SENSOCON WS and WM Series DataSling LoRaWAN Wireless Sensors User Manual

Contents

SENSOCON WS and WM Series DataSling LoRaWAN Wireless Sensors

Product Description / Overview

Product Overview

This section introduces the sensor, highlighting its key functions and applications. The sensor is part of a wireless end-to-end solution designed for monitoring environmental parameters such as temperature, humidity, differential pressure, and more. Its low power consumption and long-range communication capabilities make it ideal for many applications, including pharmaceuticals, HVAC, industrial settings, greenhouses, cleanrooms,s and others.

Key Features

Wireless Connectivity: Powered by two CR123A lithium batteries, Sensocon® DataSling™ Wireless Sensors leverage LoRaWAN® (Long Range Wide Area Network) technology for long-range, low-power communication with typical battery life of 5+ years, dependent upon settings.
Single or Multi-Parameter Monitoring: Oered as a single variable or multi-variable unit capable of measuring multiple environmental factors such as temperature, humidity, di?erential pressure, current/voltage input, and more in one package.
Easy Integration: Ideal for use with the Sensocon Sensograf™ cloud-based platform, DataSling WS & WM Series Sensors are also compatible with existing 3rd party LoRaWAN gateways and network servers, offering seamless integration into various monitoring systems.
Scalable Design: Suitable for small to large-scale deployments, with flexible configuration options to suit di?erent operational needs.
Data Accuracy and Reliability: High-precision sensors ensure accurate data collection for reliable monitoring and control of environments.

Applications

Pharmaceuticals: Ensure compliance with stringent environmental standards by monitoring and recording environmental parameters in production and storage areas.
HVAC Systems: Optimize energy usage by providing real-time data on system performance.
Industrial Monitoring: Track critical conditions in equipment, manufacturing, and storage, reducing downtime through predictive maintenance alerts.
Cleanrooms: Maintain controlled environments by monitoring and recording temperature, humidity, and many other variables to prevent contamination.

Greenhouses: Provide precise monitoring to optimize growing conditions, enhancing crop quality and yield while reducing water and energy consumption. User alerts ensure rapid response to environmental changes.

Benefits

Enhanced Operational Eefficiency: Helps reduce energy consumption and optimize environmental conditions.
Regulatory Compliance: Supports compliance with industry standards by providing accurate, real-time environmental data.
Reduced Initial Costs: Affordable as single devices, multi-variable units reduce the already low acquisition cost. Little to no wiring is required and the transmission automatically starts upon applying power, reducing installation time.
Ongoing Cost Savings: Minimizes maintenance costs and reduces downtime with predictive alerts and remote monitoring capabilities.
Scalable Solutions: Suitable for diverse applications, from small-scale setups to complex, multi-site deployments.

Specifications

Detailed Technical Specifications

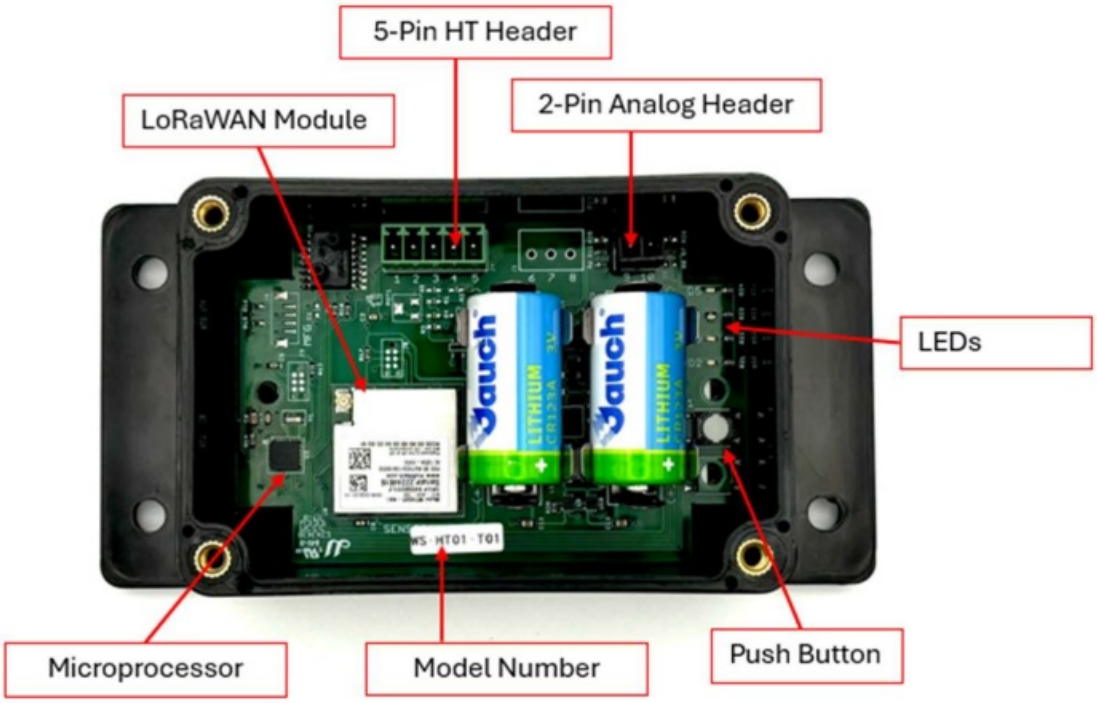
Weight	7 oz
Enclosure Rating	IP 65
Operating Temperature	-40° to 149°F (-40 to 65°C) -4° to 149°F (-20 to 65°C) differential pressure models
Antenna	External Pulse Larsen W1902 (short) Optional External Pulse Larsen W1063 (long)
Battery Life	5+ Years
Minimum Interval	10 minutes
Wireless Technology	LoRaWAN® Class A
Wireless Range	Up to 10 miles (clear line-of-sight)
Wireless Security	AES-128
Max Receive Sensitivity	-130dBm
Max Transmit Power	19dBm
Frequency Bands	US915
Battery Type	CR123A (x2) Lithium Manganese Dioxide (Li-MnO2)

Figure 1: General Specifications

Unit-level specifications can be found on their respective datasheets at **www.sensocon.com**

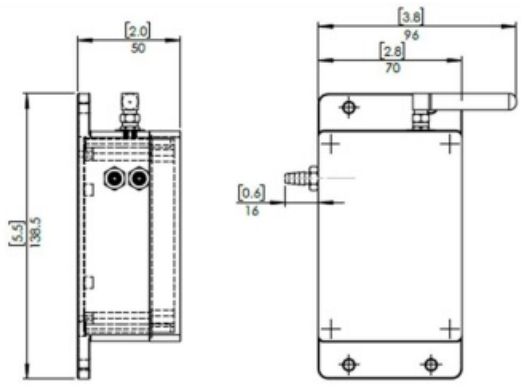
Physical Dimensions and Diagrams

Internal Components

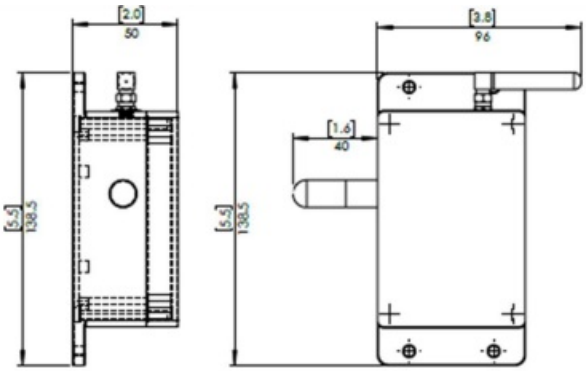


Picture 1: Internal Components

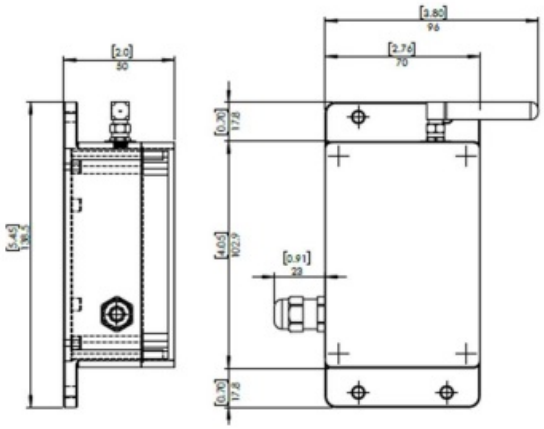
Dimensional Drawings



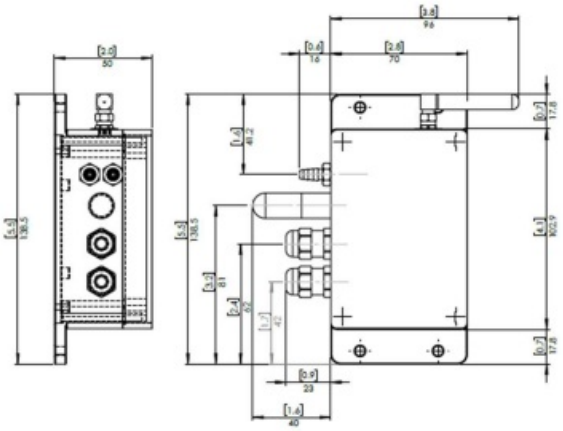
Drawing 1: Housing with Barbed Fittings



Drawing 2: Housing with Attached RH/Temp Probe



Drawing 3: Housing with Cable Gland



Drawing 4: Multivariable Housing with (2) Barbed Fittings, (1) RH/Temp Attached Probe, & (2) Cable Glands

Installation Roadmap

There are three common use cases that determine how best to install a private LoRaWAN network, depending upon where the hardware is purchased from and what platform is being used for device/data management.

1. Sensors and gateway hardware purchased from Sensocon, with a Sensograf subscription.
    1. The gateway and platform are pre-provisioned. No further programming or settings changes should be needed. Simply power gateway, then sensors, and check platform for successful JOIN.
2. Sensors and gateway purchased from Sensograf, with a 3rd party platform subscription
    1. The gateway will be provisioned to recognize the sensors. The platform provider will need to supply APPKEY and APP/JOIN EUI information. Payload information is listed on page 11 and 12 of this manual to assist with ensuring that the 3rd party platform recognizes the transmitted data.
3. Sensors and gateway purchased from 3rd party, with Sensograf 3rd party subscription
    1. The hardware provider will need to provide the DEV EUI from the hardware, as well as Gateway EUI information so that the platform can be set up.

End-to-End Installation – Sensocon Sensograf Platform Subscriber

The sequence shown below is the standard sequence of full end-to-end installation of the sensor. Additional steps within each sequence are provided in the next sections. NOTE: registering the device, whether sensor or gateway,

on Sensograf is NOT needed if purchased from Sensocon.

Figure 2: End-to-End Installation of Sensocon-Supplied Sensor, Gateway, & Sensograf Platform

End-to End Installation – 3rd Party Platform Subscriber
To use a 3rd party platform with Sensocon wireless sensors, you will need the App EUI and App Key from the platform provider, in addition to gateway-specific settings. Please refer to gateway and platform manuals for detailed instructions.

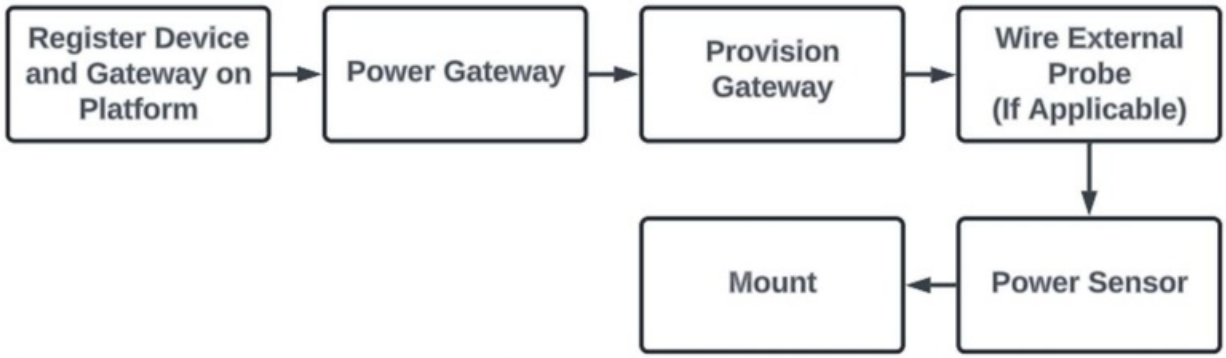


Figure 3: End-to-End Installation of Sensocon Sensor with 3rd Party Gateway & Platform

Installation

Unpacking and Inspection
Before installing the sensor, carefully unpack and inspect the device and all included components. Ensure that no parts were damaged during shipping.

Included Components:

- LoRaWAN Sensor
- 2x CR123A Battery (pre-installed with insulated pull tabs)
- Quick Start Guide
- Enclosure Mounting Screws (#8 x 1” self-tapping)

Registering Device, Connecting to Gateway & Sensograf Platform
The addition of a Sensocon DataSling WS or WM sensor to the Sensograf device management platform is designed to be simple and fast. Sensocon-supplied gateways are pre-provisioned to begin communication to the platform with little to no further intervention. This should enable instant communication upon sensor power-up. However, it may be necessary at times to ensure that the following fields under “Add Device” on the Sensograf platform are populated correctly:

- DEV EUI: A 16-digit identifier that serves as the address of the device. Pre-populated on platform and located on device product label.
- APP EUI: A 16-digit identifier that tells the network where to route data. Pre-populated on platform and printed on individual label inside sensor box.
- APP KEY: A 32-digit security key for encryption and authentication. Pre-populated on platform and printed on

individual label inside sensor box.

If any of these items are inaccessible, please call or email Sensocon customer support via email at info@sensocon.com or telephone at (863)248-2800.

Step-By-Step Process for Registering & Confirming Device on Sensograf Platform
For devices not pre-provisioned by Sensocon.

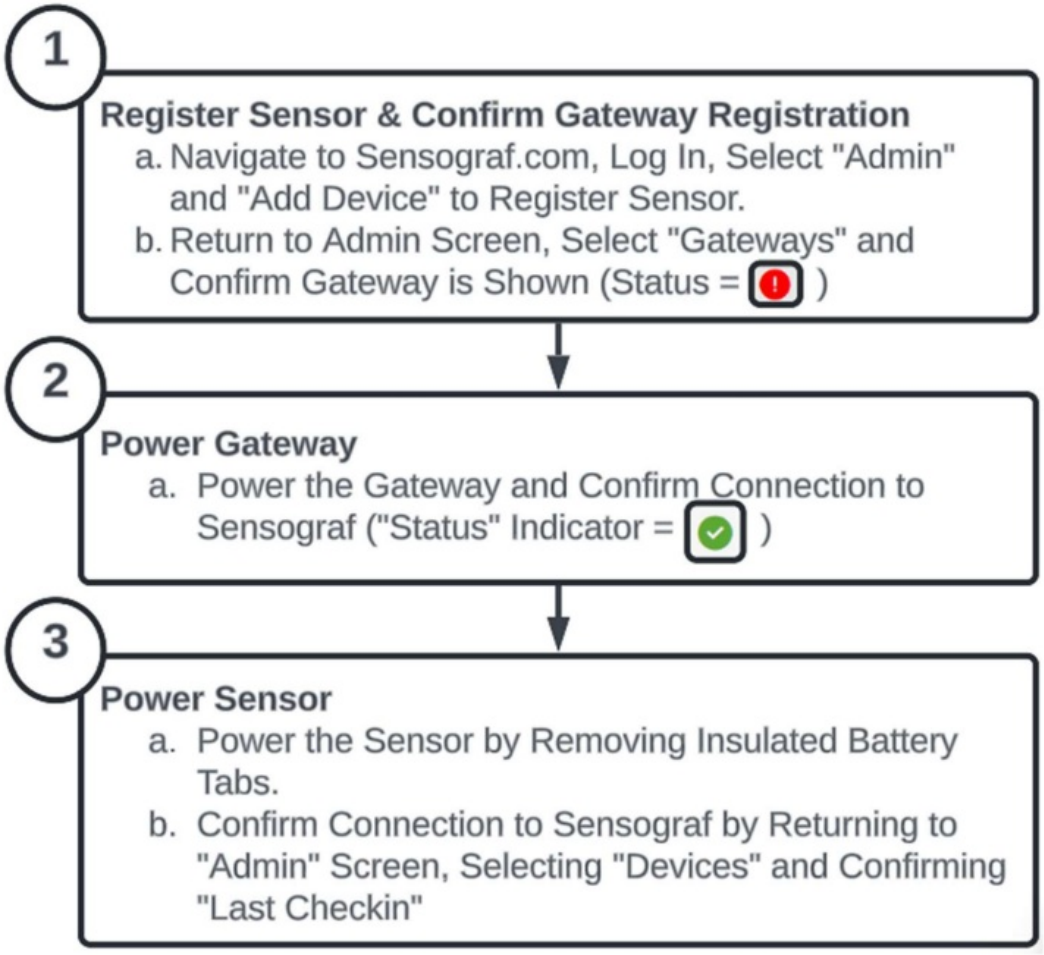


Figure 4: Step-by-Step Process to Install and Register Sensocon-Supplied Sensor, Gateway, and Platform

Registering Device, Connecting to Gateway & 3rd Party Platforms
This section is provided as a general guide. Please refer to the gateway user's manual and platform provider guide for detailed instructions. Both the gateway and device will need to be registered on the 3rd party platform with the proper information for routing traffic from the sensor to the application.

Step-By-Step Process for Registering & Confirming Device on 3rd Party Platform

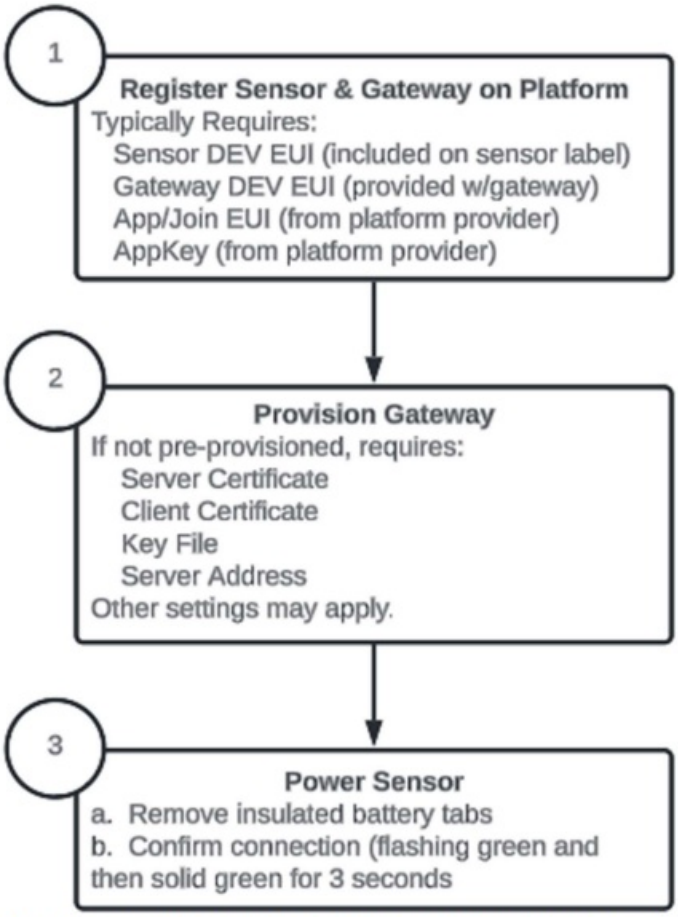


Figure 5: Step-by-Step Process to Install and Register Sensocon-Supplied Sensor with 3rd Party Gateway, & Platform

Payload Configuration (3rd Party Platforms Only)
Sensocon DataSling Sensors are designed to work well with third-party platforms that have custom payload decoders. Information about how the sensor data is formatted, including encoding details, is included below to streamline setup. This will ensure the platform can interpret the data correctly.

Figure 8: Packet Format for 3rd Party Platforms

STX = Start of Text = "aa"

Within each measurement:
Byte [0] = type (see "Measurement Types" below)
Byte [1-4] = data IEEE 724 floating

Code	Attribute	Base Unit
0	Pressure	Inches of WC
1	Humidity Temperature	F
2	Humidity	%
3	Battery Voltage	V
4	Contact	0=No Contact, 1=Contact
5	Velocity	
6	Voltage	V
7	Current	mA
8	Temperature	F
9	Altitude	
10	Latitude	
11	Light	
12	Longitude	
13	Resistance	
14	Vibration	
15	X Position	
16	Y Position	
17	Z Position	
255	Empty	

Figure 9: Measurement Types

Troubleshooting
If the sensor does not respond to configuration changes, ensure it is properly connected. Review the configuration settings for accuracy and consult the troubleshooting guide for further assistance.

Wiring External Inputs

Connect external probes to the pluggable connector provided on the PCB board. The connector needs to be removed
from the board for wiring and re-installed when wiring is complete.

- Thermistor and Contact inputs (Sensocon supplied): wiring is not polarity sensitive.
- Industrial Input Sensors (e.g. 4-20mA, 0-10V): see below

Picture 2: Two-Position Pluggable Connector Wiring for Polarity Sensitive External Sensors

Sensor Power-up Procedure, LED Indicators & Button
To activate the sensor, remove the battery insulation tabs (shown below). The sensor will power up automatically

once the batteries are in contact with the battery holder.
Once powered and initialization is complete, the JOIN procedure will commence. The internal LEDs will indicate progress towards joining LoRaWAN Server Network (LNS) via the gateway.

Picture 3: Battery Insulating Pull Tabs. Remove to Apply Power.

LED FUNCTIONS

FUNCTION	LED	DESCRIPTION
Initializing	●	Solid Yellow LED
Network JOIN	✳	Flashing Green LED
JOIN Success	●	Solid Green LED (3 Seconds)
Unsuccessful JOIN	●	Solid Red LED (3 Seconds)
Transmitting Data	✳	Flashing Green LED

Figure 6: LED Functions

If JOIN is unsuccessful, ensure gateway is powered, within range, with the correct credentials. The sensor will continue JOIN attempts until successful. See the troubleshooting guide on page 18 in this manual for help.

BUTTON FUNCTIONS

BUTTON FUNCTION	DESCRIPTION
Manual Transmit	Short Press
Test/Manufacture Mode	Short Press During Initialization

Figure 7: Button Functions

Mounting and Physical Setup

Location

Select an appropriate location for installation, considering the following:

- Height and Position: Install the sensor at a height of at least 1.5 meters above ground level. Transmission will often improve by increasing elevation where possible.

- Obstacles: Minimize obstacles such as walls, metal objects, and concrete that could impede wireless communication. Position the sensor near an opening (e.g., window) when possible to enhance signal strength.
- Distance from Interference Sources: Keep the sensor a minimum of 1-2 feet away from other electronic devices that might cause interference.

Mounting
Depending on the sensor model, different mounting options are available:

- **Wall Mounting**
  - Use the provided screws or ones more appropriate for your installation to secure the sensor onto a flat surface, ensuring the sensor is firmly attached.
- **Pipe or Mast Mounting:**
  - Use clamp fasteners (not included) to secure the sensor to a pipe or mast. Ensure the sensor is oriented correctly and securely attached to prevent movement.

Testing and Verification

After installation, confirm that the sensor is communicating correctly with the network. Use the device's status indicators or the network platform to verify.

Safety and Maintenance

- Regularly check the sensor for signs of wear or damage, especially if installed in harsh environments.
- Replace batteries as needed as indicated in Sensograf (or 3rd party platform), or according to a planned maintenance schedule that incorporates battery life expectations based on interval selection.
- Clean the sensor gently with a dry cloth. Avoid using water or cleaning agents that could damage the device.

Note: Refer to the troubleshooting section on page 18 if any issues arise during installation or operation.

Configuration

Initial Setup and Configuration
Configuring your LoRaWAN sensor correctly is essential for ensuring optimal performance and reliable data transmission. The sensor uses Over-the-Air (OTA) methodology. OTA configuration allows the sensor settings to be adjusted remotely via the Device Management Platform. Configuration of the sensor requires that it be registered on the platform and communicating properly.

- Configuration Commands: Access the platform and navigate to the sensor's settings. Use the available configuration commands to adjust parameters such as data reporting interval, alert settings, and sensor scaling.
- Monitor and Confirm: After sending the configuration commands, monitor and/or test the changed parameters to ensure that the sensor begins operating with the new settings.

Configuration Options
Below are key configuration parameters that can be adjusted from the device platform during setup:

- Reporting Interval: Defines how often the sensor transmits data. This can be set to intervals ranging from minutes to hours, depending on the application.

- Alert Thresholds: Set alerts as upper and/or lower limits for parameters like temperature, humidity, or pressure to trigger alerts via email and/or text when these limits are breached.
- Battery Status Monitoring: Enable battery status monitoring to receive alerts when the battery voltage drops below a specified level.
- Lost Communications: Configure the system to alert designated users when a defined number of check-ins are missed.

Battery Information

Battery Specifications

Specification	Details
Type	Lithium Manganese Dioxide (Li-MnO2)
Nominal Voltage	3.0 V
Cutoff Voltage	2.0V
Capacity	1600 mAh each
Max Continuous Discharge	1500 mA
Operating Temperature	-40°C to 70°C (-40°F to 158°F)
Shelf Life	Up to 10 years
Dimensions	Diameter: 17 mm (0.67 in), Height: 34.5 mm (1.36 in)
Weight	Approx. 16.5g
Self-Discharge Rate	Less than 1% per year
Chemistry	Non-rechargeable Lithium
Protection	No built-in protection circuit

Figure 10: Battery Specifications

Key Battery Features

- High Energy Density: Provides a longer run time compared to other batteries of similar size.
- Wide Operating Temperature Range: Suitable for use in extreme temperatures, making it ideal for industrial and outdoor applications.
- Low Self-Discharge Rate: Maintains charge during long-term storage, making it reliable for devices that are used infrequently.
- Long Shelf Life: Up to 10 years, ensuring reliable performance when stored.

These specifications are typical of CR123A lithium batteries, though exact values may vary slightly depending on the manufacturer.

Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Sensor not connecting to network	Incorrect network settings	Verify the gateway network configuration settings.
	Weak signal	Ensure the sensor is within range of the gateway by tes ting closer to gateway. Verify connection at close range, then move to final installation location.
		Check for any obstacles blocking the signal and repositi on the sensor if necessary and possible.
		Check for any obstacles blocking the signal and repositi on the sensor if necessary and possible.
Data not updating on platform	Configuration issues or com munication errors	Check the sensor's reporting interval settings.
		Restart the sensor by disconnecting batteries for 10 sec onds to clear any misconfigurations.
Short battery life	High frequency of data trans mission	Reduce the reporting frequency or adjust alert/notificati on thresholds to balance transmission frequency with b attery life.
	Extreme environmental cond itions	Extreme cold or heat can significantly impact battery pe rformance, move to cooler/warmer location if practical.
Incorrect temperature or humidity readings	Environmental interference	Make sure the sensor is installed in a location free from direct sunlight, drafts, or moisture that could affect readi ngs.
	Condensation on humidity sensor	Remove from condensing environment and allow senso r to dry.
Sensor not responding to commands	Power problems	Check the power source and replace the batteries if necessary.
Missed check-ins	Signal interference caused b y obstacles such as metal objects or thick walls	Relocate the sensor to an area with fewer obstructions. Elevate the sensor to improve line-of-sight with the gate way.
LED indicators do not turn on	Power supply issues or incor rect installation	Check the battery connections and ensure the sensor is properly installed. Replace batteries if necessary.

Figure 11: Troubleshooting Chart

Customer Support

Contact Information for Technical Support

At Sensocon, Inc., we are committed to providing exceptional support to ensure that your LoRaWAN sensor operates efficiently and meets your needs. If you encounter any issues or require assistance with your sensor, please do not hesitate to reach out to our customer support team.

Contact Information:

Address:
Sensocon, Inc.
3602 DMG Dr Lakeland, FL 33811 USA

Phone: 1-**863-248-2800**
Email: **support@sensocon.com**

Support Hours:
Our customer support team is available Monday through Friday, 8:00 AM to 5:00 PM EST.

Compliance and Safety Precautions

Compliance Statement
This device complies with all applicable national and international standards, including:

Federal Communications Commission (FCC): This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

FCC Radiation Exposure Statement: This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Industry Canada Compliance: This device complies with Industry Canada's license-exempt RSS standards. Operation is subject to the following conditions:

- This device may not cause interference.
- This device must accept any interference, including interference that may cause undesired operation of the device.

IC Radiation Exposure Statement: This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment and should be installed and operated with a minimum distance of 20 cm between the radiator and your body.
RoHS Compliance: The product complies with the Restriction of Hazardous Substances Directive, ensuring it contains no more than the allowable levels of lead, mercury, cadmium, hexavalent chromium, and other hazardous materials.

Safety Precautions

Installation and Use

Install the device with a minimum distance of 20 cm from all persons. For best results, ensure the device is not co-located with any other transmitter.

Battery Safety
The device contains lithium batteries. Do not recharge, disassemble, heat above 100°C (212°F), or incinerate. Replace only with approved battery types as specified in this manual. Ensure proper handling and disposal in accordance with local regulations.

Handling and Maintenance:
Avoid exposure to extreme temperatures, water, or moisture beyond the rated enclosure protection level (IP65). Handle the device with care to avoid damage. Improper handling may void warranty and compliance status.

Regulatory Warnings:
Changes or modifications not expressly approved by the responsible party for compliance could void the user's authority to operate the equipment. Ensure that all local and national regulations are adhered to when deploying and operating this device.

Legal Notices

Disclaimers

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1. the product has not been subjected to abuse, neglect, accident, incorrect wiring not our own, improper installation or servicing, or use in violation of labels or instructions provided by SENSOCON;
2. the product has not been repaired or altered by anyone except SENSOCON;
3. the maximum ratings label and serial number or date code have not been removed, defaced, or otherwise changed;
4. examination discloses, in the judgment of SENSOCON, the defect in materials or workmanship developed under normal installation, use and service; and
5. SENSOCON is notified in advance of and the product is returned to SENSOCON transportation prepaid before expiration of the warranty period.

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Revision History

Document Version History

Version	Date	Change(s)
1.0	9/23/24	Initial Version

Figure 12: Revision History Chart

Figure 12: Revision History Chart

Documents / Resources

	SENSOCON WS and WM Series DataSling LoRaWAN Wireless Sensors [pdf] User Manual WS and WM Series DataSling LoRaWAN Wireless Sensors, DataSling LoRaWAN Wireless Sensors, LoRaWAN Wireless Sensors, Wireless Sensors

References

- Sensocon | Trusted Differential Pressure Gauges and Airflow Measurement Solutions | Sensocon | Trusted Measurement Expertise
- User Manual