

1 INFORMATION ON THIS DOCUMENT

1.1 Function

The present operating instructions provide information on installation, connection and safe use for the following articles: **ST G*****-G•T**, **ST H*******.

1.2 Target audience

The operations described in these operating instructions must be carried out by qualified personnel only, who are fully capable of understanding them, and with the technical qualifications required for operating the machines and plants in which the safety devices are to be installed.

1.3 Application field

These operating instructions apply exclusively to the products listed in paragraph Function, and their accessories.

1.4 Original instructions

The Italian language version is the original set of instructions for the device. Versions provided in other languages are translations of the original instructions.

2 SYMBOLS USED

i This symbol indicates any relevant additional information.

! Attention: Any failure to observe this warning note can cause damage or malfunction, including possible loss of the safety function.

3 DESCRIPTION

3.1 Device description

The safety device described in these operating instructions is defined as a coded, type-4 interlocking device without contact acc. to EN ISO 14119.

The safety sensors with RFID technology to which these operating instructions refer are safety devices designed and implemented for the control of gates, guards, enclosures, and doors in general, which are installed to protect dangerous parts of machines without inertia.

3.2 Intended use of the device

- The device described in these operating instructions is designed to be applied on industrial machines (as defined in the Machinery Directive) for state monitoring of movable guards.

- The direct sale of this device to the public is prohibited. Installation and use must be carried out by qualified personnel only.

- The use of the device for purposes other than those specified in these operating instructions is prohibited.

- Any use other than as expressly specified in these operating instructions shall be considered unintended by the manufacturer.

- Also considered unintended use:

- using the device after having made structural, technical, or electrical modifications to it;
- using the product in a field of application other than as described in paragraph TECHNICAL DATA.

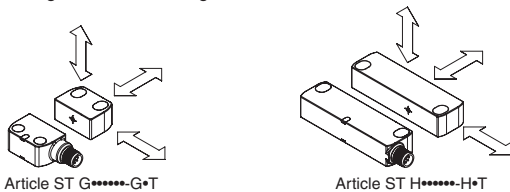
4 INSTALLATION INSTRUCTIONS

! Attention: Installing a protective device is not sufficient to ensure operator safety or compliance with machine safety standards or directives. Before installing a protective device, perform a specific risk analysis in accordance with the key health and safety requirements in the Machinery Directive. The manufacturer guarantees only the safe functioning of the product to which these operating instructions refer, and not the functional safety of the entire machine or entire plant.

4.1 Actuation directions

The device can be actuated by approaching the actuator from any direction.

i The centring symbols \oplus indicated on the device and actuator must face one another when the guard is closed, regardless of actuation direction.



4.2 Selection of the actuator type

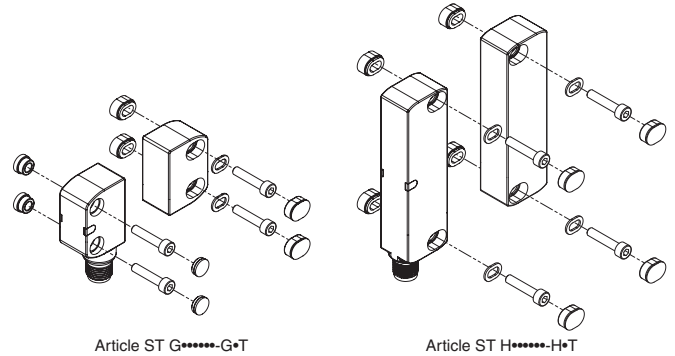
! Attention: The device is available with two types of RFID actuator: with high (articles SM •1T) or low (articles SM •0T) level of coding. If the chosen actuator has a low level of coding, the additional specifications given in Std. EN ISO 14119:2013 paragraph 7.2 must be applied during the installation.

! Attention: If the chosen actuator has a low level of coding, any other low level coded actuators present in the same place where the device has been installed must be segregated and kept under strict control in order to avoid any bypassing of the safety device. If new low level coded actuators are fitted, the original low level coded actuators must be disposed of or rendered inoperable.

i It is advisable to use high coding level actuators to make the installation safer and more flexible. In this way, no device screening, installation in inaccessible zones or other requirements specified by the Std. EN ISO 14119 for low coding level actuators will be necessary.

i The device can also be used in conjunction with the SM D•T, SM E•T, and SM L•T actuators, with high or low coding level, and the safety levels will remain unaffected.

4.3 Fixing of the device and actuator



The sensor can be fixed in any position, by rotating it into the most suitable direction so that the outputs of the connections face the direction required by the application in question.

! Attention: Once you have defined the sensor fixing direction, insert the threaded sleeves provided in the holes on the opposite side to where the screws are inserted.

Always affix the sensor and actuator with 2 M4 screws with resistance class 4.6 or higher, and flat seating heads. Install the screws with medium resistance thread lock, and a number of threads engaged equal to or greater than the screw diameter. The device or actuator must never be fixed with less than 2 screws. Tightening torque of the M4 screws between 0.8 and 1.0 Nm.

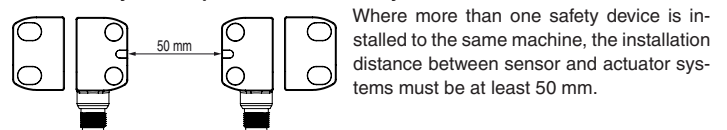
! Attention: As required by EN ISO 14119, the actuator must be fixed immovably to the door frame.

For correct fixing, other means can also be used, such as rivets, non-removable security screws (one-way), or other equivalent fixing system, provided that it can ensure adequate fixing.

i Tamperproof safety caps are provided with the device. Inserting the caps is considered a suitable measure, to reduce the possibility of actuator disassembly to a minimum, in accordance with EN ISO 14119. Therefore, by applying the caps supplied to the device, normal screws can be used to affix the actuator.

Do not use a hammer for the adjustments, unscrew the screws and adjust the device manually, then tighten it in position.

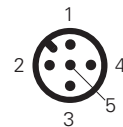
4.4 Assembly of multiple sensor-actuator systems



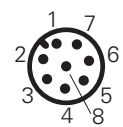
Where more than one safety device is installed to the same machine, the installation distance between sensor and actuator systems must be at least 50 mm.

4.5 Electrical connections of the device

5-pole versions ST G•1****, ST G•2****, ST G•3**** ST H•1****, ST H•2****, ST H•3****		
M12 connector	Cable	Connection
1	brown	A1 (+)
2	white	OS1
3	blue	A2 (-)
4	black	OS2
5	grey	O3 (a)



8-pole versions ST G•3****, ST G•4****, ST G•5****, ST G•7****, ST G•8****, ST G•9**** ST H•3****, ST H•4****, ST H•5****, ST H•7****, ST H•8****, ST H•9****		
M12 connector	Cable	Connection
1	white	A1 (+)
2	brown	IS1
3	green	A2 (-)
4	yellow	OS1
5	grey	O3 (a)
6	pink	IS2
7	blue	OS2
8	red	not connected (b) I3 (c) EDM (d)



Notes
(a) inverted output for articles ST ••3****, ST ••7****, ST ••8****, ST ••9****; disabled output for articles ST ••1****, ST ••2****, ST ••4****, ST ••5****, ST ••6****, ST ••7****, ST ••8****, ST ••9****.
(b) for articles ST ••3****, ST ••7****, ST ••8****, ST ••9****.
(c) for articles ST ••4****, ST ••5****, ST ••6****, ST ••7****, ST ••8****, ST ••9****.
(d) for articles ST ••5****, ST ••9****.

Legend:

A1-A2 = supply
IS1-IS2 = safety inputs
OS1-OS2 = safety outputs

I3 = programming input
O3 = signalling output
EDM = monitoring input external contactors

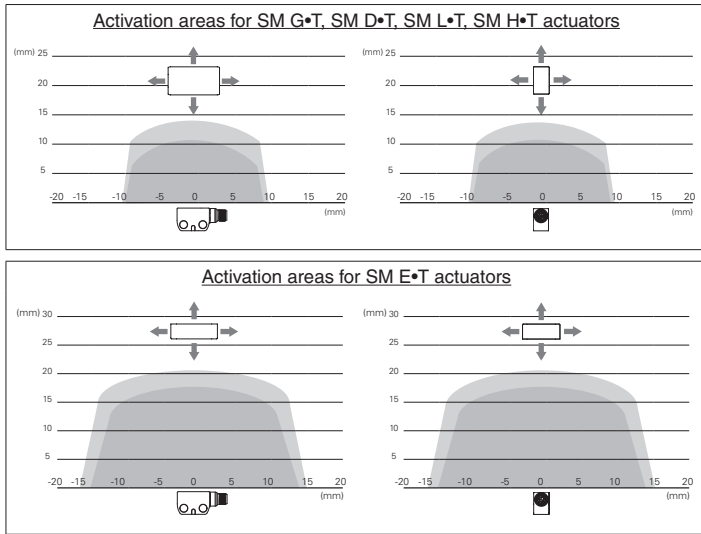
4.6 RFID sensor switching points

When the actuator is brought inside the safe activation zone (dark grey area), the sensor enables the safety outputs (LED on, green).

When the actuator moves out of the safe zone, the sensor keeps the safety outputs enabled and, via the yellow LED flashing, 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 (LED on, yellow).

⚠ Attention: The device actuation/release distances can be influenced by the presence of conductive or magnetic material in the sensor vicinity. The working actuation and release distances must always be checked following installation.



Legend:

■ Rated operating distance s_n (mm)

■ Rated release distance s_{nr} (mm)

Note: The progress of the activation areas is for reference only; the possible application on metal surfaces can reduce the operating distances.

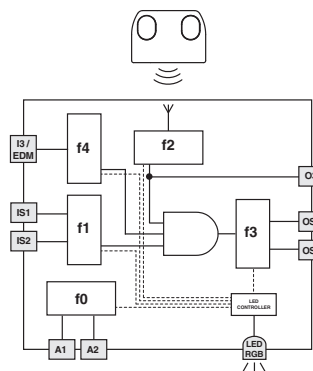
5 OPERATION

5.1 Definitions

States of the sensor:

- OFF: sensor off, not powered.
- POWER ON: state immediately following switch on, during which the sensor carries out internal tests.
- RUN: state in which the sensor is in normal operation.
- ERROR: safety state in which the safety outputs are disabled. Indicates presence of a failure, either internal or external to the device, such as for example:
 - a short circuit between the safety outputs (OS1, OS2);
 - a short circuit between a safety output and ground, or
 - a short circuit between a safety output and the supply voltage;
 To exit this state, the sensor must be restarted.
- The EDM External Device Monitoring function (where present) is a function which allows the device to monitor the state of external contactors. Activation and deactivation of external contactors must follow the sensor safety outputs within a predefined time period (see paragraph TECHNICAL DATA).

5.2 General operation description



Following correct installation in accordance with these instructions, the sensor can be powered. The diagram shows the logic functions which interact inside the sensor.

In the initial POWER ON state, the sensor f0 function carries out an internal self diagnosis. When this terminates successfully, the device switches to the RUN state. If the test is not passed, the sensor enters the ERROR state.

The RUN state is the normal operation state: the f2 function checks the presence of the actuator within the safety activation area.

The f3 function enables safety outputs OS1 and OS2 according to the sensor version:

- in versions without safety inputs IS1 and IS2 (ST **1****, ST **2****, ST **6****), pres-

- in versions with safety inputs IS1 and IS2 (ST **3****, ST **4****, ST **7****, ST **8****), presence of the actuator and activation of inputs IS1, IS2 are checked;
- in versions with EDM (ST **5****, ST **9****), presence of the actuator, activation of inputs IS1, IS2, and presence of the feedback signal of the external contactors are checked.

In the RUN state, function f0 carries out internal test cycles in order to identify any failures. Detection of any internal error switches the sensor to "ERROR" state (LED illuminates red, continuous or flashing) to allow immediate deactivation of the safety outputs by the f3 function. The ERROR state can be reached also where short-circuits between the safety outputs (OS1, OS2), or a short circuit of an output towards ground or towards the supply voltage, are identified. In this case also, the f3 function deactivates the safety outputs and the error state is indicated by the corresponding LED blinking frequency.

The O3 signalling output, depending on the version selected, activates or deactivates during the RUN state corresponding to detection of the actuator within the activation area, independently of the state of any IS1 and IS2 inputs.

The f4 function monitors the actuation state of input I3 (versions ST **4**** and ST **8****) or EDM (versions ST **5**** and ST **9****):

- in the versions with I3 input for actuator programming, when the input is active and the device is in RUN state, the f4 function enables the actuator programming state (see paragraph REPLACEMENT OF THE ACTUATOR);
- in the versions with EDM input, the f4 function verifies the coherence of the EDM signal during state changes and when the safety outputs are off (see paragraph DESCRIPTION OF OPERATION IN VERSIONS WITH EDM INPUT).

The information derived from the states of functions f0, f1, f2, f3, f4 is processed, and communicated to the user via the illumination sequences and colours of the external device RGB LEDs, as described in paragraph OPERATING STATES.

5.3 Description of operation in versions with safety inputs IS1 and IS2 (articles ST **3****, ST **4****, ST **5****, ST **7****, ST **8****, ST **9****)

The f1 function evaluates the state of inputs IS1, IS2.

The IS1 and IS2 inputs are monitored not only for their state, but also for their coherence: generally the inputs are actuated simultaneously. In the event of deactivation of just one of the two inputs, the sensor deactivates the safety outputs and signals an inconsistent state of the inputs via the corresponding LED illumination sequence (see paragraph OPERATING STATES).. Both inputs must be deactivated, for subsequent reactivation, so that the safety outputs can be reactivated.

5.4 Description of operation in versions with EDM input (articles ST **5****, ST **9****)

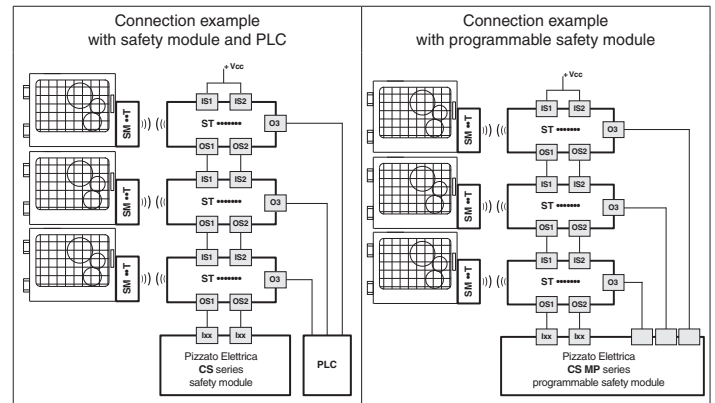
The f4 function carries out a check of the NC contacts of contactors or forcibly guided relays controlled by the safety outputs of the sensor itself; this check is carried out by the sensor monitoring the EDM (External Device Monitoring) input. When the safety inputs are active and the actuator is in the activation zone, the safety outputs are activated only when the EDM input is active. When the safety outputs are activated, the device checks that the EDM input deactivates within the time t_{EDM} . When the safety outputs are deactivated, the device checks that the EDM signal reactivates within the time t_{EDM} .

If the maximum time t_{EDM} is exceeded, the system goes into ERROR state, deactivating (where active) the safety outputs, and indicating the error via the corresponding LED illumination sequence (see paragraph OPERATING STATES).

5.5 Connection in series with safety modules

Where a sensor with no EDM input is used, the OS1 and OS2 safety outputs must be connected to a safety module or to a safety PLC.

The device also has an O3 signalling output that is activated (in articles ST **2****, ST **3****, ST **4****) or deactivated (in articles ST **6****, ST **7****, ST **8****) when the corresponding guard is closed. Depending on the specific requirements of the implemented system, this information can be managed by a PLC, or a programmable Pizzato Elettrica CS MP series safety module. This enables control of both safety and signalling outputs.



It is possible to install multiple cascade-connected sensors, up to a maximum of 32 devices, whilst maintaining safety category 4 / PL e according to EN ISO 13849-1 and integrity level SIL CL 3 according to EN 62061.

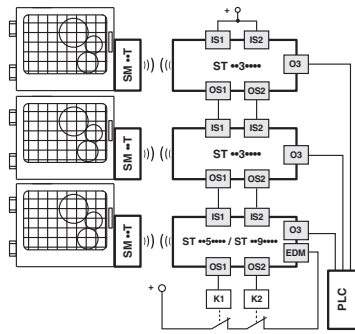
Check that the PFH and MTTFd values of the system consisting of the cascade of devices and the entire safety circuit meet the requirements of the SIL/PL level requested by the application.

For this connection type, the following warnings must be observed.

- Connect the inputs of the first device in the chain to the supply voltage.
- The OS1 and OS2 safety outputs of the last device in the chain must be connected to the safety circuit of the machine.
- Where a safety module is used, check that the properties of safety outputs OS1/OS2 are compatible with the safety module inputs (see paragraph INTERFACING).
- Respect the stray capacitance limits on the output lines indicated in the electrical data (see paragraph TECHNICAL DATA).
- Check that the response time of the cascade meets the requirements of the safety function to be implemented.
- The activation time of the cascade must be calculated taking into account the response time of every single device.

i The maximum number of 32 cascade-connected devices also depends on the lengths and cross-sections of the wires used between the devices. Our technical support service can help you with calculating the maximum distances and minimum cross-sections of the wires to be used, for correct operation of cascade-connected devices (see paragraph SUPPORT).

5.6 EDM connection (External Device Monitoring)

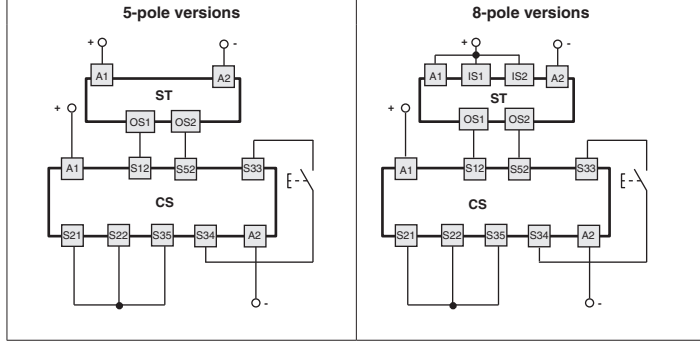


For certain specific applications, as an alternative to connection to safety modules, it is possible to use the ST **5**** or ST **9**** articles with check of the NC contacts of the forcibly guided relays (K1, K2) connected to the EDM input, installed as the last sensor in the cascade.

5.7 Interfacing

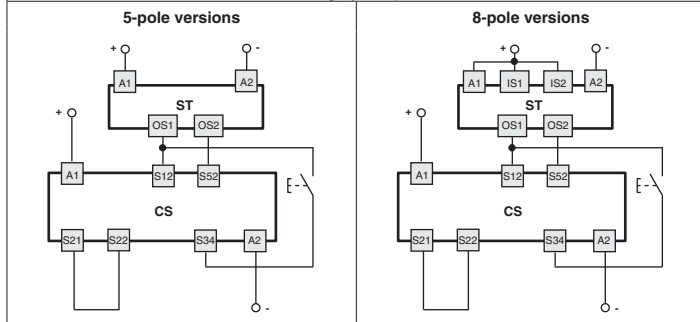
Connections with CS AR-08**** safety modules

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



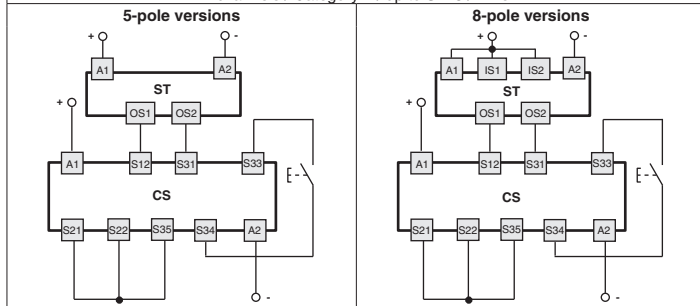
Connections with CS AR-05**** / CS AR-06**** safety modules

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



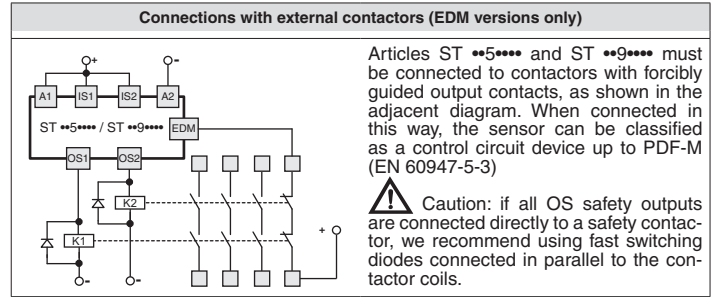
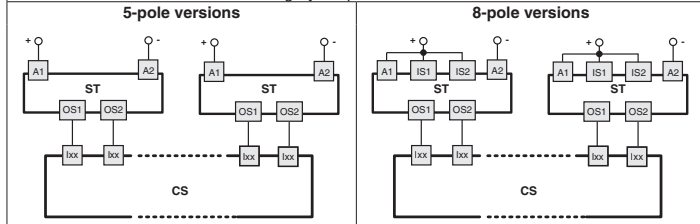
Connections with CS AT-0**** / CS AT-1**** safety modules

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

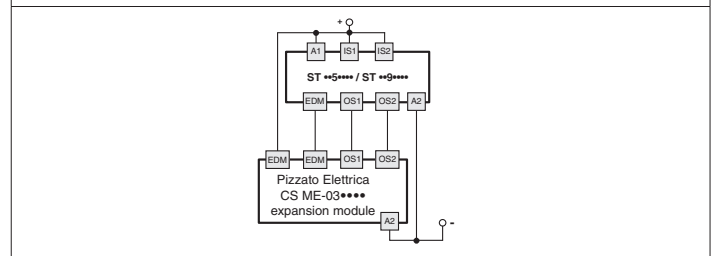


Connections with CS MF****0, CS MP****0 safety modules

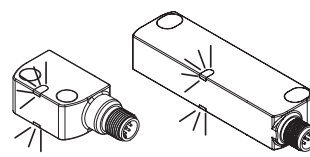
The connections vary according to the program of the module
Category 4 / up to SIL 3 / PL e



Connections with Pizzato Elettrica expansion modules (e.g. CS ME-03****) (only ST **5****, ST **9**** versions)



5.8 Operating states



The sensor has a multicolour signalling LED, which, through the use of illumination, flashing, and colour sequences, indicates the various device operating states to the user, as well as any warnings or errors affecting internal electronic components. The LED can be seen on both sides of the sensor, regardless of device installation direction.

rection.

The predefined sensor operating states (OFF, RUN, ERROR, SET) are indicated by a constantly lit LED.

LED illumination sequence	Sensor state	Description
	OFF	Sensor off.
GN	RUN	Normal operating state with safety outputs on. No pending error or warning.
YE	RUN	Normal operating state with safety outputs off. No pending error or warning.
TQ	RUN	Normal operating state with detected actuator and safety outputs off. No pending error or warning. NOTE: for versions with multitag programming only.
VT	SET	New actuator acquisition state.
RD	ERROR	Internal device error state.

Table 1: Predefined operating states

If an ERROR event is identified, the LED cycles between continuous light corresponding to the ERROR state (see Table 1) with one of the illumination sequences listed in Table 2, each of which corresponds to a different message type.

LED illumination sequence	Sensor state	Description	Priority
RD RD RD	ERROR	Temperature error: the sensor temperature is outside permitted limits.	9
RD RD RD RD	ERROR	Voltage error: the sensor supply voltage is outside permitted limits.	8
RD RD YE RD	ERROR	Short circuit between the safety outputs OS1 and OS2.	7

Table 2: ERROR messages

If a WARNING event is identified, the LED cycles between continuous light corresponding to the current operating state (see Table 1) with the corresponding illumination sequence listed in Table 3.

LED illumination sequence	Sensor state	Description	Priority
RD	WARNING	Temperature warning: the sensor temperature is close to permitted limits.	6
RD RD	WARNING	Voltage warning: the supply voltage is close to permitted limits.	5
YE YE	WARNING	No signal at the inputs IS1 and IS2.	4
YE GN	WARNING	Inputs IS1 and IS2 inconsistent.	3
YE	WARNING	The actuator is in the detection limit area.	2

Table 3: WARNING messages

Legend: GN = green RD = red YE = yellow
BU = blue VT = purple TQ = turquoise

i WARNING events are generally reversible. ERROR events are not reversible: the device does not recover from the error, but must be switched off, and the cause of the error resolved prior to switching back on.

i If multiple ERROR or WARNING events are present at the same time, the highest priority error only is indicated. For example, where both a temperature warning and a voltage warning are present, only the temperature signalling sequence is indicated; the voltage warning sequence is indicated only once the temperature warning is no longer active, i.e. the temperature exits the alert threshold.

5.9 Reset input

The following error states due to a failure external to the device can be reset using the I3 input:

- a short circuit or overload of safety outputs (OS1, OS2),
- a short circuit between a safety output and the supply voltage.

5.10 Replacement of the actuator (for articles ST **4***, ST **8*** only)

! Attention: The machine manufacturer must restrict access to the sensor programming mode to authorised personnel only.

Via input I3 it is possible to replace the coded actuator with a second actuator at any time. This operation is repeatable an unlimited number of times. After programming has been completed, the sensor will recognise only the actuator code corresponding to the last executed programming operation.

- 1) Power the sensor at the rated voltage. The sensor carries out internal tests. The LED illuminates as described in paragraph OPERATING STATES.
- 2) Activate the I3 programming input, by applying the voltage U_{e1} (see paragraph TECHNICAL DATA). The LED illuminates purple to indicate it is ready to receive the new code to be stored.
- 3) Move the new actuator towards the sensor, with the centring symbols aligned. The LED flashes green twice, once programming has completed successfully.
- 4) Disable the I3 programming input: the sensor restarts automatically and repeats the internal tests to switch to the RUN operating state.

The second actuator must be suitably fixed to the guard as described in paragraph INSTALLATION INSTRUCTIONS. Once the operation is carried out, check recognition of the newly programmed actuator and perform the sequence of functional tests specified in these operating instructions.

This operation must not be carried out as a repair or maintenance operation. If the device ceases to function correctly, replace the entire device and not just the actuator.

i The programming operation of the actuator can be carried out either with the safety inputs deactivated or with the safety inputs activated.

6 INSTRUCTIONS FOR PROPER USE

6.1 Installation

! Attention: Installation must be carried out by qualified staff only. The OS1 and OS2 safety outputs of the device must be connected to the safety circuit of the machine. The signalling output O3 is not a safety output and may not be used individually in a safety circuit to determine safe state of guard closed.

- Do not stress the device with bending and torsion.
- Do not modify the device for any reason.
- Do not exceed the tightening torques specified in the present operating instructions.
- The device carries out an operator protection function. Any inadequate installation or tampering can cause serious injuries and even death, property damage, and economic losses.
- These devices must not be bypassed, removed, turned or disabled in any other way.
- If the machine where the device is installed is used for a purpose other than that specified, the device may not provide the operator with efficient protection.
- The safety category of the system (according to EN ISO 13849-1), including the safety device, also depends on the external components connected to it and their type.
- Before installation, make sure the device is not damaged in any part.
- Avoid excessive bending of connection cables in order to prevent any short circuits or power failures.
- Do not paint or varnish the device.
- Do not drill the device.
- Do not use the device as a support or rest for other structures, such as raceways, sliding guides or similar.
- Before commissioning, make sure that the entire machine (or system) complies with all applicable standards and EMC directive requirements.
- The fitting surface of the device must always be smooth and clean.
- The documentation required for correct installation and maintenance is available online in various languages on the Pizzato Elettrica website.
- Should the installer be unable to fully understand the documents, the product must not be installed and the necessary assistance may be requested (see paragraph SUPPORT).
- Before commissioning the machine, and periodically, check for correct switching of the outputs and correct operation of the system comprising the device and associated safety circuit.
- In proximity of the device do not carry out arc welding, plasma welding, or any other process that may generate electromagnetic fields of intensity higher than the limits prescribed by the standards, even when the sensor is off. Where welding operations are to be carried out in the proximity of a previously installed device, it must first be moved away from the work area.
- No work that can cause high-intensity electrostatic discharges (e.g. stripping or rubbing plastic surfaces or other materials that can be electrostatically charged) may be carried out in the vicinity of devices that are supplied with electrical energy, even if they are switched off or not wired.
- Always attach the following operating instructions to the manual of the machine in which the device is installed.
- These operating instructions must be kept available for consultation at any time and for the whole period of use of the device.

6.2 Do not use in the following environments

- In environments where the application causes collisions, impacts or strong vibrations to the device.
- In environments containing explosive or inflammable gases or dusts.
- In environments where ice can form on the device.
- In environments with strong and sudden temperature changes. For example in hot working environments where cleaning with cold water is performed. In these cases it is advisable to protect the sensor with suitable shields.
- In environments containing strongly aggressive chemicals, where the chemical products used coming into contact with the device may impair its physical or functional

integrity. Always check before installation the chemical compatibility between the materials of which the device is made (see paragraph TECHNICAL DATA) and the chemical products that could come into contact with the device.

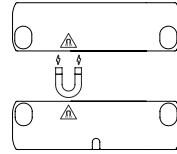
- Prior to installation, the installer must always ensure that the device is suitable for use under the ambient conditions on site.

6.3 Mechanical stop

! Attention: The door must always be provided with an independent end-limit mechanical stop at limit of travel.

Do not use the device as mechanical stop for the door. The actuator must not strike the sensor.

6.3.1 Versions with holding magnet



The devices with an internal magnet allow to generate a holding force between the sensor and the actuator that can keep the guard shut even if there are vibrations.

The magnetic holding force is available in various magnitudes that can be chosen depending on the application (see paragraph TECHNICAL DATA).

6.4 Maintenance and functional tests

! Attention: Do not disassemble or try to repair the device. In case of any malfunction or failure, replace the entire device.

! Attention: In case of damages or wear it is necessary to change the whole device including its actuator. Correct operation cannot be guaranteed when the device is deformed or damaged.

- The installer is responsible for establishing the sequence of functional tests to which the device is to be subjected before the machine is started up and during maintenance intervals.

- The sequence of the functional tests can vary depending on the machine complexity and circuit diagram, therefore the functional test sequence detailed below is to be considered as minimal and not exhaustive.

- Perform the following sequence of checks before the machine is commissioned and at least once a year (or after a prolonged shutdown):

- 1) Open the guard while the machine is moving. The machine must stop immediately. The stopping time of the machine must be always shorter than the time required by the operator for opening the guard and reaching the dangerous parts.
- 2) Try to start the machine while the guard is open. The machine must not start.
- 3) Check correct actuator to device alignment.
- 4) Check that no external parts are damaged. If damaged, replace the entire device.
- 5) The actuator must be securely locked to the door; make sure that none of the machine operator's tools can be used to disconnect the actuator from the door.

- The device has been created for applications in dangerous environments, therefore it has a limited service life. Although still functioning, after 20 years from the date of manufacture the device must be replaced completely. The date of manufacture is placed next to the product code (see paragraph MARKINGS).

6.5 Wiring

! Attention: Check that the supply voltage is correct before powering the device.

- Keep the charge within the values specified in the electrical operation categories.
- Only connect and disconnect the device when the power is off.
- Do not open the device for any reason.
- Discharge static electricity before handling the product by touching a metal mass connected to earth. Any strong electrostatic discharge could damage the device.
- Power the safety switch and the other devices connected to it from a single SELV/PELV source and in accordance with the applicable standards.
- Always connect the protection fuse (or equivalent device) in series with the power supply for each device.
- During and after the installation do not pull the electrical cables connected to the device.
- For devices with integrated cable, the free end of the cable (if it does not have a connector) must be properly connected inside a protected housing. The cable must be adequately protected from cuts, impacts, abrasion, etc.

6.6 Additional prescriptions for safety applications with operator protection functions

Provided that all previous requirements for the devices are fulfilled, for installations with operator protection function additional requirements must be observed.

- The utilization implies knowledge of and compliance with following standards: EN 60947-5-3, EN ISO 13849-1, EN 62061, EN 60204-1, EN ISO 14119, EN ISO 12100.

6.7 Limits of use

- Use the device following the instructions, complying with its operation limits and the standards in force.

- The devices have specific application limits (min. and max. ambient temperature, mechanical endurance, IP protection degree, etc.) These limitations are met by the device only if considered individually and not as combined with each other.

- The manufacturer's liability is to be excluded in the following cases:

- 1) Use not conforming to the intended purpose;
 - 2) Failure to adhere to these instructions or regulations in force;
 - 3) Fitting operations not carried out by qualified and authorized personnel;
 - 4) Omission of functional tests.
- For the cases listed below, before proceeding with the installation contact our technical assistance service (see paragraph SUPPORT):
- a) In nuclear power stations, trains, airplanes, cars, incinerators, medical devices or any application where the safety of two or more persons depend on the correct operation of the device;
 - b) cases not listed in these operating instructions.

7 MARKINGS

The outside of the device is provided with external marking positioned in a visible place. Marking includes:

- Producer trademark
- Product code
- Batch number and date of manufacture. Example: A20 ST1-123456. The batch's first letter refers to the month of manufacture (A=January, B=February, etc.) The second and third letters refer to the year of manufacture (20 = 2020, 21 = 2021, etc...)

8 TECHNICAL DATA

8.1 Housing

Housing made of glass fibre reinforced technopolymer, self-extinguishing. Versions with integrated cable 5 x 0.25 mm² or 8 x 0.25 mm², length 2 m, other lengths on request.

Versions with M12 plastic or stainless steel connector.

Versions with 0.2 m cable length and integrated M12 connector, other lengths on request.

Maximum length of connecting cables: 50 m.

(The cable length and section alter the deactivation impulses at the safety outputs. Check that the capacity between the connecting cable's conductors is lower than that permitted in the electrical data of the safety outputs)

Protection degree: IP67 acc. to EN 60529, IP69K acc. to ISO 20653

(Protect the cables from direct high-pressure and high-temperature jets)

Materials of versions with integrated M12 connector: PA66, PC, AISI304

Materials of versions with PVC cable: PA66, PC, NBR, PVC, AISI304

Materials of versions with PUR cable: PA66, PC, NBR, PUR, AISI304

Materials of versions with cable and M12 connector: PA66, PC, NBR, PVC, PUR, AISI304, nickel-plated brass

8.2 General data

For safety applications up to: SIL 3 acc. to EN 62061
PL e, cat. 4 acc. to EN ISO 13849-1:2015
type 4 acc. to EN ISO 14119
high with SM •1T actuators
low with SM •0T actuators

Interlock, no contact, coded:

Level of coding acc. to EN ISO 14119:

Safety parameters:

MTTF_D: 1551 years

PFH_D: 1,19E-09

DC: High

Mission time: 20 years

Operating temperature for articles without cable:

ST ••••MP, ST ••••MK: -25°C...+70°C

ST ••••MK-T8: -35°C...+85°C

Operating temperature for articles with cable:

ST ••••N•, ST ••••M•: -25°C...+70°C, fixed installation

-15...+70°C flexible, mobile installation

ST ••••H•: -25°C...+70°C fixed, flexible, mobile

installation

ST ••••N•-T8, ST ••••H•-T8, ST ••••M•-T8: -35°C...+85°C, fixed installation

-15...+85°C flexible, mobile installation

ST ••••H•: -35°C...+85°C

Storage temperature:

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

8.3 Power supply electrical data

8.3.1 Power supply electrical data

Rated operating voltage U_e: 24 Vdc SELV/PELV
10 ... 30 Vdc SELV/PELV (articles ST H•••1••)
± 15% of U_e (Only for 24 Vdc)

Supply voltage tolerance:

Operating current at U_e voltage:

minimum: 20 mA

with all outputs at maximum power: 550 mA

Rated insulation voltage U_i: 32 Vdc

Rated impulse withstand voltage U_{imp}: 1.5 kV

External protection fuse: 1 A type Gg or equivalent device

Overvoltage category: III

8.3.2 Electrical data of IS1/IS2/IS3/EDM inputs

Rated operating voltage U_{e1}: 24 Vdc
10 ... 30 Vdc (articles ST H•••1••)

Rated current consumption: 2.5 mA

Switching time EDM state (t_{EDM}): 500 ms

8.3.3 Electrical data of OS1/OS2 safety outputs

Rated operating voltage U_{e2}: 24 Vdc
10 ... 30 Vdc (articles ST H•••1••)

Output type: PNP type OSSD

Maximum current per output I_{e2}: 0.2 A

Minimum current per output I_{m2}: 0.5 mA

Thermal current I_{th2}: 0.2 A

Utilization category: DC-13; U_{e2}=24 Vdc, I_{e2}=0.2 A

Short circuit detection: Yes

Overcurrent protection: Yes

Resettable internal protection fuse: 0.3 A

Duration of the deactivation impulses at the safety outputs: < 300 μs

Permissible capacitance between outputs: < 200 nF

Permissible capacitance between output and ground: < 200 nF

Response time (tr) after deactivation of inputs IS1 or IS2: < 15 ms

Response time (tr_A) after actuator removal: < 60 ms

Availability time: 2 s

8.3.4 Electrical data of O3 signalling output

Rated operating voltage U_{e3}: 24 Vdc
10 ... 30 Vdc (articles ST H•••1••)

Output type: PNP
Maximum current per output I_{e3}: 0.1 A^(a)
Utilization category: DC-13; U_{e3}=24 Vdc, I_{e3}=0.1 A^(a)
Short circuit detection: No
Overcurrent protection: Yes
Resettable internal protection fuse: 120 mA
^(a) 0,05 A for articles ST ••••••-T8 with operating temperature T > 70°C

8.3.5 Actuation data

	(A)	(B)
Assured operating distance S _{ao} :	8 mm	14 mm
Assured release distance S _{ar} :	20 mm	26 mm
Rated operating distance S _{on} :	11 mm	18 mm
Rated release distance S _{or} :	13 mm	20.5 mm

(A) = with SM G•T, SM D•T, SM L•T, SM H•T actuators; (B) = with SM E•T actuators

Repeat accuracy: ≤ 10 % s_n
Differential travel: ≤ 20 % s_n
RFID transponder frequency: 125 kHz
Max. switching frequency: 1 Hz
Minimum distance between two sensors: 50 mm
Magnetic holding force of the actuator: 25 N (articles ST HE•••••-H•TE)
40 N (articles ST HE•••••-H•TF)
50 N (articles ST HE•••••-H•TG)

8.4 Compliance with standards

EN ISO 14119, IEC 61508-1, IEC 61508-2, IEC 61508-3, IEC 61508-4,
EN ISO 13849-1, EN ISO 13849-2, EN 62061, EN 60947-5-3, EN 60947-5-2,
EN 60947-1, EN 61326-1, EN 61326-3-1, EN 61326-3-2, EN IEC 63000,
ETSI EN 301 489-1, ETSI EN 301 489-3, ETSI 300 330-2, UL 508, CSA 22.2 No.14

8.5 Compliance with directives

Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, Radio Equipment Directive 2014/53/EU, RoHS Directive 2011/65/EU, FCC Part 15


9 SPECIAL VERSIONS ON REQUEST

Special versions of the device are available on request.

The special versions may differ substantially from the indications in these operating instructions.

The installer must ensure that he has received written information from the support service regarding installation and use of the special version requested.

10 DISPOSAL

 At the end of service life product must be disposed of properly, according to the rules in force in the country in which the disposal takes place.

11 SUPPORT

The device has been created for safeguarding people's physical safety, therefore in case of any doubt concerning installation or operation methods, always contact our technical support service:

Pizzato Elettrica Srl - Italy
Via Torino, 1 - 36063 Marostica (VI)
Telephone +39.0424.470.930
E-mail tech@pizzato.com
www.pizzato.com

Our support service provides assistance in Italian and English.

12 EC CONFORMITY DECLARATION

I, the undersigned, as a representative of the following manufacturer:

Pizzato Elettrica Srl - Via Torino, 1 - 36063 Marostica (VI) - ITALY
hereby declare that the product is in conformity with whatever prescribed by the 2006/42/EC Machine Directive. The complete version of the present conformity declaration is available on our website www.pizzato.com
Marco Pizzato

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. Taking into account the great variety of applications and possible connections of the device, the examples and diagrams given in the present manual are to be considered as merely descriptive; the user is deemed responsible for checking that the specific application of the device complies with current standards. This document is a translation of the original instructions. In case of discrepancy between the present sheet and the original copy, the Italian version shall prevail. All rights to the contents of this publication are reserved in accordance with current legislation on the protection of intellectual property. The reproduction, publication, distribution and modification, total or partial, of all or part of the original material contained therein (including, but not limited to, texts, images, graphics), whether on paper or in electronic form, are expressly prohibited without written permission from Pizzato Elettrica Srl.
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