Smart Sense

ELECTRIC S101-EL11

USER MANUAL

Version: S101-EL11-D00-UM-EN-1.0.0

SMART, CONNECTED.

KAIRO

WARNING:
IMPORTANT INFORMATION FOR THE READER

   1. This manual is intended for the sensor S101-EL11-D00.
   2. Please check "www.kairo.solutions/downloads" for its PDF version and for any available updates.
   3. Before installing and using the equipment, please carefully read all the installation instructions contained herein, and pay particular attention to the safety information. Kairo srl will not be responsible for the consequences of improper use of the equipment.

The information in this manual is subject to change without notice.
It is the user's responsibility to verify that the hardware in his possession is among those covered by this manual.

CONTACTS

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WARRANTY CONDITIONS

Kairo srl, hereinafter referred to as Kairo, guarantees the product for a period of twelve months from the delivery date certified by the delivery documents.

Kairo's products will be free from defects in conditions of normal use and service.

Kairo's obligation is limited to the repair or replacement of parts that are returned to Kairo, without alteration or further damage, and which, in the opinion of Kairo, were defective or became defective during normal use.

Kairo cannot be held responsible for any direct, indirect, accidental or consequential damage or injury caused by the correct or improper operation of its equipment, whether defective or non-defective.

Before returning any equipment to Kairo, it is necessary to request authorization; once the parts to be repaired arrive at Kairo, these will be inspected to verify that they are eligible for repair or replacement.

Kairo will not be obliged to repair or replace products returned as defective but damaged by misuse, negligence or transport damage.

End customers must ensure that defective products are properly packaged for return.

The above warranty is unique and exclusive and no other warranties, written or oral, are expressed or implied.

Kairo's warranty does not extend and does not apply to products:
• which have been repaired or altered by personnel not authorized by Kairo;
• which have been subject to misuse, negligence, accident, damage, improper installation;
• which have been connected to equipment other than that supplied or envisaged by Kairo;
• which have been damaged by natural disasters;
• in which hardware or software or accessories not installed by Kairo and / or without any approval by Kairo have been installed.

SAFETY RECOMMENDATIONS

Before commissioning the system, carefully read the following safety recommendations.

WARNING	Do not use the sensor for purposes other than those indicated in this manual.
WARNING	For a correct use of the sensor, refer to the relevant sections in this manual.
CAUTION	Do not operate the sensor if either the connector or the main body parts are damaged.
WARNING	Install the sensor following the instructions provided in this manual. The sensor must be installed according to the national regulations in force.
CAUTION	Carry out maintenance of the sensor following the instructions provided in this manual. Before carrying out any operation, follow the operation instructions of the machine or system apparatus the sensor is going to be installed on, to safely stop the system and turn off the power source.
DANGER	Electric shock hazard. Do not open the sensor and / or modify any internal or external part.
RADIO FREQUENCY	The sensor contains a radio frequency section. The antenna's area must be positioned so that there are no obstacles in the immediate vicinity (electromagnetic shield).

If technical assistance is needed during normal operations or maintenance, contact the reseller or the manufacturer.

DISPOSAL

	In accordance with the requirements of Directive 2012/19/EU as regards waste from electrical and electronic equipment (WEEE), the user is required to ensure that this product is separated from other waste at the end of its life cycle and delivered to the WEEE collection for proper recycling.

CONTENTS

1. INTRODUCTION

1.1 Recommendations

Thank you for purchasing the Kairo S101-EL11-D00 sensor (hereinafter also referred to as "sensor" or "sensor S101"). This document describes the device and provides the main concepts that the user must learn before its use. We strongly recommend to read the manual before installing and commissioning the device. To properly understand the terms and parameters mentioned in this manual and, therefore, for an effective use of the sensor, the reader must have:

• the knowledge and the information necessary to install the sensor and pair it with a gateway;

• basic notions relating to electromagnetic waves, useful for understanding specific terms and parameters.

We recommend that the equipment is used only by trained and qualified personnel. Failure to observe these conditions and safety instructions may result in personal injury or damage.

1.2 How to use this manual

This manual consists of the following chapters:

• Chapter 1: Introduction - This chapter introduces the device and the manual.

• Chapter 2: System Operation - This chapter provides the reader with basic information on the operation of the IoT platform of which the sensor is part.

• Chapter 3: Technical Specifications - This chapter lists the technical characteristics of the sensor.

- Chapter 4: Overview of the sensor - This chapter describes the structure of the sensor and its main parts.

- Chapter 5: Installation - This chapter provides the user with all the necessary information for the correct installation of the equipment.

- Chapter 6: Maintenance - This chapter explains the recommended maintenance operations for the sensor.

- Chapter 7: Troubleshooting - This chapter indicates the operations to be performed to keep the sensor in perfect working order over time.

- Chapter 8: Accessories - This chapter lists the main accessories available for the sensor.

1.3 Intended use

The S101-EL11-D00 sensor is intended for monitoring the activity of generic industrial equipments. It can be connected by means of M8 3 pins female electric connector to a generic PNP 24Vdc digital output signal from a PLC (or dry-contact). The sensor works only paired to a G404 smartsense gateway.

2. SYSTEM OPERATION

The self powered S101 sensors, together with the G404 gateway and the Cloud service, constitutes the Kairo system called SmartSense for data collection and monitoring of process data. SmartSense can be adopted in countless contexts: from individual monitoring of molds and/or molding machines to both manual and automatic workstations or equipment.

Using self-powered sensors without cables and without batteries, the system can be installed in a very short time and in a non-invasive way both on latest generation machines/devices and on traditional systems without intelligence or PLC. The radio messages generated by the S101 sensors are collected by the listening G404 gateways.

Data are then forwarded in real time to a Cloud server for storing, analysis and presentation purpose. The Cloud also carries out all the stastical processing requested by the user.

The peripheral sensors transmit a message, always the same, upon the occurrence of an event that corresponds to the change of state of the electric digital input signal (high level or low level). Each radio message consists in the transmission of two identical messages at a distance in a certain time interval. Once the transmission is over, the peripheral sensors remain off until the next event. The transmission on the radio channel occurs unidirectionally without acknowledgment.

In order for the gateway to receive the radio signals correctly, certain conditions must be verified:

1. The transmitters must be within the working range of the radio signal, which is usually a few tens of meters. The working range may be significantly reduced in case of obstacles and interference between the transmitter and the gateway;

2. Before activation, each peripheral sensor must be registered in the network, with a so-called teach-in procedure. If no registration is carried out, the signals transmitted by that sensor are ignored by the gateway;

3. There must be fewer sensors in the network than the maximum allowed number. Some signals may be lost otherwise.

Since all sensors use the same radio frequency, in the event that two or more of them transmit simultaneously, a conflict may occur and the gateway may be unable to interpret the individual messages, which would be actually lost. This circumstance is rather unlikely since each sensor engages the radio channel for a very small time, but the probability increases with the increase in the number of sensors in the network and with the increase in the frequency of events recorded by the sensors.

In the unlikely event of a conflict on the radio channel, there is however a mechanism by which the Cloud server can detect the loss and reconstruct afterwards the correct sequence of messages.

The transmission of reception notifications from the gateway to the Cloud can only take place in the presence of a broadband Internet connection, with low latency. With lower speed connections delays of the order of several seconds may occur between the occurrence of the single event and the display on the server.

In the event of an interruption of the Internet connection, the gateway is able to store data for a few minutes and transmit the related notifications when the connection is restored.

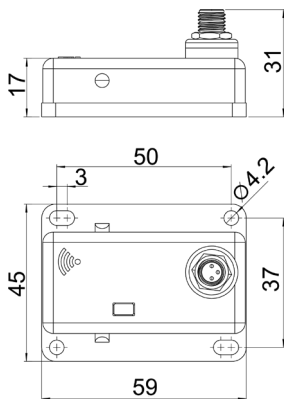## 3. TECHNICAL SPECIFICATIONS

3.1 Physical dimensions and features

Figure 1: sensor S101-EL11-D00 outer dimensions

FEATURES	
ACTUATION	Digital input signal or dry-contact
INPUT SIGNAL TYPE	PNP
INPUT SIGNAL VOLTAGE LEVEL	24 Vdc
CONNECTION	M8 3 pins male connector
NOMINAL OPERATING RATE	1 Hz
MAX OPERATING RATE	3 Hz
MASS	45 g
BODY MATERIAL	PA66 + 30% glass fiber
IP RATING	IP65
POWER SUPPLY	24 Vdc ± 10%
TEMPERATURE RANGE	from -10°C to +80°C
RADIO FREQUENCY	868 MHz
SIGNAL COVERAGE	10-80 m (depending on layout)
CERTIFICATIONS	EN60950-1, ETSI 301 489-1 V.2.1. ETSI 301 489-3 V.2.2.2 ETSI EN302802

Table 1: sensor S101-EL11-D00 features

3.2 Typical connection

Figure 2: typical connection schema

4. OVERVIEW OF THE SENSOR

Radio Antenna

Mounting holes

0001001010010010111

Teach-in
(red button)

M8 3 pins male
connector

Figure 3: structure of the sensor

Sensors are provided with a marking label on the side which contains relevant information for identification and commissioning purpose.

Product number

Radio frequency

KAIRO SRL 868 MHz
S101-EL11-D00 24V/PNP
batch/serial #
ID. FFFFFFFF CE

Globally
unique identifier
(ID number)

Power supply and
input signal type

Batch and
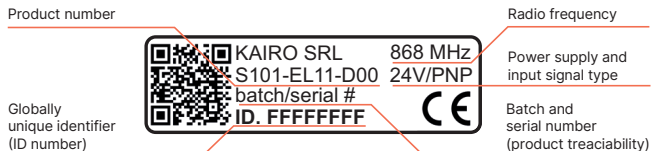serial number
(product treaciability)

Figure 4: identification label of the sensor

The sensor works by the toggling of the state of the digital input signal. The actuation turns on - off the sensor triggering immediately the radio transmission to the Cloud of the state of the sensor (ACTIVE or DE-ACTIVE) along with its unique ID number.
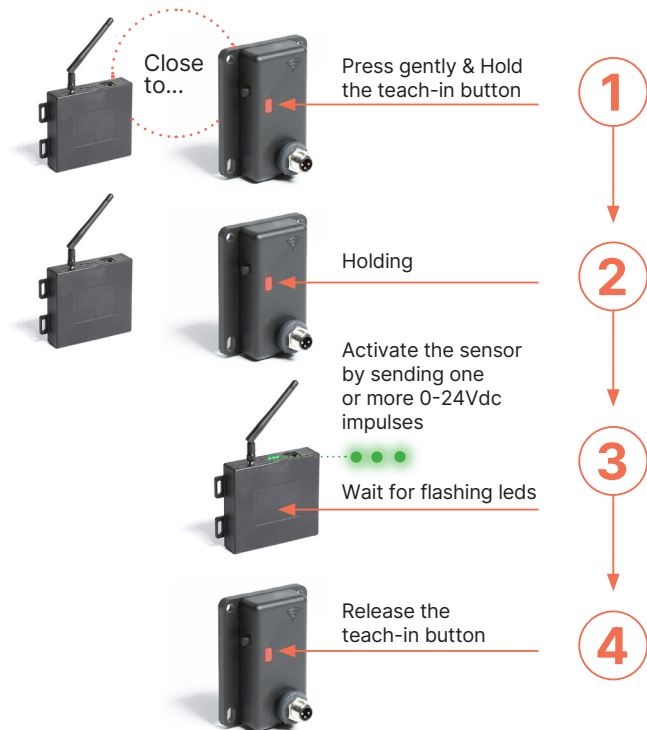
5. INSTALLATION

Press gently & Hold the teach-in button

1

Holding

2

Activate the sensor by sending one or more 0-24Vdc impulses

Wait for flashing leds

3

Release the teach-in button

4

Figure 5: teach-in procedure

1. Put the sensor near the gateway (some meters) and press gently, by a small tool (ex. pencil or screwdriver), the teach-in red button.

2. By holding the teach-in button, activate the sensor by toggling the input digital signal. The flashing of all the leds of the gateway means that the sensor has been acquired by the gateway. For more information please refer to gateway manual.

3. Find a surface where to install the sensor. Four holes have been created in order to fix the sensor onto the surface.
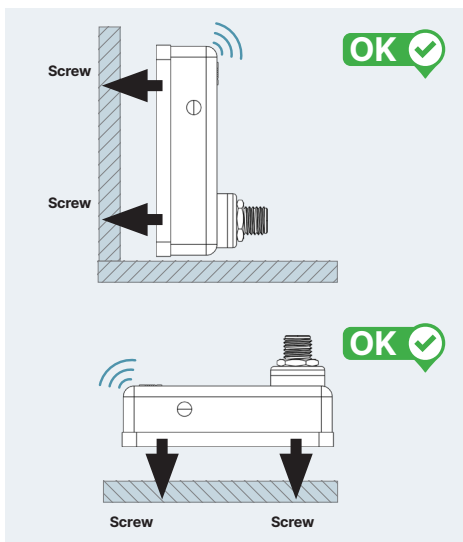
Figure 6: correct mounting

4. Keep the radio area free from metallic shield or any other object causing signal attenuation of the antenna.
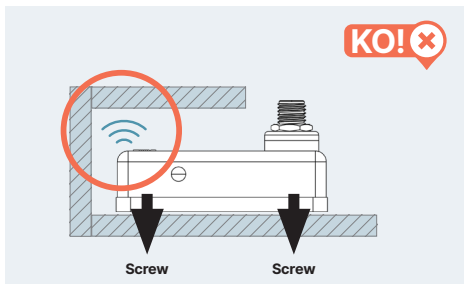

Figure 7: wrong mounting (radio shielding)

5. Connect the sensor by using a standard electric connection cable (industrial standard M8 3 pins female connector) and fix the portion of the cable closest to the sensor to avoid stress to the embedded male connector.
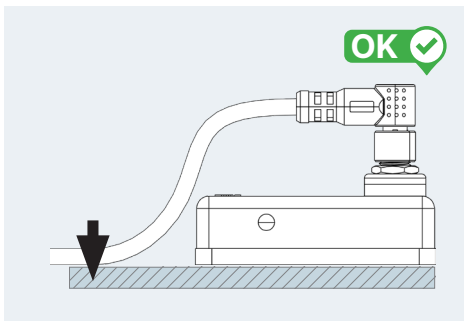

Figure 8: proper connection of the electric cable

6 Install the sensor to avoid bending and torsional stress to the electric cable (see figure below).
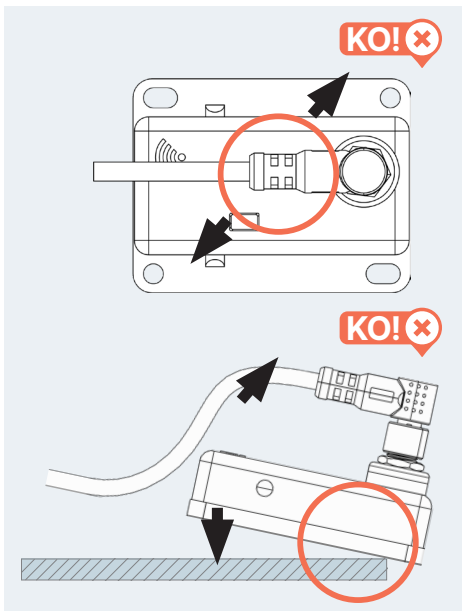

Figure 9: wrong movements of the electric cable

7 Login into the Kairo Cloud platform (available at https://smartsense.kairo.cloud/login), configure the parameter of the sensor and to start monitoring and optimizing your process.

6. MAINTENANCE

The S101 sensor does not require any particular maintenance operations.

Depending on the environment in which it is placed, it is sufficient to periodically check that the external surface of the case is not damaged and that it is free of dust or other residues. In environments with a lot of dust, a more frequent check is recommended.

It is also suggested to check with the same frequency the correct tightening of the screws and the correct actuation and restoring of the mechanical lever and push-button of the sensors.

7. TROUBLESHOOTING

The S101 sensor is an electronic device controlled by a microprocessor, and may be subject to malfunctions. In case of malfunction, refer to Table 2 where possible corrective actions are indicated.

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTIONS
The sensor does not transmit data to the gateway	• Incorrect wiring • Sensor and gateway unpaired • Damaged sensor or damaged actuator	• Check wiring of the sensor, the electric voltage level and the signal type (PNP/Dry-Contact) • Repeat the teach-in procedure documented in chapter 5 • Check any presence of damages or failures of either the sensor structure or the external actuator and in case replace the sensor or repair the actuator

| Failure to receive messages from peripheral sensors on the radio channel of the gateway | • Obstacles between the sensor and the gateway, or excessive distance
• The sensor is not registered in the network
• The sensor is registered in the network but the gateway has not downloaded the teach-in table correctly | • Remove any obstacles between the gateway and the sensor. Try moving the gateway closer to the sensors
• Repeat the teach-in procedure documented in chapter 5
• Restart the gateway by removing and re-inserting the Ethernet cable after a few seconds, so that it correctly downloads the teach-in table |
| Sensor data not accessible within the Cloud platform | • The sensor has not been paired with any gateway
• Either the sensor or the gateway have not been configured in the platform | • Repeat the teach-in procedure documented in chapter 5
• Follow the configuration instruction of the Cloud platform user guide |

Table 2: troubleshooting guide

If the above actions do not solve the problem and the malfunction persists, please contact the device vendor.

8. ACCESSORIES

Mounting bracket set
Part. Nr. : SPBS-S001-D00
Num. Code: 10100001000

Single head female M8 3 pins unterminated 90° connector
Part. Nr. : DCN1FAA030032M5P-D00
Num. Code: 99210000003

NOTES

SMART, CONNECTED.

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