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1. INTRODUCTION

This user manual must be read and understood completely, prior to carrying out any operation on the **SMS../CLS..** sensors, by personnel dealing with all the activities of the sensors.

All the operations described in this manual must be carried out exclusively by specialized personnel carefully following all the indications given.

The **SMS..** safety sensors are suited for gate/door monitoring applications whose safety category (according to EN 954-1) can reach level 4. The sensors and the coded magnetic units **CLS..** are only a subset of the safety-related parts of the machine: the safety level of the entire system - according to EN 954-1 - depends also on all the other safety components and devices of the system set.

The sensors have onboard N.O. and/or N.C. safety and/or warning contacts, operated when the corresponding **CLS..** magnetic unit is close to the sensor.

All the **SMS..-CLS..** pairs described in this manual make up a multiple flow redundant coded system that meets the requirements of the EN 1088 harmonized standard. The design of the **SMS..** sensors and of the **CLS..** magnetic units result in

SMS../CLS pairs which cannot be easily operated by readily available instruments, increasing the safety level of the application.

NOTE.

The meanings of "Normally Open" and "Normally Closed" contact throughout this manual are the following:

- ✓ **N.O.:** open contact with **SMS..** sensor not operated, therefore without the operating magnetic unit (**CLS..** far from **SMS..**).
- ✓ **N.C.:** closed contact with sensor not operated, therefore without the operating magnetic unit (**CLS..** far from **SMS..**).

The user is responsible for the risks evaluation of the safety system; he decides with complete responsibility that the products described in the user manual are suitable for his application.

The **SMS../CLS..** sensors do not require internal maintenance: if they are tampered with they lose their safety functions and the guarantee is annulled.

2. MOUNTING AND MECHANICAL DIMENSIONS

2.1 Parallelepiped sensors

The **SMS../CLS..** pairs (see the mechanical dimensions in Fig. 1) can be mounted using the slots on both sides of the enclosure, suitable for M4 screws. It is

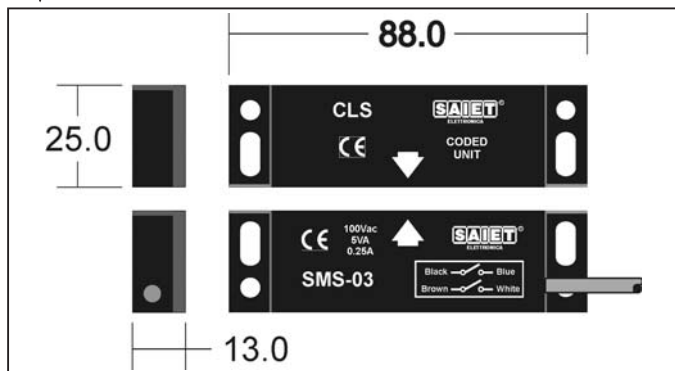


Fig. 1: Mechanical dimensions of the sensors and the operating units parallelepiped housing.

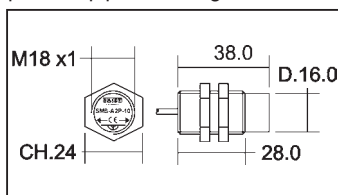


Fig. 2: Dim. of std cylindrical SMS (other available on request)

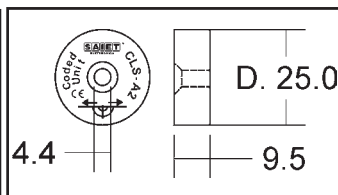


Fig. 3: CLS-A2 magnetic unit dimensions

recommended to use brass or nonmagnetic steel screws, so as not to reduce the operating distances of the sensors.

2.2 Cylindrical sensors

The **SMS..** sensors (see the mechanical dimensions in Fig. 2) can be mounted using the M18x1 threaded part and the special nut, 24 spanner.

The **CLS..** magnetic unit (see the

mechanical dimensions in Fig. 3) can be mounted using the countersunk hole, suitable for M4 screws. It is recommended to use brass or nonmagnetic steel screws, so as not to reduce the operating distances of the sensors.

3. OPERATING MODES

An **SMS..** sensor is "operated" when all its safety and/or signaling

contacts have changed their open/close condition when the **CLS..** magnetic unit is close to the sensor (see Technical Data for operating distances).

The coded structure of the **SMS../CLS..** pairs requires, in order to operate correctly the sensors, that the magnetic units are brought closer to the sensors following a defined alignment with them.

3.1 Parallelepiped sensors

The **CLS..** unit must be brought closer to the **SMS..** sensors so that the printed arrows are faced (see Fig. 4).

The alignment is achieved moving the **CLS..** unit towards the **SMS..** sensor along the **X** axis (side alignment, e.g. sliding door) or **Y** axis (frontal alignment e.g. hinged gate/door or slide) or

perpendicularly to the XY plane (**Z** axis, e.g. hinged gate/door).

A correct positioning is achieved when the **SMS..** sensor and the **CLS..** unit lie on the same XY plane, aligned to the same position **X0**. In that position, if the distance between the sensor and the magnetic unit is less than the Operating Distance (**D-ON**, see Technical Data), the sensor is correctly operated.

Different alignments can lead to wrong operating conditions (e.g. none or only one internal contact changes its status).

Starting from **SMS..** correctly operated by the **CLS..** unit as stated before, and Y distance null, the sensor can be properly operated also with the magnetic unit misaligned along the X axis or Z axis up to a maximum position

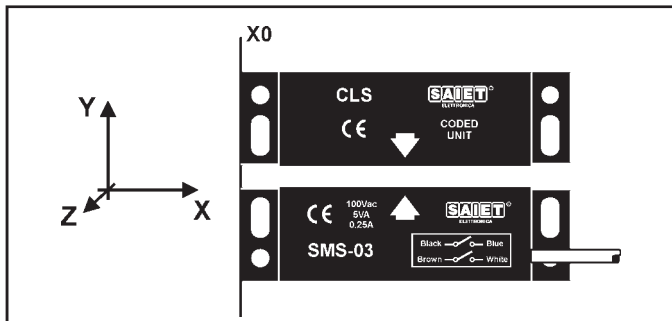


Fig. 4 - Operating and alignment direction of the parallelepiped sensors.

of $X0 \pm n$ mm or $Z0 \pm n$ mm (see Technical Data), if the XY plane in which lies the **CLS..** is parallel to the XY plane in which lies the sensor.

3.2 Cylindrical sensors

The alignment between **SMS..** and **CLS..** must be carried out:

- radially, centering sensor and magnetic unit so that the axes of the two cylindrical cases match (see **A Axis** in Figure 5),
- angularly, facing the

corresponding sensor and magnetic unit arrow lines, so that the printed lines **B** and **C** are parallel (see Figure 5).

The operation must be carried out by bringing the magnetic unit closer to the sensor axially or radially. The **SMS../CLS..** axes must coincide for axial operating movement or must be parallel for radial operating movement.

The **SMS..** sensors can be properly operated also when the

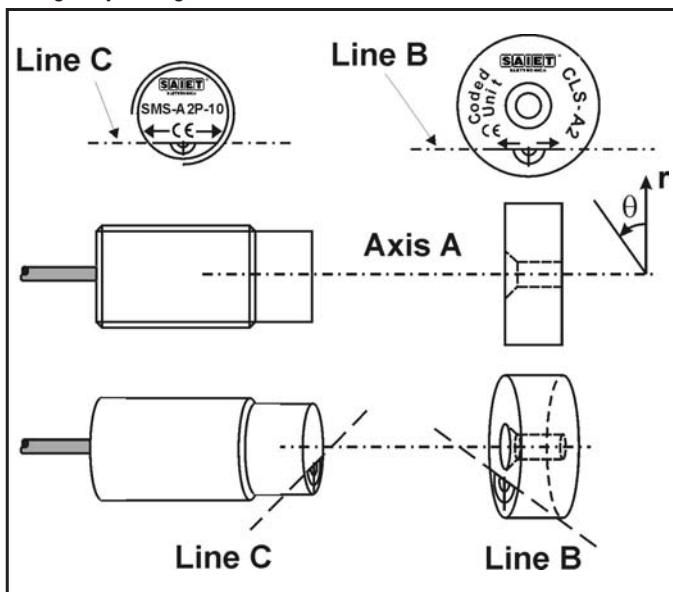


Fig. 5: Cylindrical sensors alignment and operation

CLS.. unit is misaligned (with null distance between sensor and magnetic unit) along the r direction (see Technical Data) if their axis are always parallel.

4. INSTALLATION

4.1 **Warnings**

The safety sensor and the relative coded magnetic unit must be installed according to the standards in force in the country of use, when the machine is not powered and with no dangers for the operator.

It is recommended to keep the connection cables separate from power supply loads cables of other devices.

Ensure that there are no conductors, cables or loose materials that can come into contact with the sensor and/or with the coded magnetic unit.

Ensure that the conductors are not excessively tight, that their positioning avoids potential cuts or squashing and that they are not in the way of people or things.

Ensure that the machine can operate according to all the technical data in this manual.

Avoid installation during storms.

Do not dispose of the packaging in the environment.

4.2 **Wiring**

The **CLS..** coded magnetic unit must be mounted on the moving

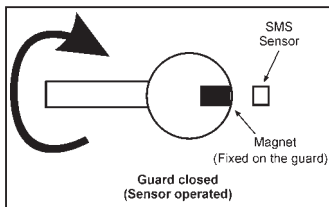


Fig. 6: Example of application on hinged guard

guard of the machine, and the **SMS..** magnetic sensor must be fixed on a stationary part of the machine.

All the screw and nuts must be properly clamped; the position of the **SMS..** sensors must avoid any possibility for the operator to reach dangerous parts of the machine.

The connections of all the **SMS..** sensors are listed in Table 1; the pin-out of the connectorized models is shown in Fig. 7 and 8.

Fitting the sensor and/or the magnetic unit directly on ferromagnetic parts (or very close to ferromagnetic parts), would lead to a reduction of the operating distances.

It is recommended to fit the sensor and/or the coded magnetic unit on non ferromagnetic parts.

If fitted on ferromagnetic material, it is necessary to place a non ferromagnetic material (min. thickness of 6 mm) between the

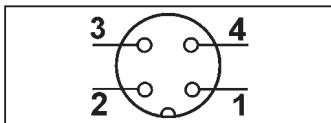


Fig. 7: Pin-out of female connectors

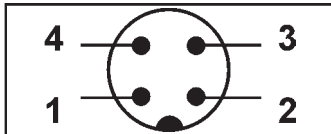


Fig. 8: Pin-out of male connectors

SMS../CLS.. pair and the ferromagnetic parts of the machine closest to them.

To avoid mutual interactions between different magnetic sensors, when using more than one pair of **SMS../CLS..** on the same application, every pair of sensor-magnet must be placed at least 50 mm far from the adjacent sensor-magnet pair in any direction.

At the end of the installation, the machine installation procedure must be carried out to check for correct wiring and in particular to check that the machine stop time is less than the operator access to the machine time, once the guard is open.

NOTE.

The **SMS../LD** models make available a signaling LED in series to the N.C. contact: this contact is

not voltage free, but is polarized; it needs and forces a voltage drop when not operated. If the wires are connected with the wrong polarity, the LED is permanently OFF (however the sensor still works properly).

NOTE.

The EN 1088 standard states that the magnetic type of protection devices associated to the guard cannot be easily eluded through the use of easily available instruments or objects such as screws, nails, pieces of metal, keys and generally through objects or tools related to the normal machine working operations.

Based on the indication of the standard, a multiple flow coded magnet, such as the SMS..+CLS.. systems, is a device that is difficult to elude.

Nevertheless, due to the impossibility of guaranteeing non elusion through any substituted magnetic actuator for the coded magnetic unit, the machine manufacturer must carry out an installation that includes mechanical obstacles which do not allow the insertion of a substitution actuator in front of the sensor (with the guard open).

5. MAINTENANCE

The integrity of the **SMS../CLS..**

sensors and of all the parts connected to them must be checked regularly. The frequency

of the inspections is part of the machine risks evaluation and it is under the complete responsibility

SENSOR	CABLE	CONNECTIONS
SMS-01, SMS-02, SMS-A2P-02	4x0.15 mm ² cable	BLUE - BLACK : N.O.
		WHITE - BROWN : N.C.
SMS-02/LD	4x0.15 mm ² cable	BLUE - BLACK : N.O.
		WHITE - BROWN : N.C. (BROWN: LED anode)
SMS-02/S1	4x0.15 mm ² cable	BLUE - BLACK : N.O. (39 Ohm series)
		WHITE - BROWN : N.C.
SMS-03	4x0.15 mm ² cable	BLUE - BLACK : N.O.
		WHITE - BROWN : N.O.
SMS-03+ CM-1A4..	CM-1A4	Pin 1 - Pin 2: N.O. (Fig. 8)
		Pin 3 - Pin 4: N.O. (Fig. 8)
SMS-03/NC	4x0.15 mm ² cable	BLUE - BLACK : N.O.
	2x0.35 mm ² cable	WHITE - BROWN : N.O.
SMS-03/NC/S1	CM-1A4	BLUE - YELLOW : N.C. (not for safety functions)
	CF-1A4	Pin 1 - Pin 2: N.O. (Fig. 8)
SMS-10/NC	4x0.15 mm ² cable	Pin 3 - Pin 4: N.O. (Fig. 8)
		Pin 1 - Pin 3: N.C. (Fig. 7) (not for safety functions)
SMS-10/NC	4x0.15 mm ² cable	BLUE - BLACK : N.O.
		WHITE - BROWN : N.C. (not for safety functions)
SMS-A2P-10 SMS-10	2x0.35 mm ² cable	BLUE - BLACK : N.O.
SMS-A2P-30 SMS-A2P-30/S2	4x0.15 mm ² cable	BLUE ^(†) - BLACK : N.O.
		WHITE - BROWN ^(†) : N.O.

^(†) The BLUE and BROWN conductors are short-circuited

Table 1: **SMS..** sensors output features.

of the person in charge of such evaluations.

Operator safety can be compromised by the lack of regular inspections or maintenance, or if they are carried out incorrectly, or by non specialized personnel, or at lower intervals than prescribed.

Regular inspections consist of carrying out an inspection of the wiring, of the installation, of the tightening and of the integrity of the **SMS../CLS..** pair, and in repeating - for each sensor / magnetic unit pair - all the operations concerning the machine start-up procedure.

Maintenance consists of a regular cleaning of the sensor and the magnetic unit and of all the connected devices: dust and other substances must be removed from the devices and it must be dried of liquids or any condensation. All cleaning operations must be carried out whilst the machine is rigorously not powered.

6. TECHNICAL DATA

All the distances involved are referred to a sample CLS.. device, with **SMS../CLS..** pairs mounted far away from other magnetic parts or devices, and with SMS.. **frontally** operated (see Fig. 4).

The **Operating Distance (D-ON)** is the one in which all safety

contacts have switched their status.

The **Release Distance (D-OFF)** is the one in which, when the magnetic unit moves away from the sensor, one contact releases returning to the rest position, while the other (if any) is still switched.

The **Reset distance (D-RESET)** is the one in which, when the magnetic unit moves away from the sensor, all safety contacts have released and return to the rest position.

The letters **V, I, P**, refer to the **V**oltage, **C**urrent, **P**ower that characterizes the output contacts of the sensors.

In Table 2 is summarized for each **SMS..** model the corresponding **CLS..** actuating magnet and the maximum safety category of the whole safety-related part of the machine in which the sensor / magnet pair can be employed.

NOTE.

The technical data of this manual are applicable also to the **SMS..** models with different cable length.

Model	Output contacts	Associated Magn. Unit	Usage category
SMS-01	1 N.O. + 1 N.C.	CLS	Max. 4
SMS-02	1 N.O. + 1 N.C.	CLS	Max. 4
SMS-03	2 N.O.	CLS	Max. 4
SMS-10	1 N.O.	CLS	Max. 2
SMS-03/NC	2 N.O. + 1 N.C. aux.	CLS	Max. 4
SMS-10/NC	1 N.O. + 1 N.C. aux.	CLS	Max. 2
SMS-03 + CM-1A4/..MT	2 N.O.	CLS	Max. 4
SMS-03/NC/S1	2 N.O. + 1 N.C. aux.	CLS	Max. 4
SMS-02/S1	1 N.O. + 1 N.C.	CLS	Max. 4
SMS-02/LD	1 N.O. + 1 N.C.	CLS	Max. 4
SMS-A2P-02	1 N.O. + 1 N.C.	CLS-A2	Max. 4
SMS-A2P-10	1 N.O.	CLS-A2	Max. 2
SMS-A2P-30	2 N.O.	CLS-A2	Max. 3
SMS-A2P-30/S2	2 N.O.	CLS-A2	Max. 3

Table 2: Summary of the main features of the **SMS..** safety sensors.

PARAMETERS	PARALLELEPIPED MODELS	CYLINDRICAL MODELS
Housing material	ABS NOVODUR L3FR	PBT + 30% glass
Housing flammability class	V0 (UL 94)	
Shock resistance	30 g / 11 ms	
Vibration resistance	10 - 55 Hz	
Degree of protection	IP67	
Operating temperature	[-25 ÷ 75] °C	
Operating / storage humidity	5 ÷ 95 %	
Misalignment SMS../CLS	Max ± 4 mm	Max ± 2 mm
Weight	Ca. 70 g	Ca. 60 g
External Dimensions (mm)	25 x 88 x 13	(M18x1) x 38 ⁽¹⁾

⁽¹⁾ The SMS-A2P-30/S2 dimensions are (M18x1) x 50 mm

Table 3: General features for all parallelepiped and cylindrical models

PARAMETERS	SMS-01	SMS-02	SMS-03	SMS-03 + CM-1A4
Function	1 N.O. + 1 N.C.		2 N.O.	
D-ON (mm)	10 ± 3	20 ± 3	20 ± 3	
D-OFF (mm)	15 ± 3	30 ± 5	22 ± 3	
D-RESET (mm)	20 ± 3	35 ± 5	22 ± 3	
Switching V max	100 Vac			
Switching I max	0.25 A			
Switching P max	5 VA			
Max continuous I	1.0 A			
Connection	4x0.15 mm ² PVC cable, 2m		Cn. M12 TPU 4-pin	

PARAMETERS	SMS-03/NC and SMS-03/NC/S1	
Function	1 N.C. (Signal)	2 N.O. (Safety)
D-ON (mm)	17 ± 5	20 ± 3
D-OFF (mm)	21 ± 5	22 ± 5
D-RESET (mm)	21 ± 5	22 ± 5
Switching V max	100 Vac	
Switching I max	0.25 A	
Switching P max	5 VA	
Max continuous I	1.0 A	
Connection	SMS-03/NC: PVC cable, 2m	
	2x0.35 mm ²	4x0.15 mm ²
	SMS-03/NC/S1: M12 TPU Connector, 0.3m	
	CF-1A4 type	CM-1A4 type

PARAMETERS	SMS-02/LD	
Function	See SMS-02	
LED Colour	RED	
LED ON	N.C. Contact Closed	
LED Anode	BROWN wire (BRN)	
LED Cathode	WHITE wire (WHI)	
Voltage Drop (N.C. closed)	BRN - WHI (LED ON)	WHI - BRN (LED OFF)
	1.2 ÷ 3.2 V	0.3 ÷ 0.9 V
Max continuous I	0.7 A	

PARAMETERS	SMS-02/S1		SMS-10/NC		SMS-10
Function	1 N.O. + 1 N.C.		1 N.O. ⁽²⁾ (Safety)	1 N.C. (Signal)	1 N.O.
D-ON (mm)	20 ± 3		20 ± 3	17 ± 5	20 ± 3
D-OFF (mm)	30 ± 5		22 ± 3	21 ± 5	22 ± 5
D-RESET (mm)	35 ± 5		22 ± 3	21 ± 5	22 ± 5
	N.O.	N.C.			
Switching V max	100 Vac	100 Vac	100 Vac		
Switching I max	0.25 A	0.25 A	0.25 A		
Switching P max	5 VA	5 VA	5 VA		
Max continuous I	0.2 A ⁽¹⁾	1.0 A	1.0 A		
Connection	PVC cable, 2m				
	4x0.15 mm ²				2x0.35 mm ²

⁽¹⁾ Due to a 39 Ohm, 2 W series-connected resistor.

⁽²⁾ Two N.O. series-connected contacts

PARAMETERS	SMS-A2P-02	SMS-A2P-10	SMS-A2P-30 SMS-A2P-30/S2
Function	1 N.O. + 1 N.C.	1 N.O. ⁽¹⁾	2 N.O. ⁽²⁾
D-ON (mm)	15 ± 4	16 ± 4	16 ± 4
D-OFF (mm)	20 ± 6	20 ± 6	20 ± 6
D-RESET (mm)	25 ± 7	20 ± 6	20 ± 6
Switching V max	100 Vac		
Switching I max	0.25 A		
Switching P max	5 VA		
Max continuous I	1.0 A		
Connection	PVC cable, 2m		
	4x0.15 mm ²	2x0.35 mm ²	4x0.15 mm ²

⁽¹⁾ Multiple flux coded.

⁽²⁾ The BROWN and WHITE wires are short-circuited





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