors used at nominal load. $B_{10d} = 2,000,000$ (see EN ISO 13849-1 - Table C.1)
- CS is a safety module (CS AR-01) with $MTTF_d = 227$ years and DC= High

Assumption of the frequency of use

365 days/year, 16 h/day, 1 operation every 4 minutes (240 s). $n_{op}/year = 87,600$

MTTF_d Calculation

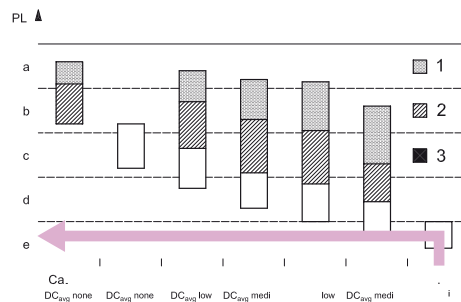
- $MTTF_{d, SS1} = 228$ years
- $MTTF_{d, SS2} = 571$ years
- $MTTF_{d, KM1, KM2} = 228$ years
- $MTTF_{d, CS} = 227$ years
- $MTTF_{d, CH1} = 67$ years (SS1, CS, KM1)
- $MTTF_{d, CH2} = 77$ years (SS2, CS, KM2)
- $MTTF_d$: symmetrically arranging the two channels, the result is $MTTF_d = 72.1$ years (High)

Diagnostic Coverage DC_{avg}

- SS1, SS2 have DC=99% since SS1, SS2 contacts are monitored by the CS and they have different operating principles.
- KM1 and KM2 contactors are monitored by CS via the feedback circuit. DC=99% (High)
- The CS AR-01 has an internal redundant and self-monitoring circuit. DC = High
- $DC_{avg} = High$

PL verification

A category 4 circuit with $MTTF_d = 72.1$ years and $DC_{avg} = High$ corresponds to a PL e.



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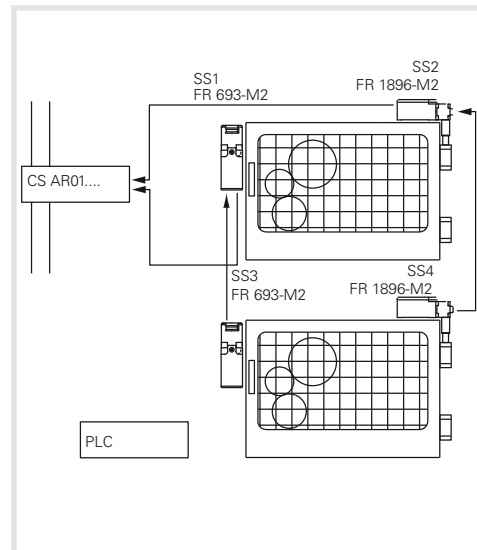
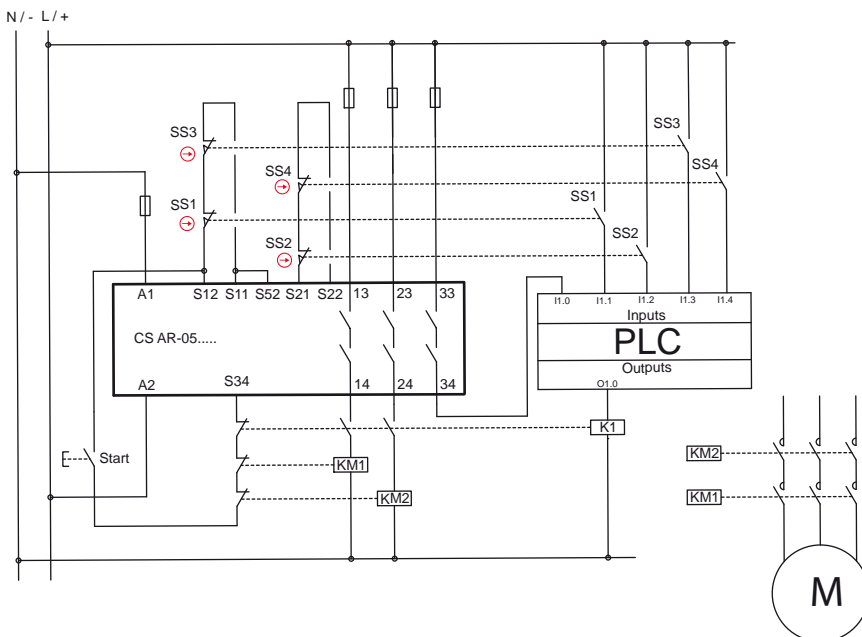
EXAMPLE 4**Application: Guard monitoring**

Reference standard EN ISO 13849-1

Safety category

4

Performance Level

PL e**Description of the safety function**

The opening of a guard causes the SS1, SS2 switches to intervene on the first guard and SS3, SS4 on the second; the switches trigger the safety module and the KM1 and KM2 contactors.

The SS1, SS2 and SS3, SS4 device signal is redundantly monitored by the CS safety module, furthermore the switch auxiliary contact is monitored by PLC.

The switches have a different operating principle.

Also the KM1 and KM2 contactors (with forcibly guided contacts) are monitored by CS via the feedback circuit.

Device data:

- SS1, SS3 (FR 693-M2) are switches with positive opening. The B_{10d} value is equal to 2,000,000 (see page 333)
- SS2, SS4 (FR 1896-M2) is a hinge switch with positive opening. $B_{10d} = 5,000,000$ (see page 333)
- KM1, KM2 are contactors used at nominal load. The device B_{10d} value is equal to 2,000,000 (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 and 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
- $MTTF_{d, KM1, KM2} = 285$ years
- $MTTF_{d, CS} = 152$ years
- $MTTF_{d, Ch1} = 84$ years (SS1, CS, KM1) / (SS3, CS, KM1)
- $MTTF_{d, Ch2} = 93$ years (SS2, CS, KM2) / (SS4, CS, KM2)
- $MTTF_d$: symmetrically arranging the two channels, the result is $MTTF_d = 88.6$ years (High).

Diagnostic Coverage DC_{avg}

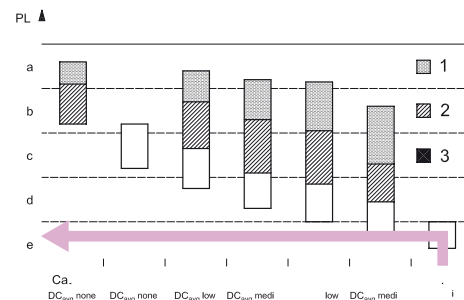
- KM1, KM2 contacts are monitored by CS via the feedback circuit. DC=99%
- All auxiliary contacts of the switches are monitored by PLC. DC=99%
- The CS AR-05 module has a DC= High (see page 333)
- The diagnostic coverage for both channels is 99% (High)

CCF Common Cause Failure

- We assume a score > 65 (based on EN ISO 13849-1 - annex F).

PL verification

- A category 4 circuit with $MTTF_d = 88.6$ years (High) and $DC_{avg} = \text{High}$ corresponds to a PL e.

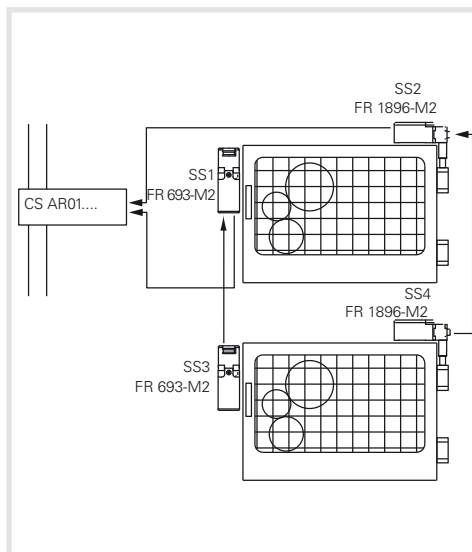
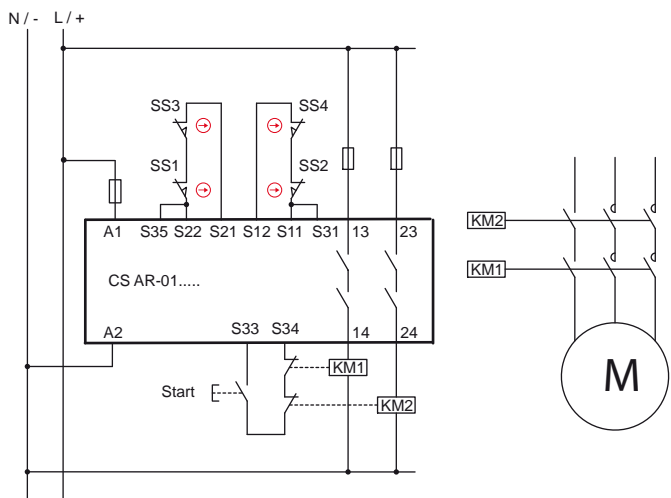


EXAMPLE 5

Application: Guard monitoring

Reference standard EN ISO 13849-1

Safety category **3**
Performance Level **PL e**



Description of the safety function

The opening of a guard causes the SS1, SS2 switches to intervene on the first guard and SS3, SS4 on the second; the switches trigger the safety module and the KM1 and KM2 contactors.

The SS1, SS2 and SS3, SS4 device signal is redundantly monitored by the CS safety module.

The switches have a different operating principle.

Also the KM1 and KM2 contactors (with forcibly guided contacts) are monitored by CS via the feedback circuit.

Device data:

- SS1, SS3 (FR 693-M2) are switches with positive opening. The B_{10d} value is equal to 2,000,000 (see page 333)
- SS2, SS4 (FR 1896-M2) is a hinge switch with positive opening. B_{10d} = 5,000,000 (see page 333)
- KM1, KM2 are contactors used at nominal load. The device B_{10d} value is equal to 2,000,000 (see EN ISO 13849-1 table C.1)
- CS is a safety module (CS AR-01) with $MTTF_d=227$ years and DC= High

Assumption of the frequency of use

- 2 times per hour for 16 h/day and 365 days/year equal to $n_{op}/year = 11,680$
- The contactors will operate for twice the number of operations = 23,360

MTTF_d Calculation

- $MTTF_{d, SS1, SS3} = 1,712$ years
- $MTTF_{d, SS2, SS4} = 4,281$ years
- $MTTF_{d, KM1, KM2} = 856$ years
- $MTTF_{d, CS} = 227$ years
- $MTTF_{d, CH1} = 162$ years (SS1, CS, KM1) / (SS3, CS, KM1)
- $MTTF_{d, CH2} = 172$ years (SS2, CS, KM2) / (SS4, CS, KM2)
- $MTTF_{d} =$ value restricted to 100 years

Diagnostic Coverage DC_{avg}

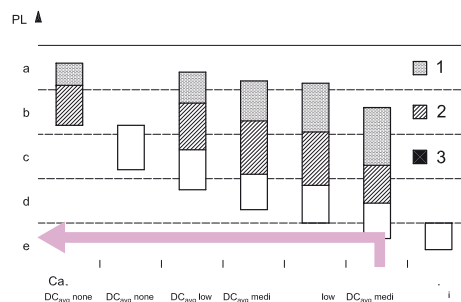
- KM1, KM2 contacts are monitored by CS via the feedback circuit. DC=99%
- Not all faults in the switch series can be detected. DC=60%
- The CS AR-01 module has a DC= High
- We assume a diagnostic coverage of 92% (Medium)

CCF Common Cause Failure

- We assume a score > 65 (based on EN ISO 13849-1 - annex F).

PL verification

- A category 3 circuit with $MTTF_d=100$ years and DC_{avg} =medium corresponds to a PL e.



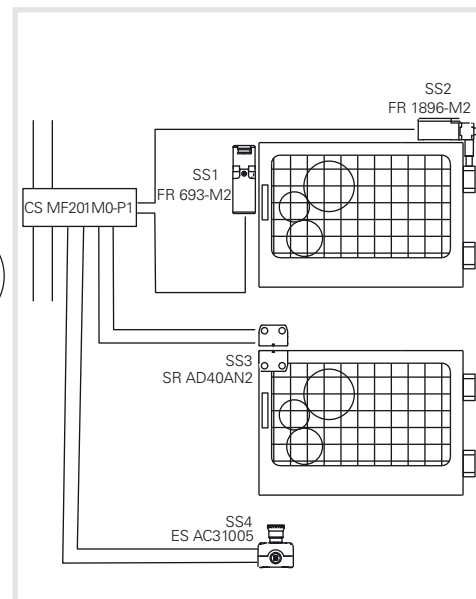
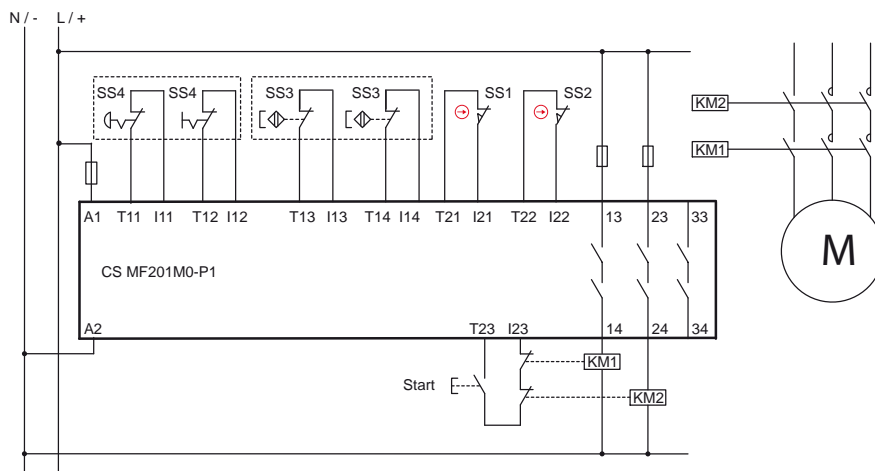
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EXAMPLE 6

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 causes the SS1, SS2 switches to intervene on the first guard and SS3 sensor on the second; the switches trigger the safety module and the KM1 and KM2 contactors.

The SS1, SS2 and SS3 device signals are redundantly monitored by the CS MF safety module.

There is also an emergency button, which is also connected with a double channel to the safety module.

Also the KM1 and KM2 contactors (with forcibly guided contacts) are monitored by CS MF via the feedback circuit.

Device data:

- SS1 (FR 693-M2) is a switch with positive opening. $B_{10d} = 2.000.000$ (see page 333)
- SS3 (FR 1896-M2) is a hinge operating switch with positive opening. $B_{10d} = 5.000.000$ (see page 333)
- SS3 (SR AD40AN2) is a magnetic safety sensor. $B_{10d} = 20.000.000$ (see page 333)
- SS4 (ES AC31005) is a box with emergency button (E2 1PERZ4531) with two NC contacts. $B_{10d} = 600.000$ (see page 333)
- KM1, KM2 are contactors used at nominal load. $B_{10d} = 2.000.000$ (see Table C.1 of EN ISO 13849-1)
- CS MF201M0-P1 is a safety module with $MTTF_d = 842$ years and $DC = 99\%$

Assumption of the frequency of use

- Each gate is opened 2 times per hour for 16 h/day and 365 days/year equal to $n_{op}/year = 11.680$
- It is assumed that the emergency button is actuated at most 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
- $MTTF_d KM1, KM2 = 843$ years
- $MTTF_d CS = 842$ years
- $MTTF_d CH1 = 338$ years (SS1, CS, KM1)
- $MTTF_d CH2 = 383$ years (SS2, CS, KM2)
- $MTTF_d =$ value restricted to 100 years

Guard SS3

- $MTTF_d SS3 = 17.123$ years
- $MTTF_d KM1, KM2 = 843$ years
- $MTTF_d CS = 842$ years
- $MTTF_d = 411$ years
- $MTTF_d =$ value restricted to 100 years

Emergency button SS4

- $MTTF_d SS4 = 16.438$ years
- $MTTF_d KM1, KM2 = 843$ years
- $MTTF_d CS = 842$ years
- $MTTF_d = 410$ years
- $MTTF_d =$ value restricted to 100 years

Diagnostic Coverage DC_{avg}

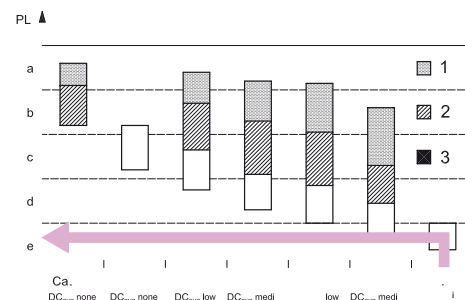
- KM1, KM2 contacts are monitored by CS MF via the feedback circuit. $DC = 99\%$
- All faults in the device series SS1, SS2 and SS3 can be detected. $DC = 99\%$
- The CS MF201M0-P1 module has a $DC = 99\%$
- We assume a diagnostic coverage of 99% (High)

CCF Common Cause Failure

- We assume a score > 65 (based on EN ISO 13849-1 - annex F).

PL verification

- A category 4 circuit with $MTTF_d = 100$ years and $DC_{avg} =$ High corresponds to a PL e.
- The safety functions connected to guards SS1/SS2, SS3 and to the button have PL e.



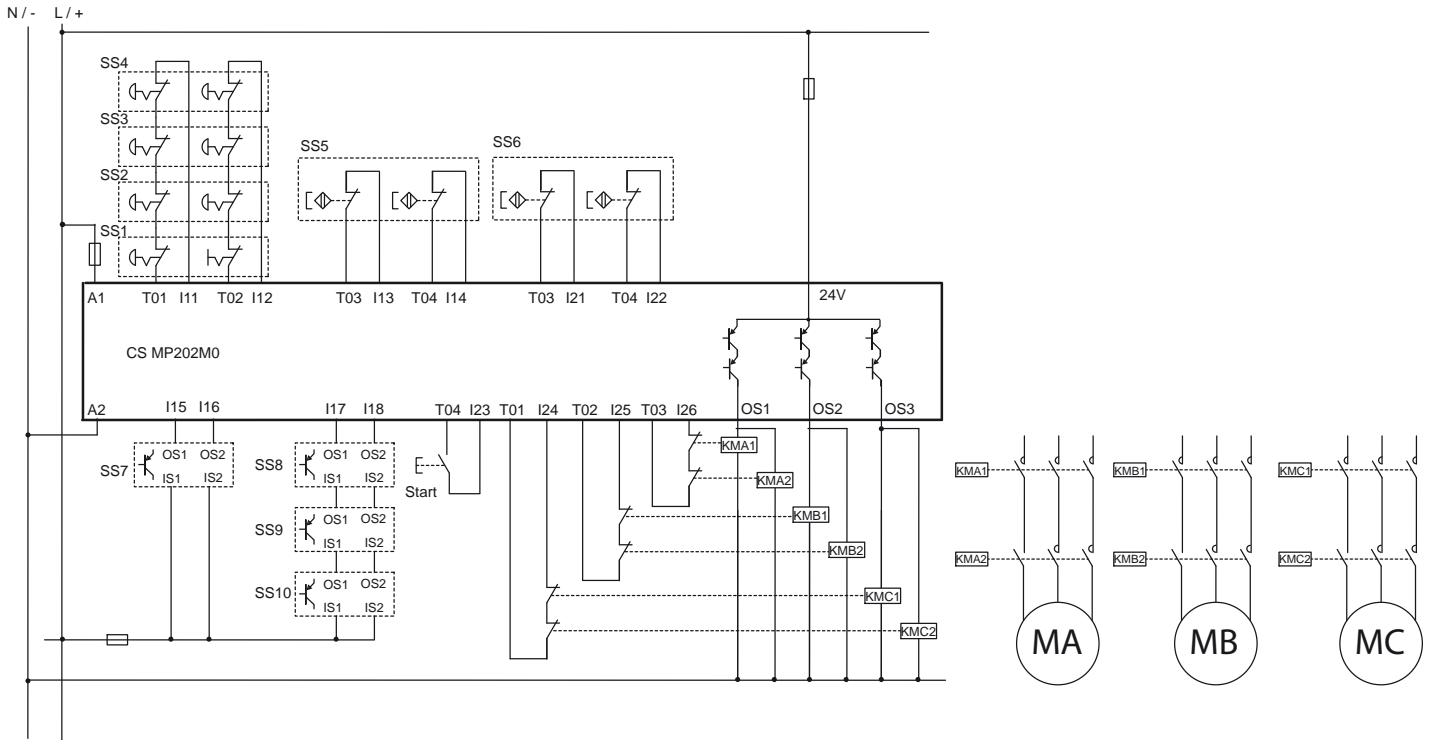
Any information or application example, included the connection diagrams, described in this document are to be intended as purely descriptive. The choice and application of the products in conformity with the standards, in order to avoid damage to persons or goods, is the user's responsibility.

EXAMPLE 7

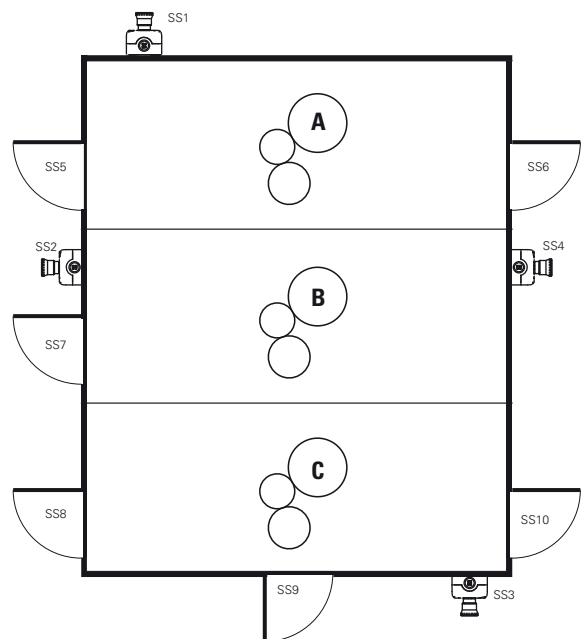
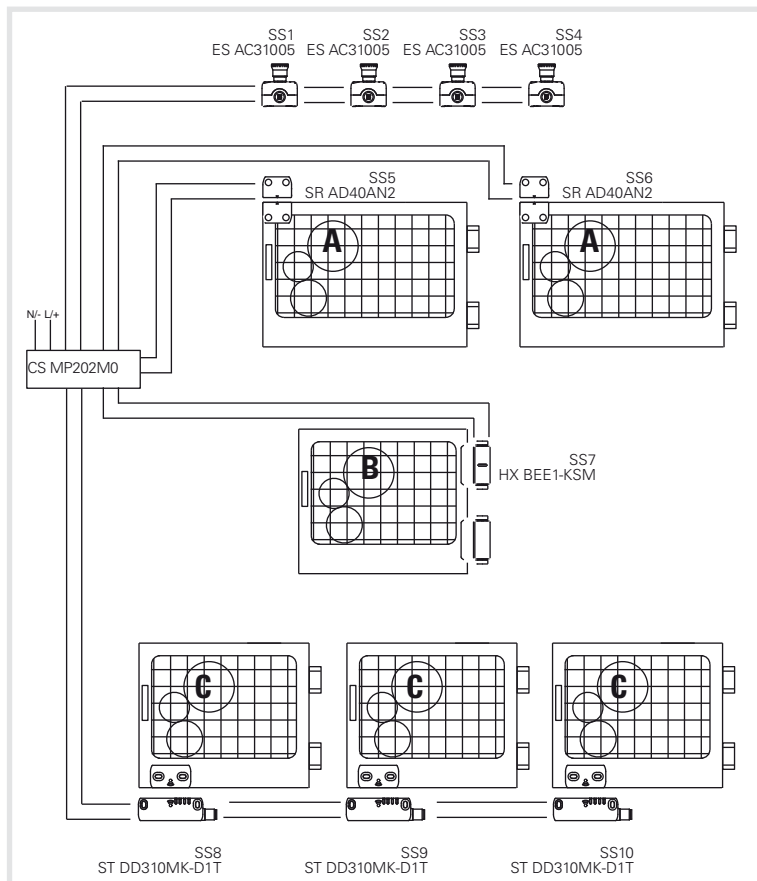
Application: Guard monitoring

Reference standard EN ISO 13849-1

Safety category **4**
Performance Level **PL e**



Module CS MP202M0
Technical data: see pages 269-270



Description of the safety function

The machine is divided into 3 different zones: access to each area is controlled by guards, and there is a series of 4 emergency buttons. When activating the emergency button, the CS MP safety module and the forcibly guided contactors KMA1/2, KMB1/2, KMC1/2 stop all motors.

The opening of a guard in zone A causes the intervention of device SS5 or SS6, which triggers the CS MP safety module and contactors KMA1 and KMA2, thus stopping the MA motor. Devices SS5, SS6 are connected separately and with a double channel to the CS MP safety module.

The opening of the guard in zone B causes the intervention of SS7, which triggers the CS MP safety module and the two contactors KMB1 and KMB2, thus stopping the MB motor. The SS7 hinge has two OSSD outputs and is controlled redundantly by the CS MP safety module.

The opening of a guard in zone C causes the intervention of device SS8, SS9 or SS10, which triggers the safety module and the two contactors KMC1 and KMC2, thus stopping the MC motor. Sensors SS8, SS9 and SS10 are connected to each other via to the OSSD outputs, and are redundantly controlled by the CS MP safety module.

Device data

- SS1, SS2, SS3 and SS4 (ES AC31005) are emergency buttons (E2 1PERZ4531) with 2 NC contacts. $B_{10d} = 600,000$ (see page 333)
- SS5 and SS6 (SR AD40AN2) are magnetic safety sensors. $B_{10d} = 20,000,000$ (see page 333)
- SS7 (HX BEE1-KSM) is a safety hinge with OSSD outputs. $MTTF_d = 4077$ years / DC=99% (see page 333)
- SS8, SS9 and SS10 (ST DD310MK-D1T) are safety sensors with RFID technology and OSSD outputs. $MTTF_d = 4077$ years / DC=99% (see page 333)
- KMA, KMB and KMC are contactors used at nominal load. $B_{10d} = 2,000,000$ (see Table C.1 of EN ISO 13849-1)
- CS MP202M0 is a safety module with $MTTF_d = 2035$ years / DC=99%

Assumption of the frequency of use

- Each zone A gate is opened 2 times per hour for 16 h/day and 365 days/year equal to $n_{op}/year = 11,680$. The contactors will operate for twice the number of operations = 23,360
- Zone B gate is opened 4 times per hour for 16 h/day and 365 days/year equal to $n_{op}/year = 23,360$. The contactors will operate for a given number of operations = 23,360
- Each zone C gate is opened once per hour for 16 h/day and 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 most once a week, $n_{op}/year = 52$
- Fault exclusion: it is hypothesized that the pairs of contactors connected in parallel to the respective safety outputs are permanently cabled inside the electrical panel; therefore, the possibility of short circuit between +24V and contactors is excluded. (see Table D.4, D.5.2 of EN ISO 13849-2).

MTTF_d Calculation

Emergency buttons

- $MTTF_d$ SS1/SS2/SS3/SS4 = 115,384 years
- $MTTF_d$ CS = 2035 years
- $MTTF_d$ KMC1, KMC2 = 1141 years
- $MTTF_d$ e-stop = 727 years, value restricted to 100 years

Zone A guards

- $MTTF_d$ SS5/SS6 = 17.123 years
- $MTTF_d$ CS = 2035 years
- $MTTF_d$ KMA1, KMA2 = 856 years
- $MTTF_d$ A = 582 years (SS5/SS6, CS, KMA), value restricted to 100 years

Zone B gate

- $MTTF_d$ SS7 = 4.077 years
- $MTTF_d$ CS = 2035 years
- $MTTF_d$ KMB1, KMB2 = 856 years
- $MTTF_d$ B = 525 years (SS7, CS, KMB), value restricted to 100 years

Zone C guards

- $MTTF_d$ SS8/SS9/SS10 = 4.077 years
- $MTTF_d$ CS = 2035 years
- $MTTF_d$ KMC1, KMC2 = 1141 years
- $MTTF_d$ C = 620 years (SS8/SS9/SS10, CS, KMC), value restricted to 100 years

Diagnostic Coverage DC_{avg}

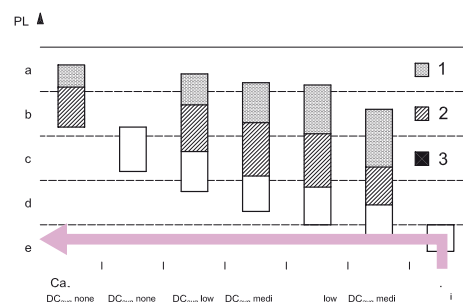
- KMA, KMB e KMC contacts are monitored by CS MP via the feedback circuit. DC=99%
- All faults of the various devices can be detected. DC=99%
- CS MP202M0 module has a DC=99%
- For each function we assume a diagnostic coverage of 99%

CCF Common Cause Failure

- We assume a score > 65 for all safety functions (based on EN ISO 13849-1 annex F).

PL verification

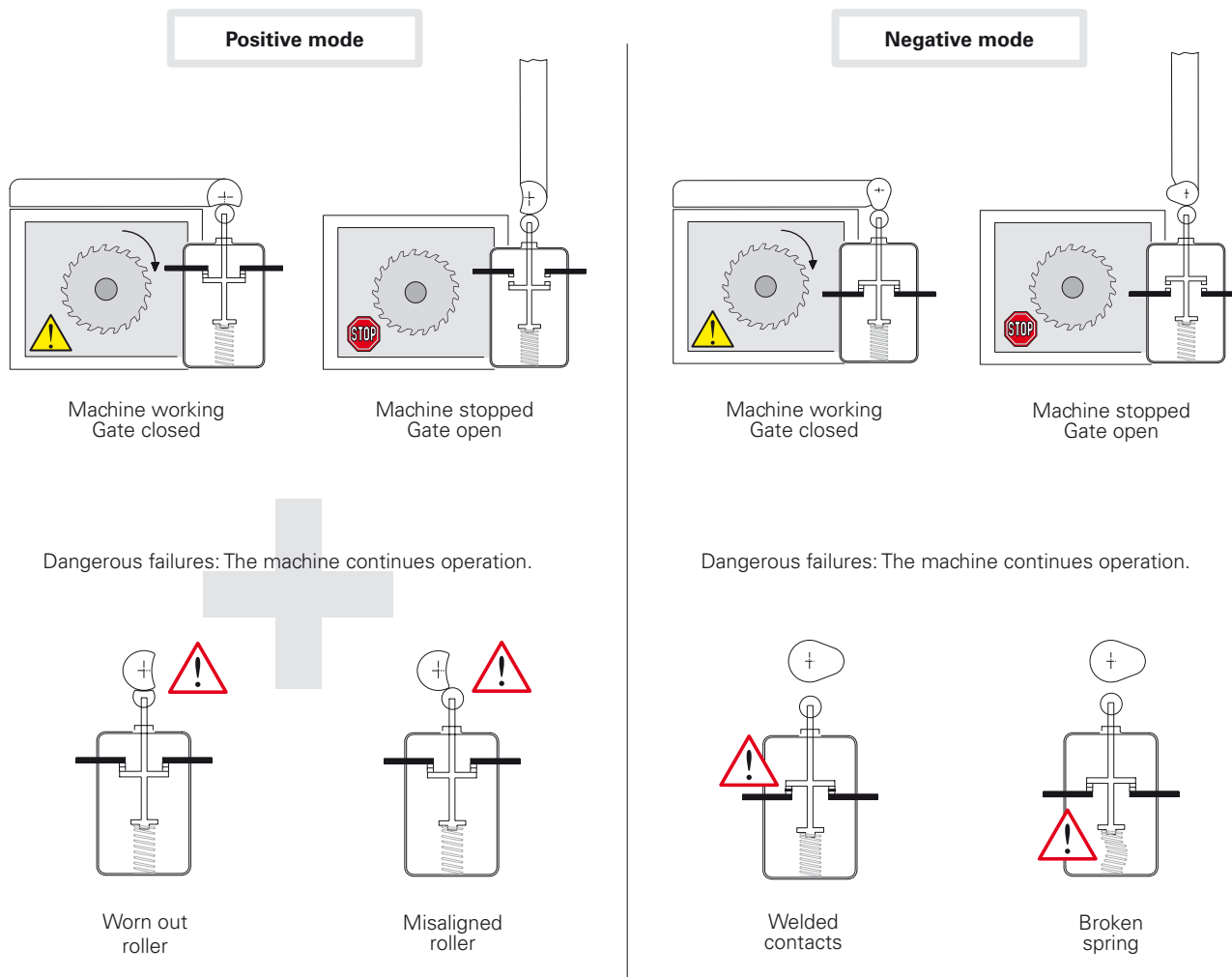
- A category 4 circuit with $MTTF_d = 100$ years and $DC_{avg} = \text{High}$ corresponds to a PL e.
- All safety functions for the guards and the emergency buttons have PL e.



7 - Positive opening, redundancy, diversification and self-control

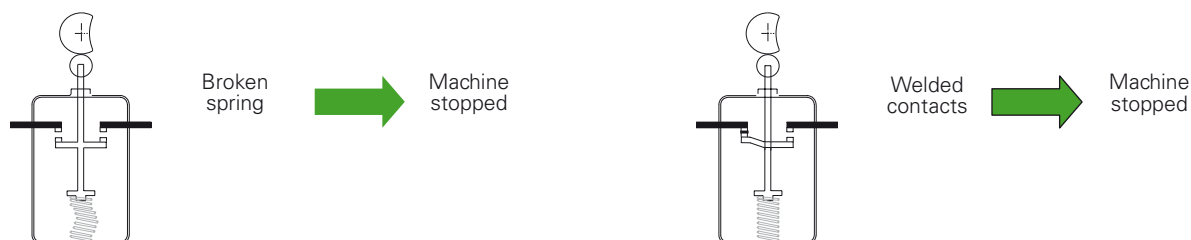
Positive mode and negative mode.

According to the standard EN ISO 12100, if a mechanical component in motion, directly drives another component, through physical contact or a rigid mechanical linkage, that connection is said to be in a **positive manner**. 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.) their connection is in a **negative manner**.




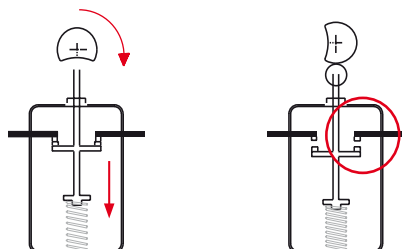
The positive mode avoids, with preventive maintenance, the dangerous failures indicated above. In negative mode, on the contrary, failures occur inside the switch and are therefore difficult to be detected.

With positive mode, internal failures (welded contacts or broken springs) allow the opening of the contacts and therefore the stop of the machine.



Use of switches in safety applications

When a single switch is used in a safety function, it must be actuated in a positive manner. The opening contact (normally closed), must be with “**positive opening**” in order to be used for safety applications. All switches with the symbol  are provided with NC contacts with positive opening.



Rigid non-flexible connection between the moving contacts and the actuator, where the actuating force is applied.

If the switches are two or more, it is suggested that they should operate in opposite modes, for example:

- One with a normally closed contact (opening contact) actuated by the guard in positive mode.
- The other with a normally open contact (closing contact), actuated by the guard in negative mode.

This is a common practice, however, it does not exclude, if justified, the use of two switches actuated in a positive mode (see diversification).

Diversification

Safety in the redundant system is increased by **diversification**. It is obtained by the application of two limit switches with different design and/or technology, in order to avoid failures caused by the same reasons. Some examples of diversification are: the use of a switch working in positive manner together with one working in non-positive manner; a switch with mechanical actuation and one with non mechanical actuation (e.g. electronic sensor); two switches with mechanical actuator working in positive manner but with different actuation principles (e.g. one actuator operated FR 693-M2 and one hinge operated FR 1896-M2 switch).

Redundancy

The **Redundancy** is the use of more than one device or system in order to guarantee that, in case of a function failure in one of them, another one is available to perform the safety functions. If the first failure is not detected, an eventual second failure may cause the loss of the safety functions.

Self-monitoring

The **Self-monitoring** consists in the automatic checking of the right function of every device running in the machine working-cycle. Consequently, the next working cycle can be either accepted or rejected.

Redundancy and self-monitoring

The combination of both systems, **redundancy** and **self-monitoring** allows that a first failure in the safety circuit does not cause the loss of safety functions. This first failure will be detected at the next re-start or anyhow before a second failure, which may cause the loss of the safety functions.

Definitions complying with the standards EN 60947-1 and EN 60947-5-1**Control switches**

A mechanical switching device which serves the purpose of controlling the operations of switch gear or control-gear, including signalling, electrical interlocking, etc.

Utilization category

A combination of specified requirements related to the conditions in which the switching device fulfils its purpose.

Operating cycle

Succession of two movements, one for closure and second for opening.

Rated current I_e

A current that takes into account the rated operating voltage, the rated frequency, the utilization category and the type of protective enclosure, if appropriate.

Thermal current I_{th}

Max. value of current to be used for temperature-rise tests of equipment without enclosure, in free air. Its value shall be least equal to the maximum value of the rated operational current I_e 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 made without repair or replacement.

Mechanical endurance

Number of no-load operating cycles (i.e. without current at the main contacts), under the conditions defined by the corresponding product standard, which can be effected before it becomes necessary to service or replace any mechanical parts.

Contact element

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 element

Contact element which opens or closes the conducting path of its circuit in one location only.

Double interruption contact element

Contact element which opens or closes the conducting path of its circuit in two locations in series.

Make-contact element (normally open)

Contact element which closes a conducting path when the control switch is actuated.

Break-contact element (normally closed)

Contact element which opens a conducting path when the control switch is actuated.

Change-over contact elements

Contact element combination which includes one make-contact element and one break-contact element.

Electrically separated contact elements

Contact elements belonging to the same control switch, but adequately insulated from each other, so they can be connected to electric circuits with different tension.

Independent action contact element (snap action)

Contact element of a manual or automatic control device in which the velocity of contact motion is substantially independent of the actuator's motion velocity.

Dependent action contact element (slow action)

Contact element of a manual or automatic control device, the contact motion velocity of which depends on the actuator's motion velocity.

Minimum actuating force

The minimum force value to be applied to the actuator that will cause all contacts to reach their switched position.

Position switch

Pilot switch the actuating system of which is operated by a moving part of the machine, when that part reaches a predetermined position.

Foot switch

Control switch having an actuator intended to be operated by the force exerted by a foot.

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 determined under prescribed conditions surrounding the complete switching device.

Rated operating voltage U_e

Voltage which, combined with the rated operational current I_e , determinates the application of the equipment and the referred utilization categories.

Rated insulation voltage U_i

Voltage to which dielectric test voltage and creepage distances are referred.

Impulse withstand voltage U_{imp}


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 blocks

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) on subjects of safety and quality. Its function therefore is to guarantee to the governing authorities of the various countries the fulfilment of their obligations under the law.

IMQ marking



The IMQ (Italian Institute of the Quality Mark) is the organization in Italy (third and independent) whose task is to check and certify the compliance of the materials and the equipment with the safety standards (CEI standards in the electric and electronic branch). This voluntary conformity certification is a guarantee of quality, safety and technical value.

UL marking



UL (Underwriters Laboratories Inc.) is an independent non-profit laboratory 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. Regulations and testing made by UL is often taken as valid, by many governing authorities, with regard to conformity with local regulations on the subject of safety.

CCC marking



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 organization makes preliminary company visits and periodical verification inspections. Position switches cannot be sold in the Chinese territory without this mark.

TÜV SÜD certification 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 marking



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.

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. Devices for emergency stop, 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).

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 apparatus 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

BG-GS-ET-15: Prescriptions about how to test switches with forced contact opening to be used in safety applications (German standard).

UL 508: Standard for industrial control equipment. (American standard).

CSA 22-2 no. 14: Standard for industrial control equipment. (Canadian standard).

European directives

2006/95/EC	Directive on low-voltage switchgear and controlgear
2006/42/EC	Machinery Directive
2004/108/EC	Directive on electromagnetic compatibility
94/9/EC	ATEX Directive

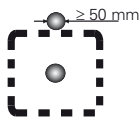
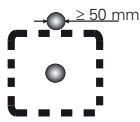
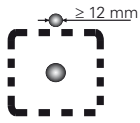
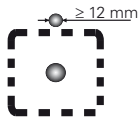
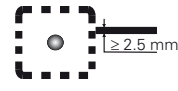
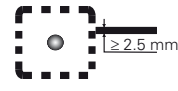
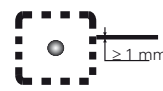
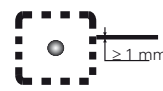
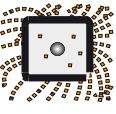
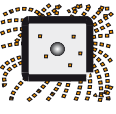




Regulatory Organisations

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	TUV	Technischer Überwachungs-Verein (DE)

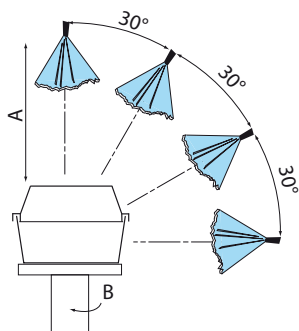
Protection degree of the housings for electrical material according to IEC 60529

This table indicates the protection degrees according to IEC 60529, EN 60529, CEI 70-1 standards.

The degrees are identified by the letters IP and 2 numbers. 2 more letters can be added, in order to give the protection degree for people or other features. The first number means the degree of protection against penetration of external solid materials. The second one indicates the degree of protection against penetration of water.

1st number	Description	Protection for the machine	Protection for persons	2nd number	Description	Protection for persons
0		Not protected	Not protected	0		Not protected
1		Protected from solid bodies of more than 50 mm in diameter	No access to hazardous parts with back of the hands (Ø 50 mm)	1		Protected from drops of water falling vertically
2		Protected from solid bodies of more than 12 mm in diameter	No access to hazardous parts with a finger (Ø 12 mm)	2		Protected from drops of water at an angle of 15° max.
3		Protected from solid bodies of more than 2.5 mm in diameter	No access to hazardous parts with tool (Ø 2.5 mm)	3		Protected from drops of water at an angle of 60° max.
4		Protected from solid bodies of more than 1 mm in diameter	No access to hazardous parts with wire (Ø 1 mm)	4		Protected from splashes of water around it
5		Protected from dust	No access to hazardous parts with wire (Ø 1 mm)	5		Protected from jets of water discharged around it
6		Totally protected from dust	No access to hazardous parts with wire (Ø 1 mm)	6		Protected from strong jets of water around it
				7		Protected from temporary water immersion (30 minutes in a depth of one meter)
				8		Protected from continuous water immersion by aggrement

Protection degree IP69K according to ISO 20653



ISO 20653 provides a particularly stringent test. The standard provides that a device has to pass a particularly heavy test which 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 temperature 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: $80 \pm 5^\circ\text{C}$
 Test duration: 30 s each position

Housing features 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 like the kind of gasket or the use of solvent materials.

Type	Use guidance 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	Both indoor and open-air utilization, supplied with a protection degree against falling rain, sprinkling of water and direct water from the pipe. It is not damaged by the freezing of the housing and is rust-proof. Resistant against corrosion.
12	Indoor utilization, supplied 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 standard IEC 60947-1, the pollution degree is a conventional number based on the quantity of conducting hygroscopic dust, ionized gas or salt, on the relative humidity and on the frequency of occurrence, which is translated into hygroscopic absorption or humidity condensation, having the effect of reducing the dielectric rigidity 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 because of conductive dust or rain or snow.

Where not otherwise specified by the applicable standard 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 the particular applications.

Utilization categories for switching elements according to EN 60947-5-1

Alternate current utilization

Utilization category	Description
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 utilization

Utilization category	Destination
DC12	Control of resistive loads and solid state loads with insulation by optocouplers.
DC13	Control of electromagnet loads without economy resistors in circuit
DC14	Control of electromagnet loads with economy resistors in circuit

Legend:

CS AM-0.....

The dots indicate a generic alphanumeric character

Article	Page	Article	Page
AC 8512	93	FR ••96-M2	77
AP A001	151	FR ••C-M2	83
AP G•••••	151	FS •••••••	107
CS AM-0•••••	229	FW ••92-M2	23
CS AR-01•••••	183	FX ••74-M2	167
CS AR-02•••••	185	FX ••93-M2	23
CS AR-04•••••	187	FX ••96-M2	77
CS AR-05•••••	189	FX ••C-M2	83
CS AR-06•••••	189	FZ ••74-M2	167
CS AR-07•••••	191	FZ ••96-M2	77
CS AR-08•••••	193	FZ ••C-M2	83
CS AR-20•••••	195	HC ••	51
CS AR-21•••••	195	HP AA0•••••••	51
CS AR-22•••••	197	HP AB0•••••••	51
CS AR-23•••••	197	HX CB	61
CS AR-24•••••	199	HX •••••••	61
CS AR-25•••••	199	NG •••••••	117
CS AR-40•••••	201	SM A01N	35
CS AR-41•••••	201	SM B0•F	29
CS AR-46•••••	203	SM D••	41
CS AR-51•••••	207	SR A•••A•••••	35
CS AR-91•••••	205	SR BD••A•••••	29
CS AT-0•••••	209	ST D•••••••	41
CS AT-1•••••	211	VE TS3•RA1	179
CS AT-3•••••	213	VF AC2205	287
CS DM-01•••••	223	VF AC7032	51
CS DM-02•••••	225	VF AD•••••••	287
CS DM-20•••••	227	VF AF-CA••	175
CS FS-1•••••	215	VF AF-IF1GR••	175
CS FS-2•••••	217	VF AF-K•••••	175
CS FS-3•••••	219	VF AF-ME••	175
CS FS-5•••••	221	VF AF-MR5	175
CS ME-01•••••	231	VF AF-TR••	175
CS ME-02•••••	233	VF AP-P•••••••	143
CS ME-03•••••	235	VF AP-A•••••••	117
CS ME-20•••••••	237	VF AP-C•••••	143
CS ME-30•••••••	239	VF AP-K••	143
CS ME-31•••••••	239	VF AP-S13•••••	149
CS MF•••••-P•	269	VF CA•••••••	287
CS MP•••••••	243	VF CB•••••••	287
ES AC31•••••	179	VF CBS•••••••	287
ES AC32010	143	VF CBM•••••••	287
ES AC32043	143	VF CC•••••••	287
ES AC33047	143	VF CN•••••••	287
FC ••78-M2	159	VF CY•••••••	287
FC ••79-M2	167	VF DFP•••••	287
FC ••80-M2	167	VF F05•••••	175
FC ••83-M2	159	VF FG•••••••	93
FC ••84-M2	159	VF FSFI•••••	93
FC ••93-M2	17	VF FSPB•••••	93
FC ••95-M2	71	VF FSPZ	93
FD ••74-M2	167	VF IL•••••••	287
FD ••78-M2	159	VF KB1	17
FD ••79-M2	167	VF KB2	93
FD ••80-M2	167	VF KEYD••	23
FD ••83-M2	159	VF KEYF••	17
FD ••84-M2	159	VF KEYF••	93
FD ••93-M2	17	VF KLA371	93
FD ••95-M2	71	VF KLB300	117
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FD ••R2-M2	127	VF PF•••••••	287
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FK ••93-M1	23	VF SB400	175
FK ••96-M1	77	VF SFH•	51
FK ••C-M1	83	VF SFH•••	51
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FL ••80-M2	167	VF VAM•••••••-X	287
FL ••83-M2	159	VN NG-F••	117
FL ••84-M2	159	VN NG-LP••	117
FL ••93-M2	17	VS SP•••••	29
FL ••95-M2	71		
FM ••74-M2	167		
FM ••96-M2	77		
FM ••C-M2	83		
FP ••74-M2	167		
FP ••78-M2	159		
FP ••79-M2	167		
FP ••93-M2	17		
FP ••99-M2	135		
FP ••R2-M2	127		
FR ••74-M2	167		
FR ••93-M2	23		

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

Orders: Purchasing orders must be booked with us in writing (fax, e-mail). We reserve the right to not accept e-mail orders in case of missing characteristics necessary to correctly identify the sender or to not process them when we recognise virus presence or uncertain origin annexed.

Minimum order amount: Unless specifically agreed, for abroad countries the minimum amount of the order is 200 Euro. A 10 Euro extra fee will be applied to orders below 200 Euro delivered in Italy or San Marino. For deliveries abroad, the extra cost will be 30 Euro.

Prices: List prices does not includes VAT, custom taxes or other similar charges. Unless specifically agreed, prices are not binding and may change without prior notice.

Purchasing Quantity: Some products are supplied in packs. Total order quantity of these items must be multiple of the package content.

Order cancellation/changes: Orders variation could be accepted depending on status of manufacturing process. Changes or cancellation of special article orders will not be accepted.

Supply: The supply will include only what mentioned in the sales confirmation. We reserve the right to stop supply in case of changes in the customer's financial standing.

Delivery date: Delivery is specified on the order confirmation, which shows the expected week of shipment from Pizzato Elettrica, not the date of arrival at the customer's premises. This date is an approximate value and can not be used as a reason of the order non-fulfilment.

Packaging: Packaging is free. Over six boxes, pallets could be necessary for the transport.

Shipment: Good's transport is at customer's risk, even when delivery term is agreed at customer's site. It is a customer obligation to check the number of boxes delivered by the forwarder, to verify packaging damages and to control the weight declared in documents before accept the goods. Any discrepancy or mistakes should be reported by writing within eight days from the good's receipt. If case of Ex works deliveries it is responsibility of customer to verify that forwarder is authorized to the goods carriage in compliance with Italian law.

Warranty: The warranty has a validity of 12 months starting from the delivery date of the material. Warranty does not cover improper use of the material, negligence or wrong installation/assembling. The warranty does not cover parts subjected to wear or products used over the technological limits described in the general catalog, or items that have not received the right maintenance. Pizzato Elettrica engages itself to repair, replace parts or the complete product for those elements that present evident manufacturing defects, provided that they are still covered by warranty. Pizzato Elettrica is responsible only for the product's value and refund request are not accepted for machine down-time, repair or expenses for damages direct or indirect as consequence of products performance. It is a manufacturer's responsibility to evaluate the importance of chosen products and any malfunction consequences and adopt necessary technical measures to minimize consequences on machines and people safety (redundancy systems, self-controlled systems, etc). Warranty is subjected to the due payments respect.

Products: Products are subjected to technical improvements in any moment without prior notice.

Payment terms: Payments should be settled within the terms agreed in the sales confirmation. The type of payment is always at buyer's risk, regardless of the means chosen. In case of delayed payment, Pizzato Elettrica reserves the right to stop the delivery of current orders and charge the interest according to the European Directive 2011/7/EU. Technical or commercial claims does not give the right to stop due payments.

Returns: Any return should be previously authorised in writing. Pizzato Elettrica reserves the right to not accept the goods and send it back with freight collect, through the same way of forwarding. Returns have to be sent back within 3 months from the authorization date and no later. After this period, returns will not be accepted.

Ownership: The delivered products remain property of Pizzato Elettrica until full settlement of the invoices.

Proper Law: The Court of Vicenza shall have jurisdiction in any disputes.

Any information or application example, included the connection diagrams, 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.

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General Catalogue
Detection



General Catalogue
HMI



General Catalogue
Safety



General Catalogue
LIFT



DVD



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www.pizzato.com



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