

## 1 INFORMATION ON THIS DOCUMENT

### 1.1 Function

The present instruction manual provides information on installation, connection and safe use for the following articles: **NG 2\*\*\*\*\***, **VN NG-F\*\***

### 1.2 Target audience

The operations described in this instruction manual 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 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

 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 this manual is defined as a coded, type-4 interlocking device with lock and without contact acc. to EN ISO 14119.

The safety switches with solenoid and RFID technology to which these usage 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 with or without inertia.

### 3.2 Intended use of the device

- The device described in this manual is designed to be applied on industrial machines 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 this manual is prohibited.


- Any use other than as expressly specified in this manual shall be considered unintended by the manufacturer.

- Also considered unintended use:

a) using the device after having made structural, technical, or electrical modifications to it;

b) 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 this instruction manual refers, and not the functional safety of the entire machine or entire plant


### 4.1 Actuation directions

 The centring symbols  on the device and actuator must be facing each other.


### 4.2 Selection of the actuator type

 Attention: The device is available with two types of RFID actuator: with high (article VN NG-F31) or low (article VN NG-F30) 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.

 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.

### 4.3 Selection of the working principle

 Attention: The switch is available with two working principles:

1) Working principle D for versions NG 2D1D\*\*\*\*, NG 2D5D\*\*\*\*, NG 2D6D\*\*\*\*, NG 2D7D\*\*\*\*: locked actuator with de-energised solenoid (spring lock, release by activation of I4 input);


2) Working principle E for versions NG 2D1E\*\*\*\*, NG 2D7E\*\*\*\*: locked actuator with energised solenoid (lock with activation of I4 input, spring release).

Working principle D (spring lock) maintains the actuator lock even if the machine is disconnected from the power supply. Therefore if the machine has dangerous movements with inertia, inaccessibility to dangerous parts (actuator locked) is


ensured, even in the event of a sudden power failure. If the machine structure allows a person to enter the danger area with the whole body and possibly end up being stuck inside the machine, the switch must be provided with an escape release button, in order to allow the trapped person to get out even in case of power failure.

Working principle E (lock with activation of I4 input) keeps the actuator lock only when the machine is connected to the power supply. Therefore, before choosing this working principle, carefully evaluate all dangers deriving from sudden power failure with a consequent possible immediate actuator release.

The choice between working principles D and E must always be made following a risk analysis of the specific application.

 In case of machines without inertia, i.e. with dangerous elements being immediately blocked as soon as the guard is opened, for which a device with lock has been chosen merely to safeguard the production process, the first or the second working principle can both be used indifferently.

### 4.4 Selection of the safety outputs actuation mode

 Attention: the device is available with three different safety outputs actuation modes:

- **mode 1 (NG \*\*\*\*\* items)**: safety outputs active with inserted and locked actuator;

- **mode 2 (NG \*\*\*\*\* items)**: safety outputs active with inserted actuator;

- **mode 3 (NG \*\*\*\*\* items)**: OS1 safety output active with inserted and locked actuator and IS1 active, OS2 safety output active with inserted actuator and IS2 active.

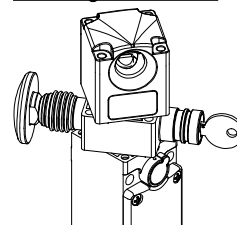
Mode 1 activates the OS safety outputs when the actuator is both inserted and locked, so that the actuator cannot be extracted with the safety outputs activated. In mode 1 the device is coded, type 4 (interlock with lock) acc. to EN ISO 14119.

For specific applications, mode 2 allows the actuator to be released while keeping the safety chain enabled (normally for specific, low inertia applications) when the hazard does not continue after opening the guard. In mode 2 the device is coded, type 4 (interlock without lock) acc. to EN ISO 14119.


Mode 3, for specific applications, provides a channel with "mode 1" functionality, and a channel with "mode 2" functionality. This allows emulation of electromechanical interlocking devices with lock, without complex machine wiring modifications.

Using modes 2 and 3 must always follow a risk analysis on the specific application, with particular focus on the function of cascaded mode 3 devices.

### 4.5 Fixing of the device

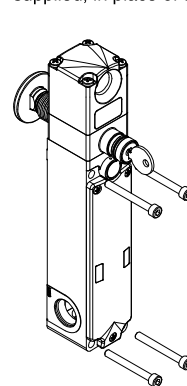



Before fixing the device, it is possible, if necessary, to adjust the position of the head and the release device (if present) in order to turn the device to the position best suited to the application. Completely remove the 4 screws from the head to turn either the head or the release device independently of each other on an arc of 270°.


 Attention: Do not force rotation beyond 270° as this could cause damage to the device. Once adjustment is complete, re-tighten the head screws with

a torque between 0.8 and 1.2 Nm.


Once the head of the device is in position, you must use the two safety screws supplied, in place of the two original screws, at opposite corners.

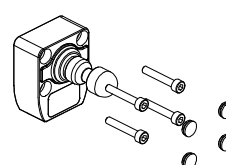


 Attention: Always affix the device with 4 M5 screws with resistance class 8.8 or higher, and flat seating heads. Install the screws with medium resistance thread lock, and a number of threads engaged equal to or greater than the screw diameter. The device must never be fixed with less than 4 screws. Tightening torque of the 4 M5 screws between 2 and 3 Nm

 It is advisable to install the device in the top part of the door, in order to prevent any dirt or work residues from getting inside the hole where the actuator is to be introduced. In order to avoid device bypassing it is advisable to fix the device body to the machine frame so that it cannot be removed.

### 4.6 Fixing the actuator to the guard

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

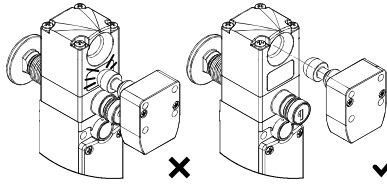


Always affix the actuator with at least 4 M5 screws with resistance class 8.8 or higher, and flat seating heads. Install the screws with medium resistance thread lock, and a number of threads engaged equal to or greater than the screw diameter. The actuator must never be fixed with less than 4 screws. Tightening torque of the 4 M5 screws between 2 and 3 Nm.

After fixing, you must plug the 4 screw holes with the caps supplied. Inserting the caps is considered a supplementary measure to reduce the potential of actuator disassembly to a minimum, in accordance with EN ISO 14119.

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.

#### 4.7 Device-actuator alignment



**⚠ Attention:** Although the device is designed to facilitate alignment between the device and its actuator, excessive misalignment could cause damage to it. Periodically check the correct alignment between the device and the respective actuator.

Maximum admissible misalignment from hole axis, for rigid doors:  $\pm 2$  mm (vertical and horizontal).

The actuator must not knock on the outside of the actuator inlet area, and must not be used as a centring device for the mobile protection.

In the event of application on hinged doors, check that the radius between the actuator axis and the axis of the hinge fitted to the door is greater than 150 mm.

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

This device is not suitable for applications in which the moving door with immovably fastened actuator permits misalignments of an entity that prevents the pin entering the corresponding hole in the device with the door completely closed.

**i** The device is provided with a through hole for inserting the actuator. If used in dusty environments, we recommend not to obstruct the outlet hole opposite to the inlet one. This will allow any dust entering the hole to exit from the opposite side.

#### 4.8 Escape release button

Some of the device versions are equipped with a release button in order to allow any personnel accidentally trapped inside the machine to get out. This button, complying with the EN ISO 14119 standard, directly acts on the lock mechanism and immediately releases the actuator regardless of the state of the device. Pressing this button causes:

- in mode 1: immediate deactivation of the safety outputs OS1, OS2 and of the signalling output O4;
- in mode 2: immediate deactivation of the signalling output O4 only;
- in mode 3: immediate deactivation of the safety output OS1 and of the signalling output O4;

**i** This escape release button unlocks the guard even if the device is not powered on.

For correct installation of the escape release button, the following instructions are to be observed.

- The release button must be clearly visible from inside the machine.

- Button activation must be easy, immediate and independent from the machine operating status; to help you recognise the button and explain its function, identification stickers are available in various languages (contact the sales department for detailed information).

- For an operator standing outside the machine, it must be impossible to activate the release button when the door is closed.

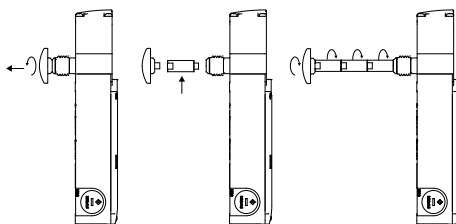
- To guarantee correct operation and easy resetting, a distance ranging from 10 to 35 mm must be kept between the wall from where the button protrudes and the release button.

- The actuation path of the release button must always be kept clean, since dirt or chemical products could compromise the device operation.

- The personnel concerned must be adequately trained on correct button operation, so as to avoid any improper use (i.e. the button must not be used as a clothes-hook).

- The release button must not be used as a machine emergency stop.

For installation on walls thicker than 20 mm, extensions for the release button are available.



For correct installation of the extensions, the following instructions are to be observed:

- do not exceed an overall length of 500 mm between the release button and the device;

- always use medium resistance threadlocker adhesive on every threaded connection between button, extensions, and device;

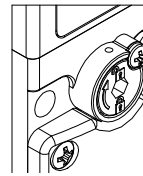
- avoid twisting or bending the release button. Where necessary, use an appropriate sliding guide (pipe or bushing), if the button and its extensions have a length greater than 100 mm;

- tightening torque of button and extensions: from 4 to 5 Nm.

#### 4.9 Auxiliary release with a tool or a lock

Some of the device versions are provided with an auxiliary release in order to allow an easy installation (release with a screwdriver) or the opening only to authorised personnel (lock release). Both these mechanical release devices act inside the device like the escape release button described previously. Therefore they also unlock the guard in case of power failure. These release devices may only be operated by a machine maintenance engineer who has received adequate training on the dangers deriving from their use.

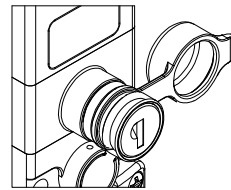
##### 4.9.1 Use of the auxiliary release with a screwdriver



- Unscrew the locking screw with a PH1 cross-head screwdriver
- Turn the hexagonal-hole bush clockwise by 180°
- Do not force the bush beyond 180°
- To avoid any improper use of the auxiliary device with a tool, it is advisable to seal the device through the appropriate hole found in the upper part, or to seal the screw cross head with a few drops of paint.

- After each actuation, it is advisable to reseal the device.

##### 4.9.2 Use of the auxiliary release with a lock



- Open the protection cap.
- Insert the key supplied with the device and turn clockwise by 180°.
- Do not force the key beyond 180°.
- Each time after the key is extracted, close the rubber cap.
- The release key must only be available to the machine maintenance engineer and kept in a secluded place.

- The release key must not be available to the machine operator.

- Never leave the release key inserted in the device during normal machine operation.

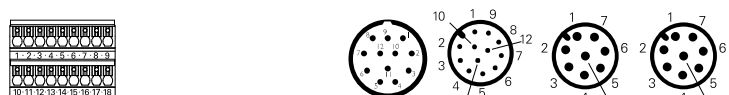
**i** For particular applications, versions are available without any auxiliary release device.

#### 4.10 Electrical connections of the device

**⚠ Attention:** The device is fitted with OSSD type solid state electronic outputs. These outputs behave differently from electromechanical contacts. Use and installation of a safety device with solid state outputs is only permitted if all characteristics of this particular type of outputs are known in detail.

##### 4.10.1 Internal connections

To open the device cover, use a PH2 cross-head screwdriver, and tighten the screws to a torque between 0.8 and 1.2 Nm.



Internal terminal strip for switch	Connection	M23 connector 12-pole	M12 connector, 12-pole	M12 connector, 8-pole, stand-alone connection	M12 connector, 8-pole, series connection with Y connectors
1	A2	Supply input 0 V	3	3	3
2	B2	0 V auxiliary supply output	3	3	3
3	I4	Solenoid activation input for single channel mode (c)	10	10	8
4	O3	Signalling output, actuator inserted (d)	5	5	2
5	O4	Signalling output, actuator inserted and locked (b) (d)	9	9	5
6	I3	Actuator programming input / reset	8	8	6
8	IE1	Solenoid activation input for double channel mode	10	10	/
9	IE2	Solenoid activation input for double channel mode	12	12	/
10	A1	Supply input +24 Vdc	1	1	1
11	B1	Auxiliary supply output +24 Vdc, 8 A max.	1	1	1
12	IS1	Safety input	2	2	/
13	IS2	Safety input	6	6	/
14	I5	EDM input (a)	11	11	/
15	OS1	Safety output	4	4	4
16	OS2	Safety output	7	7	7

Important: terminals 7, 17, 18, of the internal terminal strip must not be used.

(a) Available in NG 2D\*\*5\*\*\* version only.

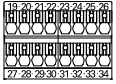
(b) For NG 2D\*\*6\*\*\*: the output signals the fault condition of the device.

(c) In single-channel actuation mode, inputs IE1 and IE2 must be short-circuited.

(d) For NG 2D\*\*7\*\*\*: the signalling outputs O3 and O4 have a negative working logic (active-low signal).

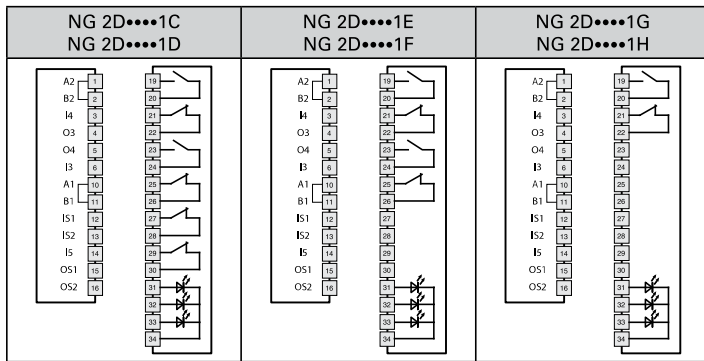
#### 4.10.2 Internal connections of integrated control devices

The switch can be supplied with a cover equipped with between one and three integrated control devices. The below illustrates the standard connections for these devices. Other configurations are available on request.

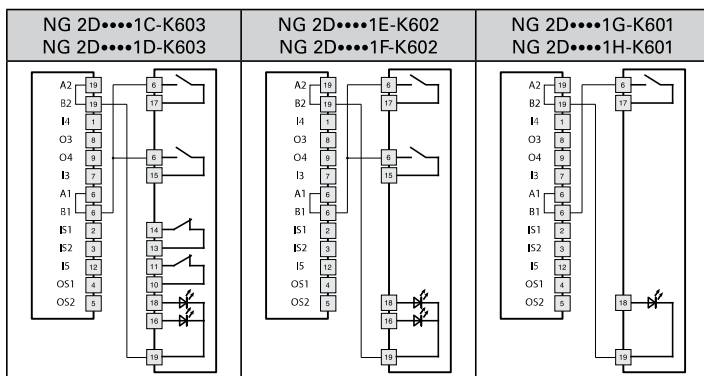


Internal terminal strip integrated control devices	Connection		
19	Contact 1	Device 1	
20			
21	Contact 2	Device 1	
22			
23	Contact 1	Device 2	
24			
25	Contact 2	Device 2	
26			
27	Contact 1	Device 3	
28			
29	Contact 2	Device 3	
30			
31	Supply input +24 Vdc / LED device 1		
32	Supply input +24 Vdc / LED device 2		
33	Supply input +24 Vdc / LED device 3		
34	Supply input 0 V / LED		

#### 4.10.3 Switch with integrated field-wireable control devices

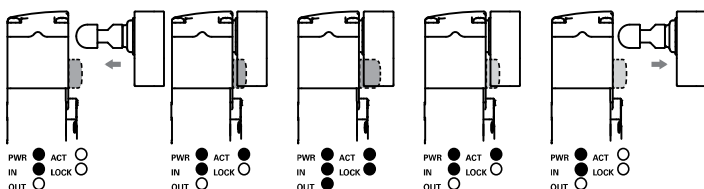


#### 4.10.4 Switch with integrated control devices and M23 connector, 19-pole



#### 4.11 RFID sensor intervention points

The RFID sensor on the device recognises the actuator when placed in front of it. Within this range the signalling output O3 is activated along with the ACT LED to indicate the "guard closed" condition. In this condition, it is possible to lock the "guard closed" state by means of the I4 input. After locking, the LOCK LED and the output O4 are activated. At the same time the RFID sensor extends its release distance to prevent vibrations or impacts from causing involuntary opening of outputs OS1, OS2 and O4 when the guard is locked. If the input I4 (or IE1/IE2) is activated or deactivated, without the actuator present, the device does not lock or activate any of the outputs OS1, OS2, O4. To open the guard it is necessary to operate via the input I4; with guard unlocked, output O4 will be deactivated and the LOCK LED will switch off. At this point, the RFID sensor will reset its operating distance to the initial values and by opening the guard the output O3 and the ACT LED will be deactivated.



## 5 OPERATION

### 5.1 Access monitoring

These devices alone are not sufficient to protect any operators or maintenance engineers in the event that they are able to physically enter the danger area with their whole body, since any unintentional closing of a guard behind them could allow the machine to be restarted. In case the machine restarting control is entirely entrusted to these switches, a device must be provided to avoid that risk, such as a lock-out/tag-out system which stops the machine from being restarted. A specifically designed lock-out/tag-out device is available as an accessory for the switch, which prevents any unintentional machine start up with the operator still inside. Please contact our sales offices for more information (see paragraph SUPPORT).

### 5.2 Definitions

States of the switch:

- OFF: device is off, not powered.
- POWER ON: state immediately following switch on, during which the device carries out internal tests.
- RUN: state in which the device is working in normal operation.
- ERROR: error 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 the ground,
  - a short circuit between a safety output and the supply voltage,
  - an excessive misalignment between the switch and the locked actuator,
  - an exceedance of the maximum retention force with failure of the device in locked condition,
  - an exceedance of the maximum or minimum admissible ambient temperature,
  - an internal failure.

• The safety functions are defined as follows.

- Mode 1:
- 1.1 The OS safety outputs must be disabled when the actuator is detected as released.
  - 1.2 The OS safety outputs must be disabled when the actuator is no longer detected.
  - 1.3 The OS safety outputs must be disabled when at least one of the safety inputs (IS1 or IS2) is not enabled.
- Mode 2:
- 2.1 The OS safety outputs must be disabled when the actuator is no longer detected.
  - 2.2 The OS safety outputs must be disabled when at least one of the safety inputs (IS1 or IS2) is not enabled.
- Mode 3:
- 3.1 The OS1 safety output must be disabled when the actuator is detected as released.
  - 3.2 The OS2 safety output must be disabled when the actuator is no longer detected.
  - 3.3 The OS1 safety output must be disabled when the IS1 safety input is not enabled.
  - 3.4 The OS2 safety output must be deactivated when the IS2 safety input is not enabled.

With any operation mode the device must keep the guard closed and locked when the solenoid is enabled (working principle E for versions NG 2D1E..., NG 2D7E...) or disabled (working principle D for versions NG 2D1D..., NG 2D5D..., NG 2D6D..., NG 2D7D...) and a force less than the declared value  $F_{2h}$  is applied.

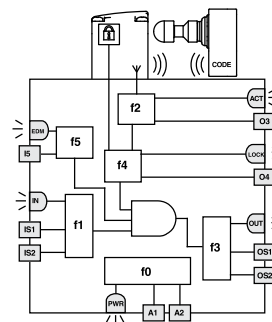
- The EDM External Device Monitoring function (where present) is a function which allows the device to monitor the state of external contactors. Activation and deactivation of external contactors must follow the NG switch safety outputs within a maximum delay.

### 5.3 Description of operation

Note: the following functional descriptions refer to a device with safety outputs enabled with guard closed and locked (mode 1).

A device with safety outputs enabled by closing the guard (mode 2) differs from the above operating mode for the fact that the safety outputs OS1 and OS2 are enabled without the f4 function verifying the guard locking. Mode 3 differs, in that OS1 is enabled when the guard is closed and locked, and OS2 with guard closed.

Following correct installation in accordance with these instructions, the safety device can be powered. The diagram below represents the 5 logic functions which interact inside the safety device.



In the initial "POWER ON" state, the safety device 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 because of an internal failure, the device enters the "ERROR" state.

In EDM versions, on power-up, the EDM signal is checked and must be active within 500 ms from device start. If the EDM signal is not present, after the delay time the F5 function sets the device to the FAULT state.

The "RUN" state is the normal operation state: the f1 function evaluates the state of inputs IS1, IS2; at the same time the f2 function checks the presence of the actuator and the f4 function verifies that the actuator has been locked.

In the EDM versions the f5 function verifies the coherence of the EDM signal during state changes and when the safety outputs are off.

When these three conditions are given, the f3 function of the device enables the safety outputs OS1 and OS2.

The device inputs IS1 and IS2 are normally activated simultaneously and so are monitored both for state and coherence. In the event of deactivation of just one of the two inputs, the device deactivates the safety outputs and signals a non-coherent condition of the inputs via the IN LED flashing green/orange. In order to reactivate the safety outputs, both inputs have to be deactivated and subsequently reactivated. In the RUN state, function f0 carries out internal test cycles in order to identify any failures. Detection of any internal error switches the device to the "ERROR" state (PWR LED continuously red) which deactivates immediately the safety outputs.

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 OUT LED flashing red.

The O3 signalling output activates during the "RUN" state, at the actuator insertion into the device, independently of the state of the IS1 and IS2 inputs. The state of this output is displayed via the ACT LED.

The O4 signalling output activates during the "RUN" state, when the actuator has been introduced and locked into the device, independently of the state of the IS1 and IS2 inputs. The state of this output is displayed via the LOCK LED.

The actuator lock or release command is transmitted to the device through the I4 input.

### 5.4 Replacement of the actuator

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

Via input I3 it is always possible to replace the coded actuator with a second actuator at any time. By activating this input the device sets to the programming mode and the IN LED flashes orange; it disables all OS1, OS2, OS3, OS4 outputs and releases the actuator. With the input enabled, insert the second actuator. Acquisition of the second actuator is confirmed by the IN LED switching off and by four flashes of the ACT LED. At this point the I3 input can be disabled. The device will automatically set to restart and the first actuator will no longer be recognised.

The second actuator must be suitably fixed to the guard as described in paragraph INSTALLATION 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.

### 5.5 Reset input

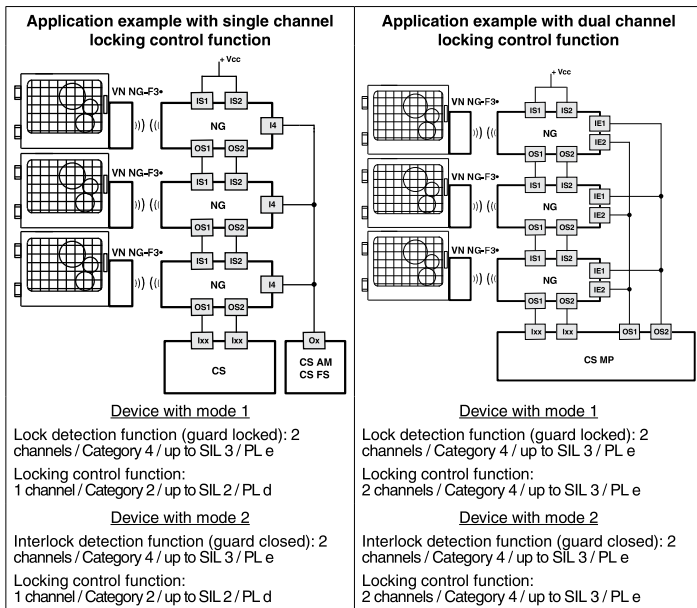
The following error states due to a failure external to the device can be reset using the I3 input:

- a short circuit or overcharge of safety outputs (OS1, OS2),
- a short circuit between a safety output and the supply voltage,
- an excessive misalignment between the device and the locked actuator.

### 5.6 Connection in series with safety modules

It is possible to install multiple cascade-connected devices, up to a maximum of 32 units, 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<sub>d</sub> value and MTTF<sub>d</sub> value 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.



- When connecting the devices in series as described above, observe the following:
- 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.

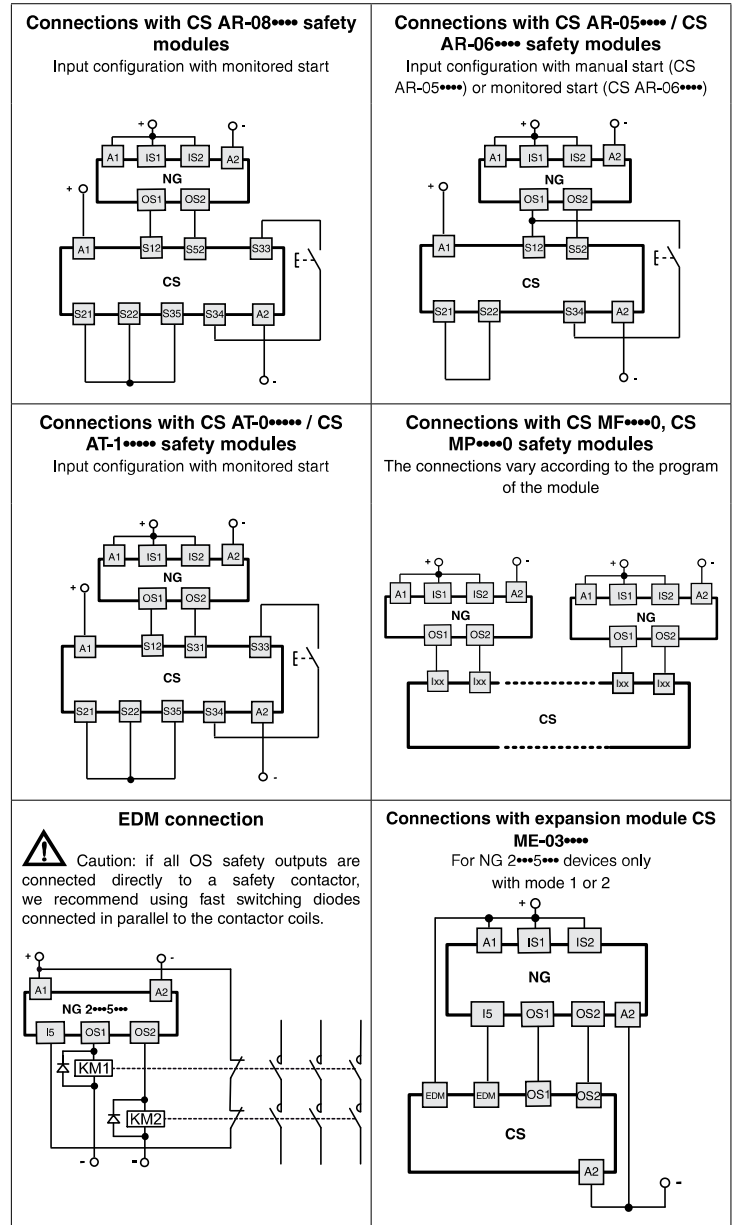
### 5.7 Operating states

PWR LED	IN LED	OUT LED	ACT LED	LOCK LED	EDM <sup>a</sup>	Device state	Description
O	O	O	O	O	O	OFF	Device switched off.
green / red, alternating	green / red, alternating	green / red, alternating	green / red, alternating	green / red, alternating	green / red, alternating	POWER ON	Internal tests upon activation.
green	O	O	*	*	*	RUN	Safety inputs of the device not active.
green	green	*	*	*	*	RUN	Activation of safety inputs.
green	green / orange, alternating	O	*	*	*	RUN	Safety inputs incoherence. Recommended action: check for presence and/or wiring of inputs.
green	*	*	*	blinking red	*	RUN	Incoherence of solenoid activation inputs IE1, IE2. Recommended action: check for presence and/or wiring of inputs.
green	*	*	green	*	*	RUN	Actuator in safe area. O3 signalling output active.
green	*	*	green	green	O	RUN	Actuator in safe area and locked; O3 and O4 outputs active.
green	green	green	green	green	O	RUN	Mode 1 Activation of safety inputs IS1, IS2. Actuator in safe area and locked. O3, O4, OS1 and OS2 outputs active.

green	green	green	green	*	O	RUN	Mode 2 Activation of safety inputs IS1, IS2. Actuator in safe area. O3, OS1 and OS2 outputs active.
green	orange	orange	green	green	O	RUN	Mode 3. Actuator present, guard closed and locked. IS1 enabled, IS2 disabled, OS1 enabled, OS2 disabled
green	green	orange	green	O	O	RUN	Mode 3. Actuator present, guard closed and not locked. IS1 and IS2 enabled, OS1 disabled, OS2 enabled
green	*	red, alternating	*	*	*	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.
green	O	O	red, alternating	O	O	ERROR	Actuator detection error. Check the physical integrity of the device and, in case of failure, please replace the entire device. If undamaged, realign the actuator with the device and restart the device.
red	O	O	O	O	O	ERROR	Internal error. Recommended action: restart the device. If the failure persists, replace the device.
red, alternating	O	O	O	O	O	ERROR	Temperature error outside the permissible range
green	*	O	*	*	green	RUN	EDM signal active (external relay off) <sup>a</sup>
green	green	green	green	green	O	RUN	EDM signal not active (external relay on) <sup>a</sup>
green	O	O	O	O	red, alternating	ERROR	Error in the EDM <sup>a</sup> function

O = off \* = indifferent (a) = available only in version NG 2\*\*\*5\*\*\*

### 5.8 Interfacing



## 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 outputs O3 and O4 are not safety outputs 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 manual.
- 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.
- Before installation, ensure that the connection cables are not powered.
- 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 documents necessary for a correct installation and maintenance are always available in the following languages: English, French, German and Italian.
- Should the installer be unable to fully understand the documents, the product must not be installed and the necessary assistance may be requested from the manufacturer (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 device is off. Where welding operations are to be carried out in the proximity of the previously installed device, it must first be moved away from the work area.
- When the device is installed on a mobile frame and the actuator is installed on a mobile door, ensure that the device cannot be damaged by simultaneous opening of the frame and the door.
- After installation, check for correct operation of the auxiliary release (if present) and the escape release button (if present).
- Always attach the following 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 continual changes in temperature cause the formation of condensation inside the device.
- In environments where the application causes the device to be subjected to strong impacts or vibrations.
- In environments with the presence of explosive or flammable gases.
- In environments where ice can form on the device.
- In environments containing strongly aggressive chemicals, where the products used coming into contact with the device may impair its physical or functional integrity.

### 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.

### 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 device 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) Lock the protection and start the machine. It must be impossible to open the guard.
  - 2) Try to start the machine while the guard is open. The machine must not start.
  - 3) Check correct actuator to device alignment. If the actuator inlet is worn, replace the entire device and actuator assembly.
  - 4) When the escape release button (if present) is pressed, the protection must open freely and the machine must not start. Each time the escape release button is activated, the machine must stop and the door must open immediately. The escape release button must slide freely and be tightly screwed in. The signs placed inside the machine, indicating the function of the escape release button (if present), must be intact,

clean and clearly readable.

5) When the auxiliary release (if present) is activated, the protection must open freely and the machine must not start (for devices with mode 3 check that the machine shows the expected behaviour)

6) If the guard is closed but not locked, it must not be possible for the machine to start (not applicable in mode 2, for devices with mode 3 check that the machine shows the expected behaviour).

7) All external parts must be undamaged.

8) If the device is damaged, replace it completely.

9) 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.

10) 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.
- 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 device and the other components connected to it from a single SELV 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.
- At the end of the wiring, check that no contaminating element has been introduced inside the device.
- Before closing the device cover verify the correct positioning of the gaskets.
- Verify that the electrical cables, wire-end sleeves, cable numbering systems and any other parts do not obstruct the cover from closing correctly or if pressed between them do not damage or compress internal parts
- During and after the installation do not pull the electrical cables connected to the device. If traction is applied to the cables (not supported by an appropriate cable gland) internal parts of the device may be damaged.
- The device contains two internal PUSH-IN spring type terminals for connecting the following wire types.
  - Cross-section of rigid wires or with wire-end sleeve:  
min. 0.34 mm<sup>2</sup> (AWG 22) max. 1.5 mm<sup>2</sup> (AWG 16).
  - Wire cross-section with pre-insulated wire-end sleeve:  
min. 0.34 mm<sup>2</sup> (AWG 22) max. 0.75 mm<sup>2</sup> (AWG 18).
  - Stripping length of electrical conductors: min. 8 mm - max. 12 mm.

### 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

- By connecting the two solenoid activation inputs IE1, IE2 on two distinct channels to two OSSD safety outputs of a safety PLC or safety module, the device can be used as a component with interlocking functions in a system with safety category 4 /PL according to EN ISO 13849-1 and integrity level SIL CL 3 according to EN 62061.
- By connecting both solenoid activation inputs IE1 and IE2 to the same channel, or by connecting the I4 input only after having short-circuited the two solenoid activation inputs IE1 and IE2, the device can be used as a component with interlocking functions in a system with safety category 2/PL d according to EN ISO 13849-1 and integrity level SIL CL 2 according to EN 62061. Any fault on the single I4 activation line of the solenoid can cause the actuator to be released, and the safety outputs switched off.
- 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) Applications not listed in this instruction manual.
- Permanent application of maximum holding force F<sub>zh</sub> is not permitted.

## 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: A18 NG1-123456. 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 (18 = 2018, 19 = 2019, etc...).

## 8 TECHNICAL DATA

### 8.1 Housing

Metal housing, baked powder coating.  
Three M20x1.5 threaded conduit entries  
Protection degree: IP67 acc. to EN 60529, IP69K acc. to ISO 20653  
Protection degree for switch with integrated control devices: IP65 acc. to EN 60529  
The protection degree indicated above is ensured only by installing a suitable cable gland (or other equivalent connection system) with the same or higher protection degree

### 8.2 General data

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

	SIL	PL	Cat.	PFH <sub>D</sub>	MTTF <sub>D</sub>	
Mode 1 / Mode 2	Interlock monitoring function (guard closed)	3	e	4	1,15E-09	3946
	Guard locking function (guard locked) - Not available in mode 2	3	e	4	1,15E-09	2968
	Monitoring of the guard locking function	3	e	4	1,51E-10	4011
	System (general)	3	e	4	1,17E-09	2725
Mode 3	Interlock monitoring function (guard closed)	2	d	2	1,48E-09	3927
	Guard locking function (guard locked)	2	d	2	1,48E-09	2957
	Monitoring of the guard locking function	3	e	4	1,51E-10	4011
	System (general)	2	d	2	1,84E-09	2511

Note: The SIL, PL, cat. values indicated are those that can be achieved by the device. The final values also always depend on the external circuit and the wiring.

DC: High  
Mission time: 20 years  
Ambient temperature: -20°C ... +50°C  
Storage temperature: -40°C ... +75°C  
Max. operating altitude: 2000 m  
Start time on switching on: 2 s  
Max. actuation frequency with actuator lock and release: 600 operating cycles/hour  
Mechanical endurance: 1 million operating cycles  
Max. actuation speed: 0.5 m/s  
Min. actuation speed: 1 mm/s  
Mounting position: any  
Maximum force before breakage  $F_{1max}$ : 9750 N acc. to EN ISO 14119  
Max. holding force  $F_{2n}$ : 7500 N acc. to EN ISO 14119  
Maximum clearance of locked actuator: 4 mm  
Released actuator extraction force: ~ 30 N

### 8.3 Power supply electrical data

Rated operating voltage  $U_e$ : 24 Vdc  $\pm$ 10% SELV  
Operating current at  $U_e$  voltage:  
- 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  
Rated impulse withstand voltage  $U_{imp}$ : 1.5 kV  
External protection fuse: 2 A type gG or equivalent device  
Overvoltage category: III  
Solenoid duty cycle: 100% ED  
Solenoid consumption: 9 W  
Pollution degree: 3 acc. to EN 60947-1

#### 8.3.1 Electrical data of IS1/IS2/IS3/IS4/IS5/IE1/IE2/EDM inputs

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

#### 8.3.2 Electrical data of OS1/OS2 safety outputs

Rated operating voltage  $U_{e2}$ : 24 Vdc  
Output type: PNP type OSSD  
Maximum current per output  $I_{e2}$ : 0.25 A  
Minimum current per output  $I_{m2}$ : 0.5 mA  
Thermal current  $I_{m2}$ : 0.25 A  
Utilization category: DC13;  $U_{e2}$ =24 Vdc,  $I_{e2}$ =0.25 A  
Short circuit detection: Yes  
Overcurrent protection: Yes  
Internal self-resettable protection fuse: 1.1 A

Duration of the deactivation impulses at the safety outputs: < 300  $\mu$ s  
Maximum permissible capacitance between outputs: < 200 nF  
Maximum permissible capacitance between output and ground: < 200 nF  
Activation time of safety outputs OS1 and OS2 after deactivation of inputs: Typically 7 ms, max. 15 ms

Activation time after unlocking the door: Typically 7 ms, max. 12 ms  
Maximum EDM signal status change delay: 500 ms

#### 8.3.3 Electrical data of signalling outputs O3/O4

Rated operating voltage  $U_{e3}$ : 24 Vdc  
Output type: PNP  
Maximum current per output  $I_{e3}$ : 0.1 A  
Utilization category: DC13;  $U_{e3}$ =24 Vdc,  $I_{e3}$ =0.1 A  
Short circuit detection: No  
Overvoltage protection: Yes  
Internal self-resettable protection fuse: 1.1 A

#### 8.3.4 RFID sensor data

Assured operating distance  $S_{a0}$ : 2 mm  
Assured release distance  $S_{ar}$ : 4 mm (actuator not locked)  
10 mm (actuator locked)  
Rated operating distance  $S_n$ : 2.5 mm  
Repeat accuracy:  $\leq$ 10 %  $s_n$   
Differential travel:  $\leq$ 20 %  $s_n$   
Max. switching frequency: 1 Hz

Response time of safety outputs to actuator extraction: typically 120 ms, max. 200 ms

Minimum distance between two identical devices to avoid reciprocal radio interference: 2 mm

### 8.4 Technical data of the integrated control devices

#### 8.4.1 General data

Protection degree: IP65 acc. to EN 60529  
Mechanical endurance:  
Spring-return button: 1 million operating cycles  
Emergency button: 50,000 operating cycles  
Selector switch: 300,000 operating cycles  
Key selector switch: 50,000 operating cycles  
30,000 operating cycles including removal of the key

#### 8.4.2 Actuating force

Spring-return button: 4 N min 100 N max.  
Emergency button: 20 N min 100 N max.  
Selector switch: 0.1 Nm min 1.5 Nm max.  
Key selector switch: 0.1 Nm min 1.3 Nm max.

#### 8.4.3 Contact block

Material of the contacts: silver contacts  
Contact type: Self-cleaning contacts with double interruption

#### 8.4.4 Electrical data

Thermal current (Ith): 1 A  
Rated insulation voltage ( $U_i$ ): 32 Vac/dc  
Rated impulse withstand voltage ( $U_{imp}$ ): 1.5 kV  
LED supply voltage: 24 Vdc  $\pm$  15%  
LED supply current: 10 mA per LED

#### 8.4.5 Utilization category of the contact block

Direct current: DC-13

$U_e$  (V) 24

$I_e$  (A) 0.55

### 8.5 Compliance with standards

EN ISO 14119, EN 60947-5-3:2013, EN 60947-1, EN 60204-1, EN ISO 12100, EN 60529, EN 61000-6-2, EN 61000-6-3, BG-GS-ET-19, IEC 61508:2010, SN 29500, EN ISO 13849-1:2015, EN ISO 13849-2:2012, EN 620614:2005 + EC:2010 + A1:2013 + A2:2015, 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  
IEC 60947-5-1, IEC 60947-5-5, EN ISO 13850

### 8.6 Compliance with standards

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

FCC Part 15 Statements: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## 9 SPECIAL VERSIONS ON REQUEST

Special versions of the device are available on request.

The special versions may differ substantially from the indications in this instruction sheet.

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 can be used 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  
Via Torino, 1 - 36063 Marostica (VI) - ITALY  
Telephone +39.0424.470.930  
Fax +39.0424.470.955  
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 Machinery 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. The present manual may not be reproduced, in whole or in part, without the prior written permission by Pizzato Elettrica.

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