

## 1 INFORMATION ON THIS DOCUMENT

### 1.1 Function

The present instruction manual provides information on installation, connection and safe use for the following articles: **SR A\*\*\*\*\*.\*\*\***

### 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 without contact acc. to EN ISO 14119.

Coded magnetic sensors of the SR A series are devices suitable for monitoring protections and guards which, when linked to a safety module, can create a system with safety category up to SIL 3 according to EN IEC 62061, up to PL e according to EN ISO 13849-1 and up to category 4 according to EN ISO 13849-1.

The devices consist of a sensor that detects the magnetic field and which is connected to the machine structure and of a coded magnetic actuator, which is connected to the movable guard.

### 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:

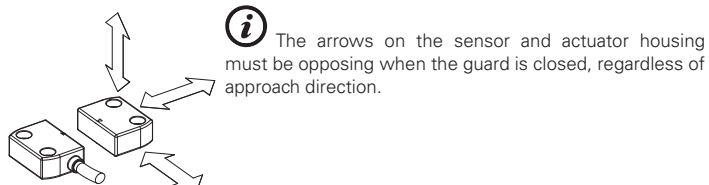
a) using the device after having made structural, technical, or electrical modifications to it;

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



### 4.2 Selection of the actuator type

SR series actuators are classified as low level coded in accordance with EN ISO 14119. A suitable actuator must be used to actuate the safety device; conventional magnets may not be used.

 Attention: 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.

### 4.3 Fixing of the device

 Attention: Always affix the device 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 must never be fixed with less than 2 screws. The tightening torque of the two M4 screws must be between 0.8 and 2 Nm

### 4.4 Fixing the actuator to the guard

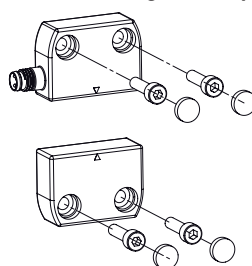
 Attention: As required by EN ISO 14119, the actuator must be fixed immovably to the door frame.

Always affix the actuator with at least 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 actuator must never be fixed with fewer than 2 screws. The tightening torque of the two M4 screws must be between 0.8 and 2 Nm

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.

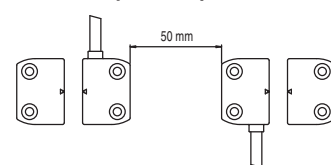
Do not use a hammer for the adjustments, unscrew the screws and adjust the device manually, then tighten it in position.

### 4.5 Protection against tampering



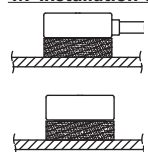
After fixing, you must plug the holes of the 2 screws with the caps supplied both on the device and on the actuator. Inserting the caps is considered a suitable measure, to reduce the possibility of actuator disassembly to a minimum, in accordance with EN ISO 14119.

### 4.6 Assembly of multiple sensor-actuator systems

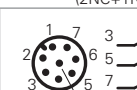
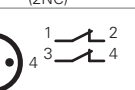


Where more than one safety device is installed to the same machine, the minimum installation distance between sensor and actuator systems must be at least 50 mm.

### 4.7 Installation on ferromagnetic material

 If possible do not mount the sensor and the actuator on ferromagnetic materials. To avoid a reduction in the switching distances, use the special VS SP1AA1 spacer.

### 4.8 Internal cable and connector connections

| With cable (2NC+1NO)                                                                                                                              | With cable (2NC)                                                                                                               | With cable (1NC+1NO)                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
|  <p>Green<br/>Brown<br/>Grey<br/>Pink<br/>White<br/>Yellow</p> |  <p>Black<br/>White<br/>Brown<br/>Blue</p> |  <p>Black<br/>White<br/>Brown<br/>Blue</p> |
| With M8 connector (2NC)                                                                                                                           | With M8 connector (1NC+1NO)                                                                                                    |                                                                                                                                 |
|                                                                |                                            |                                                                                                                                 |
| With M12 connector (2NC+1NO)                                                                                                                      | With M12 connector (2NC)                                                                                                       | With M12 connector (1NC+1NO)                                                                                                    |
|                                                                |                                            |                                            |

 Attention: If the sensor is the only safety device installed on the guard, always use at least 2 channels connected to a safety module.

When using a SR A•41AN• (2NC+1NO) sensor with cable, the two channels used must include the yellow and green cables. When using a SR A•41AM0.1 (2NC+1NO) sensor with connector, the two channels used must include pins 5-6.

If these requirements are not met, the sensor will have no anti-tampering code.

### 4.9 Connection with safety modules

 Attention: A coded magnetic sensor alone cannot be used for safety functions because its operating principles are not considered safe by the standards. For this reason, a magnetic sensor coded for use in safety applications must always be connected to a safety module with at least two channels that monitors the proper function.

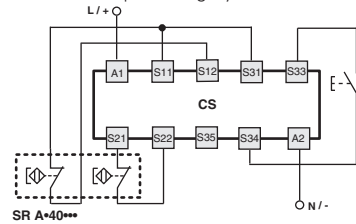
Use the safety sensors and actuators in conjunction with the safety modules indicated. The sensor connected to the safety module can be classified as a proximity device with defined behaviour under fault conditions (PDDB in accordance with EN 60947-5-3).

SR A•••••••• devices can be connected to safety modules:  
 CS AR-01•••••; CS AR-02•••••; CS AR-04•••••; CS AR-05•••••; CS AR-06•••••;  
 CS AR-08•••••; CS AR-46•024; CS AR-91•••••; CS AR-94•••••; CS AR-95•••••;  
 CS AT-0•••••; CS AT-1•••••; CS AT-3•••••; CS FS-5•••••; CS MF•••••••;  
 CS MP•••••••.

(\*) Compatible with modules with production batch later than 06/2014 only.  
 The SR AD42A•• sensor is compatible with CS MF202••P4 and CS MP••••••• modules only.

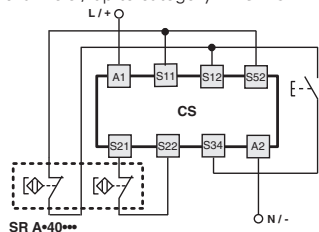
**Connections with CS AR-01•••••, CS AR-02•••••, CS AR-04•••••, CS AR-08•••••, CS AR-91•••••, CS AR-94•••••, CS AR-95••~••, CS AT-0••~••, CS AT-1••~••, CS AT-3••~•• safety modules**

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



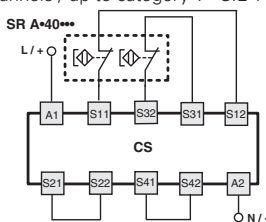
**Connections with CS AR-05••~••, CS AR-06••~•• safety modules**

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



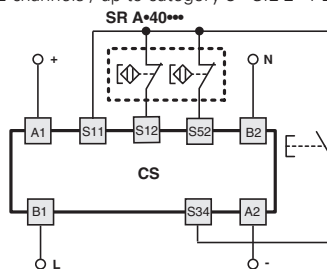
**Connections with CS AR-46•024 safety modules**

Input configuration with automatic start  
 2 channels / up to category 1 - SIL 1 - PL c

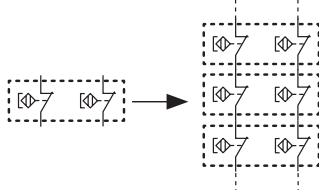


**Connections with CS FS-5••~•• safety modules**

Input configuration with manual start  
 2 channels / up to category 3 - SIL 2 - PL d



**Connection of multiple sensors to the safety module**



Connection of multiple sensors to one safety module is technically feasible; by connecting the corresponding NC contacts for each sensor in series. The control system can achieve a maximum of category 3 in accordance with EN ISO 13849-1. Adhere to the maximum input resistances indicated in the specifications of the safety modules.

**!** Attention: the series connection of two or more coded sensors reduces the self-monitoring capacity of the system, see ISO/TR 24119.

## 5 OPERATION

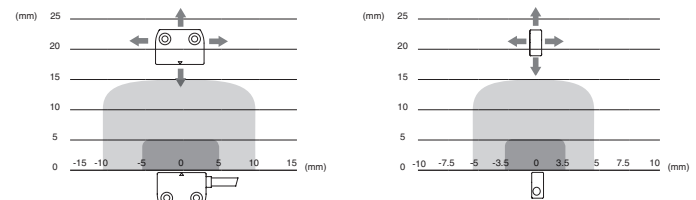
The safety sensor with coded magnet is used in safety circuits (EN 60204) as an electrical interlocking device (EN ISO 14119) associated with a movable guard, and with the relative safety module with automated monitoring for signals elaboration (EN 60947-5-3). When correctly installed and connected to the safety modules, these sensors allow control circuits with a safety category of up to SIL 3 in accordance with EN IEC 62061, up to PL e in accordance with EN ISO 13849-1, and up to category 4 in accordance with EN ISO 13849-1, to be implemented.

### 5.1 Actuation distances

When the actuator is brought inside the safe activation zone (dark grey area), the sensor contacts are in the base closed door position.

When the actuator is brought outside the assured release area (light grey area), the sensor contacts are in the open door position.

**!** Attention: Installing the sensor and coded magnet on ferromagnetic material reduces the switching distances. The working actuation and release distances must always be checked following installation.



Legend:

Assured operating distance  $s_{ao}$  (mm)  
 Assured release distance  $s_{ar}$  (mm)

## 6 INSTRUCTIONS FOR PROPER USE

### 6.1 Installation

- 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.
- Observe the assured operating ( $s_{ao}$ ) and release ( $s_{ar}$ ) distances.
- Do not mount the sensor and actuator in strong magnetic fields.
- 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.
- Avoid any impact with the sensor. Excessive shock and vibrations may affect the correct operation of the sensor.
- The actuator must not strike the sensor.
- In case of damages or wear, the entire device – including the actuator – must be replaced.
- 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. If the sensor is not physically close to the welding point, the negative pole of the welding current must be as close as possible to the welding location.
- 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 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 containing strongly aggressive chemicals, where the products used coming into contact with the device may impair its physical or functional integrity.
- 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.

### 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) All external parts must be undamaged.

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

6) 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. In particular, make sure that the supply current does not exceed the values indicated in the TECHNICAL DATA paragraph; high currents can cause safety device failures or malfunctions.

The safety device may be used exclusively with resistive loads. The use of inductive loads can lead to the loss of the safety function.

- 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 sensor 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 to the safety electrical contacts.

- 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 IEC 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) Applications not contemplated in this instruction manual.

## 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: A21 SR1-123456. 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 (21 = 2021, 22 = 2022, etc...).

## 8 TECHNICAL DATA

### 8.1 Housing

Housing made of glass fibre reinforced technopolymer, self-extinguishing.

Versions with integrated cable 4 x 0.34 mm<sup>2</sup> or 6 x 0.25 mm<sup>2</sup>, M8 or M12 connector

Protection degree:

IP67 acc. to EN 60529

IP69K acc. to ISO 20653

### 8.2 General data

Assured operating distance  $S_{ao}$ :

5 mm with actuator SM A01N

Assured release distance  $S_{ar}$ :

15 mm with actuator SM A01N

Repeat accuracy:

≤ 10%

Switching frequency:

up to 150 Hz

Distance between two sensors:

minimum 50 mm

"Maximum SIL":

Up to SIL 3 acc. to EN IEC 62061:2021\*

\* By connecting a single dual channel sensor to a Pizzato safety module

Functional safety EN ISO 13849-1:2015

Structure of the electrical circuit connected to the device:

- with channels controlled by a compatible safety module: can be used up to category 4 and PL e.

It should be noted that the series connection of two or more devices reduces the self-monitoring capacity of the system, see ISO/TR24119

Interlock, no contact, coded: type 4 acc. to EN ISO 14119

Coding level:

low acc. to EN ISO 14119

$B_{10D}$  per channel:

20,000,000 (used with Pizzato safety modules)

400,000 (used with max load DC12: 24 V 0.25 A)

Mission time:

20 years

Ambient temperature:

-25°C ... +80°C (with flexible installation cable)

Storage temperature:

-25°C ... +80°C

Vibration resistance:

10 gn (10...150 Hz) acc. to EN 60068-2-6

Shock resistance:

30 gn; 11 ms acc. to EN 60068-2-27

Pollution degree:

3

Screw tightening torque:

0.8 ... 2 Nm

### 8.3 Electrical data

Rated insulation voltage  $U_i$ :

120 Vac (with cable)

50 Vac / 75 Vdc (with M8 connector)

120 Vac (with M12 connector, 4-pole)

30 Vac / 36 Vdc (with M12 connector, 8-pole)

Rated impulse withstand voltage  $U_{imp}$ :

6 kV / 1.5 kV (with connector)

Thermal current  $I_{th}$ :

0.25 A

Maximum switching load:

6 W (resistive load)

Rated operating voltage  $U_e$ :

24 Vac/dc

Rated operating current  $I_e$ :

0.25 A (resistive load)

Protection fuse:

0.25 A type F

Electrical endurance:

1 million operating cycles

### 8.4 Compliance with standards

EN 60947-1, EN 60947-5-1, EN 60947-5-2, EN 60947-5-3 (in combination with a safety module), EN ISO 14119, EN ISO 12100, EN ISO 13849-1, EN ISO 13849-2, EN IEC 62061, EN 60204-1, EN 60529, EN 61508-1, EN 61508-2, EN 61508-4, EN IEC 63000, EN 20653, UL 508, CSA C22.2 No. 14.

### 8.5 Compliance with directives

Machinery Directive 2006/42/EC, EMC Directive 2014/30/EU, RoHS Directive 2011/65/EU.

## 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

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](http://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