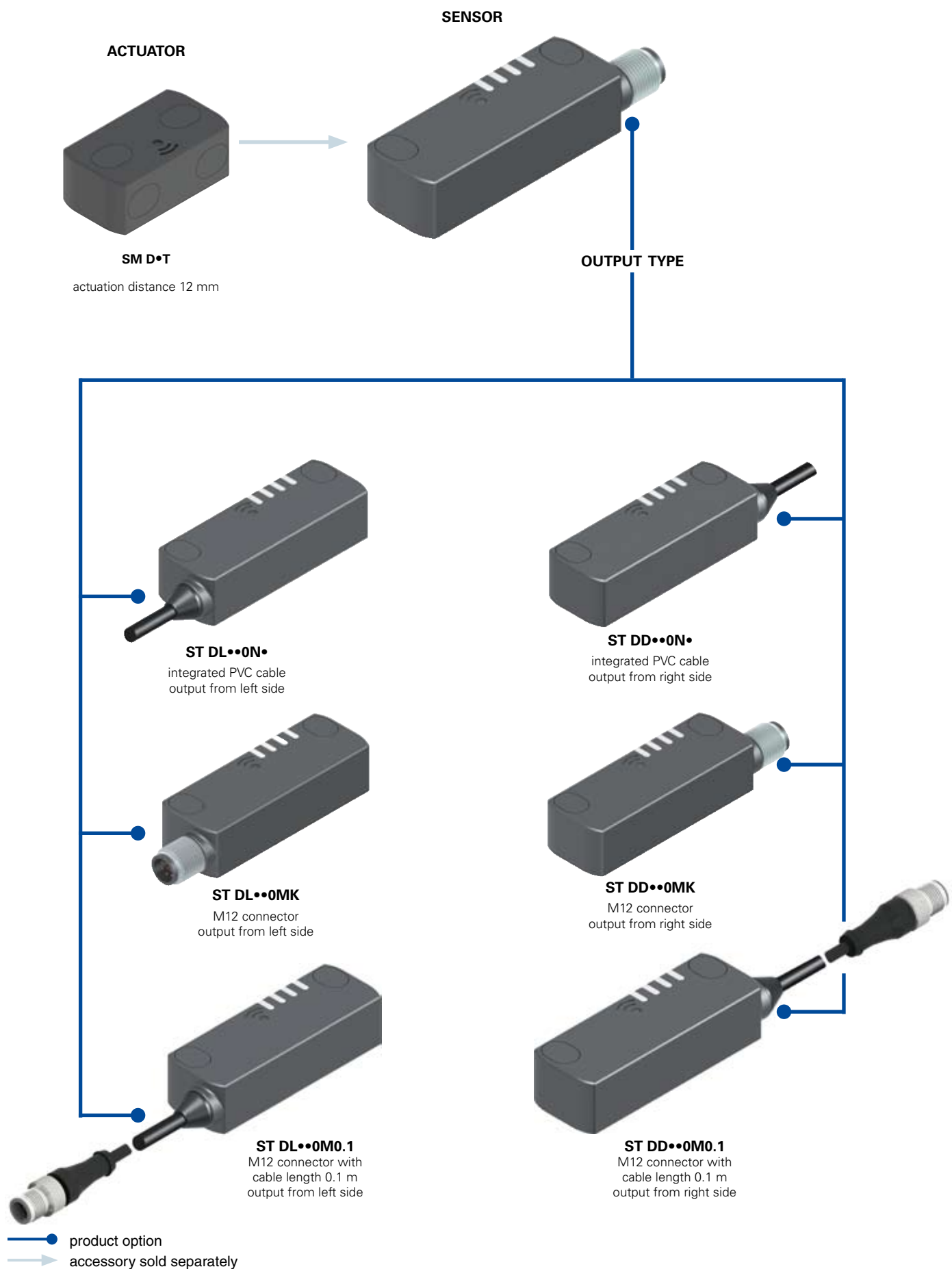


Selection diagram





Introduction

Pizzato Elettrica ST series sensors, combined with appropriate safety modules, are suitable for controlling protections and guards, allowing the system where they are incorporated to attain a safety category up to SIL 3 according to EN 62061 standard, up to PLe and category 4 according to EN ISO 13849-1 standard.

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.

Sensor with actuator code structure

ST DD420N2-D1T

Connection output direction	
D	output from right
L	output from left

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

Inputs, outputs and programming				
	safety outputs OS	auxiliary outputs O	safety inputs IS	programming inputs I
21	2	1	-	-
31	2	1	2	-
42	2	1	2	1

Type of cable or connector	
N2	integrated PVC cable, length 2 m (standard)
...
N10	integrated PVC cable, length 10 m
MK	5 or 8 poles M12 connector
M0.1	M12 connector with cable length 0.1 m (with ST D•3••••• / ST D•4••••• versions only)

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

Single sensor code structure

ST DD420N2

Connection output direction	
D	output from right
L	output from left

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

Inputs, outputs and programming				
	safety outputs OS	auxiliary outputs O	safety inputs IS	programming inputs I
42	2	1	2	1

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	coded actuator
D1T	uniquely coded actuator

Coded: Switch accepts any actuator type D0T.
 Uniquely coded: Switch accepts only one actuator, no teach-in facility.



Main data

- Non-contact operation using RFID technology
- Digitally coded actuator
- Protection degree IP67 and IP69K
- 4 LEDs for status display of the sensor
- Versions with M12 connector

Markings and quality marks:



Approval UL: E131787
 Approval TÜV SÜD: Z10 10 09 75157 001
 Approval GOST: POCC IT.AB24.B04512

In conformity with requirements requested by:

Low Voltage Directive 2006/95/EC
 Machinery Directive 2006/42/EC
 Electromagnetic Compatibility 2004/108/EC
 FCC Rules & Regulation 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

Approvals:

UL 508.

Connection with safety modules with personnel protection function:

Connection with safety modules CS AR-05•••••; CS AR-06•••••; CS AR-08•••••; CS AT-0•••••; CS AT-1•••••; CS MP•••••.
 The sensor connected with the safety module can be classified as device for control circuit up to PDF-M (EN 60947-5-3).
 The system can be used in safety circuits up to PLe / SIL 3 / category 4 according to EN ISO 13849-1.

Technical data

Housing

Made of glass-reinforced polymer, self-extinguishing, shock-proof thermoplastic resin. Version with integrated cable with 6 x 0.5 mm² or 8 x 0.34 mm² wires length 2 m, other lengths on request.

Versions with M12 connector

Versions with M12 connector with cable length 0.1 m

Protection degree: IP67 according to EN 60529
 IP69K according to DIN 40050
 (Protect the cables from direct high-pressure and high-temperature jets)

General data

For safety applications up to SIL 3 / PL e

Safety parameters: see page 7/34
 Ambient temperature: -25...+70 °C
 Storage and transport temperature: -25...+85 °C
 Vibrations holding: 10 gn (10...500 Hz) according to IEC 60068-2-6
 Shock holding: 30 gn (11 ms) according to IEC 60068-2-27
 Pollution degree: 3
 Max screw driving torque: 0,8 ... 2 Nm

Input circuits IS1/IS2/I3

Rated operational voltage U_{e1}: 24 Vdc
 Absorbed rated current: 5 mA

Safety output circuits OS1/OS2

Rated operational voltage U_{e1}: 24 Vdc
 Signal type: PNP
 Max current for output I_{e1}: 0,25 A
 Utilization category: DC12; U_e=24 Vdc, I_e=0,25 A
 Short circuits detection: yes
 Protection against short circuits: yes
 Time for deactivation impulses on safety outputs: < 300 us
 Capacity admitted between one output and the next: < 200 nF
 Capacity admitted between output and ground: < 200 nF

Output circuit O3

Rated operational voltage U_{e1}: 24 Vdc
 Signal type: PNP
 Max current for output I_{e1}: 0,1 A
 Short circuits detection: No
 Protection against short circuits: yes

Actuating 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
 Maximum frequency of operating cycles: 1 Hz
 Distance between two sensors: min. 50 mm

Electrical data

Rated operational voltage U_e: 24 Vdc -15%...+10%
 Rated operational current I_e: 0,25 A
 Thermal current I_{th}: 0,25 A
 Rated minimum current: 0,5 mA
 Max switching load: 6 W
 Power consumption (U_e): < 1W
 Rated insulation voltage U_i: 32 V
 Rated impulse withstand voltage U_{imp}: 1,5 kV
 Internal restorable protection fuse (OS1+OS2+O3): 0,75 A
 Protection fuse: 1 A
 Over-voltage category: III
 Electrical endurance: 1 million operations cycles

Data type approved by UL

Utilization categories: 24 Vdc, 0,25 A (resistive load)

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

Accessory for series CS.

In conformity with standard: UL 508

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

Data type approved by TÜV SÜD

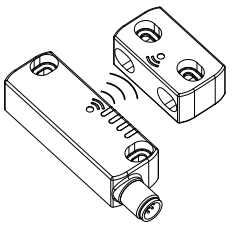
Supply voltage: 24 V ac/dc
 Output switching current (max): 0,25 A
 Working temperature: -25 °C ... + 80°C
 IP code: IP67
 PL, Category: PL e, Cat. 4 with CS AR-08

Tested according to: 2006/42/EEC Machine 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.



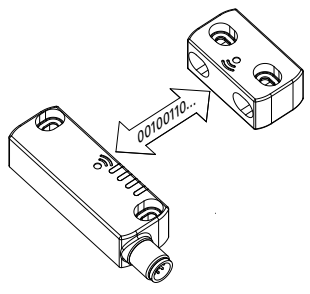
Use of RFID technology



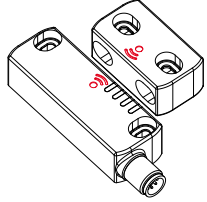
The ST series sensors exploit the advantages deriving from using RFID (Radio Frequency IDentification) technology. The unique digital code contained in the actuator can guarantee the system where they are installed a high level of safety and reliability, preventing any possible mishandling. Their specific resistance to dynamic stress, absence of moving mechanical parts and shape without recesses allow these sensors to be used even in particularly hostile thermal conditions or in the presence of dirt and dust.

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.



Easy sensor/actuator alignment

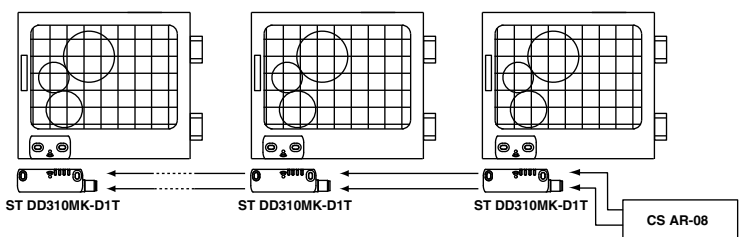


The sensors and the actuators are provided with engraved markings on the housing in order to make alignment easier during the fitting stage. For correct operation, install the sensors and the actuators so that their markings correspond.

Connection in series of several sensors

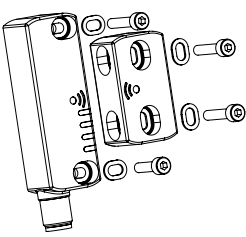
One of the major characteristics of Pizzato Elettrica ST products is that several sensors can be connected in series, up to a maximum number of 32 devices, **while maintaining the maximum safety level (PLe) prescribed by the EN 13849-1 standard.**

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.



SIL 3 / PLe

Fixing plates in stainless steel



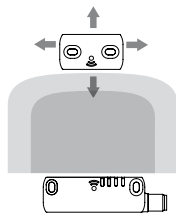
The presence of stainless-steel fixing plates in ST sensors, besides ensuring that fitting on surfaces not perfectly level does not damage the slots, makes the sensor sturdier against mechanical stress. The system therefore becomes safer and more reliable. It is advisable to block the sensor and the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

Protection degree IP67 and IP69K

IP69K IP67

The ST series sensor 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 DIN 40050 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.

Wide actuation zone



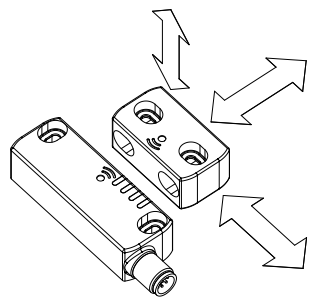
Since they exploit the intrinsic characteristics of RFID technology, the ST series sensors cover a wide activation zone, which makes them particularly suitable in conditions of poorly defined protections or with mechanical characteristics changing over time.

Laser marking

Pizzato Elettrica has introduced a new laser marking for sensors ST series. Thanks to this new system which excludes the use of labels, markings on the products are indelible. Furthermore, in case of machineries subjected to intense high pressure water jets, there is no risk of labels detaching from the product.



Activation from various 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.

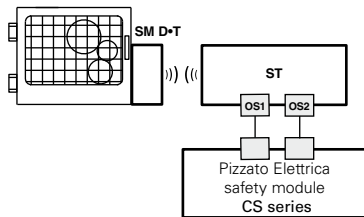
Sensors used for safety applications

The redundant internal structure of the ST sensor meets the characteristics required by the EN ISO 13489-1 and IEC 62061 standards, therefore the actual sensor can be classified as a device of category 4, PLe and SIL 3. Its high diagnostic cover and high MTTF for each single channel make it possible for the ST sensor not to lose its safety function even in the case of one single anomaly. These are the reason why the sensor can be used in series, while maintaining the PLe safety level, as long as it is connected to an appropriate module which controls its correct operation.

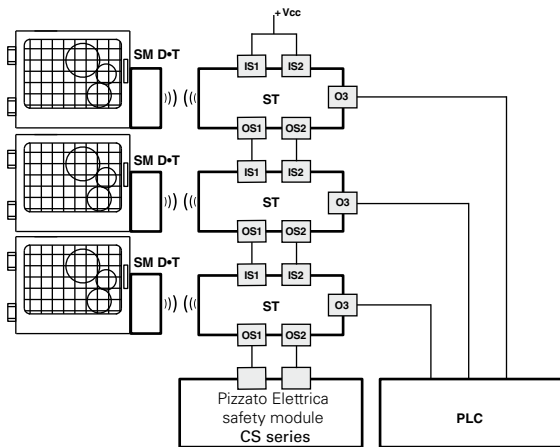
Complete safety system

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.

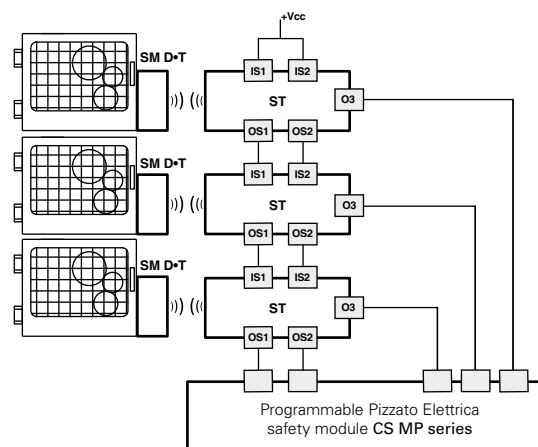
Sensors	Compatible safety modules	Safety module output contacts		
		Safety instantaneous contacts	Safety delayed contacts	Signaling contacts
ST D••••0••	CS AR-05•••••	3NO	/	1NC
	CS AR-06•••••	3NO	/	1NC
	CS AR-08•••••	2NO	/	/
	CS AT-0••••••	2NO	2NO	1NO
	CS AT-1••••••	3NO	2NO	/
	CS MP•••••••	see page 5/67		



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).

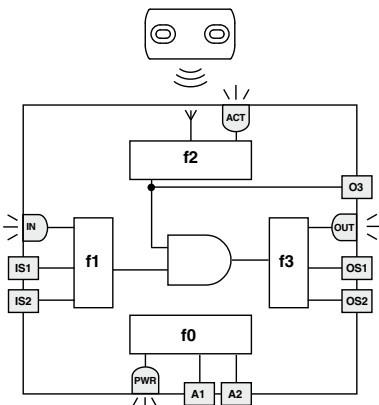


Possible connection in series of several sensors in order to simplify the safety system wiring, after evaluating the outputs from the last sensor in the chain by means of a Pizzato Elettrica safety module (table for safety modules to be combined). Each ST sensor is provided with a signalling output, 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 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 diagram

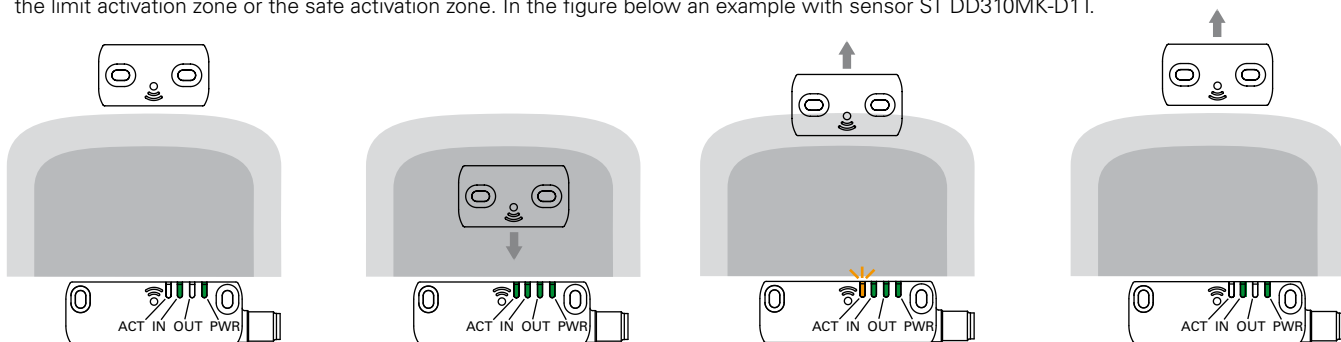


The side scheme shows the 4 logical functions interacting inside the sensor. F0 function has the fundamental task to control the sensor's power supply and the internal tests which the sensor cyclically undergoes. F1 function has the task to control the status of the sensor's inputs, while F2 checks the actuator's presence within the activation zone limits. F3 function has the task to enable the safety outputs and check their possible failure or short circuit. 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. Each function's status is displayed by means of an individual LED (PWR, IN, ACT, OUT), to allow the operator to have an immediate evaluation of the global sensor's status.



Limit and safe activation zones

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 DD310MK-D1T.



The sensor is supplied with power (LED PWR on, green), the inputs are enabled (LED IN on, green), the outputs are disabled (LED OUT off). The actuator is on the outside of the activation zone (LED ACT off).

When the actuator is brought inside the safe activation zone (dark grey area), the sensor switches on LED ACT to green and enables the outputs (LED OUT on, green).

When the actuator leaves the safe zone, the sensor keeps the outputs enabled; however, by means of the LED ACT (blinking, orange/green), it indicates that the actuator is entering the limit activation zone (light grey area).

When the actuator leaves the limit activation zone, the sensor disables the outputs and switches off the LED OUT and LED ACT.

Operational states

PWR LED	OUT LED	IN LED	ACT LED	Sensor state	Description
○	○	○	○	OFF	Sensor off.
●	○	○	○	POWER ON	Internal tests on activation.
●	*	○	*	RUN	Sensor inputs not active.
●	*	●	*	RUN	Inputs activation.
●	*	◌	*	RUN	Inputs inconsistency. Recommended action: check the inputs and / or their wiring.
●	*	*	●	RUN	Actuator in the safe activation zone Auxiliary output O3 active.
●	*	*	◌	RUN	Actuator in the limit activation zone, O3 active. Recommended action: bring the sensor within the safe activation zone.
●	●	●	●	RUN	Inputs activation. Actuator in the safe activation zone and safety outputs active.
●	◌	*	*	ERROR	Outputs error. Recommended action: check for short circuits between outputs, outputs and ground, or outputs and power supply; restart the sensor.
●	*	*	*	ERROR	Internal error. Recommended action: restart the sensor. If the fault persists, replace the sensor.

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

Signalling LEDs

The Pizzato Elettrica ST series sensors feature 4 status signalling LEDs. The purpose of these LEDs is to make it easier to understand the actual sensor operation.



LED	Function
ACT	Actuator status
IN	Safe input status
OUT	Safe output status
PWR	Power supply/self-diagnosis

Safety screws

10 pcs packs

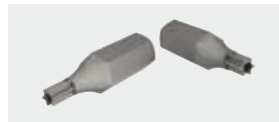


These new screws have tamper-resistant Torx buttonheads. Devices fixed with this kind of screws cannot be removed or tampered by common tools. The safety screws are in stainless steel with different threaded body lengths available: they suit any application where devices are subjected to frequent washing or corrodng substances are present.

Article	Description
VF VAM4X20BX-X	M4X20 screw, tamper-resistant Torx T20, AISI 304 for ST series
VF VAM4X25BX-X	M4X25 screw, tamper-resistant Torx T20, AISI 304 for ST series

Safety screws bits

Safety screws bits, 1/4" drive.

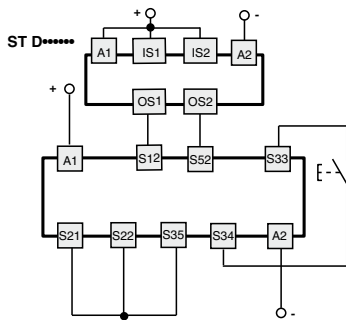


Article	Description
VF VAIT1T20	Bits for tamper-resistant Torx T20, M4 screw

Wiring with safety modules

Wiring with safety modules CS AR-08●●●●

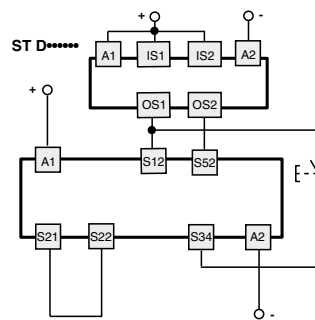
Input configuration with monitored start
2 channels / Category 4 / up to SIL 3 / PL e



Wiring with safety modules CS AR-05●●●● / CS AR-06●●●●

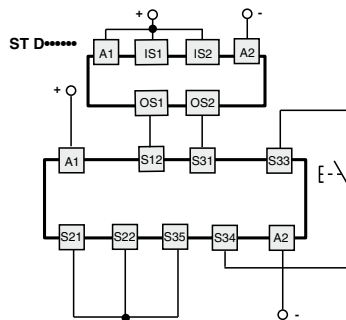
Input configuration with manual start (CS AR-05●●●●) and monitored start (CS AR-06●●●●)

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



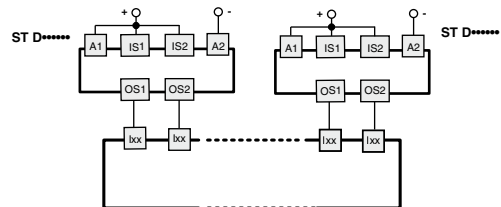
Wiring with safety modules CS AT-0●●●● / CS AT-1●●●●

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



Wiring with safety modules CS MF●●●●0, CS MP●●●●0

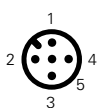
The connections vary according to the program of the module
Category 4 / up to SIL 3 / PL e



For safety modules technical data see page 5/1.

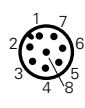
Internal connections with cable or connector

Sensor ST D●2●●●●



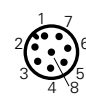
cable color	pin	connections
brown	1	A1
red/white	2	OS1
blue	3	A2
black/white	4	OS2
black	5	O3

Sensor ST D●3●●●●



cable color	pin	connections
brown	1	A1
red	2	IS1
blue	3	A2
red/white	4	OS1
black	5	O3
purple	6	IS2
black/white	7	OS2
purple/white	8	not connected

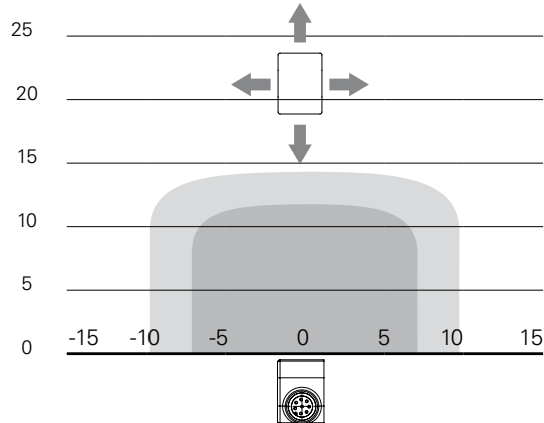
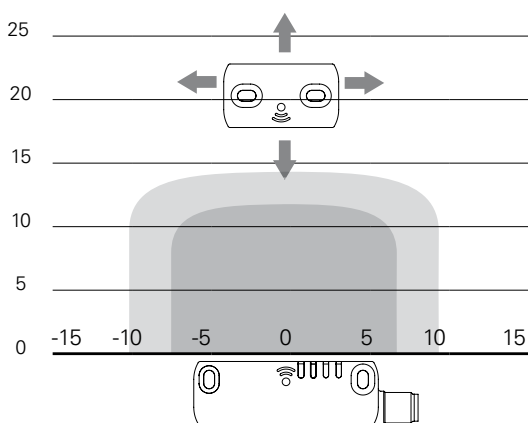
Sensor ST D●4●●●●



cable color	pin	connections
brown	1	A1
red	2	IS1
blue	3	A2
red/white	4	OS1
black	5	O3
purple	6	IS2
black/white	7	OS2
purple/white	8	I3

Legend
A1-A2 power supply
IS1-IS2 safety inputs
OS1-OS2 safety outputs
O3 auxiliary output
I3 programming input

Intervention distance



Legend:
Rated operating distance S_{ri} (mm)
Rated release distance S_{rir} (mm)

Note: The drawing of the activation areas is indicative.

Female connectors See page 6/2 - 6/3



Selection table

safety outputs OS auxiliary outputs O safety inputs IS programming inputs I programmable												
	M12 connector with cable length 0.1 m on right		M12 connector with cable length 0.1 m on left		cable on right		cable on left		M12 connector on right		M12 connector on left	
	2	1	-	-	-	-	ST DD210N•-D•T	ST DL210N•-D•T	ST DD210MK-D•T	ST DL210MK-D•T	ST DD210MK-D•T	ST DL210MK-D•T
	2	1	2	-	-	-	ST DD310M0.1-D•T	ST DL310M0.1-D•T	ST DD310MK-D•T	ST DL310MK-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 DD420M0.1-D•T	ST DL420M0.1-D•T	

Selection table

safety outputs OS auxiliary outputs O safety inputs IS programming inputs I programmable												
	M12 connector with cable length 0.1 m on right		M12 connector with cable length 0.1 m on left		cable on right		cable on left		M12 connector on right		M12 connector on left	
	2	1	2	1	•	•	ST DD420M0.1	ST DL420M0.1	ST DD420N•	ST DL420N•	ST DD420MK	ST DL420MK

Selection table

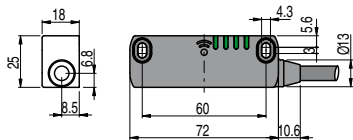


Code type	actuation distance 12 mm
coded	D0T
uniquely coded	D1T

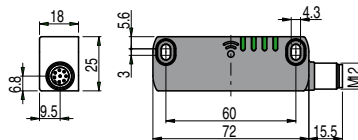
The use of RFID technology in ST series sensors makes them suitable for several applications. Pizzato Elettrica offers two different versions of actuators, in order to best suit customers' specific needs. Type D0T actuators are all encoded with the same code. This implies that a sensor associated with 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. Other types of D1T actuators will not be recognized unless a new pairing (reprogramming) is made. After reprogramming, the old actuator D1T will no longer be recognized.

Dimensional drawings

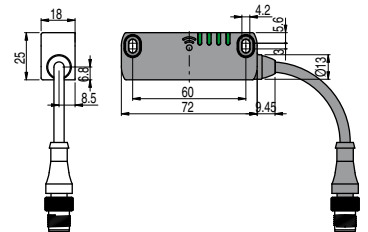
Sensor ST DD•••N• with cable output from right side



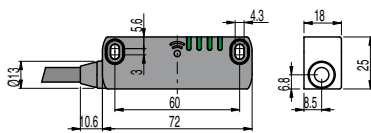
Sensor ST DD•••MK with M12 connector output from right side



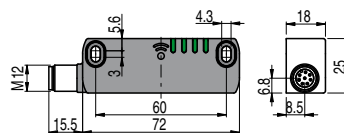
Sensor ST DD•••MK with cable and M12 connector from right side



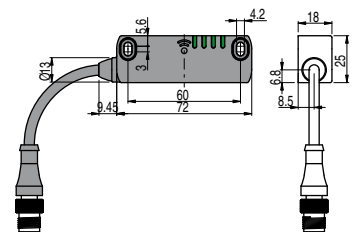
Sensor ST DL•••N• with cable output from left side



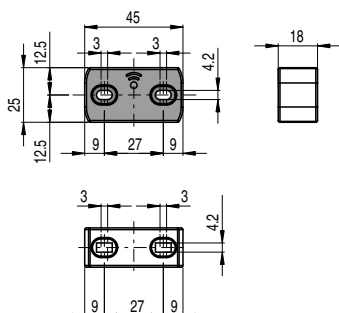
Sensor ST DL•••MK with M12 connector output from left side



Sensor ST DL•••MK with cable and M12 connector from left side



Actuator SM D•T



Accessories See page 6/1

Items with code on the green background are available in stock