

Smart Sense



MECHANIC S101-ME31

USER MANUAL

Version: S101-ME31-D00-UM-EN-1.0.0



SMART, CONNECTED.



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WARNING:

IMPORTANT INFORMATION FOR THE READER

1. This manual is intended for the sensor S101-ME31-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.*

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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 the case, the lever or the connection cable/pipe is 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.
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.
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1. INTRODUCTION

1.1 Recommendations

Thank you for purchasing the Kairo S101-ME31-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: Mounting the sensor - This chapter provides the user the necessary information to correctly mounting the sensor using the dedicated mounting kit.
- Chapter 6: Installation - This chapter provides the user with all the necessary information for the correct installation of the equipment.
- Chapter 7: Maintenance - This chapter explains the recommended maintenance operations for the sensor.
- Chapter 8: Troubleshooting - This chapter indicates the operations to be performed to keep the sensor in perfect working order over time.
- Chapter 9: Accessories - This chapter lists the main accessories available for the sensor.

1.3 Intended use

The S101-ME31-D00 sensor is intended for monitoring the activity of generic industrial equipments. It can be connected remotely or in direct contact to moving elements by limiting the actuation stroke to the maximum allowed by the sensor. The actuation of the sensor can be manual or automatic and 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 moulds and/or moulding 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 actuation of the lever or the push button (press or release) which triggers the energy generation mechanism. 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

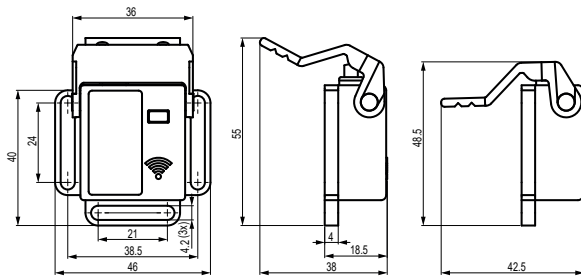


Figure 1: sensor S101-ME31-D00 outer dimensions

FEATURES	
ACTUATION	Lever/Push button
MIN ACTUATION FORCE	12 N
NOMINAL ACTUATION STROKE	2.3 mm
MAX ACTUATION STROKE	2.6 mm
NOMINAL OPERATING RATE	1 Hz
MAX OPERATING RATE	2 Hz
MASS	45 g
BODY MATERIAL	PA66 + 30% glass fiber
IP RATING	IP65
POWER SUPPLY	Self-powered (no battery, no wires)
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-ME31-D00 features

3.2 Example of actuation sources

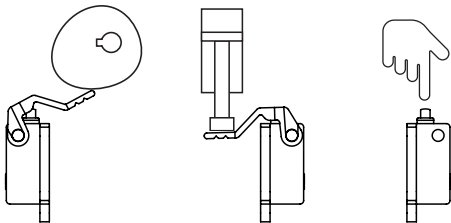


Figure 2: some examples of actuation (cam, piston, manual)

4. OVERVIEW OF THE SENSOR



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.

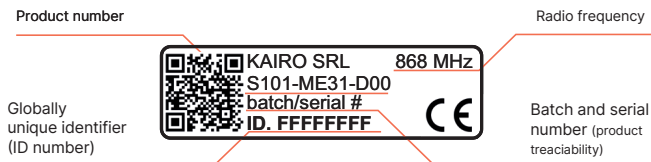


Figure 4: identification label of the sensor

The sensor works by the actuation of the mechanical lever or the integrated push-button. 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. MOUNTING THE SENSOR

Depending on the specific application, the sensor can be mounted directly onto an existing support or by using the mounting kit SPBS-S002-D00. This kit is particularly convenient in case of installation of the sensor on applicators of electric terminals and it is supplied with different spacers and screws that can be used in several combinations for adjusting the position of the sensor.

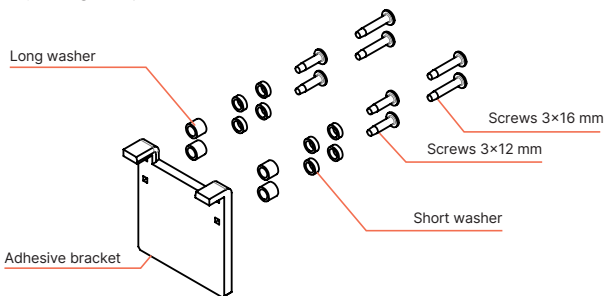


Figure 5: SPBS-S002-D00 mounting kit

WARNING: IMPORTANT INFORMATION



The bracket contained in the SPBS-S002-D00 mounting kit is equipped with a strong industrial grade adhesive for a fast, practical and reliable installation on any metallic or plastic surface. The adhesive has a multi-layer support that guarantees adhesion also on surfaces with limited irregularities. Please check the mounting surface to be clean. Possibly use alcohol or similar product to remove any trace of oil/grease and be sure the surface is completely dry before installing the bracket. Also, manually press the bracket on the mounting surface for few seconds to facilitate adhesion and wait at least 15 minutes before operating the sensor after bracket installation.

5.1 Radial adjustment

The distance of the sensor S101-ME31 from the mounting (adhesive) bracket can be modified by using different combinations of screws and washers supplied in the assembly kit. In case an additional adjustment is required, it is possible to shorten the mechanical lever of the sensor by forcing the breaking along the cutting lines.

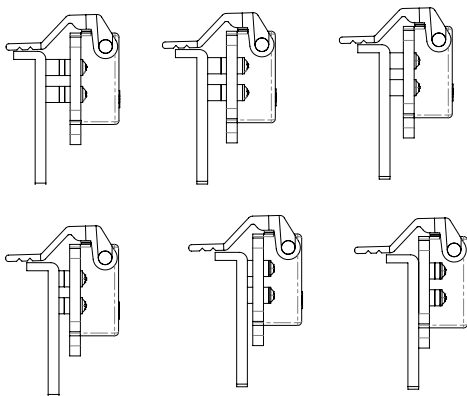


Figure 6: some mounting configuration for radial adjustment

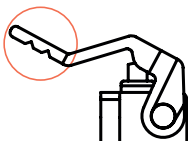


Figure 7: cutting lines of the lever for extra radial adjustment

5.2 Axial adjustment

Loose the mounting screws to adjust axially the height of the sensor respect to the mounting flange. Tight again the screws when the sensor has been properly positioned.

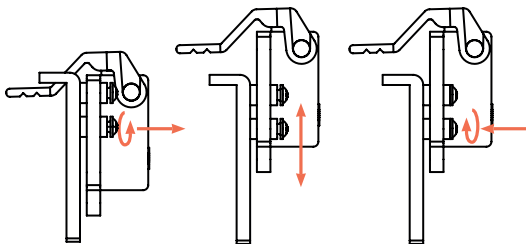


Figure 8: axial adjustment

5.3 Mounting on an applicator

The design of the S101-ME31 sensor is particularly convenient when used on commercial applicators for cable harnessing. The shape factor, the compact overall dimensions and the battery and cable free feature allow for an easy and direct installation of the sensor on the side of the majority of applicators available in the market. Applicators equipped with the S101-ME31 sensor can be mounted on both modern and highly automated machine, where limited installation space is available, and traditional crimping machines where a retrofit is necessary. Furthermore, the low actuation force of the S101-ME31 sensor is neglectable respect to the force required to crimp the electric contacts and this makes the sensor the ideal solution for monitoring the cycle time and scheduling a maintenance plan without affecting the standard production process. The S101-ME31 sensor has been designed to be directly actuated by the gratuated cylinder of the applicator.

For a proper functioning of the system, the sensor has to be mounted on the more flat surface on the side of the applicator and with a proper axial and radial distances required by both the space available inside the crimping machine and the correct actuation of the lever of the sensor. For a correct mounting of the sensor onto a specific applicator, please proceed as follows:

- identify the proper side surface of the applicator suitable for installation (the more flat one that typically hosts a marking label from the manufacturer of the applicator);
- pre-mount the sensor using the SPBS-S002 mounting kit with the proper set of washers and screws (refer also to Chapter 5) according to the characteristics of the specific applicator;
- prepare the mounting surface of the applicator and install the sensor by removing the protective layer from the adhesive of the bracket (refer also to Chapter 5).



Figure 9: example of sensor installation on a generic applicator from the market

6. INSTALLATION



Figure 10: 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 pressing and releasing the lever/push-button. Do not exceed the maximum allowed stroke of the sensor. 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.

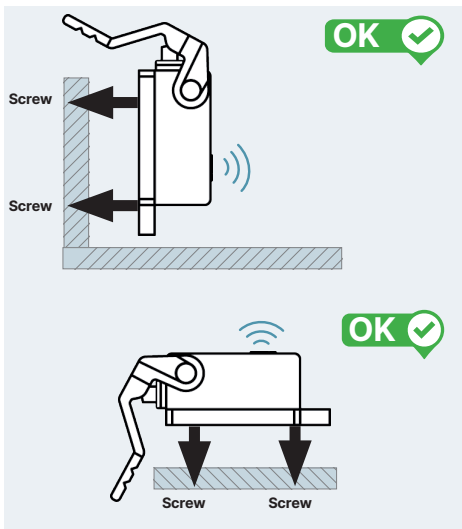


Figure 11: correct mounting

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

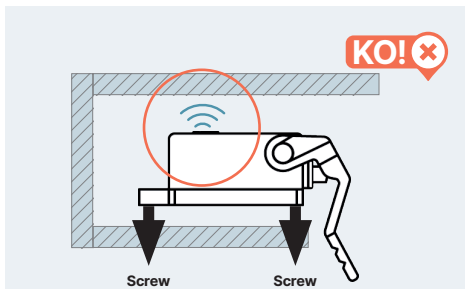


Figure 12: wrong mounting (radio shielding)

5. Identify a source of motion in the system that the sensor has to monitor. Check the characteristics of the motion source (actuation speed, force and stroke) to respect the limits of the sensor summarized in Table 1. Avoid a constant friction of moving parts with the sensor lever/push-button

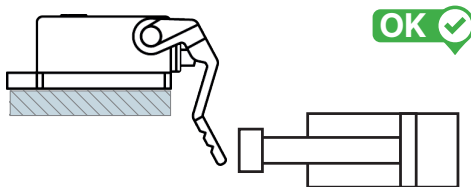


Figure 13: piston actuation example

6 Install the sensor to avoid transversal loads to the mechanical lever or the embedded push-button.

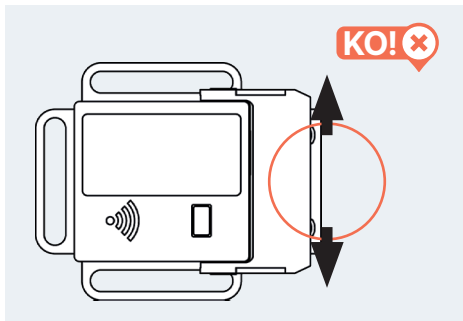


Figure 14: wrong external loads applied to the sensor lever/push-button

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

7. 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 sensor.

8. 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	<ul style="list-style-type: none"> • Uncorrect actuation stroke or force • Sensor and gateway unpaired • Damaged sensor or damaged actuator 	<ul style="list-style-type: none"> • Check the actuation stroke and force to respect the nominal values and limits • 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

<p>Failure to receive messages from peripheral sensors on the radio channel of the gateway</p>	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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
<p>Sensor data not accessible within the Cloud platform</p>	<ul style="list-style-type: none"> • The sensor has not been paired with any gateway • Either the sensor or the gateway have not been configured in the platform 	<ul style="list-style-type: none"> • 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.

9. ACCESSORIES



Mounting bracket set

Part. Number: SPBS-S002-D00

Num. Code: 10100002000

NOTES



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